ACKNOWLEDGEMENT

The world is a better place thanks to people who want to develop and lead others. What makes it even better are people who share the gift of their time to mentor future leaders. Thank you to everyone who strives to grow and help others grow. It is the professional version of The Lion King song, “Circle of Life.”

To all the individuals I have had the opportunity to lead, be led by, or watch their leadership from afar, I want to say thank you for being the inspiration and foundation for Crack Every Test.

Without the experiences and support from my peers and team at Crack Every Test, this book would not exist. You have given me the opportunity to be a part of a group of individuals—to be a leader of great future professionals is a blessed place to be. Thank you to Riya D., Priya V., Rohan C., Shweta M., Sudhanshu M., Pritesh P., Sejal C., Ashitosh K., Tejas D., Bhavika B., Shreya S., Prashant P., Rohan P., Harsh K., Krupali S.,

Having an idea, finding the right references and turning it into a book is much harder than it sounds. The experience is both internally challenging and rewarding. I especially want to thank the various sources all over the internet and various institutes that we drew the inspiration from and that helped make this happen.

I also thank, heartily my family and mentors who have been instrumental in helping us through this journey for making Crack Every Test reach to the point where it has, thereby enabling us to help and influence life of thousands of students for the betterment of their futures.

And lastly but most importantly, I thank you, the students who are using these books to prepare for putting your trust in us. I assure, we at Crack Every Test will do everything in our power to give you the best guidance and will work hard to build your future.

- Jigar Parekh
Founder, Crack Every Test
JBIMS,22

QA CALC | CONTENTS

SPEED MATHS

TABLES 1 – 25

X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225
10	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
11	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220	231	242	253	264	275
12	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300
13	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325
14	14	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280	294	308	322	336	350
15	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360	375
16	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336	352	368	384	400
17	17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340	357	374	391	408	425
18	18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414	432	450
19	19	38	57	76	95	114	133	152	171	190	209	228	247	266	285	304	323	342	361	380	399	418	437	456	475
20	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500
21	21	42	63	84	105	126	147	168	189	210	231	252	273	294	315	336	357	378	399	420	441	462	483	504	525
22	22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462	484	506	528	550
23	23	46	69	92	115	138	161	184	207	230	253	276	299	322	345	368	391	414	437	460	483	506	529	552	575
24	24	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480	504	528	552	576	600
25	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625

PRIME NUMBERS 1 – 100

2	11	23	31	41	53	61	71	83	97
3	13	29	37	43	59	67	73	89	
5	17			47			79		
7	19	There are 25 prime numbers between 1 to 100.							

SQUARES 1 – 50

No.	Square	No.	Square	No.	Square	No.	Square	No.	Square
1^2	1	11^2	121	21^2	441	31^2	961	41^2	1681
2^2	4	12^2	144	22^2	484	32^2	1024	42^2	1764
3^2	9	13^2	169	23^2	529	33^2	1089	43^2	1849
4^2	16	14^2	196	24^2	576	34^2	1156	44^2	1936
5^2	25	15^2	225	25^2	625	35^2	1225	45^2	2025
6^2	36	16^2	256	26^2	676	36^2	1296	46^2	2116
7^2	49	17^2	289	27^2	729	37^2	1369	47^2	2209
8^2	64	18^2	324	28^2	784	38^2	1444	48^2	2304
9^2	81	19^2	361	29^2	841	39^2	1521	49^2	2401
10^2	100	20^2	400	30^2	900	40^2	1600	50^2	2500

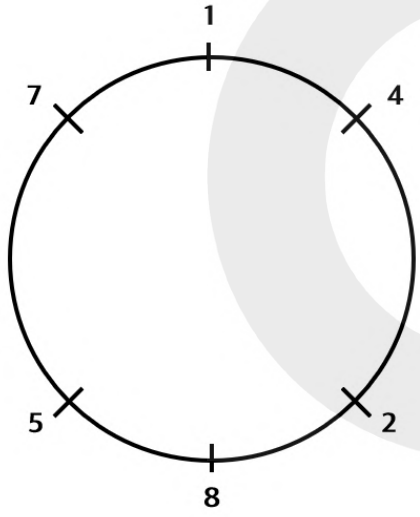
CUBES 1 – 30

No.	Cube	No.	Cube	No.	Cube
1^3	1	11^3	1331	21^3	9261
2^3	8	12^3	1728	22^3	10648
3^3	27	13^3	2197	23^3	12167
4^3	64	14^3	2744	24^3	13824
5^3	125	15^3	3375	25^3	15625
6^3	216	16^3	4096	26^3	17576
7^3	343	17^3	4913	27^3	19683
8^3	512	18^3	5832	28^3	21952
9^3	729	19^3	6859	29^3	24389
10^3	1000	20^3	8000	30^3	27000

FRACTIONS – DECIMALS – PERCENTAGES

Fraction	Decimal	Percentage
$\frac{1}{1}$	1	100%
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	0.33	33.33%
$\frac{1}{4}$	0.25	25%
$\frac{1}{5}$	0.20	20%
$\frac{1}{6}$	0.167	16.67%

Circle of 7



Fraction	Decimal	Percentage
$\frac{1}{7}$	0.142857	14.2857%
$\frac{2}{7}$	0.285714	28.5714%
$\frac{3}{7}$	0.428571	42.8571%
$\frac{4}{7}$	0.571428	57.1428%
$\frac{5}{7}$	0.714285	71.4285%
$\frac{6}{7}$	0.857142	85.7142%

Fraction	Decimal	Percentage	Fraction	Decimal	Percentage
$\frac{1}{8}$	0.125	12.5%	$\frac{1}{9}$	0.11	11.11%
$\frac{1}{10}$	0.1	10%	$\frac{1}{11}$	0.0909	9.09%
$\frac{1}{12}$	0.083	8.33%	$\frac{1}{13}$	0.0769	7.69%
$\frac{1}{14}$	0.0714	7.14%	$\frac{1}{15}$	0.066	6.66%
$\frac{1}{16}$	0.0625	6.25%	$\frac{1}{17}$	0.0588	5.88%

Fraction	Decimal	Percentage	Fraction	Decimal	Percentage
$\frac{1}{18}$	0.0555	5.55%	$\frac{1}{19}$	0.0526	5.26%
$\frac{1}{20}$	0.05	5%	$\frac{1}{21}$	0.0476	4.76%
$\frac{1}{22}$	0.04545	4.54%	$\frac{1}{23}$	0.04347	4.34%
$\frac{1}{24}$	0.04166	4.167%	$\frac{1}{25}$	0.04	4%

FACTORIAL 1-10	
No.	Factorial
0!	1
1!	1
2!	2
3!	6
4!	24
5!	120
6!	720
7!	5040
8!	40320
9!	362880
10!	3628800

POWER OF 2	
2^1	2
2^2	4
2^3	8
2^4	16
2^5	32
2^6	64
2^7	128
2^8	256
2^9	512
2^{10}	1024
2^{11}	2048
2^{12}	4096

POWER OF 3	
3^1	3
3^2	9
3^3	27
3^4	81
3^5	243
3^6	729
3^7	2187
3^8	6561

POWER OF 5	
5^1	5
5^2	25
5^3	125
5^4	625
5^5	3125
5^6	15625

LCM & HCF

Introduction

Highest Common Factor is also known as Greatest Common divisor i.e., the largest positive integer that divides more than one integer is called greatest common divisor.

Least Common Multiple is also known as Smallest Common Multiple i.e., the smallest positive integer that is divisible by more than one integer.

Definition & Formula:

LCM: Least Common Multiple is a number which is multiple of two or more than two numbers

The **least common multiple** (**LCM**) of 2 numbers is the smallest number that they both divide evenly into.

HCF: The H.C.F of two or more than two numbers is the greatest number which divides each of them without any remainder.

- Product of two numbers = Product of their H.C.F. and L.C.M
- Co-primes: Two numbers are said to be co-primes if their H.C.F. is 1
- HCM and LCM of fraction

a) LCM = L.C.M of numerators / H.C.F of denominators

b) HCF = HCF of Numerators / L.C.M of Denominators

- The H.C.F of two or more numbers is smaller than or equal to the smallest number of given numbers.
- The smallest number which is exactly divisible by a, b and c is L.C.M of a, b, c.
- The L.C.M of two or more numbers is greater than or equal to the greatest number of given numbers.
- The smallest number which when divided by a, b and c leaves a remainder R in each case. **Required number = (L.C.M of a, b, c) + R**
- The greatest number which divides a, b and c to leave the remainder R is **H.C.F of (a – R)**, **(b – R)** and **(c – R).**
- The greatest number which divide x, y, z to leave remainders a, b, c is **H.C.F of (x – a), (y – b)** and **(z – c)**
- The smallest number which when divided by x, y and z leaves remainder of a, b, c (x – a), (y – b), (z – c) are multiples of M

  Required number = (L.C.M of x, y and z) – M

Solved Examples

1. Find HCF of 12 and 16.

   A. 5 B. 4

   C. 12 D. 16

   Solution

   Find the difference between 12 and 16. The difference is 4. Now, check whether the numbers are divisible by the difference. 12 is divisible by 4 and 16 is divisible by 4. Hence, the HCF is 4.

2. Find HCF of 18 and 22.

   A. 2 B. 4

   C. 18 D. 36

   Solution

   Find the difference between 18 and 22. The difference is 4. Now, check whether the numbers are divisible by the difference. Both 18 and 22 are not divisible by 4. So take the factors of the difference. The factors of 4 are 2*2*1. Now, check whether the numbers are divisible by the factors. 18 and 22 are divisible by factor 2.

   Hence, the HCF is 2.

   Note: If there are more than two numbers, take the least difference.

   How to find LCM easily:

3. Find LCM of 2,4,8,16.

   A. 16 B. 18

   C. 12 D. 2

   Solution

   Factorize of above number.

   2 =2

   8 = 2^3

   16 = 2^4

   Choose the largest number. In this example, the largest number is 16. Check whether 16 is divisible by all other remaining numbers. 16 is divisible by 2, 4, 8. Hence, the LCM is 16.

4. Find the LCM of 2,3,7,21.

   A. 21 B. 44

   C. 36 D. 42

   Solution

   Choose the largest number. The largest number is 21. Check whether 21 is divisible by all other remaining numbers. 21 is divisible by 3 and 7 but not by 2. So multiply 21 and 2. The result is 42. Now, check whether 42 is divisible by 2, 3, 7. Yes, 42 is divisible. Hence, the LCM is 42.

Type 1: to find the greatest or smallest number

5. Find the greatest 5 digit number divisible by 5, 15, 20, and 25

   A. 99900 B. 99000

   C. 99990 D. 90990

   Solution

   LCM of 5, 15, 20, and 25 is 300

   The greatest 5 digit number is 99999

   99999/300 = 99

   Therefore, required number 99999 – 99 = 99900

Type 2: Find the numbers, sum of numbers, product of numbers if

- **Their ratio and H.C.F. are given.**
- **Product of H.C.F. and L.C.M are given.**

6. The product of two numbers is 3888. If the H.C.F. of these numbers is 36, then the greater number is:

   A. 110 B. 108

   C. 36 D. 120

   Solution

   Let the two numbers be 36x and 36y

   Now, 36x * 36y = 3888

   xy = 3888/36×36

   xy = 3

   Now, co-primes with product 3 are (1, 3).

   Therefore, the required numbers are 36 * 1 = 36

   36 * 3 = 108

   Therefore the greatest number is 108

Type 3: Tips , Tricks and Shortcuts when sum of two numbers is given, LCM and HCF is given to find the sum of reciprocals.

7. Sum of two numbers is 60 and the H.C.F. and L.C.M. of these numbers are 5 and 100 respectively, then the sum of the reciprocals of the numbers is equals to:

   A. $\frac{3}{25}$ B. $\frac{11}{220}$

   C. $\frac{21}{120}$ D. $\frac{11}{320}$

   Solution

   Let the numbers be a and b.

   Now , given a+b = 60

   a × b = HCF × LCM = 5 × 100

   = 500

   $\frac{1}{a}+\frac{1}{b}=\frac{a+b}{a\times b}$

   $\frac{1}{a}+\frac{1}{b}=\frac{60}{500}=\frac{3}{25}$

Type 4: How to Solve HCF, LCM Problems related to finding the biggest container to measure quantities

8. Suppose there are three different containers contain different quantities of a mixture of Sugar and rice whose measurements are 403 grams, 434 grams and 465 grams. What biggest measure must be there to measure all the different quantities exactly?

A. 31 grams B. 21 grams
C. 41 grams D. 30 litres

Solution

Prime factorization of 403, 434 and 465 is
403=13×31
434=2×7×31
465=3×5×31
H.C.F of 403, 434 and 465=31

Type 5: Tips , tricks and Shortcuts of HCF, LCM Problems related to Bell ring.

9. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together ?

A. 8 B. 16
C. 9 D. 10

Solution

L.C.M. of 2, 4, 6, 8, 10, 12 is 120.
Hence, the bells will toll together after every 120 seconds(2 minutes).
Therefore, in 30 minutes ,number of times bells toll together is 30/2+1 = 16

Type 6: Tips , tricks and Shortcuts of HCF, LCM Problems related to Circle Based Runner Problem.

10. Two people P and Q start running towards a circular track of length 400 m in opposite directions with initial speeds of 10 m/s and 40 m/s respectively. Whenever they meet, P's speed doubles and Q's speed halves. After what time from the start will they meet for the third time?

A. 30 seconds B. 26 seconds
C. 10 seconds D. 20 seconds

Solution:

Time taken to meet for the 1st time= 400/40+10=8 sec.
Now P's speed = 20m/s and Q's speed=20 m/s.
Time taken to meet for the 2nd time= 400/20+20 = 10 sec.
Now P's speed =40 m/sec and Q's speed = 10 m/sec.
Time taken to meet for the 3rd time= 400/10+40=8 sec.
Therefore, Total time= (8+10+8) = 26 seconds.

11. The greatest possible length which can be used to measure exactly the lengths 5 m, 4 m, 12 m 55 cm is

A. 2 B. 10
C. 25 D. 5

Solution

H.C.F. of (500 cm, 400 cm, 1255 cm) = 5 cm
The factors of 400 are: 1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 200, 400.
The factors of 500 are: 1, 2, 4, 5, 10, 20, 25, 50, 100, 125, 250, 500.
The factors of 1255 are: 1, 5, 251, 1255.
Then the highest common factor is 5

12. The H.C.F. and L.C.M. of two numbers are 10 and 5040 respectively. If one of the numbers is 175, find the other number?

A. 288 B. 300
C. 308 D. 280

Solution

We know that, Product of two numbers = H.C.F x L.C.M
175 x a = 10 x 5040
Therefore, a
$= 10 \times \frac{5040}{175} = \frac{50400}{175} = 288$
So, the other number = 288

13. Find the greatest number which on dividing 1484 and 2045 leaves remainders 4 and 5 respectively?

A. 20 B. 30
C. 10 D. 40

Solution

Required number = H.C.F. of (1484 – 4) and (2045 – 5)
H.C.F. of 1480 and 2040
1480 = 2 x 2 x 2 × 5 × 37
2040 = 2 x 2 x 2 × 3 × 5 × 17
H.C.F 1480 & 2040 = 2 x 2 x 2 x 5 = 40

14. Three numbers are in the ratio of 4: 3: 6 and their L.C.M. are 3600. Find their H.C.F:

A. 20 B. 30
C. 25 D. 50

Solution

Let the numbers be 4x, 3x and 6x
Then, their L.C.M. = (4x × 3x × 6x) = 72x
So, 72x = 3600 or x = 50
Therefore, numbers are (4×50), (3×50) and (6×50) = 200, 150, 300
The factors of 150 are: 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150
The factors of 300 are: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 25, 30, 50, 60, 100, 150, 300

The factors of 200 are: 1, 2, 4, 5, 8, 10, 20, 25, 40, 50, 100, 200

Then the highest common factor is 50.

Hence, required H.C.F. = 50

15. Find the HCF of 2/11, 4/17, 6/5

A. $\frac{1}{935}$ B. $\frac{2}{935}$

C. $\frac{2}{93}$ D. $\frac{2}{35}$

Solution

We know that

$$\text{HCF} = \frac{\text{LCM of Denominators}}{\text{HCF of Numerator}}$$

$$\text{HCF} = \frac{\text{LCM}(2,4,6)}{\text{HCF}(11,17,5)}$$

$$\text{HCF} = \frac{2}{935}$$

16. Suppose there are three different containers contain different quantities of a mixture of milk and water whose measurements are 403 litres, 434 litres and 465 litres What biggest measure must be here to measure all the different quantities exactly?

A. 31 litres B. 21 litres

C. 41 litres D. 30 litres

Solution

Prime factorization of 403,434 and 465 is

403 = 13 × 31

434 = 2 × 7 × 31

465 = 3 × 5 × 31

H.C.F of 403, 434 and 465=31

Exercise –

1. Find HCF of $\frac{156}{36}, \frac{128}{44}, \frac{33}{176}$.
   A. $\frac{1}{528}$ B. $\frac{1}{216}$
   C. $\frac{1}{135}$ D. $\frac{1}{550}$
   E. None of these
2. Three numbers are in ratio 5:7:9 and their LCM is 5670. What is their HCF?
   A. 26 B. 24
   C. 32 D. 18
   E. None of these
3. Three numbers are in ratio 5:12:13 and their LCM is 10920. What is their HCF?
   A. 26 B. 14
   C. 22 D. 18
   E. None of these
4. Three numbers are in ratio 4:5:8 and their HCF is 33. What is their LCM?
   A. 1280 B. 1320
   C. 3200 D. 2400
   E. None of these
5. Three numbers are in ratio 7:5:4 and their LCM is 4060. What is the difference between 1st and last number?
   A. 87 B. 90
   C. 93 D. 84
   E. None of these
6. Three numbers are in ratio 8:15:16 and their LCM is 3600. What is the sum of 1st and last number?
   A. 240 B. 360
   C. 120 D. 150
   E. 180
7. What is the LCM and HCF of 5/16, 7/12, 1/8?
   A. $\frac{26}{25}$ B. $\frac{35}{2}, \frac{1}{50}$
   C. $\frac{35}{4}, \frac{1}{48}$ D. $\frac{35}{4}, \frac{1}{25}$
   E. None of these
8. The least number which when divided by 6, 8, 12, 15 leaves the same remainder 5 in each case, is:
   A. 115 B. 145
   C. 165 D. 125
   E. None of these
9. Suppose you have a piece of land that measures 45 feet by 90 feet, and you want to build a fence around the perimeter. You want to use the longest possible length of fencing without wasting any fencing.
   A. 90 B. 50
   C. 60 D. 45
   E. None of these
10. A group of students needs to be divided into teams for a school project. The number of students in the group is 21, and the teacher wants each team to have the same number of students. What is the smallest possible number of teams?
    A. 7 B. 3
    C. 1 D. 21
    E. None of these
11. A factory produces two products A and B. Product A is produced every 30 days, and product B is produced every 45 days. If the factory produces both products on the same day, after how many days will it produce both products on the same day again?
    A. 80 B. 60
    C. 50 D. 90
    E. None of these
12. The traffic lights at three different road crossings change after 30 seconds, 45 A. seconds and 60 seconds respectively. If they all change simultaneously at 8:15 AM, then at what time will they again change simultaneously?
    A. 8:18 am B. 8:16 am
    C. 8:19 am D. 8:20 am
    E. None of these
13. Find the greatest number of five digits which when divided by 3, 5, 8, 12 have 4 as a remainder:
    A. 99964 B. 99984
    C. 99944 D. 99954
    E. None of these
14. Find the greatest number of five digits which when divided by 5, 8, 12, 15 & 25 have 6 as a remainder:
    A. 99672 B. 99616
    C. 99906 D. 99606
    E. None of these
15. Find the greatest number of five digits which when divided by 3, 4, 5, 7 & 9 have 8 as a remainder:
    A. 99572 B. 99516
    C. 99506 D. 99548
    E. None of these
16. Four runners started running simultaneously from a point on a circular track. They took 200 seconds, 300 seconds, 360 seconds and 400 seconds to complete

one round. After how much time do they meet at the starting point for the first time?

A. 3600 B. 4000
C. 6000 D. 5400
E. None of these

17. The maximum number of students among whom 776 pens and 873 pencils can be distributed in such a way that each student gets same number of pens and same number of pencils, is:

A. 99 B. 96
C. 97 D. 101
E. None of these

18. A milkman has 75 litres milk in one can and 105 litres in another. The maximum capacity of container which can measure milk of either container exact number of times is:

A. 20 B. 15
C. 16 D. 25
E. None of these

19. If the product of three consecutive numbers is 504 then sum of the smaller number and bigger number is:

A. 14 B. 15
C. 12 D. 16
E. 18

20. The smallest five-digit number which is divisible by 12,18 and 21 is:

A. 10070 B. 10080
C. 10060 D. 10050
E. None of these

21. Find the greatest number which when dividing 708, 823 and 444 leaves remainders 5, 6 and 7 respectively.

A. 17 B. 23
C. 37 D. 19
E. 27

22. The greatest three digit number that is completely divisible by 5, 7, 9 and 10

A. 530 B. 750
C. 630 D. 450
E. 400

23. Which of the following numbers is divisible by each one of 3, 7, 9 and 13?

A. 1755 B. 1542
C. 1638 D. 1562
E. 1624

24. The number 5374a92 is completely divisible by 11, then the smallest whole number in place of 'a' will be?

A. 0 B. 4
C. 9 D. 5
E. 2

25. What is the largest number that divides 50, 67, 100 and 149 to leave a remainder of 2,3,4 and 5 respectively?

A. 15 B. 12
C. 18 D. 24
E. 16

26. Find the least number which when divided by 5, 7, 8, 9 and 11 leaves the same remainder 1 in each case.

A. 27732 B. 27754
C. 27743 D. 27721
E. None of these

27. Find the least number which when divided by 3, 4, 5 and 7 leaves a remainder 6, but when divided by 9 leaves no remainder.

A. 835 B. 850
C. 846 D. 848
E. None of these

28. Find the least number which when divided by 5, 12, 18 and 25 leaves a remainder 6, but when divided by 7 leaves no remainder.

A. 1800 B. 1806
C. 1846 D. 1815
E. None of these

29. Find the least number which when divided by 6, 16, 25 & 30 leaves a remainder 5, but when divided by 7 leaves no remainder.

A. 3700 B. 3600
C. 3612 D. 3605
E. None of these

30. Jigar Sir has three batches for CET preparation. Each batch has 60, 75 and 105 students respectively. Jigar Sir wants to divide each batch into groups so that every group in every batch has the same number of students and there are no students left over. What is the maximum number of students Jigar Sir can put into each group?

A. 15 B. 20
C. 25 D. 22

E. None of these

31. Five bright colored lights flash once in 3, 7, 6, 9 and 10 seconds respectively. After how much time will they all flash together?
A. 10 min 40 sec B. 10 min 45 sec
C. 10 min 30 sec D. 10 min 25 sec
E.10 min 50 sec

32. A dentist advises Jyoti to have a check-up with him every 4 months and visit the hygienist every 6 months. If Jyoti has both appointments today, how long will it be before she next visits both the hygienist and the dentist on the same day?
A. 10 B. 12
C. 8 D. 24
E. None of these

33. Sushant checks the pressure in his car's tyre every 5 weeks. Sumit checks the pressure in his car's tyre every 3 weeks. If they both check the tyre pressure today, after how many weeks will they both check their tyres on the same day?
A. 25 B. 18
C. 20 D. 15
E. None of these

34. The train to CST leaves Panvel every 40 minutes and the train to Thane leaves Panvel every 12 minutes. If both trains leave at 09:00, what will the time be when they next leave Panvel at the same time for third time?
A. 13:00 B. 13:20
C. 13:05 D. 13:15
E. None of these

35. The least number which when divided by 9, 10, 11, 12 leaves the same remainder 6 in each case, is:
A. 1988 B. 1986
C. 1980 D. 1984
E. None of these

36. What is the greatest number that divides 4093 and 5234 and leaves a reminder 18?
A. 163 B. 326
C. 183 D. 256
E. None of these

37. Three planets revolve round the Sun once in 150, 300 and 600 days, respectively in their own orbits. When do they all come relatively to the same position as at a certain point of time in their orbits?
A. 600 B. 450
C. 1200 D. 800
E. None of these

38. A school has 3 buses that run on different routes. Bus A runs every 15 minutes, bus B runs every 20 minutes, and bus C runs every 24 minutes. If all the buses leave the school at 7:00 am, at what time will they leave the school together again?
A. 8:00 am B. 9:00 am
C. 9:30 am D. 9:15 am
E. None of these

39. A company has 3 machines that need to be serviced. Machine A needs to be serviced every 3 months, machine B needs to be serviced every 5 months, and machine C needs to be serviced every 10 months. If all the machines were serviced at the same time, when next will they need to be serviced together (in months)?
A. 40 B. 20
C. 24 D. 30
E. 60

40. Find the smallest number which when divided by 5, 6, 7 and 8 leaves remainders 3, 4, 5 and 6 respectively.
A. 842 B. 840
C. 838 D. 836
E. 848

41. The number between 2000 and 3000 which is exactly divisible by 22, 33, 44 and 55 is:
A. 2250 B. 2560
C. 2640 D. 2740
E. 2820

42. The number between 8000 and 9000 which is exactly divisible by 9, 11 & 17 is:
A. 8415 B. 8435
C. 8263 D. 8154
E. 8420

43. Let N be the greatest number that will divide 3840, 2560 and 6400 leaving the same remainder in each case. Then, the sum of the digits in N is:
A. 13 B. 10
C. 12 D. 11
E. None of these

44. Let N be the greatest number that will divide 2010, 3036 and 4575 leaving the same remainder in each case. Then, the sum of the digits in N is:

A. 13 B. 9
C. 12 D. 11
E. None of these

45. The HCF and product of two numbers are 18 and 9072 respectively. The number of possible pairs of the numbers is:
A. 2 B. 3
C. 1 D. 4
E. None of these

46. The HCF and product of two numbers are 13 and 4056 respectively. The number of possible pairs of the numbers is:
A. 2 B. 3
C. 1 D. 4
E. None of these

47. The HCF and product of two numbers are 23 and 8464 respectively. The number of possible pairs of the numbers is:
A. 2 B. 3
C. 1 D. 4
E. None of these

48. The LCM of two numbers is 4 times their HCF. The sum of LCM and HCF is 125. If one of the numbers is 100, then the other number is:
A. 50 B. 25
C. 75 D. 5
E. None of these

49. The LCM of two numbers is 10 times their HCF. The sum of LCM and HCF is 77. If one of the numbers is 14, then the other number is:
A. 50 B. 35
C. 45 D. 50
E. None of these

50. The LCM of two numbers is 10 times their HCF. The sum of LCM and HCF is 198. If one of the numbers is 90, then the other number is:
A. 36 B. 45
C. 54 D. 40
E. None of these

ANSWER KEY:

1) E	11) D	21) D	31) C	41) C
2) D	12) A	22) C	32) B	42) A
3) B	13) A	23) C	33) D	43) D
4) B	14) D	24) E	34) A	44) B
5) A	15) D	25) E	35) B	45) B
6) B	16) A	26) D	36) A	46) D
7) C	17) C	27) C	37) A	47) B
8) D	18) B	28) B	38) B	48) B
9) D	19) D	29) D	39) D	49) B
10) C	20) B	30) A	40) C	50) A

SIMPLIFICATION

Exercise – 1

1. Simplify

   1.1+10.01+11.11+1.001+1.01

   A. 24.231 B. 22.543

   C. 20.765 D. 24.142

   E. 22.241

2. Simplify

   11+ [56-6×4(58÷29)]+9 × (6-3)

   A. 47 B. 44

   C. 46 D. 24

   E. 75

3. Find the value of

   $\frac{38.36}{0.07}$ =?

   A. 678 B. 596

   C. 756 D. 548

   E. 656

4. If 17.66 – 9.25 = x+3.5 , then what will be the value of x?

   A. $\frac{39}{12}$ B. $\frac{59}{12}$

   C. $\frac{43}{6}$ D. $\frac{54}{7}$

   E. $\frac{47}{12}$

5. Find the value of

   $(182)^2 \div (26)^2 \times 27 \div 9$ = ?

   A. 147 B. 135

   C. 243 D. 252

   E. 192

6. Find the value of

   $\frac{289^{0.2} \times 289^{0.3}}{289^{0.6} \times 289^{0.4}} = ?$

   A. $\frac{3}{17}$ B. $\frac{1}{19}$

   C. $\frac{1}{17}$ D. $\frac{1}{15}$

   E. $\frac{5}{17}$

7. Find the value of

   $\frac{7}{\sqrt{0.0049}} + \frac{5}{\sqrt{0.0025}}$ =?

   A. 150 B. 200

   C. 450 D. 300

   E. 250

8. Find the value of

   (36÷4) × [5+{3+27-2}]-(9-2) =?

   A. 170 B. 300

   C. 350 D. 290

   E. 250

9. If 169/0.169 = 16.9/x , then the value of x will be

   A. 0.0169 B. 0.1169

   C. 0.169 D. 16.90

   E. 1.690

10. Find the value of

    0.49 ÷ 0.0049 × 0.049 × 4.9 =?

    A. 36 B. 24

    C. 74 D. 43

    E. 27

11. Find the value of

    $\frac{0.3 \times 0.3 \times 0.3 + 0.8 \times 0.8 \times 0.8}{0.3 \times 0.3 - 0.24 + 0.8 \times 0.8}$ =?

    A. 2.3 B. 2.1

    C. 1.1 D. 1.6

    E. 1.7

12. Find the value of

    5.25 × 5.25 – 102.375 + 9.75 × 9.75=?

    A. 20.50 B. 24.25

    C. 15.75 D. 18.50

    E. 20.25

13. Find the value of x in the given equation

    $\frac{\sqrt{4096}}{x} = \frac{x}{7.29}$

    A. 21.6 B. 34.2

    C. 25.4 D. 27.2

    E. 18.4

14. Simplify the given expression.

    6 × 0.6 x 0.06 x 0.006 x $\frac{1}{0.3} \times \frac{1}{0.03} \times \frac{1}{0.003}$

    A. 34 B. 74

    C. 48 D. 54

    E. 76

15. Simplify

    $$\frac{1.2^3 + 4.6^3 + 6.2^3 - 3 \times 1.2 \times 4.6 \times 6.2}{1.2^2 + 4.6^2 + 6.2^2 - 1.2 \times 4.6 - 4.6 \times 6.2 - 1.2 \times 6.2}$$

    A.12 B. 15

C. 8 D. 10

E. 16

16. Simplify the following :

$$\frac{27^3 + 45^3 + 38^3 - 3 \times 27 \times 45 \times 38}{27^2 + 45^2 + 38^2 - 27 \times 45 - 45 \times 38 - 27 \times 38}$$

A.120 B. 150

C. 155 D. 100

E. 110

17. What approximate value will come in the place of question mark (?) in the following question ?

$\left(\frac{?}{4}\right) + 32.01 + 139.99 = 68.09 + 229.01 + 86.99$

A. 845 B. 848

C. 746 D. 478

E. 955

18. What approximate value will come in the place of question mark (?) in the following question?

$(22.13)^2 + (14.96)^2 - (19.11)^2 = ?$

A. 460 B. 520

C. 348 D. 368

E. 468

19. What approximate value will come in the place of question mark (?) in the following question ?

$\frac{5}{8} \times (5471.926 - 5408.002) + 765.985 = x + 244.886$

A. 348 B. 365

C. 744 D. 561

E. 623

20. What approximate value will come in the place of question mark (?) in the following question? 599.998 + 12.003 × 13.5 – 150.365 = ? + 44.023

A. 964 B. 368

C. 457 D. 963

E. 568

21. What should come in the place of question mark (?) in the following questions?

7/5 of 67 + 3/8 of 168=?

A. 194.8 B. 156.8

C. 267.2 D. 183.6

E. 285.6

22. What approximate value will come in the place of question mark (?) in the following question?

(21.298 × 10.025÷ 15.012 + 41.99) ÷ 2.26 = $?^{1/2}$

A. 784 B. 745

C. 945 D. 961

E. 853

23. Find the square root of 72.25

A. 5.5 B. 7.5

C. 6.5 D. 9.5

E. 8.5

24. Find the value of 47-[32-{57-(33-(26+51))}]

A. 116 B. 122

C. -125 D. -116

E. - 138

25. Simplification of $\frac{0.4 \times 0.4 + 0.04 \times 0.04 - 0.4 \times 0.04}{0.36}$ gives:

A. 1.4434 B. 0.3656

C. 0.4044 D. 1.1557

E. 0.7523

26. The value of $\frac{1}{3} + \frac{1}{3\times4} + \frac{1}{3\times4\times5}$ correct to three decimal places is,

A. 0.563 B. 0.433

C. 0.377 D. 0.575

E. 0.843

27. The value of 23 × 34 -45 + (7^3+17) is

A. 1097 B. 956

C. 1785 D. 856

E. 1065

28. The value of $\frac{(0.79)^2 - (0.17)^2}{(0.79+0.17)}$ is

A. 1.24 B. 1.54

C. 0.83 D. 0.86

E. 0.62

29. Find the value of

$$\frac{1}{2+\frac{1}{3}} - \frac{1}{2+\frac{1}{2}}$$

A. $\frac{1}{15}$ B. $\frac{1}{27}$

C. $\frac{1}{35}$ D. $\frac{1}{32}$

E. $\frac{1}{41}$

30. 13+4-8 × (7+89)-96÷4+(54÷3+11×2-1)÷13 is equal to

A. 772 B. -790

C. -845 D. 865

E. none of these

31. Select the number that can replace the question mark(?) in the following equation.

$11 + 8 - 5x\left(\frac{1}{2}\right) \times 16 - \left(\frac{60}{(34-19)}\right) = ?$

A. -27 B. 22

C. 25 D. -25

E. 29

32. 1732+173.2+17.32+1.732=?

A. 1657.796 B. 1924.252

C. 1454.467 D. 1548.646

E. 1858.658

33. The value of 181.2 ÷ 6040=?

A. 0.05 B. 0.04

C. 0.03 D. 0.02

E. none of these

34. What is the value of following expression?

$\frac{(5.7)^2 - (3.8)^2}{(5.7 - 3.8)}$

A. 13.5 B. 16.5

C. 14.5 D. 12.5

E. 9.5

35. if x is the closest approximation to the product 0.3333 × 0.75 × 0.499 × 0.125 × 32, then find the value of x

A. $\frac{5}{2}$ B. $\frac{4}{5}$

C. 1 D. $\frac{1}{2}$

E. $\frac{3}{2}$

36. If $\frac{179}{0.179} = \frac{17.9}{x}$, then find the value of x

A. 0.179 B. 1.79

C. 0.0179 D. 17.9

E. none of these

37. 5[37+(35+18÷2x3-47)+5]= ?

A. 230 B. 238

C. 306 D. 385

E. 285

38. 4.143 + 3.43 - 2.82 + 8 - 5.6=?

A. 7.344 B. 7.153

C. 6.854 D. 8.068

E. 6.053

39. Select the number that can replace the question mark(?) in the following equation

$? + \frac{18}{24} + 3\frac{3}{4} = 15\frac{11}{21}$

A. $11\frac{11}{21}$ B. 11

C. $11\frac{0.5}{21}$ D. $11\frac{13}{24}$

E. none of these

40. Find the value of

$6 - \cfrac{5}{1+\cfrac{1}{3+\cfrac{1}{2+\frac{1}{4}}}}$

A. $\frac{15}{8}$ B. $\frac{13}{7}$

C. $\frac{23}{3}$ D. $\frac{17}{8}$

E. $\frac{15}{7}$

41. Find the value

$\sqrt{?+\sqrt{95-\sqrt{934+\sqrt{747-\sqrt{312+12}}}}} = 49$

A. 2393 B. 2337

C. 2383 D. 2387

E. 2347

42. Simplify

$\frac{7+7\times7}{7\times7+1} \times \frac{\frac{1}{7} \div \left(\frac{1}{7} \times \frac{1}{7}\right)}{\left(\frac{1}{7} \times \frac{1}{7}\right) \div \frac{1}{7}} - \left(7 - \frac{1}{7}\right) \times \frac{14}{2}$

A. 1.5 B. 0.5

C. 2 D. 1

E. 2.5

43. Simplify the given expression

$\frac{5}{12} \times \frac{144}{25} \times 25(65^2 - 55^2) \times \frac{1}{100}$

A. 580 B. 840

C. 650 D. 720

E. None of these

44. What is the value of the following expression?

$\frac{57}{7} \times \frac{35}{3} - 5\frac{2}{3} \div \frac{7}{9} \times \frac{147}{6}$

A. -65.5 B. -75.5

C. -80.5 D. -83.5

E. -54.5

45. 89 x 6^4 = ?

A. 156783 B. 115344

C. 145788 D. 158875

E. None of these

46. $4\frac{1}{4} + (5^3 + 4\frac{1}{2})$ =?

A. 275.35 B. 133.75

C. 125.35 D. 190.56

E. None of these

47. Find the value of

$$\frac{1}{3+\frac{1}{2-\frac{9}{7}}} + \frac{39}{22}$$

A. $\frac{22}{5}$ B. 2

C. $\frac{12}{22}$ D. $\frac{5}{22}$

E. 1

48. Simplify :

$$1 + \frac{5}{2+\frac{3}{5-\frac{1}{2}}} - \frac{1}{2}(6 \div 2)$$

A. $\frac{3}{8}$ B. $\frac{5}{7}$

C. 0 D. $\frac{11}{8}$

E. $\frac{7}{5}$

49. Simplify :

$$\sqrt{119 + \sqrt{185 + 88\sqrt{\sqrt{36} + 19}}}$$

A. 12 B. 15

C. 8 D. 9

E. 13

50. Simplify :

$$\sqrt{107 + \sqrt{156 + 8\sqrt{\sqrt{36} + 19}}}$$

A. 12 B. 11

C. 7 D. 9

E. 13

ANSWER KEY:

1) A	11) C	21) B	31) D	41) A
2) C	12) E	22) A	32) B	42) D
3) D	13) A	23) E	33) C	43) D
4) B	14) C	24) A	34) C	44) D
5) A	15) A	25) C	35) D	45) B
6) C	16) E	26) B	36) C	46) B
7) B	17) B	27) A	37) E	47) B
8) D	18) C	28) E	38) B	48) D
9) A	19) D	29) C	39) C	49) A
10) B	20) E	30) E	40) D	50) B

AVERAGES

Introduction

Average is defined as the mean value which is equal to the ratio of the sum of the number of a given set of values to the total number of values present in the set.

$Average = \frac{X_1 + X_2 + X_3 + \cdots + X_n}{n}$ Or $Average = \frac{Sum\ of\ Observations}{Total\ Number\ Of\ Observations}$

Important concepts:

- If the value of each unit in a group is increased by some value x, then the average of the group also increases by x. For example, if the height of Ramesh and Suresh increases by 20 centimeters each, the average of the total height of both also increases by 20 centimeters.
- If the value of each unit in a group decreases by some value x, then the average of the group also decreases by x. For example, if the weight of Raj and Deep is decreased by 20 kilograms individually, the average weight of both also decreases by 20.
- The average of any number series or group is always between its smallest and the largest value.
  For example– If the average test score of four children are 6, 9, 10, 11 than the average of all four name respectively is 9.
- When a person leaves the group, and replacement is made of that person then
  - If the average age increases,
    Age of new person = Age of separated person + (increase in the average × total number of persons).
  - If the average age decreases,
    Age of new person = Age of separated person – (decrease in the average × total number of persons).
- When a person joins the group,
  - When the average age is increased
    Age of new person = Previous average + (increase in average × total members including new member).
  - When the average age is decreased
    Age of new person = Previous average – (decrease in average × total members including new member).
- If any number greater than the average drawings the set then, the average increases.
- If any number less than the average joins the set then, the average decreases.
- If a number greater than the average leaves the set then, the average decreases.
- If a number less than the average leaves the set then, the average increases.
- Average of 'n' consecutive Natural Numbers = $\frac{n+1}{2}$
- Average of the square of consecutive n natural numbers = $\frac{(n+1)(2n+1)}{6}$
- Average of cubes of consecutive n natural numbers = $\frac{n\times(n+1)^2}{4}$
- Average of n consecutive even numbers = (n+1)
- Average of consecutive even numbers till n = $\frac{n}{2}+1$
- Average of n consecutive odd numbers = n
- Average of consecutive odd numbers till n = $\frac{n+1}{2}$
- Sum of 1st n even consecutive natural numbers is = n × (n + 1)
- Sum of 1st n odd consecutive natural numbers is = n^2

Solved Examples

Type 1: Weights and Ages Average

1. When a new man joins a group of 8 people after Replacing a man, their average age increases by 5 kg. If he replaces a man weighing 50 kg, how much does he weigh?

   A. 90 B. 95

   C. 80 D. 85

   Solution:

   Increased weight = (8 × 5) = 40

   Weight of the new man = (50 +40) = 90 kg

   Correct Option: A

2. The average age of 7 gorillas is 30 years. The youngest monkey is 30 years old. When he was born, the average age of the remaining monkeys was N years. Calculate the average age of the monkeys excluding the youngest monkey?

   A. 38 B. 30

   C. 35 D. 32

   Solution:

   The average age of monkey = 30 years.

   Sum of all their ages = 30 × 7 = 210 year's

   Sum of their ages excluding the youngest monkey = 210 – 30 = 180 year's

   The average age of the remaining monkey

   = $\frac{180}{6}$ = 30 years

   Correct Option: B

Type 2: Average Marks and Scores

3. If the Marks of Each student is 80 and it is increased by 10, then the average of the class will be?

   A. 80 B. 90

   C. 100 D. None of the above

   Solution:

   Average of the class = 80+10 = 90

   Correct Option: B

4. The average marks of students in two sections A and B of a class are 65 and 70, respectively. If the average marks of both sections combined are 67, then find the ratio of the number of students in section A to that of section B.

   A. 1 : 2 B. 3 : 2

   C. 5 : 9 D. None of the above

   Solution:

   Let the number of students in section A be x and those in section B be y

   Given:

   Average marks of A = 65

   Average marks of B = 70

   Combined average = 67

   (65x+70y)/(x+y) = 67

   Multiply both sides by x+y

   65x+70y=67(x+y)

   65x+70y=67x+67y

   −2x+3y=0

   3y=2x⇒

   x/y=3/2

   Correct Option: B

Type 3: Speed Distance Time Averages

5. A bus Travels from Mumbai to Pune. During this it covers 300 km in 6 hours and 700 km in 4 hours. Find the average speed of the bus.

   A. 100 B. 110

   C. None of these D. 105

   Solution:

   $$Average\ Speed = \frac{Total\ Distance\ travelled}{Total\ Time\ Taken}$$

   $$= \frac{300 + 700}{6 + 4} = \frac{1000}{10} = 100\ km/hr$$

   Correct option: A

6. The average speed of a train without stopping at any stoppages is 24 km/h, and average speed when the train stops at different stoppages is 20 km/h. How many minutes in an hour does the train stop on an average?

   A. 10 B. 12

   C. 15 D. 20

   Solution:

   The average speed of a train without stoppages = 24 km/hr

   With stoppages, the average speed reduces by (24 – 20) = 4 kms

   ∴ the time per hour the train stops on an average = $\frac{4}{24} \times 60\ minutes = 10\ minutes$

   Correct option: A

Type 4: Average Problems on Numbers

7. The average of N consecutive natural numbers is 28. Find out the value of n.

A. 54 B. 56

C. 53 D. 55

Solution:

Average of n consecutive natural numbers is = $\frac{n+1}{2}$

$\frac{n+1}{2} = 28$

$n + 1 = 56$

$n = 55$

Correct option: D

8. The average of the square of N consecutive natural numbers is 20. Find out the value of n.

A. 7 B. 8

C. 6 D. None of the above

Solution:

Average of the square of consecutive n natural numbers = $\frac{(n+1)(2n+1)}{6}$

$\frac{(n+1)(2n+1)}{6} = 20$

$(n+1)(2n+1) = 120$

$8 \times 15 = 120$

$(7+1) \times (2 \times 7 + 1) = 120$

n = 7

Correct option: A

Exercise – 1

1. The average weight of 8 sailors in a boat is increased by 1 kg if one of them weighing 56 kg is replaced by a new sailor. The weight of the new sailor is?
   A. 57 kg B. 60 kg
   C. 64 kg D. 62 kg
   E. 54 kg
2. The average age of P, Q, R, S five years ago was 45 years. By including T, the present average age of all the five is 49 years. The present age of T is?
   A. 64 years B. 48 years
   C. 45 years D. 40 years
   E. 50 years
3. At Chennai it rained as much on Tuesday as on all the other days of the week combined. If the average rainfall for the whole week was 3 cm. How much did it rain on Tuesday?
   A. 2.625 cm B. 3 cm
   C. 10.5 cm D. 15 cm
   E. 12 cm
4. The average of 50 numbers is 38. If two numbers 45 and 55 are discarded, the average of the remaining set of numbers is
   A. 38.5 B. 37.5
   C. 37.0 D. 36.5
   E. 35.0
5. The average of 6 observations is 12. A new observation is included and the new average is decreased by 1. The seventh observation is?
   A. 1 B. 3
   C. 5 D. 6
   E. 7
6. The average age of 20 men in the class is 15.6 years. Five new men join and the new average becomes 15.56 years. What was the average age of five new men?
   A. 15.5 B. 15.4
   C. 15.25 D. 15.3
   E. 15.6
7. There was one mess for 30 boarders in a certain hostel. The number of boarders being increased by 10, the expenses of the mess increased by Rs 40 per month while the average expenditure per head diminished by Rs 2. Find the original monthly expenses.
   A. Rs 390 B. Rs 410
   C. Rs 360 D. Rs 430
   E. Cannot be determined
8. The average weight of 36 men is 50 kg. It was found later that the figure of 37 kg was misread as 73 kg. What is the correct average?
   A. 49 kg B. 51 kg
   C. 50.5 kg D. None of these
   E. 52 kg
9. The average earning of a person for the first four days of a week is Rs 18 and for the last four days is Rs 22. If he earns Rs 20 on the fourth day, his average earning for the whole week is?
   A. Rs 18.95 B. Rs 16
   C. Rs 20 D. Rs 25.71
   E. Rs 23
10. The average of marks obtained by 120 boys was 35. If the average marks of passed boys was 39 and that of failed boys was 15, the number of boys who passed the examination is?
    A. 100 B. 110
    C. 120 D. 150
    E. 90
11. In a class, there are 20 boys whose average age decreases by 2 months, when one boy aged 18 years is replaced by a new boy. The age of the new boy is?
    A. 14 years 8 months B. 15 years
    C. 16 years 4 months D. 17 years 10 months
    E. 16 years
12. The average temperature from Tuesday to Friday is 48°C and from Wednesday to Saturday is 52°C. If the temperature on Tuesday is 42°C, what was it on Saturday?
    A. 52 °C B. 55 °C
    C. 58 °C D. 51 °C
    E. 53 °C
13. A man spends on an average Rs 269.47 for the first 7 months and Rs 281.05 for the next 5 months. Find his monthly salary if he saves Rs 308.46 during the whole year.
    A. Rs 300 B. Rs 500
    C. Rs 840 D. Rs 400
    E. Rs 600

14. Average temperature of first 4 days of a week is 38.6°C and that of the last 4 days is 40.3°C. If the average temperature of the week be 39.1°C, the temperature on 4th day is?
    A. 36.7°C B. 38.6°C
    C. 39.8°C D. 41.9°C
    E. 44.8 C
15. The average daily wages of A, B and C is Rs 120. If B earns Rs 40 more than C per day and A earns double of what C earns per day, the wage of A per day is?
    A. Rs 80 B. Rs 120
    C. Rs 160 D. Rs 100
    E. Rs 150
16. With an average speed of 40 km/hr a car reaches its destination on time. If it goes with an average speed of 35 km/h, it is late by 15 minutes. The total journey is?
    A. 30 km B. 40 km
    C. 70 km D. 80 km
    E. 90 km
17. Out of three numbers, the first is twice the second and is half of the third. If the average of the three numbers is 56, the three numbers in order are?
    A. 48, 96, 24 B. 48, 24, 96
    C. 96, 24, 48 D. 96, 48, 24
    E. 96, 48, 56
18. The average age of A and B is 20 years. If A is to be replaced by C, the average would be 19 years. The average age of C and A is 21 years. The ages of A, B and C in order (in years) are ?
    A. 18, 22, 20 B. 18, 20, 22
    C. 22, 18, 20 D. 22, 20, 18
    E. None of these
19. The average monthly income of a family of four earning members was Rs. 15130. One of the daughters in the family got married and left home, so the average monthly income of the family came down to Rs. 14660. What is the monthly income of the married daughter?
    A. Rs. 15350
    B. Rs. 12000
    C. Rs. 16540
    D. Cannot be determined.
    E. None of these
20. The average weight of 21 boys was recorded as 64 kg. If the weight of the teacher was added, the average increased by one kg. What was the teacher's weight?
    A. 86 kg B. 64 kg
    C. 72 kg D. 98 kg
    E. None of these
21. A student wanted to find the average of 12 numbers which came out to be 12. The numbers were as follows:
    11, 9, 15, 7, 21, 6, 9, 11, 4, 5, 20, x
    Find the value of x:
    A. 25 B. 26
    C. 27 D. 28
    E. 29
22. In a 12^{th} grade class with PCMB and PCB students there are 9 PCMB students and 16 PCB students. If the average score of PCMB students in CHEMISTRY is 39 and that of PCB students is 89. Find the average marks of the whole class for CHEMISTRY subject.
    A. 70 B. 69
    C. 71 D. 72
    E. None of the above
23. The average marks of 40 students is 30 and that of 60 different students is 40. What is the average marks of all the students.
    A. 35 B. 34
    C. 36 D. 37
    E. 35.5
24. The average weight of 8 students is 60kg, two new students join them the average weight of these new students is 50 kg, two other students join them with average weight of 46 kg. find the new average weight of all the students.
    A. 55.5 B. 56
    C. 56.5 D. 57
    E. 57.5
25. Average income of 40 men is $60,000 and that of 60 women is $70,000. Find the average of all the people if 50 children with average income of $51,000 join them.
    A. $60550 B. $60750
    C. $60950 D. $61000
    E. $61050

26. A man bought 13 articles at 70 each, 15 at 60 each and 12 at 65 each. The average price per article is

A. 60.25 B. 64.75
C. 65.75 D. 62.25
E. None of these

27. The average of 10 numbers is 7. If each number is multiplied by 12, then the average of the new set of numbers will be

A. 7 B. 19
C. 82 D. 84
E. 88

28. A library has an average number of 510 visitors on Sunday and 240 on other days. The average number of visitors per day in a month of 30 days beginning with Sunday is:

A. 290 B. 285
C. 280 D. 295
E. 275

29. In 3B industries the average wages for all workers is $9000/month. The average wages of 200 workers is $6000/month, and that of the officers is $12000/month. What is the number of the officers in 3B industries.

A. 190 B. 200
C. 210 D. 220
E. 180

30. In 3M industries there are 300 employees the average salary of workers is 600 rupees and that of officers is 1200 rupees. The average wages are 1000 rupees, find the ratio of number of workers: number of officers

A. 1:1 B. 1:2
C. 2:1 D. 2:3
E. 3:2

31. Ana and Binu study in the same class. The average score of all the students in the class, excluding Binu who was absent in a Mathematics exam was 26, while the average score of all the students in the class, excluding Ana who was absent in an English exam was 34. If the total score of the class in Mathematics and English was 1920, how many students were there in the class?

A. 34 B. 33
C. 32 D. 40
E. 36

32. The average weight of 90 people is 90 kgs. The ratio of men: women is 6:4. If the average weight of women is 54kgs what is the average weight of the men.

A. 110 B. 111
C. 112 D. 113
E. 114

33. In a classroom the ratio of number of boys: number of girls is 5:3. If the average weight of girls is 60 kgs and that of the boys is 100 kgs. Find the average weight of the class.

A. 83 B. 84
C. 85 D. 86
E. 87

34. During CET 2023 the average score of the students of an institute is 110 marks. The average score of the toppers is 140 marks and that of non-topper students is 90 marks. What is the ratio of the number of toppers: number of non-topper students.

A. 2:3 B. 3:2
C. 3:4 D. 4:3
E. 1:1

35. Aditya scored an average of 99% in his boards. He scores 95% in one of the 5 subjects. What is his score in rest of the subjects?

A. 97% B. 98%
C. 99% D. 100%
E. Cannot be determined.

36. Boiler is a dumb boy. He scores 35% in his boards. He scores 27%, 32%, 31% in 3 of the 5 subjects. What is his average score in the other 2 subjects.

A. 42.5% B. 43.5%
C. 44.5% D. 41.5%
E. None of the above

37. Nandu scores what he calls spectacularly in his boards with an average of 70%. Out of the 5 subjects he scores 65% in 3 subjects. Find the average score in the other 2 subjects.

A. 75% B. 76.5%
C. 77.5% D. 80%
E. None of the above

38. Megha is crying over scoring 99% in mathematics. Her average score for all 5 subjects of the test is 85%. What is her average score in the remaining 4 subjects.

A. 81 B. 81.25
C. 81.5 D. 81.75
E. 82

39. Chinmay delivers an average of 15 tons of crushed sand every day for 1 week. During the week he delivers 12, 18, 21, 9, 15, 25 tons for the first 6 days. What is his tonnage on the last day of the week?
A. 10 B. 11
C. 12 D. 13
E. None of the above

40. In a group of 7 people the average weight is 95 kgs. Shivam joins the group and the average increases by 4 kgs. Find the weight of Shivam.
A. 125 B. 126
C. 127 D. 128
E. 129

41. The average weight of 16 people is 75 kgs. If 5 people with average weight of 60 kgs leave the group. Find the new average weight of the group.
A. 80 kg B. 81kg
C. 82kg D. 83kg
E. None of the above

42. A group of 20 people score an average of 80% in a test. If 5 new people join the group the average decreases by 10%. Find the average score of the new people.
A. 15 B. 40
C. 25 D. 30
E. 35

43. Chinki owns a cycle shop. Her average ticket size is 6500 rupees. If the average ticket size for children's cycles is 5200 rupees and that of adult cycles is 9100 rupees. Find the ratio of adult cycles sold: children's cycles sold
A. 1:1 B. 1:2
C. 2:1 D. 2:3
E. 3:2

44. Anuja mixes 25 kgs of rice costing $1.5 /kg and 30 kgs of rice costing $1.25 /kg. find the price of the resultant mixture of rice.
A. 1.45 B. 1.38
C. 1.38 D. 1.40
E. 1.36

45. Ambuj mixes 15kgs of apples with 25 kgs of oranges and 30 kgs of pomegranate. Find the weight of pomegranate in 2100 gram of the mixture.
A. 800gm B. 900gm
C. 1000gm D. 1100gm
E. None of the above

46. Siddhi sells 2 products costing rupees 45 and rupees 65. If her average ticket size is rupees 57.5 find the ratio in which she sells the two products.
A. 5:7 B. 7:5
C. 5:3 D. 3:5
E. 7:6

47. Riddhi sells 2 types of toys for an average price of 900 /toy. The selling price of the two toys is 1200 /toy and 800 /toy. Find the ratio in which she sold the two types of toys.
A. 1:4 B. 1:2
C. 1:3 D. 1:1
E. None of the above

48. The average of 19 numbers is 9 the average of first 10 numbers is 10. The average of last 10 numbers is 9. Find the 10^{th} number.
A. 20 B. 21
C. 19 D. 18
E. 22

49. The average of 25 numbers is 15. The average of first 16 numbers is 30 and that of the next 8 numbers is 10 find the last number.
A. -150 B. -165
C. -175 D. -185
E. None of the above

50. The average of 15 numbers is 30 the average of first 8 numbers is 35 and that of the last 8 numbers is 25, find the 8^{th} number.
A. 28 B. 25
C. 35 D. 30
E. 21

ANSWER KEY:

1) C	11) A	21) B	31) B	41) E
2) C	12) C	22) C	32) E	42) B
3) C	13) A	23) C	33) C	43) B
4) B	14) D	24) B	34) A	44) E
5) C	15) C	25) D	35) D	45) B
6) B	16) C	26) B	36) A	46) D
7) C	17) B	27) D	37) C	47) C
8) A	18) C	28) B	38) C	48) C
9) C	19) C	29) B	39) E	49) D
10) A	20) A	30) B	40) C	50) D

PERCENTAGES

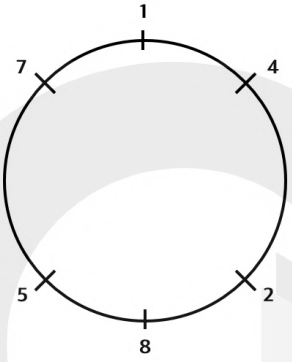
Introduction

Percentage is the number expressed as a fraction of 100. It is calculated with the help of ratio. The symbol for the Percentage is "%".

- A percentage is a number or ratio expressed as a fraction whose denominator (bottom) is 100.
  Thus, x percent means x hundredths, written as x%.
  We express x% as a fraction as $\frac{x}{100}$
- A percentage is a fraction of an amount expressed as a particular number of hundredths of that amount.
- For example: 10% = $\frac{10}{100} = \frac{1}{10}$
  What is P percent of X?
  Written as an equation: Y = P% × X.
  The 'what' is Y that we want to solve for
  Remember to first convert percentage to decimal, dividing by 100

Solution:

Solve for Y using the percentage formula Y = P% × X.

Fraction	Percentage	Circle of 7	Fraction	Percentage	Fraction	Percentage
$\frac{1}{1} \times 100$	100%		$\frac{1}{7} \times 100$	14.2857%	$\frac{1}{8}$	12.5%
$\frac{1}{2} \times 100$	50%		$\frac{2}{7} \times 100$	28.5714%	$\frac{1}{9}$	11.11%
$\frac{1}{3} \times 100$	33.33%		$\frac{3}{7} \times 100$	42.8571%	$\frac{1}{10}$	10%
$\frac{1}{4} \times 100$	25%		$\frac{4}{7} \times 100$	57.1428%	$\frac{1}{11}$	9.09%
$\frac{1}{5} \times 100$	20%		$\frac{5}{7} \times 100$	71.4285%	$\frac{1}{12}$	8.33%
$\frac{1}{6} \times 100$	16.67%		$\frac{6}{7} \times 100$	85.7142%	$\frac{1}{13}$	7.69%

Fraction	Percentage	Fraction	Percentage	Fraction	Percentage	Fraction	Percentage
$\frac{1}{14} \times 100$	7.14%	$\frac{1}{17} \times 100$	5.88%	$\frac{1}{20} \times 100$	5%	$\frac{1}{23} \times 100$	4.34%
$\frac{1}{15} \times 100$	6.66%	$\frac{1}{18} \times 100$	5.55%	$\frac{1}{21} \times 100$	4.76%	$\frac{1}{24} \times 100$	4.167%
$\frac{1}{16} \times 100$	6.25%	$\frac{1}{19} \times 100$	5.26%	$\frac{1}{22} \times 100$	4.54%	$\frac{1}{25} \times 100$	4%

Important concepts:

To calculate a % of b = $\frac{a}{100} \times b$	To find what percentage of a is b = = $\frac{b}{a} \times 100$	To calculate percentage change in value Percentage change = $\frac{Change}{Initial\ Value} \times 100$
Percentage Increase or Decrease • Percentage Increase = $\frac{R}{100+R} \times 100\%$ • Percentage Decrease = $\frac{R}{100-R} \times 100$	Successive Percentage Change If there are successive percentage increases of a % and b%, the effective percentage increase is: $a + b + \frac{ab}{100}$ %	Successive Discount: If there are successive discount of a % and b%, the effective discount is: $a + b - \frac{ab}{100}$ %
Results on Depreciation: Let the present value of a machine be P. Suppose it depreciates at the rate of R% per annum. Then: • Value of the machine after n years = $P(1 - \frac{R}{100})^n$ • Value of the machine n years ago = $\frac{P}{(1 - \frac{R}{100})^n}$ • If A is R% more than B, then B is less than A by $\frac{R}{100+R} \times 100\%$ • If A is R% less than B, then B is more than A by $\frac{R}{100-R} \times 100\%$	Increase N by S%: $N(1 + \frac{S}{100})$	Decrease N by S%: $N(1 - \frac{S}{100})$

- If the value of an item goes up or down by x%, the percentage reduction or increment to be now made to bring it back to the original point is, $\frac{x}{100+x} \times 100\%$
- If A is x% more or less than B, then B is $\frac{x}{100+x} \times 100\%$ less or more than A.

- If the price of an item goes up/down by x %, then the quantity consumed should be reduced by $\frac{x}{100+x} \times 100\%$ so that the total expenditure remains the same.

Solved Examples

Type 1: Percentage Problems based on Income, Salary, Expenditure

1. Duaa spends her monthly salary in the following manner: 20% on house rent, 20% on food, 5 % on transportation, 10% on the education, and 20% on other household expenses. She saves the remaining amount of Rs. 10000 at the end of the month. Find out her monthly salary?

   A. Rs. 70000 B. Rs. 50000

   C. Rs. 40000 D. Rs. 60000

   Solution:

   Let the Monthly Salary = 100%

   Monthly Expenditure =

   20% + 20% + 5% + 10% + 20% = 75%

   Monthly Savings = 100% – 75% = 25%

   Now, 25% of salary saved = 10000

   Let's take 100% salary as x

   25% of x = 10000

   $x = 10000 \times \frac{100}{25} = \frac{1000000}{25} = 40000$

   Therefore, her monthly salary = Rs. 40000

   Correct option: C

2. Chikoli spends 60% of his income. Suppose his income is increased by 42% and his expenditure increases by 10%, then what is the increase in his savings (in percentage)?

   A. 60% B. 36%

   C. 50% D. 90%

   Solution:

   Let Chikoli's income = 100

   Expenditure = 60 and

   Savings = 40

   (We get 40 by subtracting, 100 – 60)

   New Income is increased by 42%

   = 100 + 42 = 142

   Expenditure Increased by 10%

   = 10% more than 60 = 110% of 60 = 66

   New Savings = 142 – 66 = 76

   Therefore, increase in savings = 76 – 40 = 36

   Increase in % = $\frac{36}{40} \times 100 = 90\%$

   Correct option: D

3. Maitreya spends 40% of his salary and saves Rs. 960 per month. Find his monthly salary.

   A. 2000 B. 1600

   C. 1200 D. 1700

   Solution:

   Let the salary of Maitreya be x

   He spends 40% which means he saves 60% of the salary.

   60% of x = 960

   $\frac{60}{100} \times x = 960$

   $x = 960 \times \frac{100}{60} = \frac{96000}{60} = 1600$

   Therefore, his monthly salary = 1600

   Correct option: B

Type 2: Percentage Problems– based on Mixtures and Allegation

4. A general store shopkeeper sells black pepper at some cost price but he mixes it with papaya's seed and thereby gains 20%. Find the percentage of papaya's seed mixed with black pepper?

   A. 25% B. 33.33%

   C. 16.67% D. 10%

   Solution:

   Let the CP of 1 kg black pepper = Re. 1

   The SP of I Kg mixture = Re 1

   Gain = 20%

   Therefore, CP of 1 Kg

   mixture = $\frac{100}{120} \times 1 = \frac{5}{6}$

   Ratio of black pepper: papaya seed = $\frac{5}{6} : \frac{1}{6}$

   Hence, percentage of papaya seed in the mixture = $\frac{1}{6} \times 100 = 16.67\%$

   Correct option: C

5. A small container has 120l of milk and water mixture. It was made by mixing milk and water in which 80% is milk. Rohan came and added some water in the mixture. Now, find out how much water was added to the mixture that the percentage of milk became 60%?

   A. 40 litre B. 50 litre

   C. 4 litre D. 20 litre

   Solution:

   Given, percentage of milk = 80%

   It means, the percentage of water = 20%

   In 120L of mixture, water = $\frac{120 \times 20}{100} = \frac{2400}{100} = 24\ litre$

   Let the water added = x

   Now, $\frac{24 + x}{120 + x} \times 100 = 40$ (it is because in the new mixture milk is 60%, 100 – 60 = 40% water)

   $2400 + 100x = 4800 + 40x$

   $100x - 40x = 4800 - 2400$

   $60x = 2400$

x = 40 litres

Correct option: A

Type 3: Percentage – Problems based on Ratios and Fractions

6. If the numerator of a fraction is increased by 40% and the denominator is decreased by 20%, the value of the new fraction becomes $\frac{4}{7}$. Find the original fraction?

A. $\frac{16}{42}$ B $\frac{16}{20}$
C. $\frac{16}{49}$ D $\frac{49}{16}$

Solution:

Let original numerator be x.

Let original denominator be y.

Let original fraction be $\frac{x}{y}$.

According to the question,

Numerator of a fraction is increased by 40% = $\frac{140}{100x}$

Denominator is decreased by 20% = $\frac{80}{100}$

Now, $\frac{\frac{140}{100x}}{\frac{80}{100}y} = \frac{4}{7} \rightarrow \frac{140x}{80y} = \frac{4}{7}$

$\frac{x}{y} = \frac{4}{7} \times \frac{80}{140} = \frac{16}{49}$

Correct option: C

Type 4: Percentage Problems based on Population

7. Pune has a population of 6000. In the first year, the population decreases by 4%, and in the second year, it increases by 5%. Find the population at the end of two years?

A. 6048 B. Remains same
C. 6240 D. 5760

Solution:

In the first year, the population decreases by 4% = $6000 \times \frac{96}{100} = 5760$

In the second year it increases by 5% = $5760 \times \frac{105}{100} = 6048$

Correct option: A

Type 5: Problems based on profit and loss

8. The cost price of 40 chairs is the same as the selling price of x tables. If the profit is 25%, then find the value of x?

A. 30 B. 40
C. 32 D. 36

Solution:

Let the CP of each chair = 1

Therefore,

CP of x table = x

20 CP = X SP

Profit % = SP/CP

1.25=40/X

X=32

Correct option: C

9. If 25% of a = b, then b% of 20 is the same as:

A. 6.25% of a B. 5% of a
C. 10.25% of a D. 2.5% of a

Solution:

25% of a = b

$\frac{25}{100} \times a = b$

b% of 20 = $\frac{b}{100} \times 20 = \frac{20}{100} \times \frac{25}{100} \times a$

$= 5\% \; of \; a$

Correct option: B

Exercise – 1

1. Riya pays income tax at the rate of 10%. If her income increased by 10%, her tax rate increases to 15%. Her net income would increase by 350. What is Riya's income?
   A. 8000 B. 10,000
   C. 12,000 D. 14,000
   E. 16,000
2. The price of oil is increased by 25%. If the expenditure is not allowed to increase, the ratio between the reduction in consumption and the original consumption is
   A. 1 : 3 B. 1 : 4
   C. 1 : 5 D. 1 : 6
   E. 1 : 8
3. A scooter costs 25,000 when it is brand new. At the end of each year, its value is only 80% of what it was at the beginning of the year. What is the value of the scooter at the end of 3 years?
   A. 10000 B. 12500
   C. 12800 D. 12000
   E. 11800
4. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?
   A. 45% B. $45\frac{5}{11}\%$
   C. $54\frac{6}{11}\%$ D. 55%
   E. 58%
5. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had
   A. 588 apples B. 600 apples
   C. 672 apples D. 700 apples
   E. 650 apples
6. In a certain school, 20% of students are below 8 years of age. The number of students above 8 years of age is 2/3 of the number of students of 8 years of age which is 48. What is the total number of students in the school?
   A. 72 B. 80
   C. 120 D. 150
   E. 100
7. Two numbers A and B are such that the sum of 5% of A and 4% of B is two-third of the sum of 6% of A and 8% of B. Find the ratio of A : B.
   A. 2 : 3 B. 1 : 1
   C. 3 : 4 D. 4 : 3
   E. 5 : 4
8. A student multiplied a number by 3/5 instead of 5/3. What is the percentage error in the calculation?
   A. 34% B. 44%
   C. 54% D. 64%
   E. 74%
9. In an election between two candidates, one got 55% of the total valid votes, 20% of the votes were invalid. If the total number of votes was 7500, the number of valid votes that the other candidate got, was:
   A. 2700 B. 2900
   C. 3000 D. 3100
   E. 3200
10. Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?
    A. 57% B. 60%
    C. 65% D. 90%
    E. 85%
11. Two tailors X and Y are paid a total of Rs. 550 per week by their employer. If X is paid 120 percent of the sum paid to Y, how much is Y paid per week?
    A. Rs. 200 B. Rs. 250
    C. Rs. 300 D. None of these
    E. Rs. 400
12. If 12% of x is equal to 6% of y, then 18% of x will be equal to how much % of y?
    A. 7% B. 9%
    C. 11% D. 12%
    E. None of these
13. If the given two numbers are respectively 7% and 28% of a third number, then what percentage is the first of the second?
    A. 20% B. 25%
    C. 18% D. 14%
    E. None of these
14. Two numbers are less than a third number by 40% and 47% respectively. How much per cent is the second number less than the first? (approx.)
    A. 75% B. 11%
    C. 88% D. 36%

E. 46%

15. If a number is 20% more than another number, how much % is the smaller number less than the greater number?
A. $12\frac{1}{3}\%$ B. $16\frac{2}{3}\%$
C. $16\frac{1}{3}\%$ D. $14\frac{1}{3}\%$
E. None of these

16. The price of cooking oil has increased by 25%. The percentage of reduction that a family should affect in the use of cooking oil so as not to increase the expenditure on this account is?
A. 25% B. 20%
C. 23% D. 28%
E. None of these

17. If the price of bananas goes down by 10%, find the percentage of increase that a family should affect in its consumption so as not to increase expenditure on this account?
A. $13\frac{1}{9}\%$ B. $15\frac{1}{9}\%$
C. $16\frac{1}{9}\%$ D. $11\frac{1}{9}\%$
E. None of these

18. A number is increased by 20% and then decreased by 20%, the final value of the number is?
A. does not change B. decreases by 2%
C. increases by 4% D. decreases by 4%
E. increases by 2%

19. A batsman scored 120 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?
A. 50% B. 40%
C. 60% D. 70%
E. 80%

20. When the price of an article is reduced by 30%, the sales increases by 50%. The percentage change in the total amount of receipts is?
A. 5% decrease B. 5% increase
C. 10% decrease D. None of these
E. 10% increase

21. The length and breadth of a square are increased by 40% and 30% respectively. The area of the rectangle so formed exceeds the area of the square by?
A. 82% B. 78%
C. 80% D. None of these
E. 85%

22. In measuring the sides of a rectangle, one side is taken 20% in excess and the other 10% in deficit. Find the error per cent in area calculated from the measurement?
A. 12% deficit B. 10% excess
C. 8% excess D. 10% deficit
E. None of these

23. On decreasing the price of a colour TV by 20%, its sale is increased by 30%. The effect on the revenue is?
A. 4% decrease B. 4% increase
C. 16% decrease D. 16% increase
E. None of these

24. The price of pulses has fallen by 20%. How many quintals can be bought for the same amount which was sufficient to buy 18 quintals at the higher price?
A. 20 B. 22.5
C. 25 D. 27
E. 30

25. On a Big Billion-day sale, Google flagship mobile phone was available at a discount of 20% on Flipkart. The customers who are purchasing for the first time on Flipkart will get additional cashback of 10 % on the billing amount. Suraj being 1st time user of Flipkart purchases the mobile phone for Rs. 36000, find the actual cost price of the mobile phone.
A. Rs. 50000 B. Rs. 45000
C. Rs. 52250 D. Rs. 47250
E. None of these

26. In an exam minimum qualifying mark for class IX and X are 30% and 45% respectively. It is known that total marks of each class are same and a boy of class X scored 1225; thereby failing by 125 marks. Find passing marks for class IX.
A. 900 B. 1200
C. 1500 D. 925
E. None of these

27. Prerna decided to donate 15% of her salary to an orphanage. On the day of donation, she changed her mind and donated Rs 2,896 which was 90% of what she had decided earlier. How much is Prerna's salary (approx.)?
A. Rs. 19500
B. Rs. 17250
C. Rs. 21450

D. Can't be determined.
E. None of these

28. Equal amounts are deposited in two banks each at 3.5% p.a. for 12 years and 8.5 years respectively. If the difference between their interests is Rs. 189.875 then what is the amount?
A. Rs. 1550 B. Rs. 1650
C. Rs. 1750 D. Rs. 1850
E. Rs. 1950

29. Mrs. Kapoor invests 25% of her monthly salary, i.e., Rs. 7125 in Mutual Funds. Later she invests 24% of her monthly salary on Pension Policies. She invests another 11% of her salary on some Term Insurance Policies as well. What is the total monthly amount invested by Mrs. Kapoor?
A. 16600 B. 17100
C. 22100 D. 24600
E. None of these

30. In a college Anjana scored 80 marks out of 150 in History and 95 marks out of 120 in English. If she wants to score 70% marks in 3 subjects, find the minimum marks she should score in Geography out of 100.
A. 70 B. 55
C. 76 D. 85
E. None of these

31. What is 14.28% of 98?
A. 7 B. 11
C. 12 D. 14
E. None of the above

32. What is 5.263% of 1881?
A. 100 B. 99
C. 98 D. 97
E. 96

33. A man distributes 10%, 18% and 22% of his salary into his three children who spend 40%, 60% and 25% of that amount respectively. The difference between the total amount left with the children and man is Rs. 1015. What is the salary of the man?
A. Rs. 6000 B. Rs. 4200
C. Rs. 4800 D. Rs. 5000
E. Rs. 5600

34. AB de Villiers smashes 86 runs against Australia in 16 balls. If he only scored in boundaries (fours and sixes) only, then find the maximum percent of runs he scored by hitting fours.
A. 23.25% B. 26.4%
C. 74.5% D. 28%
E. None of these

35. A dishonest salesman buys x% more grains than what he pays for, while selling he uses counterfeit weight which measures 800 grams for every 1000 grams. If he sells the item at 10% above the cost price and earn an overall profit of 65%, then find the value of x.
A. 20% B. 25%
C. 35% D. 15%
E. None of these

36. As per a company policy only 25% of the female employees and 20% of the male employees can hold the positions higher than level 2. If the ratio of female and male employees in the company is 3 : 2, then find the percentage of employees which are working below level 2.
A. 75% B. 77%
C. 70% D. 72%
E. 79%

37. The price of rice has increased by 20%. Lalu has decided to spend only 8% more than what he initially did on buying rice. What is the percentage decrease in Lalu's rice consumption?
A. 10% B. 13%
C. 18% D. 14%
E. None of these

38. The production of a company has ups and downs every year. The production increases for two consecutive years consistently by 15% and in the third year it decreases by 20%. Again, in the next two years it increases by 25% each year and decreases by 10% in the third year. If we start counting from the year 2014 approximately what will be the effect on the production of the Company in 2018?
A. 22 B. 32
C. 30 D. 20
E. None of these

39. A person had a certain amount. He invested 5/6th of it in shares, 5% of it in mutual funds, 10% of it in debentures and kept the remaining Rs. 850 with him. If got interest at 10% for a year on debentures, what amount did he get as interest?

A. Rs. 5100 B. Rs. 7650
C. Rs. 510 D. Rs. 765
E. None of these

40. A car costing Rs. 5,00,000 of a person depreciated at the rate of 15% in the first year, 13% in the second year and so on. House of that person, costing Rs. 7,00,000 appreciated at the rate of 10% in the first year, 12% in the second year and so on. What was the change in total value of car, house at the end of 3 years?
A. Decrease of Rs. 1,34,543
B. Increase of Rs. 1,34,543
C. Increase of Rs. 1,12,214
D. Decrease of Rs. 1,12,214
E. Increase of Rs. 1,12,241

41. The ratio of Ashok's to Bhanu's earnings is 4 : 9. If Bhanu's earnings is increased by 45%, then his total earnings becomes Rs. 33930.What is the earning of Ashok?
A. Rs. 5000 B. Rs. 5200
C. Rs. 5500 D. Rs. 8200
E. None of these

42. Fresh sugarcane contains 84% water and dried sugarcane contains 28% water. How many kilograms of dried sugarcane can be obtained from 90 kg of fresh sugarcane?
A. 20 B. 35
C. 47 D. 72
E. None of these

43. In Kolkata consisting of three localities Salt Lake, South Kolkata and Rajarhat the population of the three localities Salt Lake, South Kolkata and Rajarhat are in the ratio 9 : 8 : 3. In Salt \ Lake, 80% of the people are literate, in South Kolkata, 30% of the people are illiterate. If 90% people in Rajarhat are literate. Find the percentage literacy in these three localities in Kolkata.
A. 77.5% B. 77.0%
C. 75.5% D. 75.0%
E. None of these

44. In an election of 3 candidates, Narendra Modi, Rahul Gandhi and Arvind Kejriwal. Narendra Modi gets 40% more votes than Rahul Gandhi. Narendra Modi also beats Arvind Kejriwal by 54000 votes. If it is known that Rahul Gandhi gets 10% more votes than Arvind Kejriwal, find the number of voters on the voting list (given 90% of the voters on the voting list voted and no votes were illegal)
A. 404444 B. 364000
C. 400000 D. 420000
E. None of these

45. Class A has boys to girls in the ratio 2 : 3, Class B has girls to boys in the ratio 5 : 3. If the number of students in Class A is at least twice as many as the number of students in Class B what is the minimum percentage of boys when both classes are considered together?
A. 33.33% B. 40%
C. 39.17% D. 37.5%
E. None of these

46. Virat prepares a budget to visit New York. However, he spends 12% of his budget on the first 10% days of his travel when he stays in the city. He knows that he has to spend another 35% of days in city itself, after which he would travel to the country side. What should be the minimum decrease in spending in country side as a percentage of his spending in city so as to complete his travel on the initial budget itself?
A. 33.33% B. 30.3%
C. 25% D. 32.23%
E. None of these

47. In the year 2014, the population of a city was 20,000. The population of the city increased in 2015, 2016 and 2017 by a constant number. In the year 2018, if the population of the city was increased by 20% over the previous years then the population of the city become 11200 more than that of the year 2014. What is the ratio of the percentage increase in the population of the city over the previous year in the year 2015 to that in the year 2017 over the previous year?
A. 1 : 1 B. 5 : 6
C. 6 : 5 D. 4 : 3
E. None of these

48. Salary of A is 37.5% of the total salary of A and B. B saves 60% of his salary and total savings of A and B is 50% of their total income. Their average expenditure is Rs 16000. What is the total salary of A and B?
A. Rs. 96000 B. Rs. 54000

C. Rs. 72000 D. Rs. 64000
E. Rs. 48000

49. In a class 25% of the students passed in both English and Hindi. 37.5% of the students failed in both the subjects while 60% students failed in Hindi. The difference between the students who passed in English and those who passed in Hindi is 15. What is the total number of students in class?
A. 180 B. 420
C. 360 D. 200
E. 240

50. Out of total students 100/3 % are in hostel A and remaining are in hostel B. If 20 students from hostel B are shifted to hostel A, then total students in hostel A becomes 50% of total students. If 20 students from hostel A are shifted to hostel B, then the total students in hostel. A becomes what per cent of total students?
A. 26.34% B. 16.67%
C. 12.75% D. 20.67%
E. None of these

ANSWER KEY:

1) B	11) B	21) A	31) D	41) E
2) C	12) B	22) C	32) B	42) A
3) C	13) B	23) B	33) D	43) A
4) B	14) B	24) B	34) A	44) A
5) D	15) B	25) A	35) A	45) C
6) E	16) B	26) A	36) B	46) B
7) D	17) D	27) C	37) A	47) C
8) D	18) D	28) A	38) B	48) D
9) A	19) A	29) B	39) C	49) D
10) A	20) B	30) E	40) C	50) B

PROFIT & LOSS

- **Cost Price** – Cost Price is the price at which an article is purchased by the buyer. It is abbreviated as C. P. It is basically the price at which a commodity or object is bought at. e.g., Shopkeeper buying Sugar from Farmer to sell in his grocery store.
  This cost price is further classified into two different categories:
  - **Fixed Cost:** The fixed cost is constant; it doesn't vary under any circumstances.
  - **Variable Cost:** It could vary depending on the number of units and other factors.
- **Selling Price** – Selling Price is the price at which any material or commodity is sold to known. **For ex**– Rahul is selling sugar. Here selling refers to SELLING PRICE.
- **Gain or Profit** – If SP is greater than CP then the seller is said to have profit or gain.
  - Profit or Gain = Selling price – Cost Price
  - Profit percentage (P%) = (Profit /Cost Price) x 100
- **Loss** – If Cost price is greater than the Selling price, Loss is incurred.
  - Loss = Cost Price – Selling Price
  - Loss percentage (L%) = (Loss / Cost price) x 100
- Marked Price Formula (MP) – This is basically labelled by shopkeepers to offer a discount to the customers in such a way that,
  - Discount = Marked Price – Selling Price
  - And Discount Percentage = (Discount/Marked price) x 100
- C.P in case of gain:
  - $\frac{100}{100+Gain} \times SP$
- C.P in case of Loss:
  - $\frac{100}{100-Loss} \times SP$
- S.P in case of Gain:
  - $\frac{100+Gain}{100} \times CP$
- S.P in case of Loss:
  - $\frac{100-Loss}{100} \times CP$
- If you sell two items at same selling price "s" first at x% profit and 2nd one at x% loss. Then a loss is incurred always, which is given by
  - $\left(\frac{x}{10}\right)^2$
- **Successive discounts:**
  - If d1%, d2%, d3% are successive discounts on marked price,

Selling price=marked price $\frac{100-d_1}{100} \times \frac{100-d_2}{100} \times \frac{100-d_3}{100}$

Note:

(a) If there is no discount, the marked price is equal to the selling price

(b) Discount is always calculated on marked price unless otherwise stated.

Solved Examples:

Type 1:

Seller has two Articles for same price, but first article is sold at x% profit and other at x% loss. Total Profit/Loss incurred by him is not 0%

Way to solve this question is –

Apply direct formula

Loss = $\left(\frac{x}{10}\right)^2$

Question 1:

Let us assume the articles were sold at Rs600, and 20% profit in case 1 is made and 20% loss in case 2 is made.

Solution

SP in case 1(Profit) – 600

Thus CP = $\frac{100}{100+Gain} \times SP = \frac{100}{120} \times 600 = \frac{5}{6} \times 600 = 500$

SP in case 2(Loss) – 600

Thus CP = $\frac{100}{100-Loss} \times SP = = \frac{100}{80} \times 600 = \frac{5}{4} \times 600 = 750$

Total SP = 600 + 600 = 1200

Total CP = 500 + 750 = 1250

$Loss = \frac{CP-SP}{CP} \times 100 = \frac{50}{1250} \times 100 = \frac{500}{125} = 4\%$

Also, from direct formula above = $\left(\frac{20}{10}\right)^2$

In such cases always, loss is incurred.

Type 2:

Where no CP or SP is given. But whole concept is about Percentages.

Way to solve this question is –

Assume the CP to be 100 and then solve the whole problem.

Question 2:

In a transaction, the profit percentage is 75% of the cost. If the cost further increases by 25% but the selling price remains the same, how much is the decrease in profit percentage?

Solution

Let us assume CP = Rs. 100.

Then Profit = Rs. 75 and selling price = Rs.175.

The cost increases by 25% → New CP = Rs. 125, SP = Rs. 175.

Profit % = $\frac{50}{125} \times 100 = 40\%$

Therefore, Profit decreases by 35%.

Type 3:

There are two Articles and you have to calculate total loss or profit.

Question 3:

A man bought some toys at the rate of 10 for Rs. 80 and sold them at 12 for Rs. 120. Find his gain or loss percent.

Solution

Cost price of 10 toys = Rs. 80 → CP of 1 toy = Rs. 8.

Selling price of 12 toys = Rs. 120 → SP of 1 toy = Rs. 10

Therefore, Gain = 10 – 8 = 2.

Gain percent = $\frac{2}{8} \times 100 = 25\%$

Type 4:

CP of y items is same as SP of x items and Profit or Loss of some percentage is made.

Question 4:

The cost price of 20 pens is the same as the selling price of n pens. If there is a loss of 50%, approximately what is the value of n?

Solution

Let the price of each pen be Re. 1.

Then the cost price of n pens is Rs. n and the selling price of n pens is Rs. 20.

Loss = n-20.

Loss of 50% → $\left(\frac{loss}{CP}\right) \times 100 = 50$

Therefore, $\frac{n-20}{n} \times 100 = 50$

n ≈ 40

Type 5:

If the price of an item increases by r% , then the reduction in consumption so that expenditure remains the same is

Or

If the price of a commodity decreases by r% then increase in consumption, so as not to decrease expenditure on this item is:

Solution

Just apply the following two formulas

Case 1:

$\left(\frac{r}{100+r}\right) \times 100$

Case 2:

$\left(\frac{r}{100-r}\right) \times 100$

Type 6:

A dishonest dealer claims to sell his goods at cost price, but he uses a weight of lesser weight. Find his gain%.

Solution

Apply the following formula directly:

Gain % = $\frac{True\ Weight - False\ Weight}{False\ Weight} \times 100$

Question 5:

Shopkeeper bought a product for Rs1000 per kg and is selling that at the same price. However, he uses, a weighing scale that gives scale of 1kg for every 750gms. What is his profit?

Solution

$\left(\frac{1000-750}{750}\right) \times 100 = \left(\frac{1}{3}\right) \times 100 = 33.33\%$

Type 7:

A shopkeeper sells an item at a profit of x % and uses a weight which is y % less. Find his total profit.

Use Formula: Gain% = $\left(\frac{\%Profit + \%Less\ in\ weight}{100 - \%Less\ in\ weight}\right) \times 100$

When dealer sells goods at loss on cost price but uses less weight.

Profit% or Loss% = $\left(\frac{\%\ Less\ weight - \%Loss}{100 - \%Less\ in\ weight}\right) \times 100$

A dishonest dealer sells goods at x % loss on cost price but uses a gms instead of b gms to measure as standard, his profit or loss percent:-

Use Formula: Profit% or Loss% = (100 – Loss%)$\left(\frac{Original\ Weight}{Altered\ Weight}\right) - 100$

Case-1: When dealer sells product at profit but alters weight

Profit% or loss% = (100+gain%)$\left(\frac{1000}{Altered\ Weight}\right) - 100$

Case-2: When dealer reduces weight in terms of percentage and earns profit

Question 6:

A shopkeeper sells an item at a profit of 25 % and uses a weight which is 25% less. Find his total profit.

Solution

Applying the first formula

$\left(\frac{25+25}{100-25}\right) \times 100 = 66.66\%$

Case-3: When dealer sells goods at loss on cost price but uses less weight.

Note :- profit or loss will be decided according to sign . If +ve it is profit ,if –ve it is loss.

Question 7:

A dishonest dealer sells goods at 10% loss on cost price but uses 20% less weight. Calculate profit or loss percent.

Solution

Apply formula: Case 2 Formula

$\left(\frac{20-10}{100-20}\right) \times 100 = \frac{25}{2}\% = 12.5\%$

Here sign is positive so there is a profit of 12.5%

Case 4

Question 8:

A dishonest dealer sells products at 10% loss on cost price but uses 4 gm instead of 8 gm. what is his profit or loss percent?

Solution

Apply formula:

$(100-10) \times \frac{8}{4} - 100 = 80\%$

Note: Profit or loss will be decided according to sign. If +ve it is a profit, if –ve it is a loss.

Question 9:

A shopkeeper uses 940 gm in place of one kg. He sells it at 10% profit. What will be the overall profit or loss?

Solution

A dishonest shopkeeper used to 940 grams in place of 1000 grams

Profit = 10%

Let the cost price of 1 gram be 1 rupee

For shopkeeper,

⇒ Cost price = Rs. 940

⇒ Selling price = 1000 × (100 + 10)% = Rs. 1100

⇒ The real profit of dishonest shopkeeper = [(1100 – 940)/940] × 100

∴ The real profit of a dishonest shopkeeper = (160/940) × 100

⇒ The real profit of dishonest shopkeeper = 17.02%

∴ The real profit of dishonest shopkeeper is 17.02%

OR

Effective percentage = a + b + ab/100

Profit due to quantity = 1000 – 940 = 60

Profit% due to quantity = (60/940) × 100 = 6.39%

Effective profit percentage = 6.39 + 10 + (6.39 × 10)/100

⇒ 16.39 + 0.639 = 17.02%

∴ The real profit of dishonest shopkeepers is 17.02%.

Exercise – 1

1. Priyam buys an old TV for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the TV for Rs. 5800, his gain percent is:
   A. $4\frac{4}{7}\%$ B. $5\frac{5}{11}\%$
   C. 10% D. 12%
   E. 15%
2. The cost price of 20 chocolates is the same as the selling price of x chocolates. If the profit is 25%, then the value of x is:
   A. 15 B. 16
   C. 18 D. 25
   E. 27
3. A shopkeeper bought biscuits at 6 for a rupee. How many for a rupee must he sell to gain 20%?
   A. 3 B. 4
   C. 5 D. 6
   E. 7
4. A shopkeeper expects a gain of 22.5% on his cost price. If in a week, his sale was of Rs. 392, what was his profit?
   A. Rs. 18.20 B. Rs. 70
   C. Rs. 72 D. Rs. 88.25
   E. Rs. 75.60
5. A man buys a phone for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the phone?
   A. Rs. 1090 B. Rs. 1160
   C. Rs. 1190 D. Rs. 1202
   E. Rs. 1240
6. Some toys were bought at 6 toys for Rs. 5 and sold at 5 toys for Rs. 6. Gain percent is:
   A. 30% B. 33 33%
   C. 35% D. 44%
   E. 48%
7. 100 mangoes are bought at the rate of Rs. 350 and sold at the rate of Rs. 48 per dozen. The percentage of profit or loss is:
   A. $14\frac{2}{7}\%$ gain B. 15% gain
   C. $14\frac{1}{7}\%$ loss D. 15% loss
   E. 18% loss
8. On selling an article at successive discounts of 20% and 25% a dealer makes a net profit of 20%, Find the net profit per cent if the dealer sells the same article at a discount of 25%.
   A. 50% B. 40%
   C. 66% D. 60%
   E. 70%
9. Arjun buys a toy at Rs 100 and sells it at Rs 120. Amin buys the same toy at Rs 120 but sells it at Rs 100. What is the respective profit/loss per cent for the two persons?
   A. 20%, 20% B. 20%, 16.7%
   C. 16.7%, 16.7% D. 16.7%, 10%
   E. 25%, 14%
10. Abhay sold a book at a loss of 10%. Had he sold it for Rs 108 more, he would have earned a profit of 10%. Find the cost price of the book?
    A. Rs 432 B. Rs 540
    C. Rs 648 D. Rs 740
    E. Rs 780
11. Ajay marked the price of his goods 30% more than his C.P. He then sells 1/4th of his stock at a discount of 15%, and half of the stock at the marked price, and the rest at a discount of 30%. Find his gain percentage.
    A. 16.5% B. 15.375%
    C. 14.20% D. 13.37%
    E. 16.00%
12. The marked price of a radio is Rs 1,600. Rahul gives successive discount of 10%, r% to the Pradeep. If Pradeep pays Rs 1,224 for the radio, find the value of r.
    A. 10% B. 20%
    C. 25% D. 15%
    E. 22%
13. Ajay buys 6 dozen eggs for Rs 10.80, and 12 eggs are found rotten and the rest are sold at 5 eggs per rupee. Find his percentage gain or loss.
    A. $11\frac{1}{9}\%$ gain B. $11\frac{1}{9}\%$ loss
    C. $9\frac{1}{11}\%$ gain D. $9\frac{1}{11}\%$ loss
    E. $10\frac{2}{5}\%$ loss
14. If a book is sold at 8% profit instead of 8% loss, it would have brought Rs 12 more. Find out the cost price of the book
    A. Rs 75 B. Rs 72
    C. Rs 60 D. Rs 70
    E. RS 85
15. By selling 33 metres of wire, a shopkeeper gains the price of 11 metres of wire. His gain per cent is

A. 7% B. 50%
C. 20% D. 22%
E. 25%

16. If the cost of 12 books is equal to the selling price of 10 books, the profit per cent in the transaction is
A. $16\frac{2}{3}$% B. 18%
C. 20% D. 25%
E. 22%

17. Two motor cycles were sold for Rs 9,900 each, gaining 10% on one and losing 10% on the other. The gain or loss per cent in the whole transaction is
A. Neither loss nor gain B. 1% profit
C. $\frac{100}{99}$% profit D. 1% loss
E. $\frac{100}{99}$% loss

18. A retail bookseller buys books at 58% of the list price. He expects to earn a minimum of 20% net profit. What is the maximum discount that he can offer to his customer?
A. 31.6% B. 25.5%
C. 30.4% D. 30%
E. 35%

19. If a shopkeeper offers a discount of 20% on the list price of a washing machine, then he makes a profit of 12%. What is the percentage profit or loss, if he sells at a discount of 25% on the list price?
A. 0.6% loss B. 0.5% profit
C. 4.25% loss D. 5% profit
E. 3.5% profit

20. By selling 6 dozen oranges, a person incurs a loss which is equal to selling price of 1 dozen oranges. Find his loss percentage?
A. 14.28% loss B. 12.25% loss
C. 16.66% loss D. 14.66% loss
E. 15.00% loss

21. A television set listed at Rs. 3,200 is sold to a retailer at successive discounts of 25% and 15%. What is the final amount paid by retailer of that television set?
A. Rs. 2,700 B. Rs. 2,040
C. Rs. 2,584 D. Rs. 2,500
E. None of these

22. Two horses were sold for Rs. 12,000 each, one at a loss of 20% and the other at a gain of 20%. The entire transaction resulted in
A. no loss no gain B. loss of Rs. 1,000
C. gain of Rs. 1,000 D. loss of Rs. 1,200
E. None of these

23. If cost price of 4 articles is equal to selling price of 5 articles, then find the profit/loss percentage.
A. 20% loss B. 25% profit
C. 25% loss D. 20% profit
E. None of these

24. A merchant has 100 kg of sugar, a part of which he sells at 7% profit and the rest at 17% profit. He gains 10% on the whole. How much is sold at 17% profit?
A. 70 kg B. 50 kg
C. 35 kg D. 30 kg
E. 40 kg

25. A book was sold for a certain sum and there was a loss of 20%. Had it been sold for Rs. 3 more, then there would have been a profit of 30%. If it was sold for Rs. 6.60, then the profit/ loss percentage would have been
A. Profit 10% B. Profit 8.33%
C. Loss 8.33% D. Loss 10%
E. No profit no loss

26. If selling price is doubled, the profit triples. Find the profit percent.
A. $66\frac{2}{3}$ B. 100
C. $105\frac{1}{3}$ D. 120
E. 145

27. In a certain shop, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?
A. 30% B. 70%
C. 100% D. 250%
E. 150%

28. The percentage profit earned by selling a book for Rs. 1920 is equal to the percentage loss incurred by selling the same book for Rs. 1280. At what price should the book be sold to make 25% profit?
A. Rs. 2000 B. Rs. 2200
C. Rs. 2400 D. Rs. 2500
E. Data inadequate

29. Sam purchased 20 dozen of books at the rate of Rs. 375 per dozen. He sold each one of them at the rate of Rs. 33. What was his percentage profit?
A. 3.5 B. 4.5
C. 5.6 D. 6.5
E. 7.6

30. On selling 17 pens at Rs. 720, there is a loss equal to the cost price of 5 pens. The cost price of a pen is:
A. Rs. 45 B. Rs. 50
C. Rs. 55 D. Rs. 60
E. Rs. 65

31. When a scooter is sold for Rs. 18,700, the owner loses 15%. At what price must that scooter be sold in order to gain 15%?
A. Rs. 21,000 B. Rs. 22,500
C. Rs. 25,300 D. Rs. 25,800
E. Rs. 26.000

32. A shopkeeper sells one cycle for Rs. 840 at a gain of 20% and another for Rs. 960 at a loss of 4%. His total gain or loss percent is:
A. $5\frac{15}{7}$% loss B. $5\frac{15}{17}$% gain
C. $6\frac{2}{3}$% gain D. $6\frac{2}{3}$% loss
E. None of these

33. A trader mixes 26 kg of rice at Rs. 20 per kg with 30 kg of rice of other variety at Rs. 36 per kg and sells the mixture at Rs. 30 per kg. His profit percent is:
A. No profit, no loss B. 5%
C. 8% D. 10%
E. None of these

34. A sweet seller sells 3/5th part of sweets at a profit of 10% and remaining at a loss of 5%. If the total profit is Rs 1500, then what is the total cost price of sweets?
A. Rs. 36,500 B. Rs. 37,000
C. Rs. 37,500 D. Rs. 38,000
E. None of these

35. If the absolute difference between the selling price of the article when there is 15% loss and 15% gain in selling a article is Rs 450, then what is the cost price of the article?
A. Rs 1,200 B. Rs 1,500
C. Rs 2,000 D. Rs 2,200
E. Rs 2,500

36. If the selling price of a mat is five times the discount offered and if the percentage of discount is equal to the percentage profit, find the ratio of the discount offered to the cost price.
A. 11 : 30 B. 1 : 5
C. 1 : 6 D. 7 : 30
E. 8 : 15

37. The market price of an article was 40% more than its cost price. I was going to sell it at market price to a customer, but he showed me some defects in the article, due to which I gave him a discount of 28.57%. Next day he came again and showed me some more defects, hence I gave him another discount that was equal to 12.5% of the cost price. What was the approximate loss to me?
A. Loss of 10% B. Loss of 12.5%
C. Loss of 15% D. Loss of 18%
E. None of these

38. If watches bought at prices ranging from Rs 200 to Rs 350 are sold at prices ranging from Rs 300 to Rs 425. What is the greatest possible profit that might be made in selling eight watches?
A. Rs 900 B. Rs 1,800
C. Rs 800 D. Rs 1,500
E. None of these

39. A shopkeeper marks up the price of his goods by 20% and gives a discount of 10% to the customer. He also uses a 900g weight instead of 1Kg weight. Find his profit percentage.
A. 8% B. 12%
C. 20% D. 24%
E. None of these

40. The cost price of 20 books is the same as the selling price of 'X' books. If the profit is 25%, then the value of X is ?
A. 25 B. 18
C. 16 D. 15
E. 22

41. The cost price of three varieties of oranges namely A, B and C is Rs 20/kg, Rs 40/kg and Rs 50/kg. Find the selling price of one kg of orange in which these three varieties of oranges are mixed in the ratio of 2 : 3 : 5 such that there is a net profit of 20%?
A. Rs 48 B. Rs 48.6
C. Rs 49.2 D. Rs 49.8
E. Rs. 50.4

42. 'A' sold an article to 'B' at a profit of 20%. 'B' sold the same article to 'C' at a loss of 25% and 'C' sold the same article to 'D' at a profit of 40%. If 'D' paid Rs 252 for the article, then find how much did 'A' pay for it?
A. Rs. 175 B. Rs. 200

C. Rs. 180 D. Rs. 210
E. Rs. 230

43. A sells his house to B at a profit of 10% who in turn sells it to C at a profit of 15% who in turn Sells it to D at a profit of 25% and D sells it to E at 35% profit. If cost price of E's house is Rs 35,00,000, what is the approximate cost price of A's house?
A. Rs 15,40,000 B. Rs 15,10,000
C. Rs 15,00,000 D. Rs 16,40,000
E. Rs 17,00,000

44. Cost price of 12 mangoes is equal to the selling price of 9 mangoes and the discount on 10 mangoes is equal to the profit on 5 mangoes. What is the percentage point difference between the profit percentage and discount percentage?
A. 11.11% B. 33.33%
C. 22.22% D. 12.85%
E. 22.5%

45. John sells his laptop to Mark at a loss of 20% who subsequently sells it to Kevin at a profit of 25%. Kevin after finding some defect in the laptop, returns it to Mark but could recover only Rs.4.50 for every Rs. 5 he had paid. Find the amount of Kevin's loss if John had paid Rs. 1,75,000 for the laptop.
A. Rs. 13,500 B. Rs. 2,500
C. Rs. 17,500 D. Rs. 18,000
E. None of these

46. Ajay sells goods to a customer at a profit of K % over the cost price, besides it he cheats his customer by giving 880 g only instead of 1 kg. Making an overall profit of 25%. Find the value of K.
A. 8.33% B. 8.25%
C. 10% D. 12.5%
E. 14%

47. On selling a pencil at 5% loss and a book at 15% gain, Kiran gains Rs 7. If he sells the pencil at 5% gain and the book at 10% gain, then he gains Rs 13. The actual price of the book is
A. Rs 100 B. Rs 80
C. Rs 90 D. Rs 400
E. Rs 150

48. Rehman buys a few apples at 15 for a rupee and the same number of apples at 20 for a rupee. He mixes the two lots and sells them at 35 for 2 rupees. What is his gain or loss percentage?
A. 3.62% loss B. 2.04% profit
C. No profit, no loss D. 2.04% loss
E. 3.62% profit

49. The aggregate cost of 2 apples, 3 mangoes and 4 oranges is Rs. 6 more than the aggregate cost 1 apple, 2 mangoes and 2 oranges, and the aggregate cost of 1 apple, 2 mangoes and 1 orange is Rs. 8 less than the aggregate cost of 3 apples, 3 mangoes and 5 oranges. If the aggregate list price of 3 apples, 1 mango and 6 oranges is Rs. 12, then find how much percent discount one should give on the sale of 3 apples, 1 mango and 6 oranges such that there is a net profit of 5%?
A. 10% B. 7.5%
C. 15% D. 12.5%
E. 18%

50. A shopkeeper buys an article for ₹12,000. He first sells it at a loss of 20% and then buys it back at the same price. Finally, he sells it at a profit of 25%. What is his overall profit or loss percentage?
A. 5% Profit B. 10% Loss
C. 15% Profit D. 8.33% Profit
E. No Profit No Loss

ANSWER KEY:

1) B	11) B	21) B	31) C	41) C
2) B	12) D	22) B	32) B	42) B
3) C	13) A	23) A	33) B	43) D
4) C	14) A	24) D	34) C	44) C
5) C	15) B	25) A	35) B	45) C
6) D	16) C	26) B	36) D	46) C
7) A	17) D	27) B	37) B	47) B
8) A	18) C	28) A	38) B	48) D
9) B	19) D	29) C	39) C	49) D
10) B	20) A	30) D	40) C	50) E

RATIO AND PROPORTION

What is Ratio and Proportion?

A comparison of two quantities by division is called a ratio and the equality of two ratios is called proportion. A ratio can be written in different forms like a:b or a/b and is commonly read as, a is to b.

On the other hand, proportion is an equation that says that two ratios are equivalent. A proportion is written as a:b : : c:d, and is read as a is to b as c is to d. Here, a/b = c/d where b & d are not equal to 0.

Definition of Ratio

Ratio is the comparison of two quantities which is obtained by dividing the first quantity by the other. If x and y are two quantities of the same kind and with the same units, such that y is not equal to 0, then the quotient x/y is called the ratio between x and y. Ratios are expressed using the symbol of the colon (:). This means that ratio x/y has no unit and it can be written as x:y.

Definition of Proportion

Proportion refers to the equality of two ratios. Two equivalent ratios are always in proportion. Proportions are denoted by the symbol (: :) and they help us to solve for unknown quantities. In other words, proportion is an equation or statement that is used to depict that the two ratios or fractions are equivalent. Four non-zero quantities, a, b, c, d are said to be in proportion if a : b = c : d.

Now, let us consider the two ratios - 6:7 and 30:35. Here, 6:7 can be expressed as 6:7 = 6/7 = 0.8 and 30:35 can be expressed as 30:35 = 30/35 = 6/7 = 0.8. Since both the ratios are equal, we can say that these two are proportional.

There are two types of proportions.

- Direct Proportion
- Inverse Proportion

Direct Proportion

Direct proportion describes the direct relationship between two quantities. If one quantity increases, the other quantity also increases and vice-versa. Thus, a direct proportion is written as $y \propto x$. For example, if the speed of a car is increased, then it covers more distance in a fixed period of time.

Inverse Proportion

Inverse proportion describes the relationship between two quantities in which if one quantity increases, the other quantity decreases and vice-versa. Thus, an inverse proportion is written as $y \propto 1/x$. For example, as the speed of a vehicle is increased, it will cover a fixed distance in less time.

Ratio and Proportion Formula

The formula for ratio is expressed as

a : b $\Rightarrow \frac{a}{b}$

where,

a = the first term or antecedent.

b = the second term or consequent.

For example, ratio 2 : 7 is also represented as 2/7, where 2 is the antecedent and 7 is the consequent.

Now, in order to express a proportion for the two ratios, a : b and c : d, we write it as

a:b::c:d ➔ $\frac{a}{b} = \frac{c}{d}$

The two terms b and c are called mean terms.

The two terms a and d are known as extreme terms.

In a: b = c : d, the quantities a and b should be of the same kind with the same units, whereas, c and d may be separately of the same kind and of the same units. For example, 9 kg:27 kg = Rs. 81:Rs. 243

The proportion formula can be expressed as, a/b = c/d or a:b : : c:d.

In a proportion, the product of the means = the product of the extremes. Therefore, in the proportion formula a: b : : c : d, we get b × c = a × d. For example, in 9:27::81:243, we will get 27 × 81 = 9 × 243

a : b :: c: d

a, d → extremes

b, c → means

Product of extremes = Product of means

Fourth proportional

If x : y = z: a, then a is called the fourth proportional to x, y, z.

Third proportional

If x: y = y: z, then z is called the third proportional to x and y.

Mean proportional

Mean proportional between x and y is $\sqrt{xy}$

Comparison of ratios

We say that (x: y) > (z: a), then (x/y) > (z /a).

Compounded ratio

The compounded ratio of the ratios (x: y), (z: a), (b : c) is (xzb: yac)

Formulas & Properties of Ratio

- The ratio of two people a and b is denoted as a : b.
- a : b = ma : mb, where m is a constant.

- x : y : z = X : Y : Z is equivalent to x/X=y/Y=z/Z
- If x/y = z/a then, x+y/x−y = z+a/z−a

Property of Proportion

- x/y=z/a , this means x : y ::z:a
- If x : y and z : a, then it can be solved as (x×z)/(y×a).
- If x/y=z/a=b/c, then each of these ratios is equal to (x+z+e)/(y+a+f)
- If x/y=z/a, then y/x=a/z (Invertendo)
- If x/y=z/a, then x/z=y/a (Alternendo)
- If x/y=z/a, then (x+y)/y=(z+a)/a (Componendo)
- If x/y=z/a, then (x−y)/y=(z−a)/a (Dividendo)
- If x/y=z/a, then (x+y)/(x−y)=(z+a)/(z−a) (Componendo and Dividendo)
- Four numbers x, y, z and a are said to be in proportion if x : y = z : a. If on the other hand, x : y = y : z = z : a, then the four numbers are said to be in continued proportion.
- Let us consider the ratios, x : y = y : z. Here y is called the mean proportional and is equal to the square root of the product of x and z i.e.
  $y^2 = x \times z \Rightarrow y = \sqrt{xz}$
- If the three ratios, x : y, y : z, z : a is known, we can find x : a by the multiplying these three ratios x/a = x/y × y/z × z/a
- If x, y, z, and a are four terms and the ratios x : y, y : z, z : a are known, then one can find the ratio x : y : z : a.

Solved Examples:

Type 1: Ratio and Proportions Tricks

Compound Ratio Based On Individual Ratios

Question 1:

Find the combined ratio of (7 : 6), (5 : 11), (10 : 9).

A. 56/157 B. 65/99

C. 21/31 D. 1/5

Correct answer- B

Solution:

If we compound two or more ratio, then, a : b and c : d will become ac : bd. Therefore,

(5 : 6), (7 : 9), (10 : 11) $= \frac{7}{6} \times \frac{5}{11} \times \frac{10}{9} = \frac{350}{594}$

$= \frac{65}{99}$

Question 2:

Find the compound ratio of (15 : 13), (11 : 10), (9 : 19).

A. 156:157 B. 297:494

C. 221:431 D. 1:5

Correct answer – B

Solution:

If we compound two or more ratio, then, a : b and c : d will become ac:bd.

Therefore, (15 : 13), (11 : 10), (9 : 19)

$= \frac{15}{13} \times \frac{11}{10} \times \frac{9}{19} = \frac{1485}{2470}$

= 297/494

Question 3:

Find the composite ratio of 2 : 5, 3 : 7, 5 : 3.

A. 11 : 24 B. 2 : 7

C. 14 : 23 D. 24 : 97

Correct answer – B

Solution:

The composite ratio is intended by

$\frac{2}{5} \times \frac{3}{7} \times \frac{5}{3} = \frac{30}{105}$

$= \frac{2}{7}$

Question 4:

Find the compounded ratio of (3 : 5), (11:21), and (9:7)

A. 99:245 B. 13:17

C. 114:221 D. 305:711

Correct answer – A

Solution:

If we compound two or more ratio, then, a : b and c : d will become ac:bd.

Therefore, (3 : 5), (11:21), and (9:7)

$= \frac{3}{5} \times \frac{11}{21} \times \frac{9}{7} = \frac{297}{735} = \frac{99}{245}$

Type 2: Distributing Any Quantity Based On Ratios

Question 5:

Rupees 1625 is divided among Shraddha, Sanni, and Utkarsh in such a way that 3-times Shraddha's share, 2-times Sanni's share and 4 times Utkarsh's share is equal. Calculate their individual share.

A. 492, 738, 369 B. 448, 700, 361

C. 750, 500, 375 D. 570, 768, 391

Correct answer – C

Solution:

Let the Sanni, Shraddha, and Utkarsh share be x, y, and z

Given, 2x = 3y = 4z.

Given, x + y + z = 1625

Here, we will assign values of x and z in terms of y.

Therefore, y + 3y/2 + 3y/4 = 1625

13y = 1625 × 4

13y = 6500

y= 500

x = 750

z = 375

Therefore, individual shares are Shraddha –750, Sanni – 500, Utkarsh – 375

Question 6:

Rs. 54880 is divided among 5 females, 3 men, and 1 child. The ratio of each woman, man, and kid, are 9 : 3 : 2. What is the child's share?

A. 1100 B. 1520

C. 1960 D. 1904

Correct answer – C

Solution:

Given, the ratio of females, males, and toddlers = 9 : 3 : 2

No. of females, men, and child are 5, 3, 1

Thus actual ratio of females, men, and child = 9 × 5 : 3 × 3 : 2 × 1 = 45 : 9 : 2

Therefore, part of child = (2/56) × 54880 = Rs. 1960

Question 7:

An amount of Rs. 29333 is divided among three employees in the ratio of 1/17, 1/19, and 1/21. Find the smallest share.

A. 8780.8 B. 8600.25

C. 8500 D. 5880.25

Correct answer – A

Solution:

Given, three shares $= \frac{1}{17}, \frac{1}{19}, \frac{1}{21}$.

Therefore, the ratio will be

$\frac{399}{6783}, \frac{357}{6783}, \frac{323}{6783}$

Thus, the ratio is 399 : 357 : 323

The smallest share = 29333 $\times \frac{323}{1079}$

= 8780.8

Type 3: Coins Based Ratio Problems

Question 8:

Isha has 3600 rupees in the denomination of 5 paisa, 25 paisa, and 75 paisa in ratio 6 : 3 : 1. Calculate how many 25 paisa coins he has.

A. 5600 B. 4000

C. 7000 D. 6000

Correct answer – D

Solution:

Let the number of 5 paisa coins be 6x

Let the number of 25 paisa coins be 3x

Let the number of 75 paisa coins be x

Then,

$5 \times \frac{6x}{100} + 25 \times \frac{3x}{100} + \frac{75x}{100} = 3600$

$= \frac{180x}{100} = 3600$

Therefore, x = $3600 \times \frac{100}{180}$

x = 2000

Hence, 25 paisa coins = 3 × 2000 = 6000

Question 9:

Sahil got old currencies from his cupboard worth Rs. 900 in the denomination of 2 paisa, 5 paisa, and 50 paisa in ratio 5 : 4 : 3. How many 2 paisa coins he got.

A. 2400 B. 2500

C. 2200 D. 2440

Correct answer – B

Solution:

Let the number of 2 paisa coins be 5x

Let the number of 5 paisa coins be 4x

Let the number of 50 paisa coins be 3x

Then,

$2 \times \frac{5x}{100} + 5 \times \frac{4x}{100} + 50 \times \frac{3x}{100} = \frac{180x}{100}$

Given, $\frac{180x}{100} = 900$

Therefore, $900 \times \frac{100}{180} = x$

x = 500

Hence, 2paisa coins = 5 × 500 = 2500

Question 10:

A person has 360 rupees in the denomination of 5paisa, 10paisa, and 25paisa in ratio 5 : 3 : 1. Calculate how many 25 paisa coins he has.

A. 450 B. 400

C. 700 D. 600

Correct answer – A

Solution:

Let the number of 5 paisa coins be 5x

Let the number of 10 paisa coins be 3x

Let the number of 25 paisa coins be x

Then,

$5 \times \frac{5x}{100} + 10 \times \frac{3x}{100} + \frac{25x}{100} = \frac{80x}{100}$

Given, 80x/100 = 360

Therefore, 360 × $\frac{100}{80}$ = x

x = 450

Hence, 25 paisa coins = 1 × 450 = 450 coins

Question 11:

Sanika has 3000 rupees in the denomination of 5 paisa, 25 paisa, and 50 paisa in ratio 5 : 3 : 2. Calculate how many 25 paisa coins he has.

A. 5600 B. 4000

C. 5000 D. 4500

Correct answer – D

Solution:

Let the number of 5 paisa coins be 5x

Let the number of 25 paisa coins be 3x

Let the number of 1 rupee coins be 2x

Then

$5 \times \frac{5x}{100} + 25 \times \frac{3x}{100} + 50 \times \frac{2x}{100} = \frac{200x}{100}$

Given, $\frac{200x}{100} = 3000$

Therefore, $3000 \times \frac{100}{200} = x$

x = 1500

Hence, 25 paisa coins = 3 × 1500 = 4500

Type 4: Mixtures & Addition Based Ratio Problems

Question 12:

A mixture of sugar and water is in the ratio 3 : 2. A man adds 18 litres of water, and the mixture comes in the ratio of 3 : 5. Find the quantity of sugar in the new mixture.

A. 18 B. 15

C. 12 D. 10

Correct answer – A

Solution:

Let water be 2x, and sugar is 3x.

Given, $\frac{3x}{2x+18} = \frac{3}{5}$

15x =6x + 54

9x = 54

x = 6

Therefore, quantity of sugar = 3 × 6 = 18 litres

Question 13:

Sachi and Karan's salaries are in the ratio 5 : 9. If both of their salaries are raised by Rs. 8400, then the proportion changes to 22 : 27. Find Karan's salary.

A. 18501.5 B. 16116.64

C. 14399.94 D. 13580.45

Correct answer – C

Solution:

Let Sachi and Karan's salaries be 5x and 9x

Given, $\frac{5x+8400}{9x+8400} = \frac{22}{27}$

135x + 226800 = 198x + 184800

63x = 42000

x = 666.66

Therefore, Karan's salary

= 666.66 × 9 + 8400 = 14399.94

Question 14:

Salaries of Shalini and Soumya are in the ratio 14 : 15. If both get an increment of Rs. 10600, the new ratio becomes 33 : 35. What is Shalini's salary?

A. 48000 B. 69960

C. 60200 D. 20400

Correct answer – B

Solution:

Let Shalini's salary be 14x, and Soumya's salary be 15x

Given, 14x + 10600 = 33

Given, 15x + 10600 = 35

$= \frac{14x+10600}{15x+10600} = \frac{33}{35}$

= 490x + 371000 = 495x + 349800

5x = 21200

x = 4240

Therefore, Shalini's salary

= 14 × 4240 + 10600 = 69960

Question 15:

800 g of 25% sugar syrup was added to 1200 g of 40% sugar syrup. Find the percentage of the syrup in the mixture.

A. 22% B. 34%

C. 31% D. 38%

Correct answer – B

Solution:

Amount of sugar syrup in mixture 1

$= \frac{25}{100} \times 800 = 200$

Amount of sugar syrup in mixture 2

$= \frac{40}{100} \times 1200 = 480$

The total amount of sugar syrup = 680

Percentage of sugar syrup in the mixture

$= \frac{680 \times 100}{2000} = 34$

Exercise – 1

1. Two numbers are respectively 25% and 75% more than a third number. The ratio of the two numbers is:
   A. 2:5 B. 3:5
   C. 4:5 D. 5:7
   E. 7:5
2. Expenses of Rahul and Saurabh are in the ratio 2:3. If the expenses of each are increased by Rs. 4000, the new ratio becomes 40:57. What is Saurabh's expenses?
   A. 38000 B. 48800
   C. 36700 D. 50000
   E. 68000
3. If Rs. 805 be divided into three parts, proportional to 1/2:2/3:3/4, then the first part is?
   A. Rs. 210 B. Rs. 190
   C. Rs. 192 D. Rs. 204
   E. Rs. 216
4. If 1.125: x :: 5:8, then x is equal to:
   A. 1.50 B. 1.80
   C. 1.20 D. 1.30
   E. 1.60
5. The compounded ratio of (5:6), (3:11) and (11:5) is
   A. 1:2 B. 2:1
   C. 11:24 D. 36:121
   E. 1:3
6. A mixture contains milk and water in the ratio 4 : 3. If 5 Liters of water is added to the mixture, the ratio becomes 4:5. Find the quantity of milk in the given mixture.
   A. 15 B. 12
   C. 10 D. 18
   E. 21
7. The salaries of X, Y, and Z are in the ratio of 1 : 2 : 3. The salary of Y and Z together is Rs. 5000. By what percent is the salary of Z more than that of X?
   A. 100% B. 400%
   C. 300% D. 600%
   E. 200%
8. A sum of Rs. 488 is to be divided among X, Y and Z such that 3 times X's share, 4 times Y's share and 7 times Z's share are all equal. The share of Z is:
   A. 240 B. 144
   C. 192 D. 96
   E. None of these
9. Today Seats for Arts, Science and Commerce in a college are in the ratio 5:7:8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?
   A. 2:3:4 B. 1:2:4
   C. 3:4:5 D. 4:5:6
   E. 1:2:3
10. In a farm, there are cows and hens. If heads are counted, there are 340 heads and if legs are counted there are 1060 legs. How many hens are there?
   A. 120 B. 150
   C. 170 D. 180
   E. None of these
11. The third proportional to 18 and 24 is ?
   A. 34 B. 24
   C. 36 D. 30
   E. 32
12. A If 95 is divided into four parts proportional to 7, 5, 3, 4, then the smallest part is:
   A. 12 B. 16
   C. 19 D. 15
   E. 20
13. Po's collection contains Russian, Indian and UK stamps. If the ratio of Russian to Indian stamps is 5 to 2 and the ratio of Indian to UK stamps is 5 to 1, what is the ratio of Russian to UK stamps?
   A. 10 : 5 B. 15 : 2
   C. 25 : 2 D. 20 : 2
   E. 1 : 2
14. A cat takes 4 leaps for every 5 leaps of a rat. If one leap of the cat is equal to 3 leaps of the rat, the ratio of the speed of the cat to that of the rat is :
   A. 9:5 B. 2:3
   C. 4:7 D. 5:6
   E. 12:5
15. Alloy A contains 40% Iron and 60% nickel. Alloy B contains 35% Iron and 40% nickel and 25% copper. Alloys A and B are mixed in the ratio of 1:4. What is the ratio of Iron and nickel in the newly formed alloy?
   A. 2:3 B. 9:11
   C. 5:7 D. 7:9
   E. 11:9

16. In college, the ratio of the number of boys to girls is 9 : 6. If there are 180 girls, the total number of students in the college is
A. 100 B. 250
C. 450 D. 400
E. 300

17. Two numbers are in the ratio 4 : 7. If the difference between the numbers is 27, what are the numbers?
A. 12 and 39 B. 20 and 47
C. 16 and 43 D. 14 and 41
E. None of these

18. Pencils, Pens and Exercise books in a shop are in the ratio of 8 : 2 : 3. If there are 120 pencils, the number of exercise books in the shop is:
A. 30 B. 35
C. 46 D. 56
E. 45

19. A child has three different kinds of chocolates costing Rs.3, Rs.5, Rs.10. He spends a total Rs. 120 on the chocolates. what is the minimum possible number of chocolates he can buy, if there must be at least one chocolate of each kind?
A. 16 B. 19
C. 17 D. 15
E. 20

20. The incomes of two persons A and B are in the ratio 5:6. If each saves Rs.100 per month, the ratio of their expenditures is Rs. 1 : 2. Find their incomes.
A. Rs.150 and Rs.125
B. Rs.150 and Rs.200
C. Rs.200 and Rs.250
D. Rs.250 and Rs.300
E. Rs.125 and Rs.150

21. The sum of three numbers is 427. If the ratio of the first to second is 2 : 5 and that of the second to the third is 3 : 8, then the second number is:
A. 100 B. 105
C. 125 D. 140
E. 115

22. In a temple every devotee offers fruits to the orphans. Thus every orphan receives apples, mangoes and grapes in the ratio of 4:2:7 in terms of dozens. But the weight of a grape is 24 gm and the weight of an apple and a mango are in the ratio of 3:5, while the weight of a mango is 150 gm. Find the ratio of all the three fruits in terms of weight, that an orphan gets
A. 75:42:90 B. 180:150:82
C. 30:25:14 D. 90:75:42
E. None of these

23. 72 boys and 40 girls form a group for social work. During their membership drive, the same number of boys and girls joined the group. How many members does the group have now, if the ratio of boys to girls is 4:3?
A. 224 B. 192
C. 147 D. 154
E. 202

24. What is the ratio whose terms differ by 45 and the measure of which is 2/7?
A. 18:56 B. 14:56
C. 15:63 D. 16:63
E. 18:63

25. The ratio of boys and girls in a school is 9:5. If the number of boys in the school is 135. Then total number of students is
A. 220 B. 75
C. 210 D. 140
E. 90

26. The ratio of students in coaching preparing for B.Tech and MBA is 6 : 5. The ratio of fees collected from each of B.Tech and MBA students is 25 : 18. If the total amount collected from all the students is 1.62 lakh, what is the total amount collected from only MBA aspirants?
A. Rs. 60,250 B. Rs. 72,000
C. Rs. 82,000 D. Rs. 61,750
E. None of these

27. The marks obtained by Virat and Amit are in the ratio 7:5 and those obtained by Abhinav and Amit in the ratio of 2:3. The marks obtained by Abhinav and Virat are in the ratio of?
A. 4:5 B. 15:14
C. 14:15 D. 21:10
E. 10:21

28. A bag contains 50 P, 25 P and 10 P coins in the ratio 6: 5: 4, amounting to Rs. 186. Find the number of coins of each type respectively.
A. 360, 160, 200 B. 160, 360, 200
C. 200, 360, 160 D. 200, 160, 300

E. 240, 200, 160

29. A sum of Rs.324 was divided among 100 boys and girls in such a way that the boy gets Rs.3.60 and each girl Rs. 2.40 the number of girls is
A. 35 B. 30
C. 45 D. 50
E. 40

30. If the ratio of the ages of two friends X and Y is in the ratio 3 : 5 and that of Y and Z is 4 : 5 and the sum of their ages is 171, then how old is Y?
A. 60 Years B. 75 Years
C. 45 Years D. 49 Years
E. 80 Years

31. The number of apples in three baskets are in the ratio of 2 : 4 : 5. In which ratio the no. of apples in the first two baskets must be increased so that the new ratio becomes 5 : 4 : 3?
A. 1:3 B. 25:8
C. 8:19 D. 19:8
E. 3:2

32. The concentration of Alcohol in three different mixtures (Alcohol and water) is 1/2 , 3/5 and 4/5 respectively. If 2 litres, 3 litres and 1 litre are taken from these three different vessels and mixed. What is the ratio of alcohol and water in the new mixture?
A. 4:5 B. 3:2
C. 3:5 D. 2:3
E. 5:3

33. In a competitive exam, the number of passed students was four times the number of failed students. If there had been 37 fewer students and 11 more had failed, the ratio of passed and failed students would have been 2 : 1, then the total number of students appeared for the exam?
A. 145 B. 165
C. 155 D. 175
E. 145

34. Binod has 20 rupees. He bought 1, 2, 5 rupee coupons. They are different in numbers because of no change, the shopkeeper gives 3 one rupee coupons. So how many stamps does Binod have?
A. 10 B. 18
C. 12 D. 15
E. 7

35. In a fort, there are 1200 soldiers. If each soldier consumes 4 kg per day, the provisions available in the fort will last for 35 days. If some more soldiers join, the provisions available will last for 25 days given each soldier consumes 3.5 kg per day. Find the number of soldiers joining the fort in that case?
A. 690 B. 1920
C. 720 D. 1820
E. 820

36. For any two numbers p, q; (p+q) : (p−q) : pq = 7 : 1 : 60 . Find the value of 1/p : 1/q
A. 4:3 B. 3:4
C. 8:7 D. 7:8
E. 1:4

37. In a class of 52 students the ratio of boys and girls is 3 : 1. Rupa ranks 15th among all the students from top and 8th among girls from bottom. How many boys are there below Rupa?
A. 20 B. 15
C. 10. D. 30
E. 24

38. Three people are roaming in a mall in such a way that when A takes 5 steps, B takes 6 steps and C takes 7 steps. But the 6 steps of A are equal to the 7 steps of B and 8 steps of C. What is the ratio of their speeds?
A. 140:144:147 B. 40:44:47
C. 15:21:28 D. 252:245:240
E. None of these

39. The third proportional to (a^2-b^2) and $(a-b)$ is:
A. (a+b) B. (a−b)
C. $\frac{a+b}{a-b}$ D. $\frac{a-b}{a+b}$
E. Cannot be determined

40. There are certain numbers of balls in the box. They are divided in such a way that the person who gets 1/5 of the whole gets thrice of what the others get on an average. Find the number of people amongst whom the balls are distributed?
A. 8 B. 10
C. 12 D. 9
E. 13

41. A cubical block of metal weighs 9 pounds. How much will another cube of the same metal weigh if its sides are twice as long?
A. 54 B. 72
C. 36 D. 18

E. 90

42. The ratio of the incomes of Pratap and Atul is 3 : 4 and the ratio of their expenditures are 2:3. If each person saves Rs. 1889, then find the income of Pratap?
A. 6548 B. 5667
C. 7556 D. 8457
E. None of these

43. X, Y and Z have amounts in the ratio of 3:4:5. First Y gives 1/4th to X and 1/4th to Z then Z gives 1/6th to X. Find the final ratio of amount of X, Y and Z respectively.
A. 4:3:5 B. 5:4:3
C. 3:4:5 D. 5:2:5
E. None of these

44. The wages of laborers in a factory decreased in the ratio 25:22 and there was an increase in the number of laborers in the ratio 11:15. Find the present wage bill if the original bill is Rs. 5000?
A. Rs. 5500 B. Rs. 5000
C. Rs. 6200 D. Rs. 6350
E. Rs. 6000

45. Divide Rs. 7950 among A, B and C so that after spending 80%, 75% and 66.67% of their respective saving were in the ratio of 3: 5: 6.
A. 2200, 3500 and 2700
B. 2250, 3000 and 2700
C. 2500, 3500 and 2700
D. 2250, 3500 and 2500
E. 2250, 3000 and 2400

46. Two vessels M and N contain milk and water in ratio 3 : 2 and 2 : 1 respectively. If 10 liters of the mixture is removed from vessel M and poured in vessel N then the ratio of milk to water in vessel N becomes 8 : 5. Find the initial quantity of water in vessel N.
A. 10 lit B. 6 lit
C. 2 lit D. 8 lit
E. None of these

47. A cylindrical container has a diameter of 12 cm and a height of 15 cm. A cone is removed from the top of the cylinder. The cone has a height of 6 cm and a diameter of 8 cm. What is the ratio of volume of the remaining solid to that of the cylindrical container?
A. 127:135 B. 4:5
C. 134:147 D. 135:127
E. None of these

48. A diamond is broken into four parts in the ratio 2 : 3 : 1 : 4. If the price of diamond is in proportion to the cube of its weight then find the percentage decrease in the price of diamond considering that the price of actual diamond is Rs. 100000.
A. 10% B. 80%
C. 90% D. 70%
E. None of these

49. Ratio of the total population of cities L and M is 8:9 and the ratio of the literate population of cities M and L is 5:4. If the illiterate population of city L is 8/15th of the total illiterate population of cities L and M together is 750, then find the total population of city L?
A. 1260 B. 1200
C. 800 D. 1000
E. 1400

50. If the ratio of the number of balls from box A and B is 5 : 2 and the ratio of the number of red balls from A and B is 3 : 5. If the boxes have two different colour balls red and yellow and the difference between the number of balls from A and B is 30, then what is the ratio of the number of yellow balls from A to B?
A. 41:5 B. 44:10
C. 47:5 D.22:5
E. Cannot be determined

ANSWER KEY:

1) D	11) E	21) B	31) D	41) B
2) A	12) D	22) C	32) B	42) B
3) A	13) C	23) A	33) D	43) D
4) B	14) E	24) E	34) A	44) E
5) A	15) B	25) C	35) C	45) B
6) C	16) C	26) E	36) B	46) C
7) E	17) E	27) E	37) D	47) A
8) D	18) E	28) E	38) A	48) C
9) A	19) A	29) B	39) D	49) B
10) B	20) E	30) A	40) E	50) E

SIMPLE INTEREST & COMPOUND INTEREST

Introduction

Interest: It is the money paid by the borrower to the lender for using the borrowed money.

Principal: The total amount of money borrowed by the borrower is called principal.

Amount: It is the sum of the interest and principal i.e., the total money paid back to the lender which includes principal and interest.

Simple Interest

It is the interest which is payable only on the principal.

- If the interest on a sum borrowed for certain period is calculated uniformly, then it is called simple interest.
- It is simply obtained by multiplying principal amount with rate and with given time interval.
- Formula of Simple Interest:
  $I = \frac{P \times N \times R}{100}$
  Where,
  I = simple interest
  P = principal
  R = rate of interest
  N = number of years
- e.g. Simple interest on Rs. 100 at the rate of 5% per annum will be Rs. 5 each year; after one year the amount will be 105, and after two year the amount will be Rs. 110 and so on.
- Amount = Principal + Simple Interest
  $= \text{Principal} + \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$
  $= \text{Principal}(1 + \frac{\text{Rate} \times \text{Time}}{100})$
  Or,
  $A = P(1 + \frac{R \times T}{100})$
- If the interest on a sum of money is $\frac{1}{x}$ of the principal, and the number of years is equal to the rate of interest then rate can be calculated using the formula: $\sqrt{\frac{100}{x}}$
- The rate of interest for t_1 years is r_1%, t_2 years is r_1%, t_3 years is r_3 %. If a man gets interest of Rs x for ($t_1 + t_2 + t_3 = n$) years, then principal is given by:
  $\frac{x \times 100}{r_1 t_1} + r_2 t_2 + r_3 t_3$
- If sum of money becomes x times in t years at simple interest, then the rate is calculated as $R = \frac{100(x-1)}{t}$%.
- If a sum of money becomes x times in t years at simple rate of interest, then the time is calculated as: $t = \frac{100(x-1)}{R}$.
- If an amount P_1 is lent out at simple interest of R_1% p.a. and another amount of P_2 at simple interest of R_2% p.a, then the rate of interest of the whole sum is given by:
  $$R = \frac{P_1 R_1 + P_2 R_2}{P_1 + P_2}$$

Compound Interest

Compound interest is the interest calculated on the original principal and on the accumulated past interest of a deposit or loan. Compound interest is calculated based on the principal, interest rate (APR or annual percentage rate), and the time involved.

Formulae:

$CI = P\left(1 + \frac{r}{100n}\right)^{nT} - P$

Formula of Amount = CI + P

$= P\left(1 + \frac{r}{100n}\right)^{nT} - P + P$

Here,

P = Principal

r = rate of interest

T = the number of years the amount is deposited or borrowed for.

n= the number of times that interest is compounded per unit 't'.

➢ Formulae for Compound Interest When

- Compounded Annually
  - $\text{Amount} = P\left(1 + \frac{r}{100}\right)^{T}$
  - Compound Interest = Amount – Principal
  - Rate of Interest = $\left(\left(\frac{A}{P}\right)^{\frac{1}{T}} - 1\right)\%$
- Compounded Half-Yearly
  - $\text{Amount} = P\left(1 + \frac{\frac{r}{2}}{100}\right)^{2T}$
- Compounded Quarterly
  - $\text{Amount} = P\left(1 + \frac{\frac{r}{4}}{100}\right)^{4T}$
- Compounded Monthly
  - $\text{Amount} = P\left(1 + \frac{\frac{r}{12}}{100}\right)^{12T}$

- **Compounded Annually but time is in fraction, say $2\frac{3}{2}$ years:**
  - $\text{Amount} = P\left(1+\frac{r}{100}\right)^2\left(1+\frac{\frac{3}{2}r}{100}\right)$
- When rates are different for different years
  - $\text{Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$
- Present worth of Rs. x due n years
  - $\text{Present Worth} = \frac{x}{\left(1+\frac{r}{100}\right)}$

- A sum of money placed at compound interest becomes x time in 'a' years and y times in 'b' years. These two sums can be related by the following formula:
  $x^{\frac{1}{a}} = y^{\frac{1}{b}}$
- If an amount of money grows up to Rs x in t years and up to Rs y in (t+1) years on compound interest, then,
  $r\% = \frac{y-x}{x} \times 100$
- A sum at a rate of interest compounded yearly becomes Rs. A_1 in t years and Rs. A_2 in (t + 1) years, then
  $P = A_1\left(\frac{A_1}{A_2}\right)$

Solved Examples

Simple Interest

1. Find the simple interest of Rs 2000 for 10 years at 6% p.a.?

   A. Rs. 120 B. Rs. 12000

   C. Rs. 1200 D. Rs. 12

   Solution

   We know that,

   SI = p × r × n/100

   SI = 2000 × 6 × 10 / 100

   SI = 120000 / 100

   SI = Rs. 1200

   Correct Option: C

2. Find the simple interest on Rs. 130,000 at 6(2/3)% per annum for a period of 9 months?

   A. 7040 B. 6500

   C. 4700 D. 10640

   Solution

   Principle = 130,000

   Rate = $6\frac{2}{3}\% = \frac{20}{3}\%$

   Time = 9 months = $\frac{3}{4}$

   $I = \frac{P \times N \times R}{100}$

   = Rs. [130000×(20/3)×(3/4)×(1/100)]

   = 6500

   Correct Option: B

3. What sum of money will amount to Rs. 1040 in 5 years and Rs. 1136 in 7 years at simple interest?

   A. 700 B. 800

   C. 1100 D. 1000

   Solution

   Amount in 5 years = Rs 1040

   Amount in 7 years = Rs 1136

   2 years S.I = 1136-1040 = 96

   Simple Interest for 1 year = $\frac{96}{2} = 48$

   5 years amount = Rs 1040

   For 1 years = 5*48 = 240

   P = A – S.I = 1040-240

   P = 800

   Correct Option: B

4. Find the simple interest on Rs. 1,20,000 at 13/5 % p.a. for a period of 9 months?

   A. 2340 B. 3420

   C. 23400 D. 2034

   Solution

   $I = \frac{P \times N \times R}{100}$

   P = 120000

   $R = \frac{13}{5}\%$

   $T = 9 \text{ months} = \frac{3}{4}\text{th year}$

   $I = \frac{120000 \times 13 \times 3}{5 \times 4 \times 100} = \frac{234000}{100} = 2340$

   Correct Option: A

5. What will be the ratio of simple interest earned on a certain amount at the same rate of interest for 4 years and that for 16 years?

   A. 1:2 B. 3:5

   C. 1:3 D. 1:4

   Solution

   Required Ratio = Simple Interest for 4 years/Simple Interest for 16 years

   $= \frac{T_1}{T_2} = \frac{4}{16} = \frac{1}{4} = 1:4$

   Correct option: D

6. Find the simple interest on Rs.1000 for 10 months at 5 paisa per month?

   A. Rs. 5000 B. Rs. 500

   C. Rs. 50 D. Rs. 51

   Solution

   $I = \frac{P \times N \times R}{100} = \frac{1000 \times 5 \times 10}{100} = \text{Rs. } 500$

   Correct option: B

7. If a sum of Rs.50000 is given as loan for a period of 4 years with the interest rates 2%, 4%, 5%, and 6% for the 1st, 2nd, 3rd, and 4th year respectively. What is the total amount that has to be paid at the end of 4 years?

   A. Rs. 58500 B. Rs. 59040

   C. Rs. 51840 D. Rs. 50580

   Solution

   As this is a case of Simple Interest we add 2% + 4% + 5% and 6% = 17%.

   Amount = Principal + Rate of Interest.

   Principal is 100% of the amount.

   Therefore,

   Amount = 100% + 17%.

   Therefore Amount = 117%

   Amount = (117*50000)/100

   = 58500

   Correct option: A

8. Nisha borrowed some money at the rate of 5% p.a. for the first two years. She again borrowed at the rate of 10% p.a. for the next three years. Later at the rate of 15% p.a. for the rest of the years. Total interest paid by her was Rs. 30000 at the end of 9 years. Calculate the amount of money she borrowed?

A. Rs. 30010 B. Rs. 40000
C. Rs. 30000 D. Rs. 20000

Solution

According to the question,
r1 = 5% , T1 = 2 years
r2 = 10% , T2 = 3 years
r3 = 15% , T3 = 5 years
(∵ beyond 5 years rate is 15%)
Simple interest = 30000

$\therefore P = \frac{30000 \times 100}{5\times2+10\times3+15\times4} = \frac{3000000}{10+30+60}$

$= \frac{3000000}{100} = \text{Rs. } 30000$

Correct option: C

9. Rahul invests some amount of money in three different schemes for 5 years, 10 years and 15 years at 10%, 12% and 15% Simple Interest respectively. At the completion of each scheme, he gets the same interest. Find out the ratio of his investment?

A. 3: 9: 15 B. 10: 24: 45
C. 10: 24: 40 D. 9: 24: 45

Solution

If a certain sum of money is lent out in n parts in such a manner that equal sum of money is obtained at simple interest on each part where interest rates are 10 %, 12 %,15% respectively and time periods are 5 years, 10 years, 15 years respectively.
Let the three amounts be Rs. x, Rs. y and Rs. z,
Then , according to question

$\frac{x \times 10 \times 5}{100} = \frac{y \times 12 \times 10}{100} = \frac{z \times 15 \times 15}{100}$

50x = 120, y = 225, z = k(say)
10 x = 24, y = 45, z = k

$\frac{k}{10} : \frac{k}{24} : \frac{k}{45}$

Hence, the ratio of his investment will be

$\frac{k}{10} : \frac{k}{24} : \frac{k}{45}$ = 10:24:45

Correct Option: B

10. Ram tool a loan for Rs.20000 from bank for a period of 3 years. The bank charged the interest rates as 5% for first year, 7% for second year and 9% for the third year. Find the amount he has to pay back to the bank after three years?

A. Rs. 37000 B. Rs. 29000
C. Rs. 30200 D. Rs. 24200

Solution

Simple Interest = 5% + 7% + 9% = 21%.
Amount = Principal + Rate of Interest.
Principal is 100% of the amount.
∴ Amount = 100% + 21% = 121%
According to the question, total amount to be paid

$A = \frac{121 \times 20000}{100} = 24200$

∴ the amount that Ram has to pay back to the bank after three years Rs 24200.

Correct Option: D

11. A sum of money becomes 6 times in 20 years. Calculate the rate of interest.

A. 20% B. 13%
C. 15% D. 25%

Solution

We know that, If sum of money becomes x times in t years at simple interest, then the rate is calculated as
R = 100 (x-1)/t %
R = 100 (6-1)/20
R = 100 (5)/20
R = 500/20
R = 25%

Correct Option: D

12. A sum of money becomes six times in 60 years. Calculate the rate of interest.

A. 8.33% B. 4.5%
C. 15.45% D. 15%

Solution

We know that, if sum of money becomes x times in n years at some rate of interest, then rate of interest is calculated as,

$R = 100\frac{(x-1)}{n}\% = 100\frac{(6-1)}{60}\%$

$= 100\frac{5}{60}\% = \frac{500}{60}\% = 8.33\%$

Correct Option: A

13. How much time will it take for an amount of Rs. 1260 to yield Rs. 144 as interest at 5.4 % p.a. of simple interest?

A. 2 years and 10 months
B. 1 years and 11 months
C. 2 years and 11 months

D. 1 years and 10 months

Solution

$$\text{Time} = \frac{100 \times SI}{R \times P} = \frac{100 \times 144}{5.4 \times 1260} = \frac{14400}{6804}$$
$$= 2 \text{ years and } 11 \text{ months}$$

Correct Option: C

14. Mr. Tata invested Rs. 27,800 in two different schemes I and II. The rate of interest for both the schemes were 14% and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 7016, what was the amount invested in Scheme II?

A. Rs. 4800 B. Rs. 12400

C. Rs. 12800 D. Rs. 9200

Solution

Let the amount invested in schemes I = x

∴ in schemes II = (27800 – x)

SI (scheme I) = $\frac{P \times N \times R}{100} = \frac{x \times 14 \times 2}{100}$

SI (scheme II) = $\frac{(27800-x) \times 11 \times 2}{100}$

SI (scheme I) + SI (scheme II) = 7016

$$\frac{x \times 14 \times 2}{100} + \frac{(27800 - x) \times 11 \times 2}{100} = 7016$$

$$\frac{28x}{100} + \frac{(27800 - x) \times 22}{100} = 7016$$

$$6x = 90000$$

$$x = \frac{90000}{6} = 15000$$

Hence, the sum invested in Scheme II = 27800 – 15000 = Rs. 12800

Correct Option: C

Compound Interest

15. Find the amount if Rs 1,00,000 is invested at 10% p.a. for 4 years.

A. 146410 B. 14641

C. 146500 D. 147004

Solution

$$\text{Amount} = A = P\left(1 + \frac{r}{100}\right)^n$$

$$A = 1{,}00{,}000\left(1 + \frac{10}{100}\right)^4$$

$$= 100000(1.1)^4 = 146410$$

Correct Option: A

16. If a sum of Rs.100 is invested for 10% p.a. at CI then the sum of the amount will be Rs.121 in:

A. 2 years B. 1 year

C. 1.5 years D. 3 years

Solution

$$\text{Amount} = A = P\left(1 + \frac{r}{100}\right)^t$$

$$121 = 100\left(1 + \frac{10}{100}\right)^t$$

$$\frac{121}{100} = \left(\frac{11}{10}\right)^t$$

$$\left(\frac{11}{10}\right)^2 = \left(\frac{11}{10}\right)^t$$

t = 2 years

Correct Option: A

17. Find the CI on Rs. 20,000 in 2 years at 2 % per annum, the interest being compounded half-yearly.

A. 816 B. 812.08

C. 818.06 D. 811

Solution

According to the question

P =20000, r = 2%, t = 2

We know that,

$$\text{Amount} = P\left(1 + \frac{\frac{r}{2}}{100}\right)^{2T}$$

$$A = 20000\left(1 + \frac{\frac{2}{2}}{100}\right)^{2\times2} = 20000\left(1 + \frac{1}{100}\right)^4 =$$

$$20000(1 + 0.01)^4 = 20000(1.01)^4$$

$$A = 20000(1.04)^4 = 20812.08$$

Now, CI = A – P

CI = 20812.08 – 20000

CI = 812.08

Correct Option: B

18. Find the CI on Rs. 4000 in 9 months at 12% p.a. if the interest is calculated quarterly.

A. 502.02 B. 502

C. 608 D. 370.90

Solution

According to the question,

P = 2000, r = 6%, t = 9 months (3 quarter)

We know that,

$$\text{Amount} = P\left(1 + \frac{\frac{r}{4}}{100}\right)^{4T}$$

$$A = 4000\left(1 + \frac{\frac{12}{4}}{100}\right)^{4\times\frac{9}{12}}$$

$$= 4000\left(1 + \frac{3}{100}\right)^{4\times\frac{3}{4}}$$

$$= 4000\left(\frac{103}{100}\right)^3 = 4000(1.03)^3 = 4000(1.09)$$

$$A = 4370.90$$

$$CI = A - P = 4370.90 - 4000 = 370.90$$

Correct Option: D

19. The Compound Interest on a sum of Rs 2304 is Rs 400 in two years. Find the rate of interest.

A. 7.33% B. 4.33%

C. 8.33% D. 5.33%

Solution

Amount = Compound Interest + Principal

A = 2304 + 400 = 2704

$\text{Amount} = A = P\left(1+\frac{r}{100}\right)^n$

$2704 = 2304\left(1+\frac{r}{100}\right)^2$

$\frac{2704}{2304} = \left(1+\frac{r}{100}\right)^2$

$\left(\frac{52}{48}\right)^2 = \left(1+\frac{r}{100}\right)^2$

$\frac{52}{48} = (1+\frac{r}{100})$

$\frac{52}{48} - 1 = \frac{r}{100}$

$\frac{r}{100} = 1.0833 - 1 = 0.0833$

$r = 8.33\%$

Correct Option: C

20. The CI on Rs. 40,000 at 6% per annum is Rs. 4944. Find the period (in years):

A. 2 B. 4

C. 5 D. 3

Solution

Amount = 40000 + 4944 = Rs. 44944

Let the time = n years

So,

$40000\left(1+\frac{6}{100}\right)^n = 44944$

$\left(\frac{106}{100}\right)^n = \frac{44944}{40000} = \frac{11236}{10000} = \left(\frac{106}{100}\right)^2$

$\therefore n = 2$ years

Correct Option: A

21. The principal amount is put on CI for two years at 40%. It gets 1928 more if the interest is payable half yearly. Calculate the sum.

A. Rs. 16970 B. Rs. 16971.82

C. Rs. 16960 D. Rs. 16911.82

Solution

Let us assume the Principal as Rs. 100

When compounded annually,

$A = 100(1+\frac{40}{100})^2 = 196$

When compounded half-yearly,

$A = 100(1+\frac{\frac{40}{2}}{100})^4 = 100(1+\frac{20}{100})^4 = 207.36$

Difference:

207.36 – 196 = 11.36

If difference is 11.36, then Principal = Rs 100

If difference is 964, then Principal

$= (\frac{100}{11.36}) \times 1928$

P=Rs. 16971.82

Correct Option: B

22. In what time the CI on Rs 1600 at 30% pa will amount to Rs.2704 if calculated annually?

A. 3 years B. 1.6 years

C. 2 years D. 5 years

Solution

$\text{Amount} = A = P\left(1+\frac{r}{100}\right)^t$

$2704 = 1600\left(1+\frac{30}{100}\right)^t$

$\frac{2704}{1600} = (1.3)^t$

$1.69 = (1.3)^t = (1.3)^2$

$\therefore t = 2$ years

Correct Option: C

23. The difference between the CI and SI on a certain amount at 14% p.a. for 2 years is Rs. 200. What will be the value of the amount at the end of three years if compounded annually?

A. 15117.78 B. 7500.45

C. 7558 D. 7554.56

Solution

Difference between CI and SI for 2 years, Difference = $\frac{P(R)^2}{100^2}$

$200 = \frac{P(14)^2}{100^2}$

$P = \frac{200 \times 100^2}{14^2} = \frac{2000000}{196} = 10204.08$

Now calculate the CI on Rs. 10204.08

$A = 10204.08\left(1+\frac{14}{100}\right)^3 = 10204.08\left(\frac{114}{100}\right)^3$

$= 10204.08 \times 1.48 = 15117.78$

Correct Option: A

24. If the difference between compound interest and simple interest on a certain principal amount is Rs 1000 at 10% p.a. for 2 years. Then calculate the sum.

A. 90000 B. 100000

C. 110000 D. 10000

Solution

Given the difference between SI and CI = 1000

Time = 2 years

When the difference between SI and CI is of two years then,

Difference = $\frac{P(R)^2}{100^2}$

Where P = principal amount, R = rate of interest

According to the question:

$1000 = P\frac{(10)^2}{(100)^2}$

$P = 100000$

Correct Option: B

25. The difference between CI and SI on an amount of Rs. 30,000 for 2 years is Rs. 192. Find the rate of interest?

A. 8% B. 5%

C. 4% D. 3%

Solution

Difference = $\frac{P(R)^2}{100^2}$

Where P = principal amount, R = rate of interest

$192 = 30000 \times \frac{(R)^2}{10000}$

$R^2 = \frac{192 \times 10000}{30000} = 64$

$R = 8\%$

Correct Option: A

26. The difference between CI and SI calculated annually on a certain amount of money for two years at 4% pa is Re. 2. Find the sum:

A. 1200 B. 1400

C. 1300 D. 1250

Solution

When the difference between SI and CI is of two years then,

Difference = $\frac{P(R)^2}{100^2}$

Where P = principal amount, R = rate of interest

$1 = P\times \frac{(4)^2}{(100)^2}$

$P = 1250$

Correct Option: D

27. A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to 32 times itself?

A. 20 years B. 25 years

C. 16 years D. 18 years

Solution

$x^{\frac{1}{a}} = y^{\frac{1}{b}}$

$2^{\frac{1}{4}} = 32^{\frac{1}{x}}$

$2^{\frac{1}{4}} = 2^{\frac{5}{x}}$

$\frac{1}{4} = \frac{5}{x}$

$x = 20$ years

Correct Option: A

28. A sum of money borrowed under CI gets double in 4 years. When will it become eight times of itself if the rate of interest remains same?

A. 12 years B. 20 years

C. 10 years D. 5 years

Solution

$x^{\frac{1}{a}} = y^{\frac{1}{b}}$

$2^{\frac{1}{4}} = 8^{\frac{1}{x}}$

$2^{\frac{1}{4}} = 2^{\frac{3}{x}}$

$\frac{1}{4} = \frac{3}{x}$

$x = 12$ years

Correct Option: A

29. If a certain amount of sum becomes 9 times in 2 years at compound interest, then find out the rate of interest?

A. 250% B. 100%

C. 200% D. 20%

Solution

$r = 100(\left(\frac{A}{P}\right)^{\frac{1}{t}} - 1)$

$\therefore r = 100(\left(\frac{9P}{P}\right)^{\frac{1}{2}} - 1)$

$r = 100\left((9)^{\frac{1}{2}} - 1\right)$

$= 100(3 - 1) = 100 \times 2 = 200\%$

Correct Option: C

30. At what rate percentage will certain amount of money become 27 times in three years?

A. 227.58% B. 200%

C. 221.58% D. 260%

Solution

$r = 100\left(\left(\frac{A}{P}\right)^{\frac{1}{t}} - 1\right) = 100\left((27)^{\frac{1}{3}} - 1\right)$

$= 100 \times (3 - 1) = 200\%$

Correct Option: B

31. Find the compound interest on a sum of money of Rs.20000 after 2 years, if the rate of interest is 2% for the first year and 4% for the next year?

A. Rs. 608 B. Rs. 1216

C. Rs. 2000 D. Rs. 1420

Solution

We know that,

$$Amount = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

r_1 = 2%, r_2 = 4%, P = 20000

CI = A – P

$$CI = 20000\left(1+\frac{2}{100}\right)\left(1+\frac{4}{100}\right)-20000$$

$$CI = 20000\left(\frac{102}{100}\right)\left(\frac{104}{100}\right)-20000$$

$$= 20000(51)\left(\frac{52}{2500}\right)-20000$$

$$CI = 20000\left(\frac{2652}{2500}\right)-20000$$

$$= 20000(1.06)-20000 = 21216-20000$$

$$= 1216$$

Hence, the required compound interest is Rs. 1216.

Correct Option: B

32. Ravi took an amount of Rs.40000 as loan at CI charging 5%, 10% and 20% for the 1st year, 2nd year, and 3rd year respectively. Find out the total interest to be paid by Ravi at the end of the 3rd year?

A. Rs. 14540 B. Rs. 4540

C. Rs. 15440 D. Rs. 14054

Solution

P = 40000

R = 5%, 10%, and 20%

T= 1, 2, and 3 years

$$\text{Amount} = 40000\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{20}{100}\right)$$

$$= 40000\left(\frac{105}{100}\right)\left(\frac{110}{100}\right)\left(\frac{120}{100}\right)$$

$$\text{Amount} = 40000(1.05)(1.1)(1.2) = 27720$$

$$CI = A - P = 55440 - 40000 = \text{Rs. } 15440$$

Correct Option: C

33. If the rate of CI for the 1st year is 8%, 2nd year is 10%, and for 3rd year is 15% then find the amount and the CI on Rs 20000 in three years.

A. 7252 B. 12472

C. 7332 D. 7324

Solution

$$\text{Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

$$\text{Amount} = 20000\left(1+\frac{8}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{15}{100}\right)$$

$$= 20000(1.08)(1.1)(1.15)$$

$$= 27324$$

CI = amount – principal

CI = 27324 – 20000

CI = 7324

Correct Option: D

34. Karan bought a bike of Rs. 1,20,000 by paying cash. He borrowed the cash from his friend at rate of interest 5% for the 1st year and 15% for the 2nd year. Find out the total amount he has to pay after 2 years to his friend.

A. Rs. 1,44,900 B. Rs. 1,48,500

C. Rs. 1,45,080 D. Rs. 1,50,840

Solution

$$\text{Amount} = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$$

Amount after 2 years

$$= 120000\left(1+\frac{5}{100}\right)\left(1+\frac{15}{100}\right)$$

$$= 120000(1.05)(1.15)$$

$$\text{Amount after 2 years} = \text{Rs. } 1,44,900$$

Correct Option: A

Simple Interest & Compound Interest

35. Find out the difference between Compound Interest and Simple interest for the sum of 20000 over 2 years period. If CI and SI is calculated at 20% and 23% p.a. respectively.

A. 400 B. 800

C. 200 D. 4000

Solution

R_{SI} for 2 years = 23 + 23 = 46%

R_{CI} for 2 years = $20+20+\frac{20\times20}{100}$ = 44%

Difference between CI and SI = 46 – 44 = 2%

Let the principal amount = 100%

Then 2% will be

$$\frac{2\times20000}{100}=\frac{40000}{100}=400$$

Correct Option: A

36. The difference between the CI and SI on a certain amount is at 10% p.a. for 3 years is Rs. 62. Find the principal?

A. 2000 B. 6200

C. 620 D. 200

Solution

The difference between compound interest and simple interest for three years is 62.

$$\text{Difference} = \frac{P\times(R)^2}{(100)^2}\times\frac{(300+R)}{100}$$

$$62 = \frac{P\times(10)^2}{(100)^2}\times\frac{(300+10)}{100} = P\times\frac{62}{1000}$$

$$P = 2000$$

Correct Option: A

37. If the SI on a sum of money for 2 years at 5% p.a. is Rs. 1000, what is the CI on the same sum at the same rate and for the same time?

A. Rs. 1025 B. Rs. 1043

C. Rs. 1030.4 D. Rs. 431

Solution

$\text{Sum} = \frac{1000 \times 100}{2 \times 5} = \frac{100000}{10} = 10000$

$\text{Amount} 10000(1 + \frac{5}{100})^2$

$10000 \times 1.05 \times 1.05 = 11025$

$\text{CI} = 11025 - 10000 = 1025$

Correct Option: A

38. The difference between CI and SI on a principal of Rs. 30,000 for two years is Rs. 48. What is the annual rate of interest?

A. 16% B. 4%

C. 8% D. 6%

Solution

$\text{CI} - \text{SI} = \frac{\text{P} \times (\text{R})^2}{(100)^2}$

$48 \times (100)^2 = 30000 \times \text{R}^2$

$\text{R}^2 = 16$ ➔ R = 4%

Correct Option: B

Exercise – 1

1. The compound interest on a sum of money at 10% per annum for 2 years is Rs. 6,300 What is the sum?
   A. Rs. 40,000 B. Rs. 25,000
   C. Rs. 35,000 D. Rs. 20,000
   E. Rs. 30,000
2. At what simple interest rate per annum will a sum of Rs 5000 doubles itself in 10 years?
   A. 2% B. 5%
   C. 10% D. 20%
   E. 25%
3. A sum of Rs. 2000 is invested at a simple interest rate of 8% per annum. What is the total amount after 5 years?
   A. Rs. 2400 B. Rs. 2600
   C. Rs. 2800 D. Rs. 3000
   E. Rs. 3200
4. A sum of money doubles itself in 5 years at a certain rate of simple interest. In how many years will the same amount become 5 times itself at the same rate of interest?
   A. 20 years B. 15 years
   C. 10 years D. 25 years
   E. 30 years
5. A sum of Rs. 35,000 becomes Rs. 43,400 in 3 years at a certain rate of simple interest. What is the rate of interest per annum?
   A. 5% B. 7%
   C. 6% D. 8%
   E. 4%
6. A sum of money doubles itself in 5 years at simple interest. What is the rate of interest per annum?
   A. 10% B. 12%
   C. 14% D. 16%
   E. 20%
7. The simple interest on a sum of money at 15% per annum for 3 years is Rs 2,700. What is the sum?
   A. Rs. 6000 B. Rs. 7200
   C. Rs. 5400 D. Rs. 6600
   E. Rs. 5800
8. What is the compound interest accrued on an amount of Rs. 35000 at the rate of 5% per annum at the end of 2 years?
   A. 3259.5 B. 4233
   C. 3587.5 D. 4000
   E. 3867.5
9. The difference between simple interest and compound interest on a certain sum of money for 2 years at 20% per annum is ₹ 840. Find the sum.
   A. 30000 B. 25000
   C. 21000 D. 35000
   E. 20000
10. Raju borrows Rs.8400 for 2 years at 6% per annum on simple interest. He then gives the amount to Sanath at 8% per annum for 2 years on Simple interest. Find the amount he gained.
    A. Rs. 336 B. Rs. 534
    C. Rs. 278 D. Rs. 441
    E. None of these
11. Bhushan invested a sum of money at a certain rate of SI for a period of 5 years. Had he invested the same sum for a period of 7 years, the total interest earned by him would have 38% more than the earlier interest amount. Find the rate of interest per annum?
    A. 11.11% B. 12.25%
    C. 1.75% D. 13.33%
    E. Cannot be determined.
12. Rishi invested Rs.5600 at 18% per annum simple interest and Rs.4200 at 9% per annum compound interest. What is the difference between the simple and compound interest after 2 years?
    A. Rs. 1226 B. Rs. 1639
    C. Rs. 1876 D. Rs. 1345
    E. None of these
13. A sum of money at simple interest amounts to Rs. 716 in 3 years and to Rs. 762 in 4 years. The sum is:
    A. Rs. 650 B. Rs. 590
    C. Rs. 698 D. Rs. 600
    E. Rs. 578
14. How much time will it take for an amount of Rs.1550 to yield Rs. 279 as interest at 4.5% per annum of simple interest?
    A. 3.5 years B. 4 years
    C. 4.5 years D. 5 years
    E. None of these
15. Reena took a loan of Rs. 4000 with simple interest for as many years as the rate of interest. If she paid Rs.2560 as interest at the end of the loan period, what was the rate of interest?

A. 6 B. 4
C. 8 D. 10
E. Cannot be Determined.

16. Rohan invested Rs.3500 in simple interest at 35% per annum for n years. After n years, the interest obtained by Rohan is six times more than the amount invested. Find the value of n?
A. 15 B. 10
C. 25 D. 20
E. None of these

17. The difference between the interest obtained by Sarvesh in S.I and Soham in C.I when investing the same amount at the same interest rate for 2 years is Rs.480. If the amount invested by them is Rs.12000, find the interest obtained by Sarvesh.
A. Rs. 4800 B. Rs. 7200
C. Rs. 6400 D. Rs. 8000
E. None of these

18. The difference between the simple and compound interest on a certain sum for 2 years at x% per annum is Rs.384 and the sum invested is Rs.15000 and then find the value of x%?
A. 12% B. 18%
C. 21% D. 16%
E. None of these

19. A sum of money at 5% per annum compounded annually becomes Rs 10,418 in 3 years. What is the sum?
A. Rs. 8000 B. Rs. 9000
C. Rs. 10000 D. Rs. 11000
E. Rs. 12000

20. The simple interest on a sum of money at 10% per annum for 2 years is Rs 1,500. What is the sum?
A. Rs. 5000 B. Rs. 7000
C. Rs. 7500 D. Rs. 8000
E. Rs. 8500

21. The difference between Compound Interest and Simple Interest on a certain sum of money at 10 % per annum for 3 years is Rs. 1860. Find the principal if it is known that the interest is compounded annually.
A. 60000 B. 55000
C. 40000 D. 45000
E. None of these

22. A Bank professional claims to be lending money at simple interest, but he includes the interest every six months for calculating the principal. If he is charging an interest of 20%, the effective rate of interest becomes:
A. 21% B. 21.25%
C. 20.5% D. Data Inadequate
E. None of these

23. Raman took a loan from a bank at the rate of 14% p.a. simple interest. After 5 years he had to pay Rs. 2800 interest only for the period. The principal amount borrowed by him was:
A. Rs. 40000 B. Rs. 5000
C. Rs. 15000 D. Rs. 4000
E. None of the above

24. A sum of Rs. 18,000 amounts to Rs. 21,240 in 4 years at the rate of simple interest. What is the rate of interest?
A. 3.5% B. 4.5%
C. 5% D. 6%
E. 8%

25. The compound interest on a certain sum for 2 years at 12% per annum is Rs. 636. The simple interest on the same sum for double the time at half the rate percent per annum is:
A. Rs. 400 B. Rs. 500
C. Rs. 600 D. Rs. 800
E. Rs. 550

26. On a certain rate of interest, a sum of Rs 10000 becomes Rs 15,376 in certain years at compound interest. In half of the time given, this sum will become?
A. Rs. 12400
B. Rs. 10600
C. Rs. 12000
D. Cannot be Determined
E. None of these

27. The simple interest on a sum of money will be Rs. 1000 after 5 years. If the principal is made four times after 3 years, what will be the total interest at the end of the fifth year?
A. 2350 B. 2175
C. 1250 D. 2200
E. None of these

28. Rhea deposited Rs 16000 at simple interest which amounted to Rs 22720 after 3 years. Had the interest

been 2% more, how much amount she would have got?
A. 21680 B. 29680
C. 29272 D. 23680
E. None of these

29. A sum of Rs 512 becomes 729 in 3 years at C.I. Find the rate of interest.
A. 14 (2/7) % B. 12.5%
C. 16 (2/3) % D. 8(2/3) %
E. None of these

30. Find the C.I on Rs 34,000 at 12% rate of interest in 2 years if compounded half yearly. (Approximately)
A. Rs. 42924 B. Rs. 43924
C. Rs. 44924 D. Rs. 45924
E. None of these

31. Find the compound interest on Rs. 32200 at 5% for 2 years, compounded annually.
A. 33070.5 B. 33307.5
C. 3300.5 D. 3200
E. None of these

32. The difference between SI and CI for 2 years @ 24% per annum is Rs 1728 What is the principal?
A. 30000 B. 33300
C. 33000 D. 32000
E. None of these

33. Manish invested a sum of money at CI. It amounted to Rs 3872 in 2 years and Rs 4259.2 in 3 years. Find the rate percent per annum.
A. 12% B. 15%
C. 10% D. 8%
E. None of these

34. The CI on a sum of Rs 566 in 2 years is Rs 70. Find the rate of interest.
A. 6% B. 5%
C. 4% D. 8%
E. None of these

35. A man invests Rs.14000 for 6 years at 6% p.a. Simple Interest reckoned yearly. Income tax at the rate of 33.33% on the interest earned is deducted at the end of each year. Find the amount at the end of the sixth year.
A. Rs. 10600 B. Rs. 12500
C. Rs. 17600 D. Rs. 10000
E. None of these

36. The rates of simple interest in two banks u and v are in the ratio of 14: 16. Atharva wants to deposit his total savings in two banks in such a way that he receives equal half-yearly interest from both. he should deposit the savings in banks x and y in the ratio of
A. 7 : 8 B. 5 : 8
C. 8 : 5 D. 8 : 7
E. None of these

37. Rs. 13000 is placed at SI two times
(1) for the first time for 2 years at 6% pa.
(2) second time for 4 years at 5% pa.
Find the ratio of interests
A. 1:7 B. 4:5
C. 5:3 D. 2:3
E. None of these.

38. A certain amount earns simple interest of Rs. 4350 after 9 years. Had the interest been 3% more, how much more interest would it have earned?
A. ₹ 35 B. ₹ 350
C. ₹ 245 D. Can't be determined.
E. None of these

39. A sum of Rs. 20,000 is invested at 8% per annum for 3 years. Find the compound interest earned at the end of the third year.
A. Rs. 4,382 B. Rs. 5,194
C. Rs. 4,567 D. Rs. 5,456
E. Rs. 4,746

40. A man takes a loan of Rs. 10,000 at 8% per annum for 2 years. If he repays the loan in equal annual instalments, what will be the amount of each instalment?
A. Rs. 5,800 B. Rs. 6,213
C. Rs. 6,244 D. Rs. 5,400
E. Rs. 5,607

41. A person took a loan of Rs. 20,000 at 10% per annum compound interest. He paid back Rs. 10,000 after two years. How much amount does he have to pay after another two years to clear the loan?
A. Rs. 13,645 B. Rs. 14,498
C. Rs. 15,267 D. Rs. 16,876
E. Rs. 17,182

42. Man borrowed Rs. 60,000 at 12% per annum compound interest. He repaid Rs. 20,000 at the end of the first year and Rs. 30,000 at the end of the

second year. How much does he still owe at the end of the third year?

A. Rs. 38,726.40 B. Rs. 32,540.78
C. Rs. 39,504.00 D. Rs. 25,607.68
E. Rs. 27,546.20

43. Calculate the simple interest on Rs. 85,000 for 3.5 years at 15.66% per annum. Find the amount to be paid after 3.5 years.

A. Rs. 1,31,588 B. Rs. 1,25,657
C. Rs 1,45,653 D. Rs. 1,34,564
E. Rs. 1,32,876

44. Rs. 12,000 lent at simple interest becomes Rs. 12,800 in two years' time, then how much will Rs. 20,000 become at the end of 5 years at the same rate of simple interest?

A. 19,400 B. 23,330
C. 25,600 D. 18,500
E. 26,700

45. The simple interest obtained when a sum of money is invested for 4 years at 18 % per annum is Rs. 336 more than the simple interest for 2 years at 22% per annum. What is the interest obtained when the same sum of money is invested for 5 years at 15 % per annum?

A. 500 B. 900
C. 700 D. 200
E. 1200

46. Chinmay borrowed a sum of Rs. 64000 at 5% pa compound interest from his friend due to an emergency. He repays a certain amount at the end of one year as he gets his salary and the balance amount of Rs. 35700 at the end of the second year. What amount does he repay in the first year?

A. 31200 B. 35400
C. 33200 D. 37200
E. 32700

47. If Raj accrued Rs. 2,496 compound interest on an amount of Rs. 15,000 in two years then what is the rate of interest Raj is getting?

A. 10% B. 8%
C. 15% D. 12%
E. 9%

48. What is the compound interest accrued on an amount of Rs. 24000 at the rate of 20 % annum in two years, if the interest is compounded half-yearly?

A. 11,138.4 B. 13,546.8
C. 12,645.8 D. 11,564.7
E. 12,349.2

49. Find the compound interest on Rs.4000 in 2 years at 8% per annum, the interest being compounded half-yearly.

A. 610 B. 634
C. 786 D. 679
E. 456

50. If the simple interest on a sum of money at 10% per annum for 4 years is Rs. 1800, find the amount by taking compound interest on the same sum for the same period at the same rate.

A. 6588 B. 6346
C. 7867 D. 6799
E. 4563

51. A sum of money triples itself at compound interest in 5 years. In how many years will it become twenty seven times?

A. 20 years B. 10 years
C. 15 years D. Can't be determined.
E. 30 years

52. Praneet borrowed Rs. 6,00,000 from a bank to purchase a car. If the rate of interest is 10% per annum compounded annually, what payment he will have to make after 2 years 4 months?

A. 7,50,200 B. 8,56,000
C. 9,10,000 D. 7,12,000
E. 8,20,000

53. Find C.I. on Rs. 10000 for 3 years at 8% for 1st year and 10% for 2nd year and 12% for 3rd year

A. 7630 B. 4510
C. 5430 D. 3305
E. 2355

54. Loan of 20,000 was lent to Mohish for 3 years at 10% for 1st year and 15% for the rest of 2 years. Find the amount payable by Mohish?

A. 32,456 B. 25,789
C. 29,095 D. 34,567
E. none of the above

55. What is the difference between the simple interest and compound interest on a principal of Rs 10,000 at 8% per annum for 2 years?

A. Rs 64 B. Rs 166.40
C. Rs 320 D. Rs 640

E. Rs 1,600

56. What is the rate of interest at which the simple interest on a principal of Rs 5,000 for 3 years is equal to the compound interest on the same principal for 2 years at 10% per annum?
A. 6% B. 7%
C. 10% D. 12%
E. 15%

57. A sum of Rs. 2000 amounts to Rs. 2420 in 2 years at a certain rate of simple interest. What will be the total amount at the end of 5 years for the same sum and interest rate?
A. Rs. 3100 B. Rs. 3500
C. Rs. 4000 D. Rs. 3050
E. Rs. 4800

58. A sum of money doubles itself in 4 years at compound interest. In how many years will it become eight times?
A. 8 years B. 12 years
C. 16 years D. 24 years
E. 32 years

59. The difference between C.I. and S.I. on Rs. 25000 for 1 year at 20% per annum calculated half yearly is:
A. 220 B. 270
C. 240 D. 300
E. 250

60. Dixit invests a certain sum of money for 2 years at 15% pa at simple interest rate. The SI accrued is half the CI on Rs. 10000 for 2 years at 10% pa. Find the sum placed on simple interest?
A. 3500 B. 2500
C. 4500 D. 4000
E. 4500

61. Praful invests a certain sum of money for 5 years at 10% pa at simple interest rate. The SI accrued is same as the CI on Rs. 10000 for 2 years at 15% pa. Find the sum placed on simple interest?
A. 5560 B. 7500
C. 4500 D. 8000
E. 6450

62. Himesh invests a certain sum of money for 3 years at 25% pa at simple interest rate. The SI accrued is same as the CI on Rs. 20000 for 2 years at 15% pa. Find the sum placed on simple interest?
A. 9800 B. 7500
C. 5600 D. 8600
E. 12300

63. Srushti invests a certain sum of money for 5 years at 12% pa at simple interest rate. The SI accrued is half of the CI on Rs. 20000 for 2 years at 20% pa. Find the sum placed on simple interest?
A. 9999 B. 7333
C. 5666 D. 8666
E. 5233

64. What is the compound interest accrued on an amount of Rs. 75000 at the rate of 18% per annum at the end of 2 years?
A. 32,595 B. 42,333
C. 35,875 D. 29,430
E. 38,675

65. What is the compound interest accrued on an amount of Rs. 15000 at the rate of 8% per annum at the end of 2 years?
A. 2876 B. 1987
C. 3245 D. 3429
E. 2496

66. What is the CI accrued on an amount of Rs. 15000 at the rate of 9% per annum at the end of 2 years?
A. 2821.5 B. 1987.5
C. 3245.5 D. 3429.5
E. 2496.5

67. The difference between simple interest and compound interest on a certain sum of money for 2 years at 7% per annum is ₹ 196. Find the sum.
A. 70000 B. 60000
C. 40000 D. 35000
E. 45000

68. The difference between simple interest and compound interest on a certain sum of money for 2 years at 16% per annum is ₹ 512. Find the sum.
A. 30000 B. 25000
C. 40000 D. 35000
E. 20000

69. A sum of ₹ 312 deposited at CI doubles itself after 4 years. After 20 years it will become
A. 9560 B. 9534
C. 9984 D. 8765
E. 9654

70. A sum of money was borrowed such that the rate of simple interest was 10% per annum. At the end of the

first year, Rs. 6,500 was paid off and the rate of interest on the balance was increased to 12% per annum. If the interest for the second year was $(3/4)^{th}$ of the interest for the first year, what was the original sum borrowed?

A. Rs. 13,684 B. Rs. 15,888
C. Rs. 15,000 D. Rs. 23,698
E. Cannot be determined

71. A sum of Rs. 2000 is to be divided among two sisters such that if the interest being compounded annually is 6 % per annum, then the money with the first sister after 3 years is equal to the money with the second sister after 5 years. Find the amount.

A. 599.25 and 1400.75
B. 1400.75 and 599.25
C. 1500.25 and 499.75
D. 1058.25 and 941.75
E. None of these

72. Sarah invested Rs. 32000 is invested in SI at (x + 3) % rate of interest and Rs. 25000 in CI at the rate of x% per annum for one year if she received the total amount at the end of the year is Rs. 62520, then find the rate of interest per annum for Simple interest?

A. 7 % B. 9 %
C. 13 % D. 10%
E. 11%

73. Sujay invested Rs. 48000 in two different parts one at 15% SI and another at 10% CI (Compounded half yearly). At the end of the year he received total interest Rs. 5490, then find the amount invested in SI?

A. Rs. 18000 B. Rs. 22000
C. Rs. 12000 D. Rs. 15000
E. None of these

74. Suyash lent Rs. 6000 at 30% compound interest per annum for 3 years. What is the difference between the interest earned by the man in the 2nd year only and the interest earned by the man in the 3rd year only?

A. 650 B. 452
C. 502 D. 702
E. None of these

75. A man saves Rs.10,000 at the beginning of each year and puts the money in a bank that pays 20% interest per year, interest being compounded annually. What would be the total savings of the man at the end of 6 years?

A. 1,65,340 B. 1,45,762
C. 1,66,502 D. 1,19,154
E. None of these

ANSWER KEY:

1) E	14) B	27) D	40) E	53) D	66) A
2) C	15) C	28) D	41) E	54) C	67) C
3) C	16) D	29) B	42) D	55) A	68) E
4) A	17) A	30) A	43) A	56) B	69) C
5) D	18) D	31) C	44) B	57) D	70) A
6) E	19) B	32) A	45) B	58) B	71) D
7) A	20) C	33) C	46) C	59) E	72) E
8) C	21) A	34) A	47) B	60) A	73) C
9) C	22) A	35) C	48) A	61) E	74) D
10) A	23) D	36) D	49) D	62) D	75) D
11) E	24) B	37) E	50) A	63) B	
12) A	25) C	38) D	51) C	64) D	
13) E	26) A	39) B	52) A	65) E	

PARTNERSHIPS & MIXTURES

Partnerships

Introduction

- A partnership is something where a formal agreement between two or more people is made and agreed to be the co-owners, distribute responsibilities for running an organization and share the income or losses that the business generates.

Partnership:

- When two or more than two persons run a business jointly, they are called partners and the deal is known as partnership.

Ratio of Divisions of Gains:

I. When investments of all the partners are for the same time, the gain or loss is distributed among the partners in the ratio of their investments.

Suppose A and B invest Rs. x and Rs. y respectively for a year in a business, then at the end of the year:

(A's share of profit) : (B's share of profit) = x : y.

II. When investments are for different time periods, then equivalent capitals are calculated for a unit of time by taking (capital x number of units of time). Now gain or loss is divided in the ratio of these capitals.

Suppose A invests Rs. x for p months and B invests Rs. y for q months then,

(A's share of profit) : (B's share of profit)= xp : yq.

Working and Sleeping Partners:

- A partner who manages the business is known as a working partner and the one who simply invests the money is a sleeping partner.

Mixtures and Alligation

Introduction

- Mixture and alligation are important concepts in quantitative aptitude used to determine the ratio and cost of sale for a mixture made up of two or more materials.
- Mixture and alligation is used to calculate the mean value of a mixture with different ratios and amounts of ingredients, as well as to find the proportions of elements being mixed.

What is Mixture?

- A mixture contains two or more commodities of certain quantity mixed together to get the desired quantity.

What is Alligation?

- The rule of alligation help to find the ratio in which two or more variety of ingredients of a given price must be mixed to produce a mixture of desired price.
- It is a rule for the solution of problems concerning the compounding or mixing of ingredients

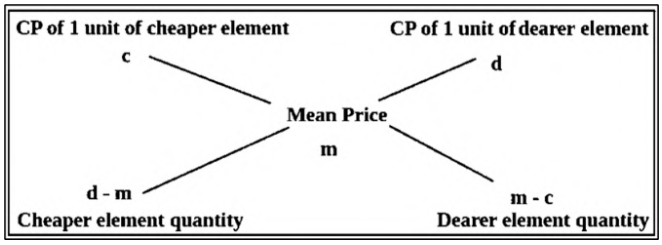
What is called Mean Price?

- The cost of a unit quantity of the mixture is called the mean price.
- Alligation is the process which allows us to identify the proportion in which the numerous ingredients must be mixed at the specified price in order to create a mixture at a given price.
- Alligation includes two different types of methods namely, alligation medial which is used to calculate the quantity of a mixture and alligation alternate which is used to calculate the quantity of each ingredient required to produce a mixture.
- A mixture, as the name suggests is mixing two or more things together and alligation enables us to find the ratio in which the ingredients/ things have been mixed to form the mixture.
- Alligation is a way to find the mean value of mixture when the ratio and amount of the ingredients mixed are different and also to find the proportion in which the elements are mixed.
- The Alligation and Mixture Formulas can be applied to any topic like mixtures, profit and loss, simple interest, time and distance, percentage, etc.

Formulas to Solve Alligations and Mixtures question: –

1)

$$\left(\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}}\right) = \frac{\text{C. P. of dearer (d)} - \text{Mean Price (m)}}{\text{Mean Price (m)} - \text{C. P. of cheaper (c)}}$$



∴ (Cheaper Commodity): (Dearer Commodity) = (d – m): (m – c)

2) Consider a container contain x unit of liquid A from which y units are taken out and replaced by water. This operation is repeated n number of times, then the quantity of pure liquid will be given by the formula:

Quantity= $[x (1– (y/x)^n]$ units

Partnership Solved Examples:

1. Three partners shared the profit in a business in the ratio 5: 7 : 8. They had partnered for 14 months, 8 months, and 7 months respectively. What was the ratio of their investments?

   A. 5: 7: 8 B. 20: 49: 64

   C. 38: 28: 21 D. None of these

   Solution

   Let their investments be Rs. x for 14 months, Rs. y for 8 months, and Rs. z for 7 months respectively.

   Then, 14x: 8y: 7z = 5 : 7 : 8.

   Now, 14x/8y = 5/7 => 98x = 40y

   → y = 49/20 x

   And 14x/7z = 5/8 => 112x = 35z

   → z = (112/35) x = (16/5) x.

   So x : y : z = x : 49/20 x : 16/5 x = 20 : 49 : 64

   Correct option: B

2. P, Q, and R enter into a partnership & their share are in the ratio of 1/2: 1/3: 1/4, after two months, P withdraws half of the capital & after 10 months, a profit of Rs 378 is divided among them. What is Q's share?

   A. 114 B. 120

   C. 134 D. 144

   Solution

   The ratio of their initial investment

   = 1/2: 1/3: 1/4

   = 6: 4: 3

   Let's take the initial investment of P, Q and R as 6x, 4x and 3x respectively.

   A: B:C = (6x × 2 + 3x × 10): 4x × 12: 3x × 12

   = (12 + 30): 4 × 12: 3 × 12

   = (4 + 10): 4 × 4 : 12

   = 14: 16: 12

   = 7: 8: 6

   B's share = 378 × (8/21) = 18 × 8 = 144.

   Correct option: D

3. A, B, C subscribe to Rs. 50,000 for business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35,000, A receives:

   A. Rs. 8400 B. Rs. 11,900

   C. Rs. 13,600 D. Rs. 14,700

   Solution

   Let C = x.

   Then, B = x + 5000 and A = x + 5000 + 4000 = x + 9000.

   So, x + x + 5000 + x + 9000 = 50000

   => 3x = 36000

   => x = 12000

   A: B: C = 21000: 17000: 12000

   = 21: 17: 12.

   So, A's share = Rs. (35000 x 21/50) = Rs. 14,700

   Correct option: D

4. P, Q, R enter into a partnership. P initially invests 25 lakh & adds another 10 lakhs after one year. Q initially

invests 35 lakh & withdrawal 10 lakh after 2 years and R invests Rs 30 Lakhs. In what ratio should the profit be divided at the end of 3 years?

A. 18:19:19 B. 18:18:19

C. 19:19:18 D. 18:19:19

Solution

P: Q: R = (25×1+35×2): (35×2: 25×1): (30×3)

= 95: 95: 90

= 19: 19: 18

Correct option: C

5. A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in a total profit of Rs. 25,000 earned at the end of 2 years from the start of the business?

A. Rs. 7500 B. Rs. 9000

C. Rs. 9500 D. Rs. 10,000

Solution

A: B: C = (20,000 x 24): (15,000 x 24): (20,000 x 18)

= 4: 3: 3.

So, B's share = Rs. (25000 x 3/10) = Rs. 7,500.

Correct option: A

6. In a business, A and C invested amounts in the ratio 2: 1, whereas the ratio between amounts invested by A and B was 3: 2. If Rs 157300 was their profit, how much amount did B receive?

A. 48000 B. 48200

C. 48400 D. 48600

Solution

Assume that investment of C = x

Then, investment of A =2x

Investment of B = 4x/3

A:B:C = 2x : 4x/3 : x = 2 : 4/3 : 1 =6 : 4 : 3

B's share = 157300 × 4/(6+4+3) =157300×4/13

= 12100×4 = 48400

Correct option: C

7. A and B invest in a business in the ratio 3: 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is:

A. Rs. 1425 B. Rs. 1500

C. Rs. 1537.50 D. Rs. 1576

Solution

Let the total profit be Rs. 100.

After paying to charity, A's share

= Rs. (95 × 3/5) = Rs. 57.

If A's share is Rs. 57, total profit = Rs. 100.

If A's share Rs. 855, total profit

= (100/57 × 855) = 1500.

Correct option: B

8. A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A want to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.

A. Rs. 1900 B. Rs. 2660

C. Rs. 2800 D. Rs. 2840

Solution

For managing, A received = 5% of Rs. 7400 = Rs. 370.

Balance = Rs. (7400 – 370) = Rs. 7030.

Ratio of their investments = (6500 x 6): (8400 x 5): (10000 x 3)

= 39000: 42000: 30000

= 13: 14: 10

B's share = Rs. (7030 × 14/37) = Rs. 2660.

Correct option: B

9. Aman started a business investing Rs. 70,000. Rakhi joined him after six months with an amount of Rs. 1,05,000 and Sagar joined them with Rs. 1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, 3 years after Aman started the business?

A. 7:6:10

B. 12:15:16

C. 42:45:56

D. Cannot be determined.

Solution

Aman: Rakhi: Sagar = (70,000 x 36): (1,05,000 × 30) : (1,40,000 × 24)

= 12:15:16.

Correct option: B

10. A, B, and C rent a pasture. A puts 10 oxen for 7 months, B puts 12 oxen for 5 months and C puts 15 oxen for 3 months for grazing. If the rent of the pasture is Rs. 175, how much must C pay as his share of rent?

A. Rs. 45 B. Rs. 50

C. Rs. 55 D. Rs. 60

Solution

A: B: C = (10 × 7): (12 × 5): (15 × 3)

= 70: 60: 45 = 14: 12: 9.

C's rent = Rs. (175 × 9/35) = Rs. 45.

Correct option: A

11. If 4 (P's Capital) = 6 (Q's Capital) = 10 (R's Capital), then out of the total profit of Rs 4650, R will receive

A. 600 B. 700

C. 800 D. 900

Solution

Let P's capital = p, Q's capital = q and R's capital = r

Then

4p = 6q = 10r

→ 2p = 3q = 5r

=>q = 2p/3

r = 2p/5

P : Q : R = p : 2p/3 : 2p/5

→ 15 : 10 : 6

R's share = 4650 × (6/31) = 150×6 = 900.

Correct option: D

Mixtures & Alligation Solved Examples

12. Calculate the average price of the resulting mixture when two variety of sugar at ₹12 per Kg and ₹15 per Kg are mixed in the ratio of 2:3.

Solution

Let average price be Aw

2/3 = (15–Aw) / (Aw–12)

2Aw–24 = 45–3Aw

5Aw = 69

Aw = 69/5 = ₹13.8 per kg.

13. Two varieties of rice are in the ratio of 3:2 such that the average price of the resulting mixture is ₹15 per Kg. The price of one of the varieties is ₹10 per Kg. Find the price of the other variety of rice.

Solution

Let Price of another variety is A2

3/2 = (A2–15) / (15–10)

15 = 2A2–30

45/2 = A2

A2 = ₹22.5 per Kg

14. Two varieties of tea are mixed in some ratio. The cost of the first variety is ₹20 per Kg and that of second variety is ₹30 per Kg. If the average cost of the resulting mixture is ₹25 per Kg, find the ratio.

Solution

x/y = (30–25) / (25–20)

x/y = 5 / 5 = 1:1

15. A 420L of the mixture contains pure milk and water in the ratio of 2:5. Now 80 L of water is added to the mixture. Calculate the ratio of milk and water in the resulting mixture.

Solution

The quantity of milk in initial mixture =

2/7 × 420 = 120 L

Quantity of water = 420–120 = 300L

Water added = 80L

Concentration of water in the resulting mixture = 300 + 80 = 380L

The ratio of the resulting mixture 120/380 = 6:19.

16. A milkman mixes 30L of water in 90L of milk. He then sells 1/4th of this mixture. Now he adds water to replenish the quantity of milk sold. Find the current proportion of milk and water.

Solution

The initial ratio of milk and water = 90:30 = 3:1

Now, 1/4th of the mixture is sold, that is the total volume of the mixture is reduced by 25%.

In other words, both water and milk are reduced by 25%.

So, the volume of milk and water is 67.5L and 22.5 respectively.

Now, 30L (25% of the total mixture volume) of water is added to the mixture.

The volume of milk = 67.5L

Volume of water = 22.5+30= 52.5L

Current ratio = 67.5/52.5 = 9:7

17. A 20 litres mixture of milk and water contains milk and water in the ratio 3 : 2. 10 litres of the mixture is removed and replaced with pure milk and the operation is repeated once more. At the end of the two removal and replacement, what is the ratio of milk and water in the resultant mixture?

Solution

In 20 liters of mixture

Milk = 3/5 × 20=12 L

Water = 8 litres

In 10 liters of mixture.

Milk = 6 liters

Water = 4 litres

On adding 10 liters of milk,

Milk = 12 – 6 + 10 = 16 L

Water = 8 – 4 = 4 L

Again in 10 liters of mixture,

Milk = 4/5 × 10 = 8 L

Water = 2 litres

On adding 10 litres of milk,

Milk =16 – 8 + 10 = 18 litres

Water = 2 litres

Therefore, Required ratio = 18 : 2 = 9 : 1

18. A cheater shopkeeper confesses to sell his pulses at cost price but he mixes it with pebbles and thereby gains 25%. The percentage of pebbles in the mixture is:

A. 14% B. 20%

C. 24% D. 16%

E. 25%

Solution

As per the formula if two materials are mixed, then

$$\left(\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}}\right) = \frac{\text{C. P. of dearer (d)} - \text{Mean Price (m)}}{\text{Mean Price (m)} - \text{C. P. of cheaper (c)}}$$

Let C.P. of 1 kg pulse be Re. 1

Then, Selling Price of 1 kg of mixture = Re. 1, Gain = 25%.

C.P of 1kg mixture = (100/125) × 1= 4/5

By the rule of alligation, we have

Ratio of pulse to pebble = 4/5:1/5 = 4:1

∴ % of pebble in the mixture

= (1 : 5) × 100 = 20%

Correct option: B

19. A vessel comprises 100 litres of fresh juice. Out of this vessel 12 litres of juice was pulled out and changed by water. This whole process was done two more times. Now calculate the quantity of fresh juice contained by the vessel?

A. 64.12 B. 68.14

C. 69.16 D. 65.23

E. None

Solution

Amount of fresh juice left after 3 times

= 100(1–12/100) 3 times

= 100 × 22/25 × 22/25 × 22/25 = 68.14 litres

Correct option: B

20. Sugar cost INR 130 per kilogram and INR 139 per kilogram are combined along a new type in the ratio 1 : 1 : 2. If the combination is cost Rs. 163 kilogram, then find out the price of the new type per kilogram?

A. 191.50 B. 160.25

C. 169.16 D. 185.23

E. None

Solution

Since first and second types are mixed in equal proportions.

So, their average price = Rs 130+139/2=134.50

So, the combination is made by mixing two types, one at Rs. 134.50 per kg and another one at INR x in the ratio 1 : 1. We have to find x.

As per the law of alligation:

(x–163) /28.50 = 1

x – 163 = 28.50

x = 191.50

Correct option: A

21. A deals in two types of black-eyed peas. Each costing INR 14 and INR 21 per kg. What ratio should the both types be mixed to get a combination worth INR18.50 per kg?

A. 1:9 B. 1:5

C. 9:5 D. 5:9

E. 5:1

Solution

According to the rule of alligation:

Required rate = (21 – 18.50) : (18.50 – 14)

Price of second black-eyed peas-mean price: Mean price-cost of first black-eyed peas

2.50 : 4.50 = 5 : 9.

Correct option: D

22. A jug has 5 parts of tomato soup and 3 parts of water. Now if we want a new combination with 1/2 water and 1/2 tomato soup, how much of the mixture must be swapped with water?

A. 1/5 B. 1/6

C. 1/3 D. 1/2

E. 1/4

Solution

Let's assume as volume of jug is 80 litres.

Water=30 litre

Tomato soup=50 litre

For every 8 litres taken out of the jug, we swap 5 litres of soup with water.

So, we need to exchange 16 litres with water.

∴ 16/80 = 1/5 of the solution needs to be swapped with water.

Correct option: A

23. Two jugs X and Y having coca cola and water mixed in the proportion 5: 2 and 7: 6 respectively. Now if we want a new mixture in jug Z having coca cola and water in the proportion of 8:5 then what will be the ratio?

A. 1:9 B. 1:5

C. 9:5 D. 7:9

E. 5:1

Solution

Let the C.P. of coca cola be Re. 1 litre.

Coca cola in 1 litre mix. of X = 5/7 litre, C.P. of 1 litre mix.

In X = Re. 5/7

coca cola in 1 litre mix. of Y = 7/13 litre, C.P. of 1 litre

mix.

in Y = Re. 7/13

coca cola in 1 litre mix. of Z = 8/13 litre, Mean price = Re. 8/13.

Required ratio = 1/13 : 9/91 = 7:9

Correct option: D

24. A lemon water hawker has two pots of lemon water. The first pot has 75% of lemon water and 25% soda. The second has 50% lemon water and 50% soda. How much lemon water should he mix from each of the pots so as to get 12 litres of lemon water such that the proportion of lemon water to soda is 5:3?

A. 10 lit B. 5 lit

C. 9 lit D. 7 lit

E. 6 lit

Solution

Let x litres from 1^{st} pot and 12-x litres from 2^{nd} pot are mixed

Lemon water from 1^{st} pot = 0.75x

Soda from 1^{st} drum = 0.25x

Lemon water from 2^{nd} pot = 0.5 × (12-x)

Soda from 2^{nd} drum = 0.5(12-x)

Total lemon water = 0.25x+6

Total soda = 0.25x + 0.5(12-x) = 6-0.25x

Proportion =(25x+6) / (6−25x) = 5/3= 75x+18 = 30−1.25x

2x =12; x=6

Correct option: E

Exercise 1

1. Jethalal and Popatlal jointly buy a Car. Jethalal's investment is one-fifth the investment of Popatlal. In a profit of Rs. 96000 what will be Popatlal's share?
   A. Rs 80000 B. Rs 85000
   C. Rs 90000 D. Rs 75000
   E. None of these
2. A and B jointly starts a business. A's investment is one-eighth the investment of B. In a profit of Rs. 9000 what will be A 's share?
   A. Rs 2000 B. Rs 1000
   C. Rs 3000 D. Rs 1500
   E. None of these
3. Ashitosh invests Rs. 30,000/- in opening a shop and starts a business. After 4 months, Rohan joins the business with an investment of Rs.40,000. At the end of the year, they make a profit of Rs. 2,55,000/-. What will be Rohan 's share(in Rs) in this profit?
   A. 1,35,000 B. 1,60,000
   C. 1,20,000 D. 1,40,000
   E. None of these
4. B invested half of what C invested. A invested 50% more than B. What is C's investment, if total investment is Rs. 3276?
   A. 1442 B. 1456
   C. 1520 D. 1550
   E. 1425
5. Pramod invested 50% more than Sujay invested. Harshad invested 50% more than Pramod. What is Pramod 's investment, if total investment is Rs. 1596?
   A. 510 B. 504
   C. 530 D. 580
   E. 520
6. Priya and Riya invest in the ratio 5 : 2. 10% of the profit is donated to a hospital before dividing it between the two. Priya gets Rs. 3510. What is the total profit?
   A. 5460 B. 5440
   C. 5360 D. 5480
   E. None of these
7. The average of three numbers is 154 and their ratio is 4:5:2. What will be the ratio of 20% of the first number to 25% of the second number to 30% of the third number?
   A. 16:25:12 B. 20:25:12
   C. 16:20:12 D. 16:25:20
   E. None of these
8. The salaries of A, B, C are in the ratio 2 : 3 : 5 . If the increments of 30%, 10% and 20% are allowed respectively in their salaries, then what will be the new ratio of their salaries?
   A. 26:31:61 B. 26:33:62
   C. 25:31:60 D. 26:33:60
   E. None of these
9. Shiv and Tushar started a business by investing Rs 10,000 and Rs 15,000, respectively. At the end of the year, they made a profit of Rs 7,500. If they decided to share the profit in the ratio of their initial investments, how much profit will each partner receive?
   A. Shiv = 3000; Tushar = 4500
   B. Shiv = 3500; Tushar = 4000
   C. Shiv = 4000; Tushar = 3500
   D. Shiv = 3550; Tushar = 3950
   E. None of these
10. Rs 600 are divided among Ajay, Binod and Chirag so that Rs 40 more than $\frac{2}{5}$ of Ajay's share, Rs 20 more than $\frac{2}{7}$ of Binod's share and Rs 10 more than $\frac{9}{17}$ of Chirag's share are all equal. Ajay's share is
    A. 200 B. 250
    C. 150 D. 160
    E. None of these
11. A, B, and C are partners in a business. A invested Rs 30,000, B invested Rs 45,000, and C invested Rs 60,000. After a year, they made a profit of Rs 88,000. If they decide to distribute the profit in the ratio of the cube of the capital of each partner, what will be B's share of the profit?
    A. 20000 B. 24000
    C. 25000 D. 14000
    E. None of these
12. Shweta and Sahil invest in the ratio of 3 : 4 in a partnership business and Shweta got Rs. 2800 as profit share out of total profit of Rs. 4200, then find the ratio of period of investment of Shweta to that of Sahil?
    A. 3:8 B. 5:3
    C. 8:3 D. 3:5
    E. None of these

13. A and B invested Rs 15000 and Rs. 27000 for 12 months and 6 months respectively. Find profit share of B is how much percent more or less than profit share of A?
A. 10% less B. 10% more
C. 11.11% more D. 11.11% less
E. None of these

14. Mrs. Harshita divides a sum of money among her four children-A, B, C, D in the ratio 3 : 5 : 7 : 11. If the share of A and C together is Rs. 62,800, what is the total amount received by C and D?
A. 1,13,100 B. 1,13,040
C. 1,13,060 D. 1,13,010
E. None of these

15. Mr. Digvijay divides a sum of money among her four children-Aman, Siya, Sonia, Srushti in the ratio 4 : 3 : 8 : 7. If the share of Sonia and Srushti together is Rs. 75000, what is the difference in the total amount received by Siya and Aman?
A. 5000 B. 6000
C. 8000 D. 10000
E. None of these

16. 2400 is divided among three friends Amit, Badal and Charu in such a way that 1/3rd of Amit's share, 1/4th of Badal's share and 1/5th of Charu's share are equal. Find Amit's share.
A. 300 B. 600
C. 900 D. 450
E. None of these

17. Three friends Anand, Bikram and Chetan open a cafe. Anand and Bikaram invest Rs 24,000/- and Rs 64,000/- respectively. Chetan invests Rs 8,000/- less than Bikram. At the end of the year the business earns a profit and Chetan gets Rs. 63,000/- as his share. What is the value of the total profit?
A. 171000 B. 162000
C. 172000 D. 165000
E. None of these

18. In a mixture of milk and water of the volume of 88 litre the ratio of milk to water is 8 : 3. How much quantity of water will be added to make mixture of equal ratio?
A. 30 B. 60
C. 50 D. 40
E. None of these

19. In a mixture of milk and water of the volume of 42 Litre, the ratio of milk and Water is 5 : 2. How much water should be added in mixture to make ratio 15 : 13?
A. 14 B. 16
C. 18 D. 20
E. None of these

20. A container contains milk and water in ratio of 5:3 and Capacity of Container is 80 lit. If half of the Container is replaced with 20 lit of water then find new quantity of water in container?
A. 40 B. 25
C. 30 D. 35
E. None of these

21. In a juice, guava is 70% and rest is sugar. In another juice, pomegranate is 90% while rest is sugar. Both the juices are mixed in the ratio of 3 : 2. Find concentration of sugar in final mixture. (in %)
A. 25 B. 22
C. 24 D. 26
E. None of these

22. An 120L solution of alcohol and water has 45% alcohol in it. If you want the mixture to be 75% alcohol, how much alcohol would you add to it?
A. 160 B. 124
C. 140 D. 144
E. None of these

23. In what ratio must a grocer mix two varieties of pulses costing Rs. 20 and Rs. 35 per kg respectively so as to get a mixture worth Rs. 30 per kg?
A. 3:2 B. 2:1
C. 1:2 D. 2:3
E. None of these

24. Govind, Krishna, Vasudev start a business of Dairy products. The ratio of their investments is 2:3:4 respectively. At the end of the year they earn a profit of 13230. Find the profit share of Vasudev.
A. 5850 B. 5860
C. 5870 D. 5880
E. 5890

25. Anjali began a business with Rs. 85,000. He was joined afterwards by Bajaj with Rs. 42,500. For how much period does Bajaj join, if the profits at the end of the year are divided in the ratio of 3 : 1?
A. 6 months B. 5 months

C. 8 months D. 4 months
E. None of the above

26. Jiggy and Riya start a new institute with initial investment of rupees 1200 each. Six months later Jiggy doubles his investment and Riya reduces her investment by rupees 200. Find the ratio of profit shared by both of them.
A. 12:7 B. 6:5
C. 4:3 D. 18:11
E. None of the above

27. Three persons A, B, and C invest in a business in the ratio of 5 : 6 : 4. If A and C invested for one year, then B should invest for how many months if he wants to receive 25% of the total profit at the end of one year?
A. 4 months B. 6 months
C. 3 months D. 9 months
E. None of these

28. Bhumika starts a new business and invests rupees 6900 initially. After 4 months Namrata joins her with the same investment. 4 more months later Snehal joins them with 13800 find the ratio in which they share profit.
A. 3:3:2 B. 3:2:3
C. 3:2:1 D. 3:2:2
E. 3:1:1

29. A milkman pays Rs. 10 per Liter of milk. He added water to it and sells the mixture at Rs. 14 per Liter at a profit of 16.66%. Find the ratio of milk to that of water added to the mixture?
A. 5:1 B. 1:6
C. 6:1 D. 1:5
E. None of these

30. Gold and Copper are mixed in different proportions to form two different alloys. Alloy 1 has them in the ratio 3:1 respectively while Alloy 2 has them in the ratio 5:3. In what ratio should Alloy 1 and Alloy 2 be mixed to form a mix which has Copper and Gold in the ratio 3:7?
A. 3:2 B. 2:3
C. 1:5 D. 5:1
E. None of these

31. A vessel contains 240 liters of milk. 60 liters of milk taken out from the vessel and replaced by water and this operation repeated two more times. Find the ratio of milk and water in resulting mixture?
A. 35:24 B. 37:27
C. 27:37 D. 24:35
E. None of these

32. A container is full of 150 litre milk. If 50 litre content of container is replaced by water and the same process is further repeated three times, then find the quantity of milk left in the final solution?
A. 31 B. 30
C. 26 D. 32
E. None of these

33. A vessel contains mixture of milk and water in the ratio of 3 : 1 respectively. If 16 liters mixture taken out from the vessel and now the difference between milk and water in the remaining mixture is 62 liters, then find initial mixture in vessel (in liters)?
A. 120 B. 160
C. 140 D. 150
E. None of these

34. Chaman and Chindi start a business with an initial investment of 2000 each. Chindi leaves after 6 months and Champu joins instead with an investment of 6000.at the end of the year what is the profit sharing ratio of Chaman:Chindi:Champu?
A. 2:3:1 B. 3:2:1
C. 3:1:2 D. 2:1:3
E. None of the above

35. Boiler, Bada Boiler and Chota Boiler start a new boiler manufacturing company with their investments being 6400, 9600, 11200 per month respectively. If at the end of the year they earn 25% profit what is the share of Chota boiler.
A. 33000 B. 33200
C. 33400 D. 33600
E. 33800

36. 8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of the water is 16 : 65. How much wine the cask holds originally?
A. 18 L B. 24 L
C. 32 L D. 42 L
E. None of the above

37. A merchant mixes 2 categories of rice first of rupees 48 /kg and another of rupees 36 /kg and sells it for rupees 45 at a profit of 12.5%. Find the ratio of mixing the rice.
A. 2:3 B. 3:2
C. 1:2 D. 2:1
E. None of the above

38. A milkman has two containers – one containing pure milk and another containing water. The pure milk container has some amount of milk and the water container has 30 litres of water. If he wants to make a mixture containing 40% milk, how many litres of milk should he mix with the water?
A. 19 B. 20
C. 21 D. 22
E. 25

39. A 50 litre mixture of milk and water contains 10% water. How much water should be added to the mixture to make it 20% water?
A. 6 B. 6.5
C. 6.25 D. 6.75
E. 7

40. Mr Vinod Chandak a tea blender has 2 qualities of tea leaves first costing rupees 250 /kg and another one costing rupees 400 /kg. he mixes them in a certain ratio and sells them for rupees 384 at a profit of 20% find the ratio in which he mixes both the tea leaves?
A. 8:9 B. 9:8
C. 7:8 D. 8:7
E. 7:9

41. Aditya a liquor store owner starts a new store with an initial investment of rupees 9,00,000. Three months later Rohan joins him with an investment of 12,00,000. Finally, Jayesh joins with an investment of rupees 36,00,000 if the ratio of profit sharing at the end of the year is 1:1:2. Find how many months after Rohan did Jayesh join.
A. 2 B. 4
C. 6 D. 5
E. 3

42. Prasanna and Parth started a company in which Prasanna invested Rs. 900000 and Parth invested Rs. 1100000. Prasanna is the working partner and draws a fixed monthly salary of Rs. 20000 (which he draws from the revenues of the company). Parth only offers consultancy services to the business and charges 15 % of the profit earned by the company. The revenue made by the company at the end of its first year is Rs. 3500000. The profit made by the company is 30 percent of its revenues. What is the difference between the amount earned by Prasanna and Parth at the end of the first year?
A. Rs. 2850000 B. Rs. 2300000
C. Rs. 1406300 D. Rs. 2050000
E. Rs. 2750000

43. Thube subscribes to a new business scheme with an initial investment of rupees 5500. Three months later he halves his investment and 3 more months later he quadruples his investment. If he gets 33.33% profit at the end of the year find the profit he earns
A. 30,000 B. 35,000
C. 31,000 D. 30,250
E. None of the above

44. Lord Rajale makes an investment of 1000 per month for 6 months. Then he increases his per month instalment by 50% for the next 3 month. For the last 3 months of the year, he further increases his instalments by 50%. If he earns 25% profit on the total investment at the end of the year, find the profit earned by Lord Rajale.
A. 4311 B. 4312
C. 4312.5 D. 4314
E. 4315

45. Riddhi is joining a new business with an initial investment of 5000 her friend Mansi joins with her with an investment of 3000. Three months later Riddhi increases her investment to 7500 and Mansi decreases her investment by 10%. Three more months later Riddhi halves her investment and Mansi doubles her investment. Find the profit sharing ratio of Riddhi and Mansi at the end of 9 months.
A. 110:100 B. 11:10
C. 101:100 D. 222:650
E. 325:222

46. A trader has 3 types of tea leaves – one worth Rs. 100/kg, another worth Rs. 200/kg and the third worth Rs. 300/kg. In what ratio should he mix them to get a mixture worth Rs. 250/kg
A. 2:1:2 B. 3:1:3
C. 1:1:4 D. 3:3:1

E. None of the above

47. A litre of mocktail is sold at Rs. 30. The bartender made this concoction by combining two types of juices that cost Rs. 23/litre and Rs. 28/litre. What fraction of Rs. 23/litre juice is in the resulting mixture if the bartender makes a 20% profit?
    A. 3:5 B. 1:3
    C. 3:4 D. 2:3
    E. None of the above
48. Kantaram a milkman buys milk at rupees 15/L and he add water to it and sell it at rupees 16 /L at a profit of 60%. Find the ratio of water which is mixed in the milk?
    A. 1:3 B. 2:5
    C. 1:2 D. 2:7
    E. 2:9
49. Shambhu started a business in 2009 by investing Rs.50,000. She invested Rs. 20,000 as additional amount in 2010 and her friend Shankar joined her with an amount of Rs.70,000. Shambhu invested another Rs. 20,000 in 2011 and Sanap joined them with Rs. 70,000. At the end of these 3 years, they earned a profit of Rs. 3,00,000. Find Shankar's share?
    A. Rs.1,00,000 B. Rs.1,25,000
    C. Rs.75,000 D. Rs.1,50,000
    E. None of these
50. With an initial investment of $25,000 per month Jacky start a SIP for 2 years with a CAGR of 20%, with his wife Jinnie who also invests $24,000 per month in another SIP which yields 25% CAGR. Find the ratio of the profits of Jacky and Jinnie.
    A. 0.96 B. 0.77
    C. 1.93 D. 1.11
    E. None of the above

ANSWER KEY:

1) A	11) B	21) B	31) C	41) E
2) B	12) C	22) D	32) B	42) C
3) C	13) A	23) C	33) C	43) D
4) B	14) B	24) D	34) D	44) C
5) B	15) A	25) C	35) D	45) E
6) A	16) B	26) D	36) B	46) C
7) A	17) B	27) B	37) C	47) E
8) D	18) D	28) D	38) B	48) C
9) A	19) A	29) C	39) C	49) A
10) C	20) D	30) A	40) D	50) A

TIME & WORK

Definition:

Time: Time is defined as the number of days or hours required to complete the task.

Work: In terms of mathematics work is defined as the amount of job assigned or the amount of job actually done.

When a duration of time (T) is required to complete a work (W) i.e., number of units of work done per unit time is called the rate of Work. Hence, whenever, some work is done and the total work itself can be taken as one unit.

Formula & Rules:

- Work from Days:
  - If A can do a piece of work in n days, then A's one day work = $\frac{1}{n}$
- Days from work:
  - If A's one day work = $\frac{1}{n}$, then A can finish the work in n days.
- Work Done by A and B:
  - A and B can do a piece of work in 'a' days and 'b' days respectively.
  - When working together they will take $\frac{ab}{a+b}$ days to finish the work.
  - In one day, they will finish $(\frac{a+b}{ab})^{th}$ part of work.
- Ratio:
  - If A is thrice as good a workman as B, then:
  - Ratio of work done by A and B = 3: 1.
  - Ratio of times taken by A and B to finish a work = 1: 3
- Efficiency:
  - Efficiency is inversely proportional to the Time taken when the amount of work done is constant.
  - $\text{Efficiency} \propto \frac{1}{\text{Time Taken}}$

Rule 1:

If A completes a piece of work in x days. And B can complete same piece of work in y days.

Then,

One day work of A = $\frac{1}{x}$

One day work of B = $\frac{1}{y}$

Work done by $A + B = \frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy}$

Total Time = $\frac{xy}{x+y}$

Rule 2:

If A completes a piece of work in x days. B completes same piece of work in y days .C completes same piece of work in z days

Then,

One day work of A = $\frac{1}{x}$

One day work of B = $\frac{1}{y}$

One day work of C = $\frac{1}{z}$

Work done by $A + B + C = \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{yz+xz+xy}{xyz}$

Total Time = $\frac{xyz}{yz+xz+xy}$

Rule 3:

If M_1 men can complete a work W_1 in D_1 days and M_2 men can complete a work W_2 in D_2 days then,

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$. It can be written as: $M_1D_1W_1 = M_2D_2W_2$

If Time required by Both M_1 and M_2 is T_1 and T_2 respectively, then relation is:

$\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$. It can be written as,

$M_1D_1T_1W_2 = M_2D_2T_2W_1$

If the persons have efficiency of E1 and E2 respectively then:

$\frac{M_1D_1T_1E_1}{W_1} = \frac{M_2D_2T_2E_2}{W_2}$.

Rule 4:

If A alone can complete a certain work in 'x' days and A and B together can do the same amount of work in 'y' days, Work done by B = $\frac{1}{y} - \frac{1}{x} = \frac{x-y}{xy}$

Then B alone can do the same work in $\frac{xy}{x-y}$ days.

Rule 5:

If A and B can do work in 'x' days.

If B and C can do work in 'y' days.

If C and A can do work in 'z' days.

Work done by A, B and C = $\left(\frac{1}{2}\right)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

Total Time taken when A, B, C work together = $\frac{2xyz}{xy+yz+xz}$

Rule 6:

$$\text{Work of One Day} = \frac{\text{Total Work}}{\text{Total Number of Working Days}}$$

Total work = one day work × Total number of working days

Remaining work = 1 – work done

Work done by A = A's one day work × Total number of working days of A

Rule 7:

If A can finish $\frac{m}{n}$ part of the work in D days.

Then total time taken to finish the work by

A = $\frac{D}{\frac{m}{n}} = \frac{n}{m} \times D$ days

Rule 8:

If A can do a work in 'x' days

B can do the same work in 'y' days

When they started working together, B left the work 'm' days before completion then total time taken to complete the work

= $\frac{(y+m)\times x}{(x+y)}$

Rule 9:

A and B finish work in a day.

They work together for 'b days and then A or B left the work.

B or A finished the rest of the work in 'd' days.

Total time taken by A or B alone to complete the work

= $\frac{ad}{a-b}$ or $\frac{bd}{a-b}$

Solved Examples:

Type 1: Calculate time taken or work completed by one, two or more worker

1. Seena and Jyoti can paint a wall in 12 days together, Jyoti and Latika can paint the same wall in 15 days together and Seena and Latika can paint that wall in 20 days together. In how many days Seena alone can paint the wall?

   A. 20 B. 30

   C. 40 D. 25

   Solution:

   Seena + Jyoti + Latika one day work

   $= \left(\frac{1}{2}\right)\left(\frac{1}{12}+\frac{1}{15}+\frac{1}{20}\right)$

   Seena + Jyoti + Latika one day work = $\frac{1}{10}$

   Now, Seena's one day work = $\frac{1}{10}-\frac{1}{15}=\frac{1}{30}$

   Therefore, Seena alone will paint the wall in 30 days.

   Correct option: B

2. Jigna can alone complete a part of assignment in 8 days. Work done by Raj alone in one day is half of the work done by Jigna alone in one day. In how many days can the assignment be completed, if Jigna and Raj work together?

   A. 5.33 days B. 16 days

   B. C. 24 days D. 4 days

   Solution:

   Jigna can finish part of assignment in one day = $\frac{1}{8}$

   Raj can finish part of assignment in one day = $\frac{1}{16}$

   Jigna + Raj together finish part of assignment in one day = $\frac{1}{8}+\frac{1}{16}=\frac{3}{16}$

   Therefore, together they will take $\frac{16}{3}=5.33$ days

   Correct option: A

3. Husband H and wife W can do a work in 24 days together. Husband can do the same job in 60 days alone. Then at what time wife can complete the same work alone?

   A. 10 B. 20

   C. 30 D. 40

   Solution:

   Wife's one day work = $\frac{1}{24}-\frac{1}{60}=\frac{1}{40}$

   Therefore, she will take 40 days.

   Correct option: D

   Type 2: When efficiency is given in percentage

4. Madhu is twice as efficient as Maya. Madhu takes 30 days less than Maya to finish the work. Calculate the time required to finish the work together.

   A. 40 days B. 30 days

   C. 20 days D. 35 days

   Solution:

   Time required to complete the job together is given by:

   $T = m \times \frac{D}{m^2-1} = 2 \times \frac{30}{2^2-1} = \frac{60}{3} = 20$ days

   Correct Option: C

5. 6 students and 3 professionals can complete a task in 12 days by working 8 hours every day. In how much time will 12 professionals complete the same task by working 6 hours every day, if the efficiency of each student is twice that of a professional?

   A. 20 days B. 10 days

   C. 25 days D. 15 days

   Solution:

   1 student= 2 professionals (as given in question, efficiency of each student is twice that of a professionals)

   6 students = 12 professionals

   As given

   (6 students + 3 professionals) * 8 * 12 = 12 professionals * 6 * D

   15 professionals * 8 * 12 = 12 professionals * 6 * D

   D = (15 x 8)/6 = 20

   Correct option: A

6. Birbal takes 6 days to complete the assignment whereas Akbar completes the same assignment in 12 days. In how much time they will complete the assignment together?

   A. 2 days B. 3 days

   C. 4 days D. 1 days

   Solution:

   Birbal can do the work in = 6 days

   Akbar can do the work in = 12 days

   Together they can do the work in = $\frac{1}{6}+\frac{1}{12}=\frac{3}{12}=\frac{1}{4}=$ 4 days

   Correct Option: B

Type 3: Calculate time/work when workers leave in between:

7. Karan can do a piece of work in 50 days. He works for 15 days and then leaves. Tarun comes and finishes the remaining work in 35 days. In how many days Tarun alone can finish the work?

   A. 50 days B. 10 days

   C. 60 days D. 45 days

   Solution:

   Karan's 1 day work = $\frac{1}{50}$

   Work done by Karan in 15 days = $15 \times \frac{1}{50}=\frac{3}{10}$

   $\therefore$ Remaining Work = $1-\frac{3}{10}=\frac{7}{10}$

Tarun finishes the remaining $\frac{7}{10}$ work in 35 days.

$\therefore$ Tarun can finish the work in $\frac{35}{\frac{7}{10}} = 50$

Correct Option: A

8. Three friends Akbar, Birbal and Chitragupta can do a work together in 12, 18, and 24 days respectively. After working 4 days Akbar and Chitragupta leaves the work. Find in how many days Birbal alone can complete the remaining work?

A. 4 days B. 5 days

C. 10 days D. $\frac{18}{3}$ days

Solution:

(Akbar + Birbal + Chitragupta)'s one day work

$= \frac{1}{12} + \frac{1}{18} + \frac{1}{24} = \frac{13}{72}$

4 day's work $= 4 \times \frac{13}{72} = \frac{13}{18}$

$\therefore$ Remaining Work $= 1 - \frac{13}{18} = \frac{5}{18}$

$\therefore$ Time taken by Birbal to complete the work $= \frac{5}{18} \times 18 = 5$

Correct Option: B

9. Mumtaz can complete a part of task in 25 days. Her friend Nur can finish it in 20 days. They work together for 5 days and then Mumtaz left the work. In how many days will Nur finish the remaining work?

A. 24 days B. 25 days

C. 20 days D. 11 days

Solution:

Time taken by Mumtaz to finish the task = 25 days

$\therefore$ Mumtaz's one day work $= \frac{1}{25}$

Nur takes time to finish the work = 20 days

$\therefore$ Nur's one day work $= \frac{1}{20}$

(Mumtaz + Nur)'s 1 day's work $= \frac{1}{25} + \frac{1}{20} = \frac{9}{100}$

(Mumtaz + Nur)'s 5 day's work $= 5 \times \frac{9}{100} = \frac{9}{20}$

$\therefore$ Remaining Work $= 1 - \frac{9}{20} = \frac{11}{20}$

$\therefore \left(\frac{11}{20}\right)^{\text{th}}$ part of work is done by Nur in 1 day.

$\therefore \left(\frac{11}{20}\right)^{\text{th}}$ work will be done by Nur in $20 \times \frac{11}{20} = 11$ days

Correct Option: D

10. Qubair can finish his assignment in 18 days. His brother Aulad can do the same assignment in 15 days. Aulad worked for 10 days and left the assignment. In how many days, Qubair alone can finish the remaining assignment?

A. 4 days B. 5 days

C. 6 days D. 8 days

Solution:

Aulad's one day of work on assignment $= \frac{1}{15} \times 10 = \frac{2}{3}$

Remaining Work $= 1 - \frac{2}{3} = \frac{1}{3}$

Qubair's one day work $= \frac{1}{18}$

$\therefore \frac{1}{3}$ work done by Qubair in $\frac{1}{3} \times 18 = 6$ days

Correct Option: C

Type 4: Share of salary based on work

11. Amar and Akbar undertook a work for Rs. 4000. Amar alone can do a part of work in 6 days. Akbar alone can do a part of work in 8 days. Their friend Anthony joined them, and they completed the work in 3 days. What is the share of Anthony?

A. Rs. 500 B. Rs. 800

C. Rs. 300 D. Rs. 120

Solution:

Anthony's one day of work $= \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right) = \frac{1}{24}$

Ratio of their one-day work $= \frac{1}{6} : \frac{1}{8} : \frac{1}{24}$

Anthony worked for 3 days

$\therefore$ his share $= 3 \times \frac{1}{3} \times 4000 = 500$

Correct Option: A

12. Katrina can do a work in 10 days. Priyanka joined and they complete the same work in 6 days. If they get Rs. 100 for the work, what is the share of Priyanka?

A. Rs. 70 B. Rs. 40

C. Rs. 60 D. Rs. 30

Solution:

Katrina can do the work in = 10 days

Both can do the work in = 6 days

Priyanka can do the work $= \frac{1}{6} - \frac{1}{10} = \frac{1}{15} = 15$ days

Katrina and Prinaka's share = 15:10 = 3:2

$\therefore$ Priyanka's share $= \frac{2}{5} \times 100 = \text{Rs. } 40$

Correct Option: B

13. Seeta, Ram, and Geeta contracted a work for Rs. 9999. Together, Seeta and Ram completed $\frac{7}{11}$ of the work. How much did Geeta get?

A. Rs. 3245 B. Rs. 3663

C. Rs. 6363 D. Rs. 3636

Solution:

Seeta + Ram did $= \frac{7}{11}$

Geeta completed $= 1 - \frac{7}{11} = \frac{4}{11}$

Seeta + Ram's Share : Geeta's Share = 7 : 4

Geeta's Share $= \frac{4}{11} \times 9999 = 3636$

Correct Option: D

14. Devki's one day work is $\frac{1}{20}$ and Rati's one day work is $\frac{1}{30}$ but with the help of Damini they finished the work in 10

days. For that work they got total of Rs. 5000. Find the share of Damini?

A. Rs. 833.33 B. Rs. 800

C. Rs. 235 D. Rs. 338.3

Solution:

Devki's one day work = $\frac{1}{20}$

$\therefore$ Devki's Total Work = $10 \times \frac{1}{20} = \frac{1}{2}$

Rati's one day work = $\frac{1}{30}$

$\therefore$ Rati's Total Work = $10 \times \frac{1}{30} = \frac{1}{3}$

The work together completed = $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

Remaining Work = $1 - \frac{5}{6} = \frac{1}{6}$

$\therefore$ Damini's share = $5000 \times \frac{1}{6} = \frac{5000}{6} = \text{Rs. } 833.33$

Correct Option: A

Exercise – 1

1. Pipe A can fill a tank in 4 hours. Due to a leak at the bottom, it takes 12 hours to fill the tank. In what time the leak alone can empty the full tank?
   A. 16 B. 10
   C. 8 D. 12
   E. 6
2. Ajay and Shyam can do a work in 16 days and 28 days respectively. They start the work together and Shyam leaves after 7 days. In how many days can Ajay do the remaining work?
   A. 6 B. 5
   C. 9 D. 10
   E. 4
3. A group of 150 men can construct a 3800 m long wall in 25 days. How many men are required to construct a wall twice the length of the previous wall in half the time?
   A. 660 B. 580
   C. 600 D. 550
   E. 430
4. P and Q together can do a work in 10 days, P and R together in 15 days, R and Q together in 30 days. In how many days can P, Q and R do the work together?
   A. 12 B. 15
   C. 20 D. 10
   E. 16
5. If a pipe fills a tank in 8 h, then what part of the tank will the pipe fill in 1 h?
   A. 11.11% B. 12.5%
   C. 14.28% D. 10%
   E. None of these
6. An outlet pipe can empty a cistern in 9 h. In what time will the pipe empty two-third part of the cistern?
   A. 4h B. 6h
   C. 3h D. 5h
   E. None of these
7. Working efficiencies of P and Q for completing a piece of work are in the ratio 6: 13. The number of days to be taken by them to complete the work will be in the ratio?
   A. 6:13 B. 12: 11
   C. 13:6 D. 15:2
   E. None of these
8. Working efficiencies of A and B for completing a piece of work are in the ratio 6: 15. The number of days to be taken by them to complete the work will be in the ratio?
   A. 6:13 B. 15: 6
   C. 30: 12 D. 15:2
   E. More than one
9. Pipe A can fill a tank in 30 min, while pipe B can fill the same tank in 10 min and pipe C can empty the full tank in 50 min. If all the pipes are opened together, how much time will be needed to make the empty tank full?
   A. 9 B. 8
   C. 8 14/17 D. 8 13/17
   E. None of these
10. Vijay can do a piece of work in 15 days while Sachin can do the same piece of work in 20 days. If they work together for 4 days, how much fraction of work left?
    A. $\frac{8}{15}$ B. $\frac{4}{15}$
    C. $\frac{8}{30}$ D. $\frac{4}{30}$
    E. None of these
11. A and B undertake to do a piece of work for Rs.1000. A can do it in 10 days and B can do it in 15 days. How much should A be paid for his contribution? (In Rs.)
    A. 300 B. 600
    C. 400 D. 700
    E. 450
12. Sumit and Dhiraj undertake to do a piece of work for Rs.1640. Sumit can do it in 30 days and Dhiraj can do it in 18 days. How much should Dhiraj be paid for his contribution? (in Rs.)
    A. 1250 B. 1020
    C. 1011 D. 1025
    E. 999
13. 15 women can complete a work in 48 days, then find how many women will be required to complete 1/3rd of the same work in 12 days?
    A. 15 B. 18
    C. 20 D. 25
    E. 24
14. 18 men can complete a work in 56 days, then find how many men will be required to complete 5/9th of the same work in 14 days?

A. 15 B. 40
C. 20 D. 25
E. 24

15. If 12 men can do a piece of work in 10 days, the time taken by 10 men to do the same piece of work will be:
A. 12 days B. 10 days
C. 8 days D. 11 days
E. None of these

16. 15 men working 4 hours a day can complete a work in 20 days. How many hours per day must 12 men work to complete the same work in 25 days?
A. 5 B. 8
C. 4 D. 3
E. 6

17. A tank can be filled by pipe P in 4h and pipe Q in 6h. At 8 am pipe P was opened. At what time will the tank be filled if pipe Q is opened at 9 am?
A. 10 am B. 9 :15 am
C. 10: 48 am D. 11 am
E. None of these

18. Kishore can do a work in 10 days and Sanjay can do the same work in 20 days. They work together for 5 days and then Kishore goes away. In how many more days will Sanjay finish the work?
A. 5 B. 8
C. 10 D. 12
E. 15

19. Veer can do 1/2 of the work in 12 days while Aryan can do 1/3 of the work in 8 days. How long will it take for both of them to finish the work?
A. 6 B. 5
C. 12 D. 8
E. 10

20. Sameer takes twice as much time as Ashish and thrice as much as Veer to finish a piece of work. Together they finish the work in 2 days. What is the time taken by Sameer to finish the work?
A. 10 B. 12
C.18 D. 16
E. 20

21. Murali is twice as good as Kartik. Together, they finish the work in 18 days. In how many days can Kartik alone do the same work?
A. 25 B. 20
C. 54 D. 27
E. 36

22. Shruti is twice as good as Srushti. Together, they finish the work in 22 days. In how many days can Shruti alone do the same work?
A. 24 B. 33
C. 44 D. 32
E. 36

23. Harshad is thrice as good a workman as Anand and therefore is able to finish the job in 40 days less than Anand. In how many days will they finish the job working together?
A. 24 B. 18
C. 20 D. 15
E. None of these

24. Karan is thrice as good a workman as Chetan and therefore is able to finish the job in 50 days less than Chetan. In how many days will they finish the job working together?
A. 18 ¾ B. 18 ¼
C. 18 D. 19
E. None of these

25. Akshay is 50 % more efficient than Salman and therefore is able to finish the job in 30 days less than Salman. In how many days will they finish the job working together?
A. 24 B. 18
C. 20 D. 36
E. None of these

26. Komal, Anju and Maya are employed to do a piece of work for Rs 825. Komal and Anju together are supposed to do 26/33 of the work and Anju and Maya together 23/33 of the work. How much should Komal be paid?
A. Rs 250 B. Rs 280
C. Rs 200 D. Rs 260
E. None of these

27. Jay is 75 % more efficient than Vijay and therefore is able to finish the job in 33 days less than Vijay. In how many days will they finish the job working together?
A. 24 B. 28
C. 20 D. 36
E. None of these

28. Raju can do a piece of work in 12 days. Raju and Shyam complete the work together and were paid Rs 58 and Rs 87 respectively. How many days must they have taken to complete the work together?
A. 5 B. 4.5
C. 6 D. 4
E. 4.8

29. Ravi can complete a task in 10 days. Ravi and Anil together complete the task and share their earnings in the ratio Rs 3: Rs 2 respectively. How many days do they take to finish the task together?
A. 6 B. 7
C. 8 D. 5
E. None of these

30. Rohan can do a work in 8 days, Kunal can do the same work in 12 days, and Charan can do the same work in 24 days. They start working together, but after 2 days, Charan leaves the work. In how many days will Rohan and Kunal together complete the remaining work?
A. 2 B. 5
C. 3 D. 2.4
E. None of these

31. Mayur can complete a work in 15 days and Ganesh can complete the same work in 20 days. They start working on alternate days, with Mayur starting on the first day. In how many days will the work be completed?
A. 18 days B. 17 days
C. 19 days D. 16 days
E. None of these

32. Sourav can complete a work in 10 days and Vishal can complete the same work in 15 days. They start working on alternate days, with Vishal starting on the first day. In how many days will the work be completed?
A. 20 days B. 10 days
C. 12 days D. 24 days
E. None of these

33. Sameer and Aryan can complete a work in 15 days and 18 days respectively. They work on alternate days, with Sameer starting on the first day. If they work for 6 days, how much fraction of work is left?
A. $\frac{16}{30}$ B. $\frac{31}{40}$
C. $\frac{19}{30}$ D. $\frac{1}{6}$
E. None of these

34. A can complete a work in 16 days and B can complete the same work in 12 days. They work on alternate days, with A starting on the first day. In how many days will the work be completed?
A. 13.75 days B. 14 days
C. 15 days D. 13.5 days
E. none of these

35. A can do a piece of work in 30 days. If A and B together can do 1 /3rd of work in 6 days, then find in how many days will B do 4/ 5th of work?
A. 28 B. 36
C. 24 D. 40
E. 32

36. Pramod and Girish each working alone can do a work in 15 days and 25 days respectively. They started the work together, but Girish left after some time and Pramod finished the remaining work in 7 days. After how many days from start did Girish leave?
A. 5 B. 6
C. 8 D. 10
E. None of these.

37. If a road can be constructed by 8 workers in 20 days, how many days will it take for 6 workers to construct the same road?
A. 26 days B. 25 days
C. 26 $\frac{2}{3}$days D. 26 $\frac{1}{3}$days
E. None of these

38. In a garrison, there was food for 500 soldiers for the month of April. After 20 days, 500 more soldiers joined the garrison. How many days would the soldiers be able to carry on with the remaining food?
A. 6 B. 10
C. 5 D. 8
E. None of these

39. In a garrison, there was food for 1200 soldiers for two months (i.e., February and March 2000). After 30 days, 300 more soldiers joined the garrison. How many days would the soldiers be able to carry on with the remaining food?
A. 30 B. 20
C. 25 D. 24
E. None of these

40. In the construction of a building, there was 100 workers were assigned to complete the building in 25

days, but 60 workers left their job in 5days, so how many remaining days it will take to complete the building?

A. 30 B. 50
C. 55 D. 40
E. None of these

41. Satish and Surya working together can do a piece of work in 24 days, Surya and Sameer working together can do the same piece of work in 15 days and Satish and Sameer working together can do the same piece of work in 20 days. They all worked together for 6 days and then Satish and Sameer leave the work. How many days will Surya take to finish the remaining work?

A. 12 B. 18
C. 20 D. 22
E. 25

42. Three persons Aman, Binod and Chintu together undertake to complete a piece of work for Rs 1200. A can complete the work alone in 6 days, Binod alone in 15 days and Chintu alone in 24 days respectively. If they complete the work with the help of person Dhiraj in 3 days, then find the wage (in Rs) of person Dhiraj?

A. 250 B. 150
C. 210 D. 350
E. 280

43. Starting on Monday morning Gopal can finish a task by Friday evening while Madhav takes 2 days more to get over with the same task. They take up a project together and are paid Rs 720/- for it. How much should be Madhav 's share in the earnings (in Rs)?

A. 360 B. 350
C. 420 D. 300
E. None of these

44. Two friends Raman and Vaman work together on an assignment and take 10 days to finish it and were paid Rs 1155/- for it. If Raman was to work alone, he would take 15 days to finish the assignment. Find their share of Raman in the earnings.

A. 770 B. 750
C. 850 D. 800
E. 720

45. Aman and Bilal can complete a work in 24 days and 36 days, respectively. Aman, Bilal and Chirag together can complete the work in 12 days. If Chirag get a total wage of Rs. 1800 to complete the work alone, then find the per day wage of Chirag?

A. 25 B. 30
C. 50 D. 60
E. None of these

46. A, B and C alone can complete a work in 60, 90 and 72 days respectively. All of them started working together but after 10 days from start A left the job and after 15 more days B also left the job. So, for how many days did C work?

A. 45 B. 40
C. 30 D. 20
E. None of these

47. Three pipes P, Q and R when opened simultaneously can fill a tank in 6 hours. R is opened for 3 hours and then closed while P and Q fill the remaining tank in 8 hours. How long will R take to fill the tank alone?

A. 30 B. 35
C. 15 D. 36
E. None of these

48. Pipes A and B can fill a tank together in 6 hours. When Pipe C is also open, the tank can be filled in 4 hours by 3 pipes together. Pipe A's efficiency is double of Pipe B. How long will Pipe B and C take to fill the tank entirely?

A. $\frac{36}{7}$ B. $\frac{36}{5}$
C. 7 D. 8
E. None of these

49. There are two inlets and one outlet to a tank. Inlet X and Y take 1.5 hours and 2 hours respectively to fill the tank. While outlet Z can empty the entire tank in 30 minutes. The water controller at the society decides to open Inlet X at 12 pm when he arrives on duty and Inlet Y one hour later. Outlet Z is opened at 2 pm. What will be the time by his watch when the tank will be entirely empty again?

A. 4:10 pm B. 4:12 pm
C. 4:00 pm D. 4:30pm
E. None of these

50. Theri Dam has four inlets. Through the first three inlets, the dam can be filed in 12 hours; through the second, the third and the fourth inlet, it can be filled in 15 hours; and through the 1st and the fourth inlet,

in 20 hours. How much time will it take all the four inlets to fill up the dam?

A. 15 B. 12
C. 10 D. 20
E. None of these

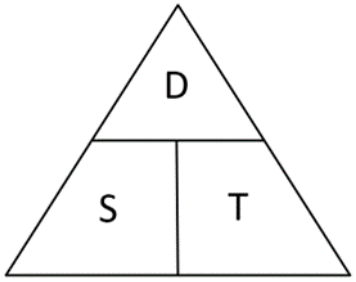
ANSWER KEY:

1) E	11) B	21) C	31) B	41) B
2) B	12) D	22) B	32) C	42) C
3) C	13) C	23) D	33) C	43) D
4) D	14) B	24) A	34) A	44) A
5) B	15) A	25) D	35) B	45) A
6) B	16) C	26) A	36) A	46) B
7) C	17) C	27) B	37) C	47) C
8) E	18) A	28) E	38) C	48) B
9) C	19) C	29) A	39) D	49) B
10) A	20) B	30) D	40) B	50) C

TIME, SPEED & DISTANCE

Introduction

$$Distance\ (D) = Speed\ (S) \times Time\ (T) \qquad Speed\ (S) = \frac{Distance\ (D)}{Time\ (T)} \qquad Time\ (T)\ = \frac{Distance\ (D)}{Speed\ (S)}$$



Formula for Conversion of Km/hr to m/sec where x is in Km/hr

1 km = 1000m 1 hr = 3600 s

1 km/hr = $\frac{1000\ \text{m}}{3600\ \text{s}} = \frac{5}{18}$

$\text{X kmph} = (\text{X} \times \frac{5}{18})\ \text{m/s}$

Formula for Conversion of m/sec to Km/hr where x is in m/sec

$1\ m = \frac{1}{1000}\ km \quad 1\ sec = \frac{1}{3600}\ hr$

$1\frac{m}{sec} = \frac{3600}{1000} = \frac{18}{5}$

$X\ m/s = (X \times \frac{18}{5})\ km/hr$

Formula for average Speed:

$$Average\ Speed = \frac{Total\ Distance}{Total\ Time}$$

- Equal Distance at two speeds:
  An object covers equal distance at speed S1 and other equal distance at speed S2 then his average speed for the distance is: $\frac{2 \times S1 \times S2}{S1+S2}$

Trains:

- S_T = Speed of Train
- S_O = Speed of Object
- L_T = Length of Train
- L_O = Length of Object

Case 1:

When Train Crosses a Stationary Object with no Length(e.g., Pole) in time t:

$S_T = \frac{L_T}{t}$

Case 2:

When Train Crosses a Stationary Object with Length L_O (e.g., Train Platform) in time t

- Objects moving in Opposite directions:
  - $S_T + S_O = \frac{L_T + L_O}{t}$
- Objects moving in Same directions:
  - $S_T - S_O = \frac{L_T + L_O}{t}$

Case 3:

When Train Crosses a Moving Object with no Length (e.g., Car has negligible length) in time t

- Objects moving in Opposite directions:
  - $S_T + S_O = \frac{L_T}{t}$
- Objects moving in Same directions:
  - $S_T - S_O = \frac{L_T}{t}$

Note: In case of a second train, Train 2 is treated as an object.

Solved Examples:

Type 1: When Distance is constant.

if Distance if constant then this equation will be

$S_1 \times T_1 = S_2 \times T_2$

Question 1:

A boy walking at a speed of 20 km/hr reaches his school 20 min late. Next time he increases his speed by 5 km/h but still he late by 5 min. Find the distance of the school from his home.

Solution

Let time be x.

S_1 = 20km/h ; S_2 = 5 + 15 = 25 km/h

$T_1 = x + 20$ $T_2 = x + 5$

20(x +20) = 25(x + 5)

400 – 125 = 5x

x = 55. => x + 20 = 75 mins = 5/4 hours

Thus distance = 20(5/4) = 25 kms.

Type 2: Object Travelling in Opposite Direction of the Train

Question 2:

Two trains are travelling in opposite directions at uniforms speeds of 120 kmph and 100 kmph. They take 5 seconds to cross each other. If the two trains travelled in the same directions, then a passenger sitting in the faster moving train would have overtaken the other train in 18 seconds. What are the lengths of the trains?

Solution

Let length of faster train and slower train be x and y respectively

When they travel in opposite direction, trains cross each other in 5 sec

Relative speed = 120 + 100 = 110 km/hr = (220 × 5) / 18 = 1100 / 18

Distance travelled = x + y

Time taken to cross each other = 5 s

Distance = Speed x Time

(x + y) = (1100 / 18) × 5 = 2750 / 9 ----(1)

When they travel in same direction, passenger sitting in the faster moving train would have overtaken the other train in 18 sec

Relative speed = 120 – 100 =20 km/hr = (20 × 5) / 18 = 100 / 18 m/s

Since the observation given is of a passenger sitting in faster train, distance travelled is equal to length of the slower train. i.e.,

distance travelled = y m.

Time taken for overtaking = 18 s

y = (100 / 18) × 18 = 100 m

From (1),

x + 100 = 2750 / 9

x = 205.56 m

Type 3: Train A leaves at X am from Position 1 v Reaches Position 2 at Y am, other train leaves from Position 2 at A Am and Reaches at B AM. Distance is given. When do two Trains Cross one another.

Question 3:

A train starts from Mumbai at 6:00 am and reaches Nashik at 10am. The other train starts from Nashik at 8am and reached Mumbai at 11:30 am, If the distance between Mumbai and Nashik is 400 km, then at what time did the two trains meet each other?

Solution

Average speed of train leaving Mumbai = 400/4 = 100 km/hr

Average speed of train leaving Nashik = 400 × 2/7 = 800/7

By the time the other train starts from Nashik, the first train had travelled 200 km as

2 hours x 100kmph = 200 Kms

Therefore, the trains meet after x hr:

100x + 800x/7 = 200

$$x = \frac{(200)}{100 + \frac{800}{7}} = \frac{14}{15} \text{ hr}$$

$$= \frac{14}{15} \times 60 = 56 \text{ minutes}$$

Hence, they meet at 8:56 am as 6 am + 2 hours + 56 mins

Type 4: Had Object been Faster by a Km/hr then time taken and had it been slower than b Km/hr. What is the Distance?

Question 4:

A train covered a certain distance at a uniform speed. If the train had been 6 km/hr faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr, the train would have taken 6 hr more than the scheduled time. The length of the journey is:

Solution

Let the length of the journey be d km and the speed of train be S km/hr

Then,

$$\frac{d}{S+6} = t - 4 \quad \text{---(1)}$$

$$\frac{d}{S-6} = t + 6 \quad \text{---(2)}$$

Subtracting (1) from (2);

$$\frac{d}{S-6} - \frac{d}{S+6} = 10 \quad \text{---(3)}$$

$$t = \frac{d}{S}$$

Substitute in (1) & solve for d

d = 720 km

Type 5: A and B start walking towards one another at same time at given speeds and separated by a given distance. What is the time they cross one another at?

A will travel some distance d1 and B will travel d2. Sum of d1 and d2 will be D(given distance between the two) solve for this equation and time will be same for both.

d1 = s1 x t

d2 = s2 x t

Question 5

A and B start walking towards each other at 10 am at speeds of 6 km/hr and 8 km/hr respectively. They were initially 35 km apart. At what time do they meet?

Solution

Let T be the hours after they meet.

Then,

6T + 8T = 35

∴T = 2.5 hours

∴ Time = 10:00 am + 2.5 hour =12:30 pm

Type 6: Unit Conversion

Question 6:

A man rides his Bike at a speed of 72 km per hour, calculate the speed in m per second?

A. 14.0 B. 11

C. 20 D. 10

Solution

We can convert km per hour by multiplying the given value by 5/ 18.

Therefore, the converted speed = 72 * 5/18 = 20 m per second.

Correct Answer: C

Type 7: Average Speed when Traveling to a Place and Returning

Question 7:

G and H are two places. A man travels on his cycle from G to H at a speed of 30km/hr and comes back at the speed of 20km/hr. Find the average speed of his entire journey.

A. 22 km/hr B. 24km/hr

C. 26km/hr D. 27km/hr

Solution

Let the distance between G and H be a

Then, time taken from G to H = a/30

Then, time taken from H to G = a/20

Therefore, time taken to cover 2a = a/30 + a/20 = a/12

Therefore, average speed = 2a/(a/12) = 24 km/hr.

Correct Answer: B

Type 8: Changing Time and Changing Speed

Question 8:

If Karishma walks a certain distance, at the speed of 8mps, if she walks at a speed of 18mps, she covers 15 miles more. Calculate her total distance.

A. 12 B. 24

C. 34 D. 32

Solution:

Let her total distance be= d

Time to cover at the speed of 16 m/s.

If she walks 36m/h, then she covers 30 miles more than actual distance = d + 30

Therefore, time taken = (d+30)/36.

Then, d/16 = d + 30/36

So, distance covered is 24 m

Correct Answer: B

Type 9: Problems on Trains

Question 9:

A train 400m long is moving at a speed of 40 km/hr. How much time will the train take to reach the station?

A. 22 B. 28

C. 36 D. 25

Solution:

Speed of the train = 40 * 5/18 = 100/9 m/sec

∴ time = 400 * 9 / 100 = 36 seconds.

Correct answer: C

Type 10: Bus with Stoppages

Question 10:

The speed of a bus excluding stoppage is 50 km per and including stoppages is 42 km per hour. Find out for how much time the bus stopped per hour.

A. 11.2 B. 9.6

C. 10 D. 25

Solution:

The bus travels 8 km less because of the stops.

Time is taken to cover 8 km = 8/50 * 60 = 9.6

The bus stopped for 9.6 minutes

Correct Answer: B

Boats & Streams

1. What is Downstream: It is related to the direction of water flow in respect with the object, when the object or body is flowing in direction of stream it is called as Downstream.
In water, the direction along the stream is called Downstream

2. What is Upstream: It is also related to the direction of water flow in respect with the object, when the object or body is flowing in opposite direction then the stream is called upstream.
The direction against the stream is called Upstream.

Formulae:

1.
If the speed of a boat in still water is u km/hr and the speed of the stream is v km/hr, then

Speed downstream = (u + v) km/hr
Speed upstream = (u – v) km/hr.

2.
If the speed downstream is a km/hr and the speed upstream is b km/hr, then
Speed in still water = $\frac{1}{2}(a+b)\ km/hr$
Rate of Stream = $\frac{1}{2}(a-b)\ km/hr$

3.
Assume that a man can row at the speed of x km/hr in still water, and he rows the same distance up and down in a stream which flows at a rate of y km/hr. Then his average speed throughout the journey is :

$$= \frac{(Speed\ Downstream) \times (Speed\ Upstream)}{Speed\ in\ Still\ Water}$$

$$= \frac{(x+y)\times(x-y)}{x}$$

4.
Let the speed of a man in still water be x km/hr and the speed of a stream be y km/hr. If he takes t hours more in upstream than to go downstream for the same distance, the distance travelled is

$$= \frac{(x^2-y^2)\times t}{2y}$$

5.
A man rows a certain distance downstream in t_1 hours and returns the same distance upstream in t_2 hours. If the speed of the stream is y km/hr, then the speed of the man in still water

$$= \frac{y\times(t_2+t_1)}{t_2-t_1}$$

6.
A man can row a boat in still water at x km/hr in a stream flowing at y km/hr. If it takes him t hours to row a place and come back, then the distance between the two places is

$$= \frac{t\times(x^2-y^2)}{2x}$$

7.

- When the speed of the boat or swimmer is 'x' km per hour and the stream's speed is 'y' km per hour, then:
  - The speed of the swimmer or boat upstream = (x – y) km per hour
  - The speed of the swimmer or boat downstream = (x + y) km per hour
- In the stationary or still water
  - The speed of the boat is given by = 1/2 (downstream speed + upstream speed)
  - The speed of the stream is provided by = 1/2 (downstream speed – upstream speed)
- A certain distance in p1 hours is covered by a man when he rows downstream and comes back the equal distance upstream in p2 hours. If the stream's speed is assumed as s km/hr, then the man's speed in still water will be: s (p2+ p1)/ (p2–p1) km/hr

Solved Examples:

Type 1: Questions on Finding Speed of Boat

Question 1:

A man rows a boat at 12 km/h along the stream and 8 km/h against the stream. Find the speed of the boat in still water.

A. 12km/hr B. 10km/hr

C. 15km/hr D. 8km/hr

Solution

Downstream speed of the boat = 12 km/h

Upstream speed of the boat = 8 km/h

Speed of the boat in still water = 1/2*(Downstream speed + Upstream speed) = 1/2 (12 + 8)

= 10 km/h

Correct option: B

Question 2:

A boat covers 1800 meters in 300 seconds against the stream and returns downstream in 3 minutes. What is the speed of the boat in still water?

A. 8 m/s B. 10 m/s

C. 12 m/s D. 6 m/s

Solution

Upstream speed = 1800/300 = 6m/s

Downstream speed = 1800/(6 * 60) = 1800/180 = 10 m/s

Speed in still water = 1/2 (speed downstream + speed upstream) = 1/2 (10 + 6) = ½ (16) = 8 m/s

Correct option: A

Question 3:

The speed of a ship in still water in 40 km/hr and the rate of current is 30 km/hr. The distance travelled downstream in 4 minutes is:

A. 4.67 km/hr B. 3.50 km/hr

C. 1.25 km/hr D. 4.33 km/hr

Solution

Speed downstream = (40 + 30) km/h = 70 km/h

Distance covered in 4 minutes = 70 * 4/60 = 4.66 km/hr

Correct option: A

Question 4:

Find the ratio of the speed of the boat and the stream if Rakesh takes thrice as long to row a distance in favour of the stream as to row the same distance against the stream.

A. 1:2 B. 2:1

C. 4:5 D. 1:1

Solution:

Let the Rakesh' upstream speed = x

Downstream speed = 3x

(Speed in still water): (Speed of stream) = (3x + x)/ 2 : (3x – x)/2 = 2: 1

Correct option: B

Type 2: Speed of Stream

Question 5:

What is the speed of the stream, if the speed of the boat against the stream is 12 km/hr and the speed of a boat in still water is 20km/hr?

A. 8 km/hr B. 4 km/hr

C. 20 km/hr D. 10 km/hr

Solution

Let the speed of stream = x

Speed of boat = 20 km/hr

Upstream speed = 12 km/hr

We know that, Upstream speed = speed of boat – speed of stream

12 = 20 – x

x = 20 – 12

x = 8 km/hr

Correct option: A

Question 6:

A man can row a boat up to 60 km down a river in 3 hours with the stream and can return back in 5 hours. What is the speed of the stream?

A. 4 km/hr B. 2 km/hr

C. 6 km/hr D. 5 km/hr

Solution

Speed Downstream= 60/3 = 20 km/hr

Speed Upstream = 60/5 = 12 km/hr

Speed of the stream = 1/2* (20 – 12) = 4 km/hr

Correct option: A

Question 7:

A man sails a boat to a place which is 48 km far. He reaches that place and comes back in 7 hours. He finds that he can sail a boat 3 km downstream in the same time as 2 km upstream. Find out the rate of the stream?

A. 2.86 km/hr B. 2.62 km/hr

C. 2.53 km/hr D. 2.76 km/hr

Solution

Suppose, He moves 3km downstream in x hours = 3/x km/hr

Speed Upstream = 2/x km/hr

48/(3/x) + 48/(2/x) = 7

16x + 24x = 7

x = 7/40

So, Downstream Speed = 3/x = 3/ (7/40) = 17.14 km/hr

Upstream Speed = 2/(7/40) = 11.42 km/hr
Rate of the stream = 1/2 (17.14 – 11.42) = 5.72/2 = 2.86 km/hr
Correct option: A

Question 8

A boat whose speed in 30 km/hr in still water goes 60 km downstream and it takes 4 hours 30 minutes to come back. Find the speed of the stream?

A. 25km/hr B. 15m/hr
C. 20km/hr D. 10km/hr

Solution

Let the speed of the stream = x
Therefore, speed downstream = 30 + x
Speed upstream = 30 – x
60/(30+x) + 60/(30-x) = 4hr 30 min
60/(30+x)+ 60/(30-x) = 9/2
On solving we get
x = 10km/hr
Correct option: D

Type 3: Using Man's Still Water Speed Calculate Stream's Speed

Question 9:

A sailor can row 12 km/h in still water. It takes him twice as long to row up as to row down the river. Find the speed of the stream.

A. 6 km/ hr B. 5 km/ hr
C. 3 km/ hr D. 4 km/ hr

Solution:

Let sailor's speed in upstream = x
Downstream speed = 2x (As given in the question, his downstream speed is twice of upstream speed)
Man's speed in still water = 1/2 (Upstream speed + Downstream speed)
= 1/2 (x + 2x) = 3x/2
3x/2 = 12 (sailor can row 12 km/h in still water)
x = 8 km/hr
Therefore, upstream speed = x = 8 km/hr
Downstream speed = 2x = 2 * 8 = 16 km/hr
Speed of stream = 1/2* (Downstream speed – Upstream speed)
= 1/2 (16 – 8)
= 4 km/ hr
Correct option: D

Question 10:

Rahul can sail a boat 6 quarters of kilometre upstream in 11(1/4) minutes and downstream in 7(1/2) minutes. Find out the speed of Rahul in still water?

A. 18 km/ hr B. 10 km/ hr
C. 8 km/ hr D. 6 km/ hr

Solution:

Three-quarters of a kilometre = 1500 meter
11(1/4) minutes = 45/4 = 675 seconds
7(1/2) minutes = 15/2 = 450 seconds
Upstream speed = 1500/675 = 20/9 m/sec
Downstream speed = 1500/450 = 10/3 m/sec
Speed in still water = ½ (20/9 + 10/3) = 25/9m/sec
To convert it into km/hr, multiply 25/9 by 18/5 = 10 km/hr
Correct option: B

Question 11:

A man's speed with the current is 40 km/hr and the speed of the current is 10 km/hr. What is the man's speed against the current?

A. 40 km/hr B. 30 km/ hr
C. 10 km/ hr D. 20 km/ hr

Solution

Man's speed with the current = 40 km/hr
speed of the man + speed of the current = 40 km/hr
speed of the current is 10 km/hr
Hence, speed of the man = 40 – 10 = 30 km/hr
Man's speed against the current = speed of the man – speed of the current
Man's speed against the current = 30 – 10 = 20 km/hr
Correct option: D

Question 12:

If a man sails a boat at the rate of 10 km/hr in still water. His upstream rate is 6 km/hr, then find the man's speed along the current?

A. 14 km/hr B. 10 km/hr
C. 16 km/hr D. 20 km/hr

Solution

Let the speed along with the current = x km/hr
Therefore, (x+6)/2 = 10
x = 14km/hr
Correct option: A

RACES: LINEAR & CIRCULAR

- Linear race: In this case participate compete in linear race track.
- Circular race: In this one the path of the race is circular in shape.
- Starting point: It's the point from where the race begins.
- Winning Point: It's the end point of the race.

LINEAR RACES

Commonly used expressions in linear races

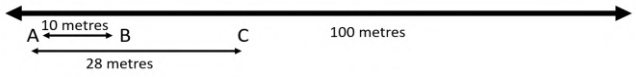
Expression	Meaning
Head-Start / A gives B start of x meters	When a racer gets a start x meters ahead of the starting point it's called head-start of x meters. Here A gives B a head-start of x meters.
Head-Start/ A can give B a start of t minutes	When a contestant gets a start by t seconds earlier than other ones, it's called head-start of t seconds. Here A gives B a head-start of t seconds.
A beats B by x meters	When A reaches the winning point before B and is x meters away from B. Then A beats B by x meters.
A beats B by t seconds	When A reaches the winning point t seconds before B. Then A beats B by t meters.
Dead Heat	A dead heat is a situation of tie. When all the participants reach the winning point at the same point.

Solved Examples:

Question 1:

In a 100 m race, A can give B a start of 10 m and C a start of 28 m. In the same race B can give C a head start of?

Solution:



A covers 100 meter in same time as B covers (100-10)=90 meter and C covers (100-28)=72 meter.

Using unitary method, we can find out the head-start that B can give to C.

Therefore, when B runs 100 meters than C runs (72/90 *100) = 80 meters.

And thus, C gets head-start of 20 mtr.

Question 2:

In a 1000 m race, the ratio of the speeds of two contestants P and Q is 4: 5. P has a headstart of 280 m. Then, P wins by?

Solution:

In order to reach the winning point P has to cover (1000 – 280) m i.e., 720 m.

Since, Ratio of Speed = Ratio of distance covered.

Therefore, P covers 4 m while Q covers 5 m.

Thus, when P covers 720 m, Q covers (5/4 * 720) m = 900 m.

∴ A wins by 100 m.

Note 1: If A is n times as fast as B and A gives B a start of x meters, then the length of the race-course, so that A and B reaches the winning post at the same time

x(n/(n-1)) meters

Note 2: If A can run x meters race in t1 seconds and B in t2 seconds, where t1 < t2, then A beats B by a distance

$x/t_2 * (t_2 - t_1)$ meters

CIRCULAR RACES

- Let X and Y be two runners running in circular path of length L with speeds x m/s and y m/s respectively. If x > y then,

i) X and Y are running in the same direction then time taken by

X & Y to meet first time anywhere on the track	X & Y to meet first time at the starting point on the track
l / (x – y)	LCM (l/x & l/y)

ii) X and Y are running in opposite direction then time taken by

X & Y to meet first time anywhere on the track	X & Y to meet first time at the starting point on the track
l / (x + y)	LCM (l/x & l/y)

- When the speed of Y is expressed in terms of X and X and Y are running in opposite direction such that speed of Y is n times of X then no. of meeting points of X and Y are n + 1 i.e., if speed of Y is equal to X then their meeting points are 2.
- If the no. of meeting points is known and the time required to meet at the starting point is also known then you can compute the time needed for them to meet for the first time using the formula

$$\frac{(Time\ after\ which\ they'll\ meet\ at\ the\ starting\ point)}{no.\ of\ meeting\ points}$$

- X and Y running in circular track and in opposite direction. If the speed of X is x/y of Y, then the total number of meeting points = x + y.

Solved Examples:

Question 1:

In a circular race of 2000m, A and B start from the same point and at the same time with speeds of 27km/hr. and 45 km/hr. Find when will they meet again for the first time on the track when they are running in the same direction and Opposite direction?

Solution:

Length of the track = 2000 m

They'll meet first time on track when they are running in

i)

Same Direction: L/ (x – y)

Here x is $27 \times \frac{5}{18} = 7.5$ m/s

y is $45 \times \frac{5}{18} = 12.5$ m/s

Time = 2000/ (12.5-7.5) = 400 seconds

ii)

Opposite direction: L/ (x + y)

Time = 2000/ (12.5+7.5) = 100 seconds

Question 2:

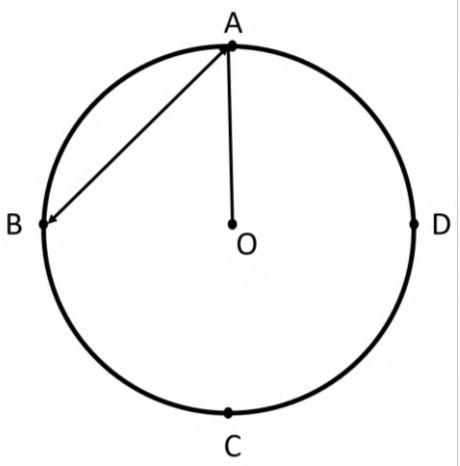
Ram and Sham are running in opposite direction around a circular track of length 40π meters. Speed of Ram is 33.33% of the speed of Sham. Find straight line distance between their first meeting point and the second meeting point. It is given that they start simultaneously from a common starting point.

Solution:

Since speed of Ram is 1/3 of Sham. Therefore, the no. of distinct points is (1+3) i.e., 4 points.

Now as all these points would be equidistant from each other.

The meeting points can be represented as:



If A is the starting point then we need to find out the distance AB. And this can be done as follows:

Circumference of the circular path is $40\ \pi$ then the radius of circle will be 20 m. Thus, using Pythagoras formula we can easily calculate the length of AB i.e., $20\sqrt{2}$ m.

Exercise – 1

1. If Jigar sees a car approaching him from a distance of 500m and the car crosses him after a time of 20 seconds find the speed of the car.
   A. 108 kmph B. 91 kmph
   C. 89 kmph D. 90 kmph
   E. None of these
2. Bhosh travels 7 km every day to go to his favorite coffee shop to drink tea. It takes him 5 mins to finish his tea. If it takes him 30 mins to return home (including the time in which he drinks tea) what is his average speed.
   A. 27.5 kmph B. 27.8 kmph
   C. 28 kmph D. 28.056 kmph
   E. none of these
3. Speed of a unicycle is 18 kmph, what is its speed in meter/ seconds.
   A. 5 m/s B. 6 m/s
   C. 5.5 m/s D. 4.5 m/s
   E. 4 m/s
4. A train running at the speed of 72 kmph takes 25 seconds to cross a tunnel 300 meter long what is the length of the train.
   A. 150 m B. 200 m
   C. 300 m D. 250 m
   E. 220 m
5. A man cycles from point A to point B at a speed of 20 km/hr. and returns to point A at a speed of 10 km/hr. If the entire journey took 15 hours, what is the distance between points A and B?
   A. 100 km B. 110 km
   C. 120 km D. 150 km
   E. 140 km
6. A man travels a distance of 60 km at a certain speed. If he had travelled 10 km/hr faster, he would have taken 1 hour less. Find the original speed of the man.
   A. 25 B. 15
   C. 30 D. 20
   E. None of these
7. Two people start moving towards each other from points P and Q. they meet each other at a point 40 kilometers from Q. if their speeds are in the ratio 1:2 find the distance between P and Q.
   A. 50 Km B. 55 km
   C. 65 km D. 60 km
   E. none of the above
8. Sound travels 330 meter in a second. When the sound follows the flash of lightning after 10 seconds the thunder cloud will be at a distance of
   A. 1300-meter B. 2000 meter
   C. 3650-meter D. 3300 meter
   E. None of these
9. A moving train crosses a man standing on a platform and a bridge 300 meters long in 10 seconds and 25 seconds respectively. What will be the time taken by the train to cross a platform 200 meters long?
   A. 16.66 seconds B. 18 seconds
   C. 20 seconds D. 22 seconds
   E. 24 seconds
10. A train passes a 50 meters long platform in 14 seconds and a man standing on the platform in 10 seconds. The speed of the train is :
    A. 24 km/hr B. 36km/hr
    C. 40 km/hr D. 45 km/hr
    E. 48 km/hr
11. If a man walks 20 km at 5 km/ hr, he will be late by 40 minutes. If he walks at 8 km/hr, how early from the fixed time will he reach?
    A. 15 minutes B. 25 minutes
    C. 50 minutes D. 1.5 hours
    E. 1.2 hours
12. A 200m long train crosses a 425m long tunnel in 5 seconds. A man walking at a speed of 5m/sec is approaching towards the moving train. The distance between the train and the man is 260m what is the time taken by the man to reach the train.
    A. 2.0 sec B. 2.1 sec
    C. 2.2 sec D. 1.9 sec
    E. 1.8 sec
13. A person jogging by the marine lines estimates to run for 100 mins and reach the gate way of India. He makes a blunder in his calculation as he assumed his speed more by 25%. Find the original time taken by the man to reach gate way of India.
    A. 125 min B. 120 min
    C. 110 min D. 133.33 min
    E. None of the above
14. Sarita and Julie start walking from the same place in the opposite directions. If Julie walks at a speed of

2.5 km/hr and Sarita at a speed of 2 km/hr, in how much time will they be 18 km apart?
A. 4.0 hrs B. 4.5 hrs
C. 5.0 hrs D. 4.8 hrs
E. 3.6 hrs

15. A 120 m long train takes 10 seconds to cross a man standing on a platform. What is the speed of the train?
A. 12 m/sec. B. 10 m/sec.
C. 15 m/sec. D. 20 m/sec.
E. 25 m/sec

16. If a man walks at the rate of 5km/hour, he misses a train by 7minutes. However, if he walks at the rate of 6 km/hour, he reaches the station 5 minutes before the arrival of the train. The distance covered by him to reach the station is
A. 6 km B. 7 km
C. 6.25 km D. 4 km
E. 5 km

17. In covering a certain distance, the speed of A and B are in the ratio of 3 : 4. A takes 30 minutes more than B to reach the destination. The time taken by A to reach the destination is:
A. 1 hour B. 1.5 hours
C. 2 hours D. 2.5 hours
E. None of the above

18. 36kmph= _____ m/sec
A. 5 m/sec B. 7 m/sec
C. 15 m/sec D. 10 m/sec
E. 6 m/sec

19. If 50 kmph= _____ m/sec
A. 13.81 B. 13.75
C. 13.89 D. 13.99
E. 14

20. 72kmph= _____ m/sec
A. 20 m/sec B. 25 m/sec
C. 15 m/sec D. 19 m/sec
E. None of these

21. 325.8 kmph= ____ m/sec
A. 91.5 m/sec B. 90 m/sec
C. 90.5 m/sec D. 92 m/sec
E. 89.5 m/sec

22. 29 kmph=_____ m/sec
A. 7 m/sec B. 6 m/sec
C. 9 m/sec D. 8 m/sec
E. 10 m/sec

23. 999 kmph=_____ m/sec
A. 275 m/sec B. 280 m/sec
C. 272.5 m/sec D. 275.5 m/sec
E. 277.5 m/sec

24. 900 m/sec =_____ km/hr
A. 3200 B. 3300
C. 3240 D. 3250
E. None of the above

25. 250 m/sec =_____ km/hr
A. 850 B. 900
C. 950 D. 100
E. 80

26. 144 m/sec = ____ km/hr
A. 500.4 B. 520.4
C. 518.4 D. 540.4
E. None of the above

27. 625 m/sec = ____ km/hr
A. 2500 B. 2000
C. 1750 D. 2250
E. None of these

28. 50 m/sec = _____ m/sec
A. 200 B. 100
C. 180 D. 175
E. 140

29. 180 m/sec = ____ km/hr
A. 600 B. 650
C. 640 D. 648
E. 700

30. Sanjana is lazy and drives to the nearby store instead of walking. Driving makes her $\frac{5}{2}$ times faster. If she takes 3 minutes less to get to the store find the time taken by her to get there on foot
A. 6 min B. 5 min
C. 4 min D. 7 min
E. 5.5 min

31. Chandak is driving through the country side, he covers the first 360 kms in 4 hours. Then he meets a rough patch of roads where he covers 100 kms in 5 hours. Finally, he covers a distance of 600 kms in the next 6 hours. Find the average speed
A. 69 kmph B. 79 kmph
C. 80 kmph D. 60 kmph
E. 70 kmph

32. While checking the live running status of Doronto express, it was observed that it covered a distance of 700 kms in 7 hours then had a break down and had to halt for 3 hours. Later it covered a distance of 540 kms in 6 hours. Find the average speed of the train throughout the journey (in km/hr)
A. 50 B. 60
C. 70 D. 77.5
E. 80

33. Nandan is a rider and he rides his bike in the Sahyadri for a total of 9000 kms takin 6 whole days riding for 8 hours a day. Find the average speed of Nandan
A. 190 kmph B. 187.5 kmph
C.185 kmph D. 192.5 kmph
E. None of the above

34. Chindi is running a marathon where he runs for 6 hours completing the marathon 30 km long which he would have completed in 5 hours if he would've run at his original speed. Find the ratio of the original speed and new speed
A. 5:6 B. 2:3
C. 3:2 D. 6:5
E. 1:3

35. During his CET exam Rohan completed his A type questions in 85 minutes which were 150 in number. Then he was done with his B type questions in another 35 minutes which were again 45 in numbers. Find his average questions per minutes
A. 1 B. 2
C. 1.5 D. 1.625
E. 1.75

36. January Cat A and cat B are 200 meters apart when they spot a mouse between them. Both start chasing after him at the same time but the mouse flees if cat A runs at a speed of 30 m/sec and both the cats meet after 4 seconds find the speed of cat B.
A. 20 m/s B. 15 m/s
C. 25 m/s D. 30 m/s
E. None of the above

37. Kanha starts from Nashik towards Pune at 6:00 am and Ganesh who is in Pune estimates him to reach there by 11:00 am. But Kanha reaches Pune at 10:00 am. If Pune is 250 kms from Nashik what is the ratio of the speed estimated by Ganesh to the actual speed of Kanha.
A. 4:3 B. 3:4
C. 4:5 D. 5:4
E. 5:3

38. Train A and Train B are 270 kms apart. If both start at 6:00 am and meet at a distance of 150 kms from A, 3 hours later. What is the speed of B
A. 40 kmph B. 50 kmph
C. 36 kmph D. 44 kmph
E. 60 kmph

39. Mridul Sharma has a concert in Mumbai which is 625 kms away from him. He has to report at the venue at 6:00 pm. He has divided the journey in three sections where he is going to travel by air first at a speed of 200 kmph then by train at 125 kmph then by bike at 25 kmph. If the ratio of distance travelled by all three means is 8:10:7. Find the time he travelled by bike.
A. 14 hours B. 7 hours
C. 10 hours D. 9 hours
E. 6 hours

40. A man rides at the rate of 18 km/hr, but stops for 6 mins. To change horses at the end of every 7th km. The time that he will take to cover a distance of 90 km is
A. 6 hr. B. 6 hr. 12 min
C. 6 hr. 18 min D. 6 hr. 24 min
E. none of these

41. A student starting from his house walks at a speed of 2.5 km/ hour and reaches his school 6 minutes late. Next day starting at the same time he increases his speed by 1 km/hour and reaches 6 minutes early. The distance between the school and his house is
A. 1 km B. 3.5 km
C. 1.75 km D. 1.25 km
E. none of the above

42. Two buses travel to a place at 45 km./hr. and 60 km./hr. respectively. If the second bus takes 5.5 hours less than the first for the journey, the length of the journey is :
A. 990 km B. 1000 km
C. 960 km D. 1020 km
E. 975 km

43. It takes 12 hours to cover a certain distance at "x" speed. If the speed is doubled and the time is halved what is the distance covered
A. 12x B. 2x

C. x D. 0.5x
E. 6x

44. Kundan beats Chandan in a 1000-meter race by 100 meters, Chandan beat Madan in a 1200-meter race by 200 meters. By what distance does Kundan beat Madan in a race of 6000 meters.
A. 1200m B. 900m
C. 1500m D. 1800m
E. none of these

45. A train passes two bridges of lengths 800 m and 350 m in 100 seconds and 50 seconds respectively. The length of the train is
A. 80m B. 100m
C. 200m D. 150m
E. none of these

46. A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is
A. 152m B. 125m
C. 250m D. 120m
E. none of the above

47. A train, 240 m long crosses a man walking along the line in opposite direction at the rate of 3 kmph in 10 seconds. The speed of the train
A. 63 kmph B. 75 kmph
C. 83.4 kmph D. 86.4 kmph
E. 72 kmph

48. A train passes two persons walking in the same direction at a speed of 3 km/hour and 5km/ hour respectively in 10 seconds and 11 seconds respectively. The speed of the train is
A. 28 kmph B. 27 kmph
C. 25 kmph D. 24 kmph
E. none of these

49. A passenger train 150m long is travelling with a speed of 36 km/ hr. If a man is cycling in the direction of train at 9 km/hr., the time taken by the train to pass the man is
A. 10 sec B. 15 sec
C. 18 sec D. 20 sec
E. none of these

50. A train 100 metres long meets a man going in opposite direction at 5 km/hr and passes him in 7.2 seconds. What is the speed of the train (in km/hr) ?
A. 45 kmph B. 60 kmph
C. 55 kmph D. 50 kmph
E. None of the above

51. The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?
A. 10 am B. 10:30 am
C. 11 am D. 11:30 am
E. None of the above

52. At his usual rowing rate, Aditya rows 12 miles downstream in a river in 6 hrs less than it takes him to travel the same distance upstream. But if he could double his usual rowing rate for his 24 miles round the downstream 12 miles would then take only one hour less than the upstream 12 miles. What is the speed of the current in miles per hours?
A. 8/3 mph B. 5 mph
C. 5/2 mph D. Data inadequate
E. None of the above

53. The distance between A and B is 80 km. Boat named Jiggy could travel from point A to B upstream and point B to A downstream in total 30 hours. Boat named jus-chill could travel from point A to B upstream and point B to A downstream in total 9 hours. If the speed of boat Jus-chill in still water is thrice of boat Jiggy in still water, what is the speed of boat Jus-chill if speed of current remains constant for both?
A. 12 kmph B. 18 kmph
C. 15 kmph D. 20 kmph
E. 12.5 kmph

54. Chalakh can row 40 km upstream and 55 km downstream in 13 hours also, he can row 30 km upstream and 44 km downstream in 10 hours. Find the speed of the man in still water and the speed of the current.
A. 8 kmph, 3 kmph B. 3 kmph, 8 kmph
C. 12 kmph, 5 kmph D. 5 kmph, 1 kmph
E. none of these

55. A rowing champion can row at a speed of 18 kmph in still water. It takes him thrice as long as row up as to row down the river. Find the rate of stream.
A. 8 kmph B. 12 kmph
C. 16 kmph D. 9 kmph

E. 15 kmph

56. Alakh and Chomu decided to meet each other at point B. Alakh started from point A at 11 : 00 a.m. and at the same time Chomu started from point C. They move towards each other to meet at point B. Chomu take 1 hour more to reach point B relative to Alakh. Speed of Chomu is 20% more than speed of Alakh and distance covered by Alakh 33 1/3 % less than distance covered by Chomu. At what time Chomu will reach at point B?
A. 2:30 pm B. 3 pm
C. 3:30 pm D. 4 pm
E. 4:30 pm

57. Riya covers certain distance in two parts. Distance covered in first part is 200% more than the distance covered in second part while speed of train is in the ratio 2 : 1 in first and second part respectively. If average speed of Riya is 64 km/hr., then find the speed of Riya in first part? (in kmph)
A. 40 B. 80
C. 50 D. 30
E. 100

58. A train covers a distance of 3584 km in 2 days 8 hours. If it covers 1440 km on the first day and 1608 km on the second day, by how much does the average speed of the train for the remaining part of the journey differ from that for the entire journey ?
A. 3 kmph more B. 3 kmph less
C. 4 kmph more D. 5 kmph less
E. none of these

59. A person travels 600 km by train at 80km/hr., 800 km by ship at 40 km/hr. 500 km by aero plane at 400 km/hr. and 100 km by car at 50km/hr. What is the average speed for the entire distance ?
A. $65\frac{5}{123}$km hr B. 60 km./hr.
C. $60\frac{5}{123}$km hr D. 62 km./hr
E. none of these

60. Nikhil can walk a certain distance in 40 days when he rests 9 hours a day. How long will he take to walk twice the distance, twice as fast and rest twice as long each day?
A. 80 B. 100
C. 90 D. 95
E. none of these

61. Traveling at $5/6^{th}$ of his speed Jigar completes the journey safely but takes 30 minutes more, Find the time taken by him to complete the journey at his usual pace.
A. 100 min B. 1 hr.
C. 3 hr. D. 150 min
E. None of the above

62. Traveling at $\frac{3^{th}}{4}$ of his speed Sudhanshu completes the trip from his school to his home whilst taking 20 minutes more. If Sudhanshu was not lazy and walked at his regular speed what would be the time needed to complete the journey
A. 50 min B. 60 min
C. 55 min D. 65 min
E. 70 min

63. Vinod loves to drive his car on highways and he drives according to the number of lanes on the road. When he comes across a 6-lane road, he drives at a speed of 120 kmph. When he comes across a 4-lane road, he drives at a speed of 90 kmph. If he covers a distance of 720 kms in 7 hours. Find the ratio of time he spent on 6 lane road to time he spent on 4 lane road
A. 3:4 B. 4:3
C. 1:2 D. 2:1
E. 5:6

64. A man travels for 5 hours 15 minutes. If he covers the first half of the journey at 60 km/h and rest at 45 km/h. Find the total distance travelled by him.
A. $1028\frac{6}{7}$ km. B. 189 km.
C. 378 km D. 270 km
E. none of these

65. By starting his travel at 40 kmph a person reaches his destination on time. He covered two-thirds the total distance in one-third of the total time. What speed should he maintain for the remaining distance to reach his destination on time?
A. 10 kmph B. 30 kmph
C. 25 kmph D. 15 kmph
E. 36 kmph

66. A boat can row 16 km/hr. along the current and 14 km/hr. against the current. Find the speed of the current and speed of the boat in still water?
A. 2 kmph, 15 kmph
B. 2 kmph, 12 kmph

C. 2 kmph, 32 kmph
D. 12 kmph, 12 kmph
E. 1 kmph , 15 kmph

67. A chipmunk climbing up a greased pole ascends 12 metres and slips down 5 metres in alternate minutes. If the pole is 63 metres high, how long will it take him to reach the top?
A. 18 min B. 16 min
C. $16\frac{7}{12}$ min D. 18 min 20 sec
E. none of these

68. Two trains leave a railway station at the same time. The first train travels due west and the second train due north. The first train travels 5 km per hr. faster than the second train. If after two hours they are 50 km apart, find the average speed of faster train.
A. 18 kmph B. 15 kmph
C. 20 kmph D. 25 kmph
E. 36 kmph

69. Chinki changed a lot in terms of speed while going to school as compared to while returning home. She travels at a speed which is $\frac{7}{10}th$ of her speed while she goes to school as compared to while returning. Resulting in her needing 21 minutes extra. Find the time taken by her to go back home.
A. 50 min B. 49 min
C. 45 min D. 48 min
E. 42 min

70. Prasanna takes 20 mins more when he drives at a speed which is $\frac{2}{3}rd$ of his original speed to reach his favourite ice-cream parlour. If he was traveling at his original speed what is the time taken by him to reach the parlor?
A. 42 min B. 41 min
C. 40 min D. 50 min
E. 45 min

71. Two trains of equal length when moving in the same direction, the faster train over takes the slower one in 1 minute. When moving in opposite direction they cross each other in $\frac{20}{3}\ seconds$. If the slower train runs at 20 m/sec find the speed of the faster train.
A. 25 m/sec B. 24 m/sec
C. 23 m/sec D. 22 m/ sec
E. 21 m/sec

72. A boat takes 4 hours to travel 60 km downstream and 5 hours to travel the same distance upstream. Find the speed of the boat in still water and the speed of the stream. (in kmph)
A. 13.5 kmph , 1.5 kmph
B. 12.5 kmph , 2.5kmph
C. 14 kmph , 1 kmph
D. 10 kmph , 5 kmph
E. 1 kmph , 15 kmph

73. A man rows a certain distance upstream in 6 hours and returns the same distance downstream in 4 hours. If the speed of the stream is 2 kmph, find the speed of the man in still water.
A. 11 kmph B. 12 kmph
C. 10 kmph D. 9 kmph
E. 6 kmph

74. A boat takes 2 hours to travel a distance of 40 km downstream, but it takes 3 hours to travel the same distance upstream. Find the speed of the boat in still water and the speed of the stream.
A. 40/3, 5/3 B. 50/3, 8/3
C. 50/3, 10/3 D. 40/3, 4/3
E. None of the above

75. A boat is moving 2 km against the current of the stream in 1 hour and moves 1 km in the direction of the current in 10 minutes. How long will it take the boat to go 5 km in stationary water?
A. 1 hr. 20 min B. 1 hr. 30 min
C. 1 hr. 15 min D. 30 min
E. 45 min

ANSWER KEY:

1) D	16) A	31) E	46) B	61) D
2) C	17) C	32) D	47) C	62) B
3) A	18) D	33) B	48) C	63) A
4) B	19) C	34) D	49) D	64) D
5) A	20) A	35) D	50) A	65) A
6) D	21) C	36) A	51) C	66) E
7) D	22) D	37) C	52) A	67) C
8) D	23) E	38) A	53) B	68) C
9) C	24) C	39) B	54) A	69) B
10) D	25) B	40) B	55) D	70) C
11) C	26) E	41) C	56) D	71) A
12) A	27) D	42) A	57) B	72) A
13) A	28) C	43) A	58) A	73) C
14) A	29) D	44) C	59) A	74) C
15) A	30) B	45) B	60) B	75) C

LCM & HCF SOLUTIONS

1. **Answer: E**
   Find HCF of numerators: 156, 128, 33
   Prime factors:
   156 = $2^2 \times 3 \times 13$
   128 = 2^7
   33 = 3×11
   Common factor = 1
   Find LCM of denominators: 36, 44, 176
   Prime factors:
   36 = $2^2 \times 3^2$
   44 = $2^2 \times 11$
   176 = $2^4 \times 11$
   LCM = $2^4 \times 3^2 \times 11 = 16 \times 9 \times 11 = 1584$
   HCF of fractions = HCF of numerators / LCM of denominators
   = $\frac{1}{1584}$
   Since $\frac{1}{1584}$ is not among the options, **E**
2. **Answer: D**
   Solution
   Let the three numbers be in 5x,7x & 9x.
   LCM of 5x,7x & 9x = 315x
   315x = 5670
   x = 18.
   So, the numbers are 5 × 18, 7 × 18, 9 × 18.
   ∴ HCF will be 18.
3. **Answer: B**
   Solution
   Let the three numbers be in 5x,12x & 13x.
   LCM of 5x,12x & 13x = 780x
   780x = 10920
   x = 14.
   So, the numbers are 5 × 14, 12 × 14, 13 × 14.
   ∴ HCF will be 14.
4. **Answer: B**
   Solution
   Let the three numbers be in 4x, 5x & 8x.
   As HCF of these numbers is x = 33
   LCM of 4x, 5x & 8x = 40x = 40 × 33 = 1320
   ∴ LCM is 1320.
5. **Answer: A**
   Solution
   Let the three numbers be in 7x, 5x & 4x.
   LCM of 7x, 5x & 4x = 140x
   140x = 4060
   x = 29.
   So, the numbers are 7 × 29, 5 × 29, 4 × 29.
   The difference between 1st and last numbers is (7x – 4x) = 3x = 3 × 29 = 87.
6. **Answer: B**
   Solution
   Let the three numbers be in 8x, 15x & 16x.
   LCM of 8x, 15x & 16x = 240x
   240x = 3600
   x = 15.
   So, the numbers are 8 × 15, 15 × 15, 16 × 15.
   The sum of 1st and last number is 15 (8+16) = 15 × 24 = 360.
7. **Answer: C**
   Solution
   LCM of 5/16, 7/12, 1/8 = LCM of (5,7,1) / HCF of (16,12,8) = 35 / 4
   HCF of 5/16, 7/12, 1/8 = HCF of (5,7,1) / LCM of (16,12,8) = 1 / 48
8. **Answer: D**
   Solution
   Given numbers are: 6, 8, 12, 15
   LCM of given numbers = 120
   So, 120 + 5 = 125 is the number that leaves 2 as a remainder.
9. **Answer: D**
   Solution
   In this case, you need to find the HCF of 45 and 90 is 45.
   Therefore, the longest length of fencing that can be used without waste is 45 feet.
10. **Answer: B**
    Solution
    To find the smallest possible number of teams, we need to find the LCM of 21.
    The prime factorization of 21 is 3 × 7.
    The LCM of 3 and 7 is 3 × 7 = 21.
    Therefore, the smallest possible number of teams is 3, with each team having 7 students.
11. **Answer: D**
    Solution
    The LCM of 30 and 45 will be the product of the highest powers of all the prime factors involved, i.e., LCM (30, 45) = 2 × 3 × 3 × 5 = 90.

∴ both products A and B will be produced on the same day again after 90 days.

12. **Answer: A**

Solution

LCM of 30, 45 and 60 seconds

= 180 seconds

= 3 minutes

∴ Required time = 8:18 am

The time they will again change simultaneously is 8:18 am.

13. **Answer: A**

Solution

The greatest number of five digits is 99999.

LCM of 3, 5, 8 and 12 = 120

After dividing 99999 by 120, we get 39 as remainder

99999 – 39 = 99960

99960 is the greatest five digits number divisible by the given divisors.

In order to get 4 as a remainder in each case, we will simply add 4 to 99960.

∴ Greatest number = 99960 + 4 = 99964.

14. **Answer: D**

Solution

The greatest number of five digits is 99999.

LCM of 5, 8, 12, 15 & 25 = 600

After dividing 99999 by 600, we get 399 as remainder

99999 – 399 = 99600

99600 is the greatest five digits number divisible by the given divisors.

In order to get 6 as a remainder in each case, we will simply add 6 to 99600.

∴ Greatest number = 99600 + 6 = 99606.

Hence option D.

15. **Answer: D**

Solution

The greatest number of five digits is 99999.

LCM of 3, 4, 5, 7 & 9 = 1260

After dividing 99999 by 1260, we get 459 as remainder

99999 – 459 = 99540

99540 is the greatest five digits number divisible by the given divisors.

In order to get 8 as a remainder in each case, we will simply add to 99540.

∴ Greatest number = 99540+ 8 = 99548.

16. **Answer: A**

Solution

Required time = LCM of 200, 300, 360 and 400 seconds = 3600 seconds

After 3600 seconds they will meet at the starting point for the first time.

17. **Answer: C**

Solution

Maximum number of students

= The greatest common divisor

= HCF of 776 and 873 = 97

Hence option C.

18. **Answer: B**

Solution

Required maximum capacity of container

= HCF of 75 lit and 105 lit

= 15 lit

The maximum capacity of container which can measure milk of either container exact number of times is 15 lit.

19. **Answer: D**

Solution

504 = 7 × 8 × 9

sum of the smaller number and bigger number is 7 + 9 = 16.

20. **Answer: B**

Solution

LCM of 12, 18 and 21 = 252

Smallest five digits number is 10000.

10000 / 252 gives 172 as a remainder.

So, to get number divisible by 252 we had to add 80 to it.

Hence, the number = 10000+80 = 10080.

21. **Answer: D**

Solution

HCF of (708-5), (823-6) and (444-7) HCF (703,817,437)

703 = 19 × 37 → 817 = 19 × 43

437 = 19 × 23 → HCF = 19

Hence, the greatest number will be 19.

22. **Answer: C**

Solution

Required number = multiple of LCM (5, 7, 9 and 10)

LCM of 5, 7, 9 and 10 is 630. The greatest three digits number is 999. So, the answer should be multiple of 630 and only 630 is three digits number.

23. **Answer: C**

Solution

LCM of (of 3, 7, 9 and 13) = 819

As options are close to each other and only 819 is a multiple of 1638.

24. **Answer: E**

Solution

To check the numbers which can be divided by 11.

Add up all the digits at odd positions in the given number. Then add up all the digits at even positions.

If the difference of the two addition should be zero, then the number is divisible

by 11, otherwise, it is not.

2+a+7+5 = 9+4+3 → ∴ a = 2

25. **Answer: E**

Solution

HCF of (50-2), (67-3), (100-4) and (149-5)

HCF of (48, 64, 96 and 144)

48 = 16 × 3

64 = 16 × 4

96 = 16 × 6

144 = 16 × 8

HCF = 16

26. **Answer: D**

Solution

L.C.M. of 5, 7, 8, 9 and 11 = 27720

Hence, required number = (27720 + 1) = 27721

27. **Answer: C**

Solution

L.C.M. of 3, 4, 5 and 7 = 420.

Required number is of the form 420k + 6.

Least value of k for which (420k + 6) is divisible by 9 is k = 2.

Required number = (420 × 2 + 6) = 840 + 6 = 846.

28. **Answer: B**

Solution

L.C.M. of 5, 12, 18 and 25 = 900.

Required number is of the form 900k + 6.

Least value of k for which (900k + 6) is divisible by 7 is k = 2.

Required number = (900 × 2 + 6) = 1800 + 6 = 1806.

29. **Answer: D**

Solution

L.C.M. of 6, 16, 25 & 30 = 1200.

Required number is of the form 1200k + 5.

Least value of k for which (1200k + 5) is divisible by 7 is k = 3.

Required number = (1200 × 3 + 5) = 3600 + 5 = 3605.

30. **Answer: A**

Solution

Above question is the application of HCF.

So, HCF of 60, 75 & 105 is

60 = 2 × 2 × 3 × 5 → 75 = 3 × 5 × 5

105 = 3 × 5 × 7 → HCF = 3 × 5 = 15.

31. **Answer: C**

Solution

LCM of 3,7,6,9 and 10 = 630

After 630 seconds i.e., 10 minutes 30 seconds will they all flash together.

32. **Answer: B**

Solution

From the above scenario we can see an application related to LCM.

LCM of 4, 6 = 12

For every 12 months, she will appointments on the same day. So, for next time to visit on the same day will come by 12 months.

33. **Answer: D**

Solution

From the above scenario we can see an application related to LCM.

LCM of 5, 3 = 15

For every 15 weeks, they will they both check their tires on the same day.

34. **Answer: A**

Solution

From the above scenario we can see an application related to LCM.

LCM of 40, 12 = 120

If for the first time they leave at 9:00, then for the third time they will leave at 13:00

35. **Answer: B**

Solution

Given numbers are: 9, 10, 11, 12

LCM of given numbers = 1980

So, 1980+ 6 = 1986 is the number that leaves 6 as a remainder.

36. **Answer: A**

Solution

When divide 4093 and 5234 by the number the remainder is 18. So, find HCF of (4093 – 18) and (5234 – 18) i.e., 4075 and 5216. HCF of 4075 and 5216 = 163

37. **Answer: A**

Solution

Given that, three planets revolve around the Sun once in 150, 300 and 600 days, respectively in their own orbits.

Required time = LCM of (150, 300 and 600) = 600 days

Hence, after 3000 days they all come relatively to the same position as at a certain point of time in their orbits.

38. **Answer: B**

Solution

To find the time at which all the buses will leave the school together again, we need to find the LCM of 15, 20, and 24.

The prime factorization of 15 is 3 x 5, the prime factorization of 20 is 2^2 x 5, and the prime factorization of 24 is 2 x 2 x 2 x 3. The LCM of 3, 2^3, and 5 is 120.

Therefore, all the buses will leave the school together again after 120 minutes, i.e., at 9:00 am.

39. **Answer: D**

Solution

To find the time at which all the machines will need to be serviced together again, we need to find the LCM of 3, 5, and 10.

LCM of 3, 5, and 10 = 30

∴ all the machines will need to be serviced together again after 30 months.

40. **Answer: C**

Solution

Here, (5-3) = 2, (6-4) = 2, (7-5) = 2 and (8-6) = 2.

Required number = (L.C.M. of 5, 6, 7 and 8) - 2

Required number = 840 – 2 = 838.

41. **Answer: C**

Solution

Firstly, we find the LCM of 22, 33, 44 and 55 = 660

∴ Required number = Multiple of 660

= 660 × 4 = 2640

because 2000 < 2640 < 3000

42. **Answer: A**

Solution

Firstly, we find the LCM of 9, 11 & 17 = 1683

∴ Required number = Multiple of 1683

= 1683× 5 = 8415

because 8000 < 8415 < 9000

43. **Answer: D**

Solution

The greatest number N = HCF of (3840– x), (2560 – x) and (6400 – x), where x is the Remainder = HCF of (3840 – 2560), (6400 – 2560) and (6400 – 3840)

= HCF of 1280, 3840 and 2560

∴ N = 1280.

the sum of the digits in N is 1+2+8+0 = 11

44. **Answer: B**

Solution

The greatest number N = HCF of (2010– x), (3036 – x) and (4575 – x), where x is the Remainder = HCF of (3036 – 2010), (4575 – 3036) and (4575 – 2010)

= HCF of 1026, 1539 and 2565

∴ N = 513.

the sum of the digits in N is 5+1+3 = 9

45. **Answer: B**

Solution

Let the numbers be 18x and 18y

So, 18x × 18y = 9072 → ∴ x × y = 28

Possible pairs = (1, 28) or (2,14) or (4,7)

46. **Answer: D**

Solution

Let the numbers be 13x and 13y

So, 13x × 13y = 4056 → ∴ x × y = 24

Possible pairs = (1, 24), (2,12), (3,8), (4,6)

47. **Answer: B**

Solution

Let the numbers be 23x and 23y

So, 23x × 23y = 8464

x × y = 16

Possible pairs = (1, 16), (2,8), (4,4)

48. **Answer: B**

Solution

Let's assume the two numbers are a and b, where a = 100 (given in the question).
We know that LCM (a, b) = 4 × HCF (a, b) ⋯ (1)
We also know that,
LCM (a, b) + HCF (a, b) = 125 ⋯ (2)
Substituting a=100 in the above equations, we get:
LCM (100, b) = 4 × HCF (100, b)
LCM (100, b) + HCF (100, b) = 125
5 × HCF (100, b) = 125
HCF (100, b) = 25
From eq. (2) we get,
LCM (100, b) = 100
LCM (a, b) x HCF (a, b) = Product of two numbers
100 × 25 = 100 × b → ∴ b = 25
The other number is 25.

49. **Answer: B**

Solution

Let's assume the two numbers are a and b, where a = 14 (given in the question).
We know that LCM (a, b) = 10 × HCF (a, b) ⋯ (1)
We also know that,
LCM (a, b) + HCF (a, b) = 77 ⋯ (2)
Substituting a = 14 in the above equations, we get:
LCM (14, b) = 4 × HCF (14, b)
LCM (14, b) + HCF (14, b) = 77
11 × HCF (14, b) = 77
HCF (14, b) = 7
From eq. (2) we get,
LCM (14, b) = 70
LCM (a, b) × HCF (a, b) = Product of two numbers
70 × 7 = 14 × b → ∴ b = 35
The other number is 35.

50. **Answer: A**

Solution

Let's assume the two numbers are a and b, where a = 90 (given in the question).
We know that LCM (a, b) = 10 * HCF (a, b) ⋯ (1)
We also know that,
LCM (a, b) + HCF (a, b) = 198 ⋯ (2)
Substituting a=90 in the above equations, we get:
LCM (90, b) = 10 × HCF (90, b)
LCM (90, b) + HCF (90, b) = 198
11 × HCF (90, b) = 198
HCF (90, b) = 18
From eq. (2) we get,
LCM (90, b) = 180
LCM (a, b) × HCF (a, b) = Product of two numbers
180 × 18 = 90 × b → ∴ b = 36
The other number is 36.

SIMPLIFICATION SOLUTIONS

1. **Answer: A**

   Solution

   = 1.1 + 10.01 + 11.11 + 1.001 + 1.01

   = 1.1 + 21.12 + 2.011

   = 22.22 + 2.011

   = 24.231

2. **Answer: C**

   Solution

   11 + [56 – 6 × 4(58 ÷ 29)] + 9× (6 - 3)

   = 11 + [56 – 6 × 4(2)] + 9 × 3

   = 11 + [56 – 48] + 9 × 3

   = 11 + [8] + 27

   = 11 + 35 = 46

3. **Answer: D**

   Solution

   38.36 / 0.07

   → 3836/7 [by multiply 100 in numerator and denominator]

   → 548

4. **Answer: B**

   Solution

   17.66 – 9.25 = x+3.5

   53/ 3 – 37/ 4 = x+7/ 2

   x = 53/ 3 – 37/ 4 – 7/ 2

   x = 53 × 4 /12 – 37× 3 /12 - 7× 6 /12

   x = 212 /12 – 111/12 - 42 /12

   x = (212-153)/12

   x = 59/12

5. **Answer: A**

   Solution

   $(182)^2 \div (26)^2$ x 9÷27

   $\frac{182 \times 182}{26 \times 26} \times \frac{1}{3}$

   = 7 × 7 = 49

6. **Answer: C**

   Solution

   $(289^{0.2} \times 289^{0.3})/(289^{0.6} \times 289^{0.4})$

   $= \frac{289^{(0.2+0.3)}}{289^{(0.6+0.4)}}$

   $= \frac{289^{0.5}}{289^{1}}$

   $= 289^{(0.5-1)}$

   $= 289^{(-0.5)}$

   $= \left(\frac{1}{289}\right)^{1/2}$

   =1/17

7. **Answer: B**

   Solution

   $7/\sqrt{0.0049} + 5/\sqrt{0.0025}$ = 7/ 0.07 + 5/ 0.05

   → 7/ 0.07 + 5/ 0.05

   → 700 /7 + 500/ 5

   → 100+100

   → 200

8. **Answer: D**

   Solution

   → (36÷4) × [5+{3+27-2}]-(9-2)

   = (9) × [5+{28}]-(7) = 9 × 33 -7 = 297-7 = 290

9. **Answer: A**

   Solution

   169/0.169 = 16.9/x

   x = (16.9 × 169) / (169 × 1000) = 0.0169

10. **Answer: B**

    Solution

    0.49 ÷ 0.0049 × 0.049 × 4.9

    = 100 × 0.049 × 4.9

    = 4.9 × 4.9

    = 24.01

11. **Answer: C**

    Solution

    $(a^3 + b^3)$ = (a + b) $(a^2 - ab + b^2)$

    $= \frac{0.3 \times 0.3 \times 0.3 + 0.8 \times 0.8 \times 0.8}{0.3 \times 0.3 - 0.24 + 0.8 \times 0.8}$

    $= \frac{0.3^3 + 0.8^3}{0.3^2 - (0.3 \times 0.8) + 0.8^2}$

    $= \frac{(0.3+0.8)(0.3^2 - (0.3 \times 0.8) + 0.8^2)}{(0.3^2 - (0.3 \times 0.8) + 0.8^2)}$

    = (0.3+0.8) = 1.1

12. **Answer: E**

    Solution

    5.25 × 5.25 – 102.375 + 9.75 × 9.75

    = (5.25^2– (2 × 5.25 × 9.75) + 9.75^2)

    = $(5.25 - 9.75)^2 = (-4.5)^2$ = 20.25

13. **Answer: A**

    Solution

    $\sqrt{4096}$/x = x/7.29

    64/x = x/7.29

    x^2 = 64 × 7.29

    x = 8 × 2.7 = 21.6

14. **Answer: C**

    Solution

    $6 \times 0.6 \times 0.06 \times 0.006 \times \frac{1}{0.3} \times \frac{1}{0.03} \times \frac{1}{0.003}$

$= \frac{6 \times 0.6}{0.3} \times \frac{0.06}{0.03} \times \frac{0.006}{0.003}$

$= 6 \times 2 \times 2 \times 2 = 48$

15. **Answer: A**

Solution

Apply $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca} = a + b + c$

Hence the answer = 1.2 + 4.6 + 6.2 = 12.

16. **Answer: E**

Solution

Apply $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca} = a + b + c$

Hence the answer is 27 + 45 + 38 = 110.

17. **Answer– B**

Solution

Writing the approximate values to the nearest integer

$\Rightarrow x/4 + 32 + 140 = 68 + 229 + 87$

$\Rightarrow x/4 + 172 = 384$

$\Rightarrow x/4 = 384 - 172$

$\Rightarrow x = 212 \times 4 = 848$

18. **Answer: C**

Solution

Writing the approximate values to the nearest integer

$\Rightarrow (22)^2 + (15)^2 - (19)^2 = x$

$\Rightarrow x = 484 + 225 - 361 = 348$

19. **Answer: D**

Solution

Writing the approximate values to the nearest integer

$\Rightarrow$

5×1/8 of (5472 – 5408) + 766 = x + 245

$\Rightarrow 5/8 \times 64 + 766 = x + 245$

$\Rightarrow 40 + 766 = x + 245$

$\Rightarrow x = 806 - 245 = 561$

20. **Answer: E**

Solution

Writing the approximate values to the nearest integer

$\Rightarrow 600 + 12 \times 13.5 - 150 = x + 44$

$\Rightarrow 600 + 162 - 150 = x + 44$

$\Rightarrow 762 - 150 = x + 44$

$\Rightarrow 612 = x + 44$

$\Rightarrow x = 612 - 44 = 568$

21. **Answer: B**

Solution

7/5 × 67 + 3/8 × 168 = 93.8 + 63 = 156.8

22. **Answer: A**

Solution

Writing the approximate values to the nearest integer

$\Rightarrow (21 \times 10 \div 15 + 42) \div 2 = x^{1/2} = \sqrt{x}$

$\Rightarrow (14 + 42) / 2 = \sqrt{x}$

$\Rightarrow 56/2 = \sqrt{x}$

$\Rightarrow \sqrt{x} = 28$

$\Rightarrow x = 784$

23. **Answer: E**

Solution

First two digit 72 is between square value of 8 and 9;

$85 \times 85 = 7225$

$\sqrt{7225} = 85$

$\sqrt{72.25} = 8.5$

24. **Answer: A**

Solution

47-[32-{57-(33-(26+51))}]

= 47-[32-{57-(33-(77))}]

= 47-[32-{57-(-44))}]

= 47-[32-101]

= 47+69 = 116

25. **Answer: C**

Solution

$$\frac{0.4 \times 0.4 + 0.04 \times 0.04 - 0.4 \times 0.04}{0.36}$$

$$= \frac{0.16 + 0.0016 - 0.016}{0.36}$$

$$= \frac{0.1456}{0.36} = 0.4044$$

26. **Answer: B**

Solution

$$\frac{1}{3} + \frac{1}{3 \times 4} + \frac{1}{3 \times 4 \times 5}$$

$$= \frac{20}{60} + \frac{5}{60} + \frac{1}{60} = \frac{26}{60} = 0.433$$

27. **Answer: A**

Solution

$23 \times 34 - 45 + (7^3+17)$

$= 23 \times 34 - 45 + (343+17)$

$= 782 - 45 + 360$

$= 737 + 360 = 1097$

28. **Answer: E**

Solution

We know that $a^2 - b^2 = (a+b)(a-b)$

By apply this,

$$= \frac{(0.79)^2 - (0.17)^2}{(0.79+0.17)}$$

$= (0.79-0.17) = 0.62$

29. **Answer: C**

Solution

$$\Rightarrow \frac{1}{2+\frac{1}{3}} - \frac{1}{2+\frac{1}{2}} = \frac{1}{\frac{7}{3}} - \frac{1}{\frac{5}{2}}$$

= 3/7 – 2/5 = (15-14)/ 35 = 1/35

30. **Answer: E**

Solution

13+4-8 × (7+89)-96÷4+(54÷3+11×2-1)÷13

= 13+4-8 × (96)-24+(18+22-1)÷13

= 13+4-768-24+(39÷13)

= 13+4-768-24+3 = 17-789 = -772

31. **Answer: D**

Solution

x = 11+8-5 × (1/2) × 16 - (60÷(34-19))

x = 11+8-5 × 8 - (60÷15) = 19-40-4 = -25

32. **Answer: B**

Solution

1732 + 173.2 + 17.32 + 1.732

= 1905.2 + 19.052

= 1924.252

33. **Answer: C**

Solution

181.2 ÷ 6040

= 181.2/6040

= (60.4 × 3)/6040 = 3/100 = 0.03

34. **Answer: C**

Solution

We know that $a^2 - b^2 = (a+b)(a-b)$

$= \frac{(5.7+3.8)(5.7-3.8)}{(5.7-3.8)} = (5.7+3.8) = 9.5$

35. **Answer: D**

Solution

0.3333 × 0.75 × 0.499 × 0.125 × 32

$= \frac{1}{3} \times \frac{3}{4} \times \frac{1}{2} \times 4$

$= \frac{1}{6} \times 3$

= 3/6

= 1/2

36. **Answer: C**

Solution

179/0.179 = 17.9 /x

179x = 17.9 × 0.179

17.9 × 10x = 17.9 × 0.179

10x = 0.179

x = 0.179/10

x = 0.0179

37. **Answer: E**

Solution

5[37+(35+18÷2×3-47)+5]

= 5[37+(35+9×3-47)+5]

= 5[37+(35+27-47)+5]

= 5[37+15+5]

= 5[57]

= 285

38. **Answer: B**

Solution

4.143 + 3.43 - 2.82 + 8 - 5.6

= 7.573 - 2.82 + 8-5.6

= 7.573 - 8.42 + 8

= 7.573 - 0.42 = 7.153

39. **Answer: C**

Solution

$x + \frac{18}{24} + 3\frac{3}{4} = 15\frac{11}{21}$

$x = 15\frac{11}{21} - \frac{18}{24} - 3\frac{3}{4}$

$x = 15\frac{11}{21} - \frac{18}{24} - \frac{15}{4}$

$x = 15\frac{11}{21} - 0.75 - 3.75$

$x = \frac{326}{21} - 4.5$

$x = \frac{(326-94.5)}{21}$

$x = \frac{231.5}{21}$

$x = 11\frac{0.5}{21}$

40. **Answer: D**

Solution

$6 - \frac{5}{1+\frac{1}{3+\frac{1}{2+\frac{1}{4}}}} = 6 - \frac{5}{1+\frac{1}{3+\frac{4}{9}}}$

$6 - \frac{5}{1+\frac{9}{31}} = 6 - \frac{5 \times 31}{40}$

= (240 -155)/40 = 85/40 = 17/8

41. **Answer: A**

Solution

$\sqrt{?+\sqrt{95-\sqrt{934+\sqrt{747-\sqrt{312+12}}}}} = 49$

$\sqrt{?+\sqrt{95-\sqrt{934+\sqrt{747-\sqrt{324}}}}} = 49$

$\sqrt{?+\sqrt{95-\sqrt{934+\sqrt{747-18}}}} = 49$

$\sqrt{?+\sqrt{95-\sqrt{934+\sqrt{729}}}} = 49$

$\sqrt{?+\sqrt{95-\sqrt{934+27}}} = 49$

$\sqrt{?+\sqrt{95-\sqrt{961}}} = 49$

$\sqrt{?+\sqrt{95-31}} = 49$

$\sqrt{?+\sqrt{64}} = 49$

$\sqrt{?+8} = 49$

$?+8 = 49^2 = 2401$

$\therefore ? = 2393$

42. **Answer: D**

Solution

$= \frac{7+7\times7}{7\times7+1} \times \frac{\frac{1}{7}\div(\frac{1}{7}\times\frac{1}{7})}{(\frac{1}{7}\times\frac{1}{7})\div\frac{1}{7}} - (7-\frac{1}{7}) \times \frac{14}{2}$

$= \frac{56}{56} \times \frac{\frac{1}{7}\div(\frac{1}{49})}{(\frac{1}{49})\div\frac{1}{7}} - (\frac{48}{7}) \times 7$

$= 1 \times 49 - 48$

$= 49-48 = 1$

43. **Answer: D**

Solution

$5/12 \times 144/25 \times 25\ (65^2-55^2) \times 1/100$

$= 1/1 \times 12/\ 5 \times 25\ (65^2-55^2\ ) \times 1/100$

$= 12/5 \times 25\ (4225 - 3025) \times 1/100$

$= 12/5 \times 25\ (1200) \times 1/100$

$= 12/5 \times 25 \times 12$

$= 12 \times 5 \times 12 = 720$

44. **Answer: D**

Solution

$\frac{57}{7} \times \frac{35}{3} - 5\frac{2}{3} \div \frac{7}{9} \times \frac{147}{6} = \frac{19}{1} \times \frac{5}{1} - \frac{17}{3} \times \frac{9}{7} \times \frac{147}{6}$

$= 19 \times 5 - 51/7 \times 147/6$

$= 95 - 2499/14$

$= 95 - 178.5 = -83.5$

45. **Answer: B**

Solution

$89\times 6^4 = 89 \times 1296 = 115344$

46. **Answer: B**

Solution

$4\frac{1}{4} + (5^3 + 4\frac{1}{2})$

$= 17/4 + (125 + 9/2)$

$= 17/4 + (250/2 + 9/2) = 17/4 + 259/2$

$= 535 / 4 = 133.75$

47. **Answer: B**

Solution

$= \frac{1}{3+\frac{1}{2-\frac{9}{7}}} + \frac{39}{22}$

$= \frac{1}{3+\frac{1}{\frac{14-9}{7}}} + \frac{39}{22}$

$= \frac{1}{3+\frac{1}{\frac{5}{7}}} + \frac{39}{22} = \frac{1}{3+\frac{7}{5}} + \frac{39}{22}$

$= \frac{1}{\frac{15+7}{5}} + \frac{39}{22}$

$= \frac{5}{22} + \frac{39}{22} = \frac{44}{22} = 2$

48. **Answer: D**

Solution

$1 + \frac{5}{2+\frac{3}{\frac{10-1}{2}}} - \frac{1}{2} \times 3$

$= 1 + \frac{5}{2+\frac{6}{9}} - \frac{3}{2} = 1 + \frac{5}{2+\frac{2}{3}} - \frac{3}{2}$

$= 1 + \frac{5}{\frac{8}{3}} - \frac{3}{2} = 1 + \frac{5\times3}{8} - \frac{3}{2}$

$= 1 + \frac{15}{8} - \frac{3}{2} = \frac{3}{8} + 1 = 11 / 8$

49. **Answer: A**

Solution

$= \sqrt{119+\sqrt{185+88\sqrt{\sqrt{36}+19}}}$

$= \sqrt{119+\sqrt{185+88\sqrt{6+19}}}$

$= \sqrt{119+\sqrt{185+88\sqrt{25}}}$

$= \sqrt{119+\sqrt{185+440}}$

$= \sqrt{119+\sqrt{625}}$

$= \sqrt{119+25}$

$= \sqrt{144} = 12$

50. **Answer: B**

Solution

$= \sqrt{107+\sqrt{156+8\sqrt{\sqrt{36}+19}}}$

$= \sqrt{107+\sqrt{156+8\sqrt{6+19}}}$

$= \sqrt{107+\sqrt{156+8\times5}}$

$= \sqrt{107+\sqrt{196}}$

$= \sqrt{107+14}$

$= \sqrt{121} = 11$

AVERAGES SOLUTIONS

1. **Answer: C**
   Solution
   Age of newcomer = Replaced weight + (change in avg) × Number of people
   = 56 + (x – 1 – x) × 8 = 64 kg
2. **Answer: C**
   Solution
   Present age of P, Q, R, S = (45 × 4) + 20 = 200
   Present age of P, Q, R, S and T = 49 × 5 = 245
   Hence, the age of T = 245 – 200 = 45 years.
3. **Answer: C**
   Solution
   Total rainfall = 3 × 7 = 21 cm
   Hence, rainfall received on Tuesday = $\frac{21}{2}$ (as it rained as much on Tuesday as on all the others days of the week combined)
   = 10.5 cm.
4. **Answer: B**
   Solution
   Average of 50 numbers is 38.
   Total = 50 × 38 = 1900
   45 and 55 are discarded i.e., 1900 – 45 – 55 = 1800
   Average = $\frac{1800}{48}$ = 37.5
5. **Answer: C**
   Solution
   Let seventh observation = X.
   Then, according to the question we have
   $= \frac{72 + X}{7} = 11$
   → X = 5.
   Hence, the seventh observation is 5.
6. **Answer: B**
   Solution
   Total age of 20 men = 15.6 x 20 = 312
   Now, total age of 25 men
   = 15.56 × 25 = 389.
   Total age of five men added later
   = 389 – 312 = 77.
   Hence, the total average of five men
   $= \frac{77}{5} = 15.4$
7. **Answer: C**
   Solution
   Let X rupees be the average of 30 boarders
   30X + 40 = (X – 2) 40
   X = 12
   Hence, original expenditure
   = Rs 12 × 30 = Rs 360.
8. **Answer: A**
   Solution
   Correct average = $\frac{[(50x36)-(73+37)]}{36}$
   $= \frac{1764}{36} = 49$ kg. **[** Subtract the wrong value and add the correct value**]**
9. **Answer: C**
   Solution
   Total earning for the week
   = Rs (4 × 18) + (4 × 22) – 20 = Rs 140
   Average earning = Rs 140 / 7 = Rs 20.
10. **Answer:** A
    Solution
    Let the number of boys who passed = X.
    Then, 39X + 15(120 – X) = 120 × 35
    24X = 4200 – 1800
    → X = 2400 / 24
    X = 100.
    Hence, the number of boys passed = 100.
11. **Answer: A**
    Solution
    Total decrease = (20 × 2) months = 40 months
    = 3 years 4 months
    Age of the new boy
    = 18 years – 3 years 4 months.
    = 14 years 8 months.
12. **Answer: C**
    Solution
    Temperature on : Tuesday + Wednesday + Thursday + Friday = 4 × 48°C = 192°C
    Temperature on : Tuesday = 42°C
    Thus,
    Wednesday + Thursday + Friday
    = (192°C – 42°C) = 150°C
    Temperature on: Wednesday + Thursday + Friday + Saturday = 4 × 52°C = 208°C
    Thus, Saturday's temperature
    = 208 – 150°C = 58°C
13. **Answer: A**
    Solution
    Total spending in 12 months
    = Rs [(269.47 × 7) + (281.05 × 5)]

= Rs 3,291.54

Total income = Spending + Saving

→ Rs 3,291.54 + Rs 308.46

→ Rs 3,600.00

Monthly salary = Rs 3600 / 12 = Rs 300

14. **Answer: D**

Solution

Let temperature on 4th day be X°C

∴ (4 × 38.6) + (4 × 40.3) – X = 7 × 39.1

= X = 41.9

∴ temperature on 4th day = 41.9°C.

15. **Answer: C**

Solution

Total wages of A + B + C = ₹ 360

Let C's wages be X , A's is 2X and B's is (X + 40)

2X + (X+40) + X = 360

4X = 320

X = 80

A's wages = 80 x 2 = 160

16. **Answer: C**

Solution

Let the total journey be X km.

$\left(\frac{X}{35}\right) - \left(\frac{X}{40}\right) = \left(\frac{15}{60}\right)$

Solving for X, we get X = 70

Therefore, total journey = 70 km.

17. **Answer: B**

Solution

Let the numbers be 2X, X and 4X

Average = $\frac{2X+X+4X}{3} = \frac{7X}{3} = 56$

$= X = \frac{3\times56}{7} = 24$

Hence, the numbers in order are 48, 24 and 96.

18. **Answer: C**

Solution

A + B = 2 × 20 = 40yr

B + C = 2 × 19 = 38yr

C + A = 2 × 21 = 42yr

On adding all three,

2 (A + B + C) = 40 + 38 + 42 = 120

→ A + B + C = 60

∴ A = (A + B + C) – (B + C) = 60 – 38 = 22yr

Similarly,

B = (A + B) – A = 40 – 22 = 18yr

C = (C + A) – A = 42 – 22 = 20yr

19. **Answer: C**

Solution

Total monthly income of 4 members =

15130 × 4 = Rs. 60520

Except daughter, total monthly income of 3 members = 14660 × 3 = Rs. 43980

∴ Monthly income of married daughter

= 60520 – 43980 = Rs. 16540

20. **Answer: A**

Solution

Total weight of 21 boys = 64 × 21 = 1344 kg

Given that if the weight of the teacher was added, the average increased by one kg

∴ Total weight along with the teacher

= 65 × 22 = 1430 kg

Now, teacher's weight = 1430 – 1344 = 86

21. **Answer: B**

Solution

In this case, we know that the average is 12, and there are 12 numbers in the set (not counting x), so we can write:

12 = (11 + 9 + 15 + 7 + 21 + 6 + 9 + 11 + 4 + 5 + 20 + x) / 12

Simplifying this equation by multiplying both sides by 12, we get:

144 = 118 + x

Subtracting 118 from both sides, we find that:

x = 26

∴ the value of x that makes the average of the 12 numbers equal to 12 is 26.

22. **Answer: C**

Solution

Let's first find the total marks of PCMB students in Chemistry:

Total marks of PCMB students in Chemistry = 9 × 39 = 351

Similarly, we can find the total marks of PCB students in Chemistry:

Total marks of PCB students in Chemistry = 16 × 89 = 1424

Average marks = (351 + 1424) / (9 + 16) = 1775 / 25 = 71

∴ the average marks of the whole class for Chemistry subject is 71.

23. **Answer: C**

Solution

Let the total marks obtained by 40 students be x, then we can write:
40 × 30 = x
Solving for x, we get:
x = 1200
Similarly, let the total marks obtained by 60 students be y, then we can write:
60 × 40 = y
Solving for y, we get:
y = 2400
Now, the total marks obtained by all the students is:
x + y = 1200 + 2400 = 3600
The total number of students is:
40 + 60 = 100
∴ the average marks of all the students is:
3600 / 100 = 36
Hence, the average marks of all the students is 36.

24. **Answer: B**

Solution

Let's begin by finding the total weight of the initial 8 students:
Total weight of 8 students = 8 × 60 kg = 480 kg
Now, let's add the two new students whose average weight is 50 kg:
Total weight of 10 students = 480 kg + (2 × 50 kg) = 580 kg
Next, let's add the two other students whose average weight is 46 kg:
Total weight of 12 students
= 580 kg + (2 × 46 kg) = 672 kg
New average weight of all students
$= \frac{672kg}{12} = 56kg$
∴ the new average weight of all the students is 56 kg.

25. **Answer: D**

Solution

Let's start by finding the total income of the 40 men.
We know that the average income of 40 men is $60,000, so we can use the following formula to find their total income:
Total income of men
= $60,000 × 40 = $2,400,000
Total income of women =
$70,000 x 60 = $4,200,000
Total income of all people =
$2,400,000 + $4,200,000 = $6,600,000
Total income of children =
$51,000 x 50 = $2,550,000
Average income of all people = $\frac{\$6,600,000 + \$2,550,000}{40 + 60 + 50}$ = $\frac{9,150,000}{150}$ = $61,000
∴ the average income of all the people (men, women, and children) is $61,000.

26. **Answer: B**

Solution

The cost of the first 13 articles is
13 × 70 = 910.
The cost of the next 15 articles is
15 × 60 = 900.
The cost of the last 12 articles is
12 × 65 = 780.
∴ the total cost of all the articles is
910 + 900 + 780 = 2590.
The total number of articles is
13 + 15 + 12 = 40.
Hence, the average price per article is
$\frac{2590}{40} = 64.75$.
∴ the average price per article is 64.75.

27. **Answer: D**

Solution

The sum of the 10 numbers is
7 × 10 = 70.
If we multiply each number by 12, we get a new set of 10 numbers whose sum is:
12 × (sum of the 10 numbers) =
12 × 70 = 840.
The average of the new set of numbers is therefore:
$\frac{sum\ of\ the\ new\ set\ of\ numbers}{10} = \frac{840}{10} = 84.$
∴ the average of the new set of numbers is 84.

28. **Answer: B**

Solution

That month will have 5 Sundays.
∴ Required average:
$= \frac{5\times510+25\times240}{30}$
$= \frac{2550+6000}{30}$
$\frac{8550}{30} = 285$

29. **Answer: B**

Solution

Let's assume there are "x" officers in 3B industries.
Average wage of all workers = $\frac{Total\ wage\ of\ all\ workers}{Total\ workers}$
→ 9000 = $\frac{6000*200+12000x}{200+x}$

→ 9000(200+x) = 12,00,000 + 12000x
→ 18,00,000 + 9000x = 12,00,000 + 12000x
→ 3000x = 6,00,000
→ x = 200
∴ there are 200 officers in 3B industries.

30. **Answer: B**

Solution

Let the number of workers be 'W' and the number of officers be 'O'.
We know that
$1000 = \frac{600W+1200O}{W+O}$
Multiplying both sides by (W + O), we get:
1000(W + O) = 600W + 1200O
Expanding and simplifying, we get:
400W = 200O
W/O = 1/2
∴ the ratio of the number of workers to the number of officers is 1:2.

31. **Answer: B**

Solution

Let the number of students in the class be n.
For the Mathematics exam, the total score is (n-1) * 26 because the average score is 26 excluding Binu.
For the English exam, the total score is (n-1) * 34 because the average score is 34 excluding Ana.
According to the problem, the total score of the class in Mathematics and English was 1920:
∴ (n-1) * 26 + (n-1) * 34 = 1920
∴ 60n – 60 = 1920
∴ 60n = 1980
∴ n = 33

32. **Answer: E**

Solution

Total weight = Average weight × Number of people
Total weight
= 90 kgs × 90 people
Total weight = 8100 kgs
The number of men is
$\frac{6}{10} \times 90 = 54$
The number of women is
$\frac{4}{10} \times 90 = 36$
We also know that the average weight of women is 54 kgs.
So, the total weight of all women is 54 kgs × 36 women = 1944 kgs.
∴ the total weight of all men is=
Total weight - Total weight of women
= 8100 kgs - 1944 kgs = 6156 kgs.
And the average weight of men is (Total weight of men) / (Number of men)
$= \frac{6156kgs}{54men} = 114kgs$
So, the average weight of the men is 114 kgs.

33. **Answer: C**

Solution

Let the total number of boys in the classroom be 5x and the total number of girls be 3x.
∴ the total weight of the boys = 100 × 5x = 500x kgs.
The total weight of the girls = 60 × 3x = 180x kgs.
The total weight of the class = 500x + 180x = 680x kgs.
The total number of students in the class = 5x + 3x = 8x.
∴ the average weight of the class = Total weight of the class / Total number of students in the class
= (680x) / (8x)
= 85 kgs.
Hence, the average weight of the class is 85 kgs.

34. **Answer: A**

Solution

Let's assume that there are "x" topper students and "y" non-topper students in the institute.
Then, we can use the given information to form the following equation:
Total score of all students = Average score × Total number of students
∴ we have:
110 × (x + y) = 140x + 90y
Expanding the equation, we get:
110x + 110y = 140x + 90y
Simplifying it, we get:
30x = 20y
Dividing both sides by 20, we get:
$\frac{x}{y} = \frac{2}{3}$
∴ the ratio of the number of topper students to the number of non-topper students is 2:3.

35. **Answer: D**

Solution

Let S be the total score of Aditya in all 5 subjects.
Then we know that:

S/5 = 99% (as he has an average of 99% in all 5 subjects)
One of the subjects has a score of 95%
Using the first equation, we can find the value of S:
S/5 = 99% S = 99% × 5 S = 495
Now, we can use the second equation to find the score of the other 4 subjects:
The total score of 5 subjects = 495 (from above)
The score of one subject = 95
The total score of the remaining 4 subjects = 495 – 95 = 400
So, the average score of the other 4 subjects is:
400 / 4 = 100
∴ Aditya's score in the rest of the subjects is 100%.

36. **Answer: A**

Solution

Let's assume that each subject is out of 100 marks.
Then, the total marks obtained by Boiler in all 5 subjects would be:
Total Marks Obtained = (27 + 32 + 31 + x + y) = (90 + x + y)
where x and y are his scores in the other 2 subjects.
Total Marks = 500 (assuming each subject is out of 100 marks)
35 = [(90 + x + y) / 500] x 100
90 + x + y = 175
x + y = 85
∴ the average score in the other 2 subjects would be:
Average Score $= \frac{(x+y)}{2}$
Average Score $= \frac{85}{2}$
Average Score = 42.5%
∴ Boiler's average score in the other 2 subjects is 42.5%.

37. **Answer: C**

Solution

Total score = Average score x Number of subjects
Total score = 70% x 5
Total score = 350/100
Total score = 3.5
Total score in 3 subjects = 65% x 3 Total score in 3 subjects = 195/100 Total score in 3 subjects = 1.95
Total score in other 2 subjects =
Total score – Total score in 3 subjects Total score in other 2 subjects
= 3.5 – 1.95
Total score in other 2 subjects = 1.55
Average score in other 2 subjects = $\frac{Total\ score\ in\ other\ 2\ subjects}{2} = \frac{1.55}{2}$
Average score in other 2 subjects
= 0.775 or 77.5%
∴ the average score in the other 2 subjects is 77.5%.

38. **Answer: C**

Solution

We know that her average score for all 5 subjects is 85%, so we can write:
$\frac{99+x}{5} = 85$
Simplifying this equation, we get:
99 + x = 425
x = 425 – 99
x = 326
∴ Megha's average score in the remaining 4 subjects is $\frac{326}{4} = 81.5\%$.

39. **Answer: E**

Solution

Total tonnage for the first 6 days
= 12 + 18 + 21 + 9 + 15 + 25 = 100 tons
Since Chinmay delivers an average of 15 tons of crushed sand every day for 1 week, the total tonnage for the week would be:
Total tonnage for the week = 15 tons/day x 7 days = 105 tons
Tonnage on last day of the week =
Total tonnage for the week – Total tonnage for the first 6 days = 105 – 100 = 5 tons
So, Chinmay's tonnage on the last day of the week is 5 tons.

40. **Answer: C**

Solution

Let the total weight of the group of 7 people be W.
Then we know that:
∴ Average weight of the group of 7 people is
$\frac{W}{7} = 95$
W = 665
Now let Shivam's weight be x. After Shivam joins the group, the new average weight becomes:
$\frac{W+x}{8} = 99$
$\frac{665+x}{8} = 99$
665 + x = 792 → ∴ x = 127
∴ Shivam's weight is 127 kgs

41. **Answer: E**

Solution

Average = $\frac{Sum\ of\ all\ values}{Number\ of\ values}$

Sum of weights = 16 × 75 = 1200 kgs

Now, 5 people with an average weight of 60 kgs leave the group. This means the total weight of these 5 people is:

Total weight of 5 people = 5 × 60 = 300 kgs

So, the total weight of the remaining 11 people is:

1200 - 300 = 900 kgs

∴ the new average weight of the group is:

New average = $\frac{Total\ weight\ of\ remaining\ people}{Number\ of\ remaining\ people}$ = $\frac{900}{11}$

= 81.82 kgs (rounded to two decimal places)

∴ the new average weight of the group is 81.82 kgs

42. **Answer: B**

Solution

Let the sum of scores of the 20 people be S.

Then, we have:

Average score of 20 people

= S/20 = 80%

So, S = 20 x 80 = 1600.

Now, when 5 new people join, we have a total of 25 people.

Let the sum of scores of the 5 new people be X.

Then, we have:

Average score of 25 people

$= \frac{S+X}{25}$= 80% - 20% = 60%

$\frac{1600+X}{25} = 60$

1600 + X = 1500

X = -(1500 – 1600) = 100

Average score= $\frac{100}{5}$.

43. **Answer: B**

Solution

Let the number of children's cycles sold be 'x', and the number of adult cycles sold be 'y'. Then, we can write:

Total revenue

= Average ticket size × Total number of cycles sold

$6500 = \frac{5200x+9100y}{x+y}$

$y = \frac{6500x-5200x}{9100-6500} = \frac{13x}{26}$

$\frac{y}{x} = \frac{\frac{13x}{26}}{x} = \frac{13}{26}$

∴ the ratio of adult cycles sold to children's cycles sold is 13:26 or 1:2.

44. **Answer: E**

Solution

The total cost of 25 kgs of rice at $1.5/kg

= 25 × 1.5 = $37.50

The total cost of 30 kgs of rice at $1.25/kg = 30 × 1.25

= $37.50

The total cost of the mixture

= $37.50 + $37.50 = $75

The total weight of the mixture

= 25 + 30 = 55 kgs

∴ the price of the resultant mixture of rice

$= \frac{Total\ cost\ of\ the\ mixture}{Total\ weight\ of\ the\ mixture}$ = $\$\frac{75}{55kgs}$

= $1.36/kg

Hence, the price of the resultant mixture of rice is $1.36/kg.

45. **Answer: B**

Solution

The total weight of the mixture is: 15 kg + 25 kg + 30 kg = 70 kg

First, we need to find the total weight of the mixture in grams:

70 kg = 70,000 grams

Now, we can find the proportion of pomegranate in the mixture:

$\frac{30kg}{70kg} = 0.42857$

This means that 42.857% of the mixture is pomegranate.

To find the weight of pomegranate in 2100 grams of the mixture, we can use the proportion:

0.42857 x 2100 grams = 900 grams

∴ the weight of pomegranate in 2100 grams of the mixture is 900 grams.

46. **Answer: D**

Solution

Let the ratio in which Siddhi sells the two products be x:y.

average ticket size

$= \frac{x\times45+y\times65}{x+y} = 57.5$

x × 45 + y × 65 = 57.5 × (x + y)

45x + 65y = 57.5x + 57.5y

12.5x = 7.5y

$\frac{x}{y} = \frac{7.5}{12.5} = \frac{3}{5}$

∴ the ratio in which Siddhi sells the two products is 3:5.

47. **Answer: C**

Solution

Let the ratio in which Riddhi sold the two types of toys be x:y.

The average selling price of the toys can be expressed as:

Average price = $\frac{x1200 + y800}{x+y}$ = 900

1200x + 800y = 900x + 900y

300x = 100y

x:y = 1:3

∴ Riddhi sold the two types of toys in the ratio 1:3.

48. **Answer: C**

Solution

Let's denote the sum of the first 10 numbers as S1 and the sum of the last 10 numbers as S2.

We know that the average of 19 numbers is 9, so the sum of all 19 numbers is:

S = 19 × 9 = 171

We also know that the average of the first 10 numbers is 10, so:

S1/10 = 10

S1 = 100

Similarly, the average of the last 10 numbers is 9, so:

S2/10 = 9

S2 = 90

So:

10th number = (S2 + S1 – S) / 1

= $\frac{100+90-171}{1}$ = 19

∴ the 10^{th} number is 19.

49. **Answer: D**

Solution

Let's denote the last number by 'x'.

the sum of all 25 numbers is:

25 × 15 = 375

We know that the average of the first 16 numbers is 30.

∴ the sum of the first 16 numbers is:

16 × 30 = 480

And the sum of the last 8 numbers is:

8 × 10 = 80

Now we can use this information to find the value of 'x':

Sum of all 25 numbers = Sum of first 16 numbers + Sum of last 8 numbers + x

375 = 480 + 80 + x

375 = 560 + x

x = 375 – 560 = -185

∴ the last number is -185.

50. **Answer: D**

Solution

Let's denote the sum of the first 8 numbers as S1 and the sum of the last 8 numbers as S2.

We know that the average of 15 numbers is 30, so the sum of all 15 numbers is:

S = 15 × 30 = 450

We also know that the average of the first 8 numbers is 35, so:

S1/8 = 35 → S1 = 280

Similarly, the average of the last 8 numbers is 25, so:

S2/8 = 25 → S2 = 200

So, 8th number = (S2 + S1 – S) / 1

= $\frac{280+200-450}{1}$ = 30

∴ the 8^{th} number is 30.

PERCENTAGES SOLUTIONS

1. **Answer: B**

   Solution

   Let Riya's income be 'x'.

   Then, Net income = (100–10)% of x

   $= x = \frac{9x}{10}$

   New net income = 85% of 110% of x

   $\left(\frac{85}{100} \times \frac{110}{100x}\right) = \frac{187}{200x}$

   x = 10000

2. **Answer: C**

   Solution

   Let original consumption be 1 unit costing 100

   New cost = 125.

   New consumption

   $= \left(\frac{1}{125} \times 100\right) = \frac{4}{5} unit$

   Ratio $= \frac{\left(1-\frac{4}{5}\right)}{1}$

   = 1 : 5

3. **Answer: C**

   Solution

   After first year, the value of the scooter

   = 20,000

   After second year, the value of scooter

   = 16,000

   After third year, the value of scooter

   = 12,800

4. **Answer: B**

   Solution

   Number of runs made by running

   = 110 – (3 × 4 + 8 × 6)

   = 110 – (60)

   = 50.

   Percentage

   $= \left(\frac{50}{110} \times 100\right) = 45\frac{5}{11}\%$

5. **Answer: D**

   Solution

   Suppose originally he had x apples.

   Then, (100–40)% of x = 420.

   $\frac{60}{100}x = 420$

   $x = \frac{420 \times 100}{60} = 700$

6. **Answer: E**

   Solution

   Let the number of students be x. Then,

   Number of students above 8 years of age

   = (100–20)% of x = 80% of x.

   80% of x $= 48 + \frac{2}{3} of\ 48$

   = $\frac{80}{100}$ x + 80

   x = 100.

7. **Answer: D**

   Solution

   5% of A + 4% of B

   = $\frac{2}{3}$ (6% of A + 8% of B)

   $\frac{1}{100}A = \frac{1}{75}B$

   $\frac{A}{B} = \frac{100}{75} = \frac{4}{3} = 4:3$

8. **Answer: D**

   Solution

   Let the number be x

   Error $= \frac{5}{3}x - \frac{3}{5}x = \frac{16}{15}x$

   Error% $= \left(\frac{16}{15}x \times \frac{3}{5}x \times 100\right)\%$

   = 64%.

9. **Answer: A**

   Solution

   Number of valid votes

   = 80% of 7500 = 6000.

   Valid votes polled by other candidate

   = 45% of 6000 = 2700

10. **Answer: A**

    Solution

    Total number of votes polled

    = (1136 + 7636 + 11628) = 20400.

    Required % $= \left(\frac{11628}{20400} \times 100\right)$ = 57%

11. **Answer: B**

    Solution

    Let the sum paid to Y per week be Rs. z.

    Then, z + 120% of z = 550.

    Z = 250.

12. **Answer: B**

    Solution

    We have,

    12% of X = 6% of Y

    = 2% of X = 1% of Y

    = (2×9)% of X = (1×9)% of Y

    Thus, 18% of X = 9% of Y.

13. **Answer: B**

    Solution

    Here, l = 7 and m = 28

    Therefore,

first number=$\frac{l}{m}$×100% of second number

$= \frac{7}{28} \times 100\%$ of second number

= 25% of second number

14. **Answer: B**

Solution

Assume the 3rd number = 100

2nd number is 40% less than the third number = 100 – 0.4(100) = 100 – 40 = 60

3rd number is 47% less than the third number = 100 – 0.47(100) = 100 – 47 = 53

$\therefore \left[\frac{60-53}{60}\right] \times 100 = 11.66\%$

∴ the second number is approximately 11% less than the first number.

15. **Answer: B**

Solution

Let the smaller number be 100.

Then the first number will be 120.

% of smaller number is less than the greater number

$= \left[\left(\frac{20}{120}\right) \times 100\right]\% = 16\left(\frac{2}{3}\right)\%$

16. **Answer: B**

Solution

Reduction in consumption

$= \left[\left(\frac{P}{100+P}\right) \times 100\right]\%$

$= \left[\left(\frac{25}{100+25}\right) \times 100\right]\%$

$= 20\%$

17. **Answer: D**

Solution

Increase in consumption

$= \left[\frac{P}{100-P} \times 100\%\right]$

$= \left[\frac{10}{100-10} \times 100\%\right]$

$= 11(1/9)\%$

18. **Answer: D**

Solution

Here, x = 20 and y = - 20

Therefore, the net % change in value

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left[20 - 20 + \frac{20x-20}{100}\right]\% \; or \; -4\%$

Since the sign is negative, there is a decrease in value by 4%.

19. **Answer: A**

Solution

Number of runs made by running

= 110 - (3 x 4 + 8 x 6)

= 120 - (60)

= 60

Now, we need to calculate 60 is what percent of 120.

$= \frac{60}{120} \times 100 = 50\%$

20. **Answer: B**

Solution

We have, receipts = Price x Sales

Therefore, net % change in receipts

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left[-30 + 50 + \frac{-30\times50}{100}\right]\% = 5\%$ increase.

21. **Answer: A**

Solution

Since $Side_1$ x $Side_2$ = Area

Therefore, net% change in area

$= (x + y + \frac{xy}{100})\%$

$= \left[40 + 30 + \frac{40\times30}{100}\right]\% \; or \; 82\%$

Therefore, area is increased by 82%

22. **Answer: C**

Solution

Since, $Side_1$ x $Side_2$ = Area

Therefore, error% in area

$= (x + y + \frac{xy}{100})\%$

$= \left[20 - 10 + \frac{-10\times20}{100}\right]\% \; or \; 8\%$

i.e., 8% excess

23. **Answer: B**

Solution

Net% change in revenue

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left[-20 + 30 + \frac{-20\times30}{100}\right]\% \; or \; 4\%.$

24. **Answer: B**

Solution

80% of original price can buy = 18 quintals.

Therefore, he can buy

$= \frac{18\times100}{80} = 22.5$ quintals at the lower price.

25. **Answer: A**

Solution

Let the price of mobile be Rs. 100X

Price of mobile after 20% discount

= Rs. 80X

Price after further 10% discount = Rs. 72X

72X = 36000

X = 500

Cost price of mobile = 100 × 500 = 50000

26. **Answer: A**

Solution

Passing marks for class X
= (1225 + 125) = 1350
Passing marks of class IX = $\frac{2}{3} \times 1350 = 900$

27. **Answer: C**

Solution

Let Prerna's salary be Rs x.
Now, according to the question,
90% of 15% of x = 2896
$\therefore x = \frac{2896}{0.9 \times 0.15}$
$\therefore R \approx 21450$

28. **Answer: A**

Solution

the amount be 'x'
$\therefore \frac{x \times 3.5 \times 12}{100} - \frac{x \times 3.5 \times 8.5}{100} = 189.875$
$42x - 29.75x = 18987.5$
$\therefore x = \frac{18987.5}{12.25} = 1550$

29. **Answer: B**

Solution

Let Mrs. Kapoor's monthly income be x. Then, 25% of x = 7125
$x = \frac{7125 \times 100}{25}$ = Rs. 28500
Total monthly amount invested by Mrs. Kapoor = 25% + 24% + 11% = 60%
$\therefore$ 60% of 28500 = Rs.17100

30. **Answer: E**

Solution

Total maximum marks
= 100 + 120 + 150 = 370
Total marks in History and English
= 95 + 80 = 175
Total marks required by her to get 70%
= 370 × 70% = 259
So, she needs
259 – 175 = 84 marks to score 70%

31. **Answer: D**

Solution

To find 14.28% of 98, we can use the following formula:
$14.28\% \times 98 = \left(\frac{14.28}{100}\right) \times 98$
$\approx (1/7) \times 98$
≈ 14
Therefore, 14.28% of 98 is approximately equal to 14.

32. **Answer: B**

Solution

Step 1: Convert 5.263% to a decimal by dividing it by 100
$\frac{5.263\%}{100} = 0.05263$
Step 2: Multiply the decimal by 1881
0.05263 x 1881 = 99
Therefore, 5.263% of 1881 is 99

33. **Answer: D**

Solution

Let the salary of the man be 1000k
Let the children be X, Y and Z

	X	Y	Z	Total
Money received	100k	180k	220k	500k
Spent	40% = 40k	60% = 108k	25% = 55k	
Money left	60k	72k	165k	297k

Money left with the man = 500k
Difference = 500k – 297k = 203k
203k = 1015
k = 5
Salary of man = 1000k = Rs. 5000.

34. **Answer: A**

Solution

ABD scored his runs only in boundaries
Let the number of fours be X and numbers of sixes be Y
Total balls played =16
X + Y = 16 ··· I
Total runs scores =86
4X + 6Y = 86 ···II
Solving I and II we get
X = 5 and Y = 11
Runs scored in boundaries = 20
% of runs scored in boundaries
$= \frac{20}{86} \times 100 = 23.25\%$

35. **Answer: A**

Solution

The original weight to be bought and sold is 1000gm but he bought x% more and sold only 800gm.
he bought $1000 \times \left(1 + \frac{x}{100}\right)$ gms and sells only 800gms for every 1000 gms
He further sells at 10% above the cost price, so we can say he sells only $800 \times \left(\frac{10}{11}\right)$ gms instead of 800gms

So, he sells only $800 \times \left(\frac{10}{11}\right)$ gms for every $1000 \times \left(1 + \frac{x}{100}\right)$ gms bought which earns him a profit of 65%.

$800 \times \left(\frac{10}{11}\right)\left(\frac{165}{100}\right) = 1000\left(1 + \frac{x}{100}\right)$

We get, x = 20%

36. **Answer: B**

Let the number of females be 3x and male be 2x.

Thus, number of employees which work below level 2

$= (75\% \times 3x) + (80\% \times 2x) = \frac{77x}{20}$

Required% = $\frac{(77x/20)}{5x} \times 100 = 77\%$

37. **Answer: A**

Solution

Let the initial price of Lalu be Rs. 100 per unit and Lalu's consumption be 10 units.

∴ Initial amount spent = 100 × 10 = Rs. 1,000

New price of rice = 120% of 100 = Rs. 120 and new total amount spent

= 108% of 1000 = Rs. 1,080

∴ New consumption = $\frac{1080}{120}$ = 9 units

∴ Decrease in consumption = 1 unit

% decrease = $\frac{1}{10} \times 100 = 10\%$

38. **Answer: B**

Solution

Suppose the production of the company in the year 2014 be x.

Then production of the company in year 2018

$= x \times \frac{115}{100} \times \frac{115}{100} \times \frac{80}{100} \times \frac{125}{100} = 1.32x$

∴ Increase % in the production in year 2018

$= \frac{(1.32x - x) \times 100}{x}$ = 32%

39. **Answer: C**

Solution

$\frac{5}{6}$ corresponds to 83.33%.

Hence, the amount that he kept with him corresponds to

100 − (83.33 + 5 + 10) = 1.67% of the total amount with him. This corresponds to Rs. 850

Also, because he placed 10% in debentures and he got 10% interest, amount obtained in interest = 10% of 10% of amount with him i.e., 1% of the amount with him.

∴ Interest earned = $\frac{(850\ x\ 1)}{1.67}$ = 850 x $\frac{3}{5}$ = 510

40. **Answer: C**

Solution

Original cost of a car and house

= 500000 + 700000 = Rs. 12,00,000

New cost of car

= 500000 × 0.85 × 0.87 × 0.89

= Rs. 329077.5

New cost of house

= 700000 × 1.1 × 1.12 × 1.14 = Rs. 983136

∴ Total new cost = Rs. 13,12,213.5

∴ Change = 1,12,213.5 ≈ Rs. 1,12,214

41. **Answer: E**

Solution

Let the salary of Ashok to Bhanu be 4x and 9x respectively.

Then , 9x × $\frac{145}{100}$ = 33930

= 9x × $\frac{33930 \times 100}{9 \times 145}$ = 2600

∴ Ashok's salary = 4x = 4 × 2600 = 10400

42. **Answer: A**

Solution

The quantity of pulp (the part that is not water) in 90 kg of fresh sugarcane

= $\frac{16}{100}$ × 90kg

This is also the quantity of pulp in the dried sugarcane formed.

Dried sugarcane has 72% pulp

= $\frac{16}{100}$ × 90 = $\frac{72}{100}$

(Quantity of dried sugarcane formed)

= $\frac{72}{100}$ × X (say)

∴ X = 20

43. **Answer: A**

Solution

Let the population of Salt Lake = 9x,

The population of South Kolkata = 8x, and The population of Rajarhat = 3x

The total population of these three localities = 9x + 8x + 3x = 20x

The number of literate in Salt Lake = 80% of 9x = 7.2x

The number of literate in South Kolkata = 70% of 8x = 5.6 x

The number of literate in Rajarhat = 90% of 3x = 2.7x

The total number of literate in these three localities = 7.2x + 5.6x + 2.7x = 15.5x

Hence Required percentage

= $\frac{15.5\ x}{20x}$ × 100 = 77.5 %

44. **Answer: A**

Solution

Let Narendra Modi is denoted by M, Rahul Gandhi is denoted by R and Arvind Kejriwal is denoted by A.

Now let R gets vote = x ⋯(I)

M = 1.4x ⋯(II)

M – A = 54000 ⋯(III)

R = 1.1A ⋯(IV)

From equation (II) and (IV) we get,

M = 1.4 × 1.1A = 1.54A ⋯(V)

From equation (III) and (V) we get,

0.54A = 54000

A = 100000

M = 1.54 × 10000 = 154000

R = 1.1 × 100000 = 110000

Hence total votes pole in election = (154000 + 110000 + 100000) = 364000

From question 90% of total votes pole on voting list.

Hence vote in voting list = $\frac{364000 \times 100}{90}$ = 404444

45. **Answer: C**

Solution

40% of students in Class A are boys, and 37.5% of boys in class B are boys.

The overall percentage of boys should lie between these two numbers.

Now, class A has at least twice as many students as class B. So, the overall weighted average should definitely be closer to the percentage of boys in class A, or closer to 40%.

Now, the number of students in class A can be much higher than the number in class B, in which case the overall percentage would practically be 40%.

This is the maximum percentage that can be there.

For the minimum percentage, we need to consider the other extreme–where class A has exactly twice as many students as class B.

The weighted average would be

= $\frac{2 \times 40\% + 1 \times 37.5}{3}$ = 39.17%

46. **Answer: B**

Solution

Budget spent on 10% of days = 12%

So, in 1% of days = $\frac{12}{10}$

35% remaining days in city = $\frac{12}{10}$ × 35= 42

Overall budget spent on 45% of days in city = 54%

Days remaining = 55%, Budget remaining = 46%

In 1% of day remaining, he can spend = $\frac{46}{55}$ of budget

Therefore, % decrease required

= $\frac{\frac{12}{10} - \frac{46}{55}}{\frac{12}{10}} \times 100$

= 30.33%

47. **Answer: C**

Solution

In the year 2015, let the population of the city increased by x over the previous year

Then, In the year 2015, the population of the city = 20000 + x

In the year 2016, 20000 + x + x = 20000 + 2x

In the year 2017,

20000 + x + x + x = 20000 + 3x

In the year 2018, the population of the city = 120% of (20000 + 3x) = 20000 + 11200

24000 + 3.6x = 31200

3.6x = 7200

x = 2000

In the year 2015,

The % increase = $\frac{2000 \times 100}{20000}$ = 10%

In the year 2016, the population = 20000 + 4000 = 24000

In the year 2017, it increased by 2000

The % increase = $\frac{2000 \times 100}{24000} = \frac{200}{24} = \frac{25}{3}$ %

The required ratio = 10: $\frac{25}{3}$ =6:5

48. **Answer: D**

Solution

Total savings of A and B = 50% of their total income

So, Total expenditure of A and B also will be equal to 50% of their total income

Average expenditure = Rs. 16000

So, Total expenditure = Rs. 32000 = 50% of their total income

So, Total income of A and B = Rs. (32000 × 2) = Rs. 64000

Hence option D is correct.

Alternate Method: -

	Salary	Expenditure	Savings
A	6k	4k	2k
B	10k	4k	6k

Salary of A is 37.5% of the total salary of A and B.

Let the total salary of A and B = 16k

The Salary of A = (3/8) × 16k = 6k → Salary of B =

10k B saves 60% of his salary and total savings of A and B is 50% of their total income.
Savings of B = 60% (10k) = 6k → Exp (B) = 4k
Total savings of A and B = 50% (16k) = 8k → savings (A) = 8k – 6k = 2k → Exp (A) = 2k
Their average expenditure is Rs 16000
Average expenditure of A and B = 4k = 16000 → k = 4000
Total salary of A and B = 16k = Rs 64000

49. **Answer: D**

Solution

Let the number of students in class = 80k
Students pass in both the English and Hindi = 25% (80k) = 20k
37.5% of the students failed in both the subjects = 37.5% (80k) = 30k
60% students failed in Hindi = 60% (80k) = 48k
Students who failed in Hindi & passed in English = 48k – 30k = 18k
Students who failed in English & Passed in Hindi = 80k – (20k + 48k) = 12k
The difference between the students who passed in English and those who passed in Hindi is 15
6k = 15
k = $\frac{5}{2}$
Total strength of class = 80k = 80 x $\frac{5}{2}$ = 200

50. **Answer: B**

Solution

Let total students = N
Students in hostel A = $33\frac{1}{3}$ % of N = $\frac{N}{3}$
Students in hostel B = N – $\frac{100N}{3}$ = $\frac{2N}{3}$
According to question
$\therefore \frac{N}{3} + 20 = \frac{N}{2}$
$\therefore 20 = \frac{N}{6}$
$\therefore$ N = 120
Now, if 20 students from hostel A are shifted to hostel B
$\therefore \frac{\frac{N}{3} - 20}{N}$ x 100 = $\frac{20}{120}\ x\ 100 = 16.67\%$

PROFIT & LOSS SOLUTIONS

1. **Answer: B**

Solution

Cost Price (C.P.)

= Rs. (4700 + 800) = Rs. 5500

Selling Price (S.P.) = Rs. 5800

Gain = (S.P.) – (C.P.)

= Rs. (5800 – 5500) = Rs. 300

$\therefore$ Gain (%) $= (\frac{300}{5500} \times 100)\ \% = 5\ \frac{5}{11}\%$

2. **Answer: B**

Solution

Let C.P. of each chocolate be Re. 1 C.P. of x chocolate = Rs. x

S.P. of x chocolates = Rs. 20

Profit = Rs. (20 – x)

Therefore, $\left[\frac{20-x}{x} \times 100 = 25\right]$

2000 – 100x = 25x

125x = 2000 → $\therefore$ x = 16

3. **Answer: C**

Solution

C.P. of 6 biscuits = Re. 1

S.P. of 6 biscuits = 120% of Re. 1 = 6/5

For Rs. $\frac{6}{5}$, biscuits sold = 6

For Re. 1, biscuits sold = (6 * 5/6) = 5

4. **Answer: C**

Solution

C.P = Rs. $\left(\frac{100}{122.5} \times 392\right) = Rs.320$

Profit = Rs. (392 – 320) = 72

5. **Answer: C**

Solution

S.P. = 85% of Rs. 1400

$= Rs.\left(\frac{85}{100} \times 1400\right)$

$= Rs.1190$

6. **Answer: D**

Solution

Suppose, number of toys bought = L.C.M. of 6 and 5 = 30.

C.P. of 30 toys $= Rs.\left(\frac{5}{6} \times 30\right)$

= Rs. 25

S.P. of 30 toys $= Rs.\left(\frac{6}{5} \times 30\right) = Rs.36$

Gain % $= \left(\frac{11}{25} \times 100\right)\% = 44\%$

7. **Answer: A**

Solution

100 yea C.P of 1 mango $= \left(\frac{350}{100}\right)$ = Rs. 3.50

S.P. of 1 mango $= \left(\frac{48}{12}\right) = Rs.4$

Gain % $= \left(\frac{0.5}{3.5} \times 100\right) = \frac{100}{7}\%$ = 14 $\frac{2}{7}\%$

8. **Answer: A**

Solution

Let the cost price and market price of the article be 'x' and 'y' respectively.

Case 1: Successive discounts of 20% and 25% selling price of the article

= (0.8)(0.75)(y) = 0.6y

Therefore, 0.6y = 1.2x or, y = 2x

Case 2: A single discount of 25%

Selling price of the article = 0.75y = 1.5x

Net profit per cent $= \left[\frac{1.5x-x}{x}\right] 100$

=50%

9. **Answer: B**

Solution

Percentage profit

$= \left[\frac{120-100}{100}\right] \times 100 = 20\%$

Percentage loss

$= \left[\frac{120-100}{120}\right] \times 100 = 16.7\%$

10. **Answer: B**

Solution

If C.P. = Rs 100

Profit of 10% – Loss of 10%

= 110 – 90 = Rs 20

When C.P. = Rs. X

Profit of 10% – Loss of 10% = Rs. 108

$X = \frac{108}{20} \times 100 = Rs.540$

11. **Answer: B**

Solution

If C.P = 100, M.P = 130

SP= $\left(\frac{1}{4}\right) \times 110.5 + \left(\frac{1}{2}\right) \times 130 + \left(\frac{1}{4}\right) \times 91$

S.P = 27.625 + 65 + 22.75 = 115.375

Hence, Profit = 15.375%

12. **Answer: D**

Solution

Marked price of the article = Rs 1,600

Therefore, Selling price

= (100 – 10)% × (100 – r%)×1600

$= \left(\frac{90}{100}\right) \times \left[\frac{100-r}{100}\right] \times 1600$

Given, $1224 = \frac{9}{10x(100-r)} \times 16$

$= 1224 \times \frac{10}{9\times16} = (100 - r)$

85 = 100 – r → $\therefore$ r = 15%

13. **Answer: A**

Solution

6 dozen egg cost = Rs 10.80

Since one dozen is rotten, he sells 5 dozen at 5 eggs per rupee.

Hence, S.P = Rs 12

Thus, Gain %

$= \left[\frac{12-10.8}{10.8}\right] \times 100 = 11\frac{1}{9}\%$

14. **Answer: A**

Solution

Let C.P. of the book be Rs. 'X'

Given, 1.08X – 0.92X = 12

→ 0.16X = 12

$X = \frac{12}{0.16} = Rs\ 75$

15. **Answer: B**

Solution

Suppose S.P of 33 meters of cloth = Rs 33

Therefore, Gain = Rs 11 => C.P = Rs 22

Gain % $= \frac{11}{22} \times 100 = 50\%$

∴ Gain = 50%

16. **Answer: C**

Solution

Let C.P. of 12 books = Rs 12

Therefore, S.P. of 10 books = Rs 12

C.P. of 10 books = Rs 10

Therefore, Profit = 20%

17. **Answer: D**

Solution

C.P. of the 1st Motor Cycle

$= \frac{9900\times100}{100+10} = Rs.9000$

C.P. Of the 2nd Motor Cycle

$= \frac{9900\times100}{100-10} = Rs.11000$

Total C.P = Rs 20,000

Total S.P = Rs 19,800

Therefore, Loss per cent

$= \left(\frac{200}{20000}\right) \times 100 = 1$

18. **Answer: C**

Solution

Let the list price of the book be Rs. 100.

∴ the booksellers cost price (CP) is Rs. 58.

The seller's profit = 20% = 1.2 × 58 = 69.6

∴ maximum discount that the seller can offer = 100 – 69.6 = 30.4%

19. **Answer: D**

Solution

Let the cost price of the washing machine be Rs. 100 and list price be Rs. x.

Then, $x - x \times \frac{20}{100} = 112$

⇒ 0.8x = 112 ⇒ x = Rs. 140

When the shopkeeper gives a discount of 25%, then selling price =

$140 - 140 \times \frac{25}{100} = 140 - 35 = Rs.105$

Hence, there will be a profit of 5%.

20. **Answer: A**

Solution

Loss = CP – SP.

1 dozen SP = 6 dozen CP – 6 dozen SP

7 dozen SP = 6 dozen CP

Loss% $= \frac{1}{7} \times 100 \approx 14.28$

21. **Answer: B**

Solution

SP of television

= 3200 × (1 – 0.25) × (1 – 0.15) = Rs. 2040

22. **Answer: B**

Solution

Total selling price = Rs. 24,000 and in this type of transaction there is always loss.

Therefore, loss percentage

$= \left(\frac{20}{100}\right)^2 = 4\%$

Now, total cost price

$= \frac{24000\times100}{96} = Rs.25{,}000$

Loss = 25000 – 24000 = Rs. 1,000

23. **Answer: A**

Solution

Let CP of one article = Rs. 1

CP of 5 articles = Rs. 5.

SP of 5 articles = CP of 4 articles = Rs. 4.

Hence SP < CP

Loss = 5 – 4 = 1

∴ Loss % $= \frac{1}{5} \times 100 = 20\%$

24. **Answer: D**

Solution

Let x kg be the quantity sold at 17% profit, and the price of sugar be Rs. 1/kg

∴ 1.17x + (100 – x) 1.07 = 110 ⇒ 0.10x = 3 ⇒ x = 30

25. **Answer: A**

Solution

Let C.P. of the book be Rs. x

Since loss = 20% S.P. = Rs. 0.8x

If S.P. = Rs. (0.8x + 3), profit = 30%.

Hence

$= Rs.\frac{100}{3}(0.8x + 3) \rightarrow \therefore x=6$

∴Required profit percentage

$= \frac{6.60-6.00}{6} \times 100 = 10\%$

26. **Answer: B**

Solution

Let C.P. be Rs. x and S.P. be Rs. Y

Then, 3(y – x) = (2y – x) y = 2x

Profit = Rs. (y – x) = Rs. (2x – x) = Rs. X

Profit % $= \left(\frac{x}{x} \times 100\right)\% = 100\%$

27. **Answer: B**

Solution

Let C.P.= Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420

New C.P. = 125% of Rs. 100 = Rs. 125

New S.P. = Rs. 420

Profit = Rs. (420 – 125) = Rs. 295

Required Percentage

$= \left(\frac{295}{420} \times 100\right)\% = \frac{1475}{21}\% = 70\%$

28. **Answer: A**

Solution

Let C.P. be Rs. x

Then, $\frac{1920-x}{x} \times 100$

$= \frac{x-1280}{x} \times 100$

1920 – x = x – 1280

2x = 3200 → ∴ x = 1600

Required S.P. = 125% of Rs. 1600

$= Rs.\left(\frac{125}{100} \times 1600\right)$ = Rs. 2000

29. **Answer: C**

Solution

Cost Price of 1 book $= Rs.\left(\frac{375}{12}\right)$

= Rs. 31.25

Selling Price of 1 book = Rs. 33

So, Gain = Rs. (33 – 31.25) = Rs. 1.75

Profit % $= \left(\frac{1.75}{31.25} \times 100\right)\%$

$= \frac{28}{5}\% = 5.6\%$

30. **Answer: D**

Solution

(C.P. of 17 pens) – (S.P. of 17 pens)

= (C.P. of 5 pens)

C.P. of 12 pens = S.P. of 17 pens = Rs.720

C.P. of 1 pen $= Rs.\left(\frac{720}{12}\right) = Rs.60$

31. **Answer: C**

Solution

85 : 18700 = 115 : x

$x = \left(18700 \times \frac{115}{85}\right) = 25300$

Hence S.P. = Rs. 25,300

32. **Answer: B**

Solution

C.P. of 1st cycle $= \left(\frac{100}{120} \times 840\right)$

= Rs. 700

C.P of 2nd cycle $= \left(\frac{100}{96} \times 960\right)$

= Rs. 1000

So, total C.P. = Rs. (700 + 1000)

= Rs. 1700.

Total S.P. = Rs. (840 + 960) = Rs. 1800.

Gain % $= \left(\frac{100}{1700} \times 100\right) = 5\ \frac{15}{17}\%$ gain

33. **Answer: B**

Solution

C.P. of 56 kg rice = Rs. (26 × 20 + 30 × 36)

= Rs. (520 + 1080) = Rs. 1600.

S.P. of 56 kg rice = Rs. (56 × 30)

= Rs. 1680.

Gain $= \left(\frac{80}{1600} \times 100\right) = 5\%$

34. **Answer: C**

Solution

Assume 'A' to be the cost price.

Therefore,

$\left[\left\{\left(\frac{3}{5}\right) \times A \times \left(\frac{10}{100}\right)\right\} - \left\{\left(\frac{2}{5}\right) \times A \times \frac{5}{100}\right\}\right]$

$= 1500$

Or A = Rs 37,500

35. **Answer: B**

Solution

If C.P. = Rs 100

Given, 115% of C.P – 85% of C.P = Rs 30

When C.P. = Rs 'X'

115% of C.P – 85% of C.P = Rs 450

Therefore, $X = \frac{450}{30} \times 100 = 1500$

36. **Answer: D**

Solution

Since S.P. = 5 (M.P. – S.P.)

=> 5 M.P. = 6 S.P.

M.P. $= \left(\frac{6}{5}\right) S.P$

Since the percentage discount = Percentage profit,

$\left[\frac{\left\{\left(\frac{6}{5}\right)S.P. - S.P.\right\}}{\left(\frac{6}{5}\right)S.P}\right] \times 100 = \frac{S.P-C.P}{C.P} \times 100$

Therefore, $\frac{1}{6} = \frac{S.P}{C.P} - 1$

$= S.P = \left(\frac{7}{6}\right) C.P$

$M.P = \frac{6}{5} S.P$

$= \frac{6}{5} \times \frac{7}{6} C.P$

$= \frac{7}{5} C.P$

Therefore, Ratio of discount to C.P

$= \frac{M.P - S.P}{C.P}$

$= \left[\frac{\left\{\left(\frac{7}{5}\right)C.P - \left(\frac{7}{6}\right)C.P\right\}}{C.P}\right] = \frac{7}{30}$

Therefore, the ratio is 7 : 30

37. **Answer: B**

Solution

Let the cost price be Rs 100

Then, market price is Rs 140

Now, the first discount is of 28.57% (approx.) = $\frac{2^{th}}{7}$ of market price.

Hence, its selling price

$= 140 \times \frac{5}{7} = Rs.100$

Now since you are selling at cost price, any further discount will be equal to loss percentage.

38. **Answer: B**

Solution

Profit would be maximum if watches are brought for Rs 200 and sold for Rs 425

Profit = Rs (425 – 200) = Rs 225

Profit of 8 watches = Rs 225 × 8

= Rs 1,800

39. **Answer: C**

Solution

Let the C.P of 1000g of goods be Rs 1,000

Market price = Rs 1,200

Selling price = Rs 1,200 × 0.9 = Rs 1,080 (after discount of 10%)

If Rs 1080 is the selling price of 900g of goods (as he cheats of 10 % while selling)

C.P of 900g = Rs 900

Profit = Rs 180

Therefore, Profit %

$= \left(\frac{180}{900}\right) \times 100 = 20\%$

40. **Answer: C**

Solution

let S.P. of X books = Rs 100

= C.P. of 20 books

Therefore, C.P. of one book

= Rs 5

Profit = 25 %

Therefore, S.P of one book = 6.25

S.P of X articles = 6.25 × X

6.25 × X = 100 → ∴ X = 16

41. **Answer: C**

Solution

Cost price of one kg of orange in which the three varieties of oranges are mixed in the ratio 2 : 3 : 5 is equal to S where

S = 0.2 × 20 + 0.3 × 40 + 0.5 × 50 = Rs 41

Selling price per kg of oranges to ensure there is a net profit of 20%

= 1.2 × 41 = Rs 49.2

42. **Answer: B**

Solution

Let the article costs 'X' to A

Cost price for B = 1.2X

Cost price for C = 0.75(1.2X) = 0.9X

Cost price for D = 1.4(0.9X) = 1.26X = 252

X = 200

Amount paid by A for the article = Rs. 200

43. **Answer: D**

Solution

Let the cost price of A's house = Rs X

Therefore, Cost price of E's house

= 1.1 × 1.15 × 1.25 × 1.35 × X

Therefore, 3500000

= 1.1 × 1.15 × 1.25 × 1.35 × X

$X = \frac{3500000}{1.1 \times 1.15 \times 1.25 \times 1.35}$

= Rs 16,39,584.25

The nearest option is Rs 16,40,000.

44. **Answer: C**

Solution

Cost price of 12 mangoes is equal to the selling price of 9 mangoes,

Let CP = 3x

∴ 9SP = 36x

∴ SP = 4x

∴ P = x

∴ 5P = 5x

MP = SP + Discount = 40x + 5x

∴ 10MP = 45x

D% = 5x/45x = 1/9 =11.11%

∴ P% = x/3x = 33.33%

∴ P% – D% = 22.22%

45. **Answer: C**

Solution

Let's assume John bought the laptop for Rs. 100,

He then sells it to Mark for Rs. 80,

Who consequently sells it to Kevin for Rs. 100,

Then, Kevin sells it back to Mark for Rs. 90 (Rs.4.50 for every Rs. 5 that he had paid initially), so he suffers a loss of Rs. 10,

Therefore, for Rs 100 there is a loss of Rs. 10,

Then for Rs. 1,75,000 there will be a loss of Rs. 17,500

46. **Answer: C**

Solution

Let C.P. of 1000g = Rs. 1000

Profit % = K %

Profit $= \frac{K}{100} \times 1000 = 10K$

He then cheats his customer by giving 880 g only instead of 1 kg,

So, C.P of 880 g = Rs. 880

S.P. of 880 g = 1000 + 10K

Profit % $= \left[\frac{1000+10K-880}{880}\right] \times 100 = 25$

K = 10%

47. **Answer: B**

Solution

Let actual price of the book = Rs X

Let actual price of the pen = Rs Y

Therefore, (X + 15% of X) + (Y – 5% of Y) = X + Y + 7

15X – 5Y = 700 …….(i)

Also (X + 10% of X) + (Y + 5% of Y)

= X + Y + 13

10X + 5Y = 1300

Using (i) and (ii) we get X = 80, Y = 100

48. **Answer: D**

Solution

Suppose Rehman buys (LCM of 15, 20 and 35) = 420 apples.

Total cost of apples bought at 15 for a rupee $= \frac{420}{15} = Rs..28$

Total cost of apples bought at 20 for a rupee $= \frac{420}{20} = Rs.21$

∴ Total C.P = Rs. (28 + 21) = Rs. 49

S.P for (420 + 420) 840 apples

$= \frac{Rs.840\times2}{35} = Rs.48$

∴ Loss % $= \frac{49-48}{49} \times 100 = 2.04\%$

Therefore, actual price of the book = Rs 80

49. **Answer: D**

Solution

Let the cost of 1 apple be 'a', cost of 1 mango be 'm' and the cost of 1 orange be 'o'

Therefore,

2a + 3m + 4r = a + 2m + 2r + 6

∴ a + m + 2r = 6 --- (1)

a + 2m + r + 8 = 3a + 3m + 5r

∴ 2a + m + 4r = 8 ---(2)

Multiply (1) by 2

∴ 2a + 2m + 4r = 12 ---(3)

(3) – (2)

m = 4

∴ a + 2r = 2 ---(4)

Multiply (4) by 3

3a + 6r = 6

∴ 3a + 6r + m = 6 + 4 = 10

∴ CP = 10

MP = 12

P = 5% = 0.5

∴ SP = 10.5

∴ d% = (1.5 × 100)/12 = 12.5%

50. **Answer: E**

Solution

First sale at 20% loss:

Selling price = $12{,}000 \times (1 - 0.20) = 12{,}000 \times 0.8 =$ ₹9,600

He buys back at ₹9,600.

Final sale at 25% profit on ₹9,600:

Selling price = $9{,}600 \times (1 + 0.25) = 9{,}600 \times 1.25 =$ ₹12,000

Total buying cost = ₹12,000 + ₹9,600 = ₹21,600

Total selling price = ₹9,600 + ₹12,000 = ₹21,600

Overall profit or loss = $21{,}600 - 21{,}600 = 0$. No profit, no loss.

RATIO AND PROPORTION SOLUTIONS

1. **Answer: D**

   Solution

   Let the third number be x.

   Then, first number = 125% of x = 125x / 100

   = 5x / 4

   Second number =175% of x = 175x / 100 = 7x/4

   Ratio of first two numbers = 5x/4 : 7x/4 = 5 : 7

2. **Answer: A**

   Solution

   Let the original expenses of Rahul and Saurabh be Rs. 2x and Rs. 3x respectively.

   Then,

   (2x + 4000) / (3x + 4000) = 40 / 57

   ⇒ 57 × (2x + 4000) = 40 × (3x + 4000)

   ⇒ 6x = 68,000

   ⇒ 3x = 34,000

   Saurabh's present expenses = (3x + 4000) = Rs.(34000 + 4000) = Rs. 38,000.

3. **Answer: A**

   Solution

   Rs.(805 × 6/23)

   Given ratio = 1/2 : 2/3 : 3/4 = 6:8:9

   1st part = Rs. 805 × (6/23) = Rs. 210

4. **Answer: B**

   Solution

   (x × 5) = (1.125 × 8)

   X = 9/5 = 1.80

5. **Answer: A**

   Solution

   Compounded Ratio :: When we compound two or more ratios with each other through product or multiplication, the result is simply a compound ratio.

   Thus, the product of two or more ratios, i.e., ab: cd is a ratio compounded of the simple ratios a:c and b: d.

   Required compounded ratio = (5/6 x 3/11 x 11/5) = 1/2.

6. **Answer: C**

   Solution

   Let the quantity of milk and water be 4x litres and 3x litres respectively

   4x / (3x+5) = 4 / 5

   20x = 4(3x+5)

   8x = 20

   x = 2.5

   Quantity of milk = (4 x 2.5) litres = 10 litres.

7. **Answer: E**

   Solution

   Let the salaries of X, Y, Z be x, 2x and 3x respectively.

   Then, 2x + 3x = 5000 → x = 1000.

   X's salary = Rs. 1000, Y's salary = Rs. 2000, and Z's salary Rs. 3000.

   Excess of Z's salary over X's

   = [(2000 / 1000) x 100] = 200%.

8. **Answer: D**

   Solution

   3X = 4Y = 7Z = k, then X = k/3, Y = k/4 and Z = k/7.

   X : Y : Z = k/3 : k/4 : k/7 = 28 : 21 : 12.

   Z's share = Rs. [488 × (12/61)] = Rs. 96

9. **Answer: A**

   Solution

   Originally, let the number of seats for Arts, Science and Commerce be 5x, 7x and 8x respectively.

   Number of increased seats are (140% of 5x), (150% of 7x) and (175% of 8x).

   ⇒ [(140/100) × 5x],[(150/100) × 7x] and [(175/100) × 8x]

   ⇒ 7x, 21x/2 and 14x.

   ⇒ The required ratio =7x : 21x/2 : 14x

   ⇒ 14x : 21x : 28x

   ⇒ 2 : 3 : 4

10. **Answer: B**

    Solution

    Suppose there are all the hens then total no of heads are 340 and total no of legs are 680.

    Now, since 380 = (1060 – 680) legs are extra, it means there will be 190 = (380/2) cows. As we know a cow has two extra legs than that of a hen.

    Therefore, number of cows = 190 and number of hens = 340– 190 = 150.

11. **Answer: E**

    Solution

    Let the third proportion to 18 & 24 be 'x'.

    → 18 : 24 = 24 : p

→ p = 24 × (24/18) = 32

12. **Answer: D**

Solution

Given ratio = 7 : 5 : 3 : 4, Sum of ratio terms = 19.

Smallest part = 95 × (3/19) = 15.

13. **Answer: C**

Solution

Indian stamps are common to both ratios. Multiply both ratios by factors such that the Indian stamps are represented by the same number.

Russian : Indian = 5 : 2, and Indian : UK = 5 : 1.

Multiply the first by 5, and the second by 2.

Now Russian : Indian = 25 : 10, and Indian : UK = 10 : 2

Hence the two ratios can be combined and Russian : UK = 25 : 2

14. **Answer: E**

Solution

Cat : Rat = (4 × 3) leaps of rat : 5 leaps of rat = 12 : 5.

15. **Answer: B**

Solution

Assume the weight of alloy A is 100 kg

Therefore, the weight of alloy B is 400kg

	Iron	Nickel	Copper
A	40kg	60kg	0kg
B	140kg	160kg	100kg
Total	180kg	220kg	100kg

Therefore, Ratio of Iron and Nickel in new alloy = 180 : 220 = 9 : 11

16. **Answer: C**

Solution

Let the number of boys and girls be 9x and 6x.

6x = 180, x = 30.

Total number of students = 15x = 15 × 30 = 450.

17. **Answer: E**

Solution

Let the two numbers be 4x and 7x

Difference = 7x−4x=3x=27

⇒x=9

Numbers:

4x=36, 7x=63

Since 36 and 63 do not match the options, **E.**

18. **Answer: E**

Solution

Let Pencils = 8x, Pens = 2x & Exercise books = 3x.

Now, 8x = 120 hence x = 15.

Number of exercise books = 3x = 45.

19. **Answer: A**

Solution

Minimum number of chocolates are possible when he purchases the maximum number of costliest chocolates.

Thus, 3 × 5 + 5 × 1 = Rs.20

Now Rs.100 must be spent on 10 chocolates as 100 = 10 × 10.

Thus, minimum number of chocolates = 5 + 1 + 10 = 16

20. **Answer: E**

Solution

Let the incomes of A and B be 5P and 6P.

If each saves Rs. 100 per month, then their expenditures = Income – savings = (5P – 100) and (6P – 100).

The ratio of their expenditures is given as 1 : 2.

Therefore, (5P – 100) : (6P – 100) = 1 : 2

Solving, we get P = 25.

Substitute this value of P in 5P and 6P.

Thus, their incomes are: Rs.125 and Rs.150

21. **Answer: B**

Solution

Let the three parts be A, B, C. Then,

A : B = 2 : 5 and B : C = 3 : 8

→ A : B : C = 6 : 15 : 40

Thus, B = 427 × (15/61) = 105.

22. **Answer: C**

Solution

Ratio of fruits (by dozen) = 4:2:7

Ratio of fruits (by weight) = 90 : 150 : 24

Therefore, Ratio of fruits (combined. by weight) = 4 × 90 : 2 × 150 : 7 × 24 = 30 : 25 : 14

23. **Answer: A**

Solution

Let us say x boys and x girls joined the group.

(72 + x) / (40 + x) = 4 / 3

216 + 3x = 160 + 4x → x = 56

Number of members in the group

= 72 + x + 40 + x = 112 + 2x = 224.

24. **Answer: E**

Solution

Let the ratio be x : (x + 45), then,

x / (x + 45) = 2 / 7

7x = 2x + 90

∴ x = 18

Required ratio = 18 : 63

25. **Answer: C**

Solution

Let the ratio be 'R'

number of boys = 135

Then,

9R = 135

R = 15

Therefore, number of girls = 5R = 5 × 15 = 75

Total number of students = 210

26. **Answer: E**

Solution

The ratio of fees collected from B.Tech : MBA = 6x × 25y : 5x × 18y

= 150xy : 90xy

= 5xy : 3xy = 5k : 3k

The amount collected only from MBA students

= (3/8) × 1.62 lakh

= Rs. 60,750

27. **Answer: E**

Solution

Virat : Amit = 7:5, Amit : Abhinav = 3:2

∴ Virat : Amit : Abhinav = 21:15:10

Abhinav : Virat = 10 : 21

28. **Answer: E**

Solution

let the ratio be x.

Hence no. of coins be 6x, 5x, 4x respectively

Now given total amount = Rs.186

→ (0.50)(6x) + (0.25)(5x) + (0.10)(4x) = 186

we get x = 40

→ No. of 50p coins = 240

→ No. of 25p coins = 200

→ No. of 10p coins = 160

29. **Answer: B**

Solution

Step (i): Let x be the number of boys and y be the number of girls.

Given total number of boys and girls = 100

x + y=100 ---------- (i)

Step (ii): A boy gets Rs. 3.60 and a girl gets Rs. 2.40

The amount given to 100 boys and girls = Rs. 324

3.60x + 2.40y = 324 ---------- (ii)

Step (iii):

Solving (i) and (ii)

3.60x + 3.60y = 360 --------- Multiply (i) by 3.60

3.60x + 2.40y = 324 --------- (ii)

1.20y = 36

y = 36/1.20 = 30

Number of girls = 30

30. **Answer: A**

Solution

The ratio of the ages of X and Y is 3 : 5.

The ratio of the ages of Y and Z is 4 : 5.

Y's age is the common link to both these ratios.

Therefore, if we make the numerical value of the ratio of Y's age in both the ratios the same, then we can compare the ages of all 3 in a single ratio. This can be done by getting the value of Y in both ratios to be the LCM of 4 and 5 i.e., 20.

The first ratio between X and Y will therefore be 12 : 20 and the second ratio between Y and Z will be 20 : 25.

Now combining the two ratios, we get X : Y : Z = 12 : 20 : 25.

Let their ages be 12x, 20x and 25x.

Then, the sum of their ages will be 12x + 20x + 25x = 57x

The question states that the sum of their ages is 171.

Y's age = 171 × (20/57) = 60.

31. **Answer: D**

Solution

Let, B1 : B2 : B3 = 2x : 4x : 5x

again B1 : B2 : B3 = 5y : 4y : 3y

Since there is increase in no. of apples in first two baskets only, it means the no. of apples remains constant in the third basket

Therefore, 5x = 3y

Hence, 2x : 4x : 5x = 6xy : 12xy : 15xy

and, 5y : 4y : 3y = 25xy : 20xy : 15xy

Therefore, increment in first basket = 19

Increment in second basket = 8

Thus, required ratio = 19/8.

32. **Answer: B**

Solution

Concentration of Alcohol in

A	B	C
1/2	3/5	4/5

Quantity of Alcohol taken from A = 1 litre out of 2 litres

Quantity of Alcohol taken from B = 1.8 litre out of 3 litres

Quantity of Alcohol taken from C = 0.8 litre out of 1 litre

Therefore, total Alcohol taken out from A, B and C = 1 + 1.8 + 0.8 = 3.6 litres

So, the quantity of water = (2 + 3 + 1) – 3.6

= 2.4 litre

Thus, the ratio of Alcohol to water = 3.6 / 2.4

= 3/2

33. **Answer: D**

Solution

Let the number of failed students be x

→ Number of passed students = 4x

So total number of students was 5x

From the given data,

If total number of students be 5x – 35

→ (4x – 37 –11) / (x+11) = 2 / 1

→ 4x – 48 = 2(x + 11)

→ 4x – 2x = 22 + 48

→ x = 35

Total number = 35 × 5 = 175

34. **Answer: A**

Solution

Given total rupees = 20 Rs

No. of one rupee coupons = 3

Now, remaining money = Rs. 17

With that he buys only 2 and 5 rupee coupons

Let number of Rs. 5 coupons = K

Let number of Rs. 2 coupons = L

5K + 2L = 17

K = 3, L = 1 (possible).

L = 6, K = 1 (possible).

→ But given that they are different in number so, K is not equal to 3

∴ one rupee stamps = 3

∴ 2 two coupons = 6

∴ 5 rupee coupons = 1

Total number of stamps = 10.

35. **Answer: C**

Solution

Assume x soldiers join the fort. 1200 soldiers have provision for 1200 (days for which provisions last them)(rate of consumption of each soldier)

= (1200)(35)(4) kg.

Also provisions available for (1200 + x) soldiers is (1200 + x)(25)(3.5) k

As the same provisions are available

→ (1200)(35)(4) = (1200 + x)(25)(3.5)

x = ([(1200)(35)(4)] / (25)(3.5)) – 1200

→ x = 720.

36. **Answer: B**

Solution

p + q / p – q = 7x / x

⇒p / q = 4x / 3x

Again, $pq = 12x^2$

and, pq = 60x

so, $60x = 12x^2$ ⇒x=5

→ p = 20 and q = 15

Hence, 1/p : 1/q = 1/20 : 1/15 = 3 : 4

37. **Answer: D**

Solution

Total student= 52, boys : girls = 3:1,

Hence, number of boys = 3/4 × (52)= 39

Number of girls = 1/4 × (52) = 13,

Since Rupa ranked 15 among 52 students from top and ranked 8 among girls from bottom, this means 7 girls are below Rupa, rest 13 – 8 = 5 girls are above

her, now from 14 topper 5 are girls Hence 14-5 = 9 boys.

Hence, the number of boys below Rupa are 39-9 = 30.

38. **Answer: A**

Solution

Frequency of step of A : B : C = 5 : 6 : 7

But in terms of size of step, 6A = 7B = 8C

Therefore, Ratio of speeds of A, B and C = 5/6 : 6/7 : 7/8 = 140 : 144 : 147

39. **Answer: D**

Solution

Let the third proportional to (a^2-b^2) and (a–b) be c.

Then,

$(a^2-b^2):(a-b)::(a-b):c$

$\rightarrow (a^2-b^2) \times c = (a-b)^2$

$\rightarrow c = (a-b)^2/(a^2-b^2)=(a-b) / (a+b)$

40. **Answer: E**

Solution

If the person who gets 1/5 of the whole gets thrice of what the others get on an average, each one will get = 1/3 × 1/5 = 1/15 of the whole.

Therefore, if there are k persons other than the person who gets one-fifth, then 1/5 + k/15 = 1

$\Rightarrow$ k=12

Hence, total number of people = 13.

41. **Answer: B**

Solution

If you double the sides of a cube, the ratio of the surface areas of the old and new cubes will be 1:4.

The ratio of the volumes of the old and new cubes will be 1:8.

Weight is proportional to volume. So, If the first weighs 6 pounds, the second weighs 9 x 8 = 72 pounds.

42. **Answer: B**

Solution

Let ratio of the incomes of Atul and Pratap be 4x and 3x and ratio of their expenditures be 3y and 2y.

4x - 3y = 1889 ... (I)

and

3x - 2y = 1889 .....(II)

Acc. to I and II

y = 1889

and x = 1889

Pratap's income = 5667

43. **Answer: D**

Solution

X : Y : Z

= 3x : 4x : 5x

= (3x + x) : 2x : (5x + x) (Y Gives 1/4 to X and 1/4 to Z)

= 4x : 2x : 6x

= (4x + x) : 2x : 5x (Z Gives 1/6 to X)

=5x : 2x : 5x

Therefore, 5 : 2 : 5.

44. **Answer: E**

Solution

Ratio of decrease of wages = 25 : 22

Ratio of decrease of laborers = 11 : 15

Compound ratio of wages of laborers

= 25 × 11 : 22 × 15 = 275:330

Original bill = Rs. 5000

For 275 ratio wages = Rs. 5000

For 1 ratio wages = 5000 / 275

For 330 ratio wages = (5000/275) × 330 = Rs. 6000

45. **Answer: B**

Solution

A's spending 80%, therefore saving = 20%

B's spending 75%, therefore saving = 25%

C's spending 66.67%, therefore saving = 33.33%

Let us suppose A, B and C saves Rs. 3, 5 and 6 respectively,

20% of A's saving = Rs.3

100% of A's saving = Rs. 15

25% of B's saving = Rs. 5

100% of B's saving = Rs. 20

33.33% of C's saving = Rs.6

100% of C's saving = Rs. 18

Divide Rs. 7950 in the ratio of 15 : 20 : 18 as

A's Share = 15 / 53 × 7950 = Rs. 2250

B's Share = 20 / 53 × 7950 = Rs. 3000

C's Share = 18 / 53 × 7950 = Rs. 2700.

46. **Answer: C**

Solution

Given ratio of initial mixture of milk and water in N = 2 : 1

Let the initial quantity of mixture in vessel N = 11x

Let quantity of Milk = 2x and let quantity of water = x

According to the question,

$2x + (10 \times \frac{3}{5})/x + (10 \times \frac{2}{5}) = 8/5$

$\rightarrow 10x + 30 = 8x + 32$

$\rightarrow x = 1$

Required Initial quantity of milk = 2 × 1 = 2 lit.

47. **Answer: A**

Solution

The volume of the cylinder is:

$V_{cylinder} = \pi r^2 h = \pi(6^2)(15) = 540\pi$

The radius of the cone is 4 cm. The volume of the cone is:

$V_{cone} = (1/3)\pi r^2 h = (1/3)\pi(4^2)(6) = 32\pi$

The volume of the remaining solid is:

$V_{remaining} = V_{cylinder} - V_{cone} = (540\pi) - (32\pi) = 508\pi$

$V_{remaining} : V_{cylinder} = 508 : 540 = 127 : 135$

48. **Answer: C**

Solution

Price of actual diamond is Rs. 100000

In this type of questions, we can calculate the actual weight of diamond by adding all the ratios.

Let the weight of 4 parts be 2x, 3x, x, and 4x

So actual weight of diamond = 10x

The price of diamond is in proportion to square of its weight

$1000x^3 = 100000$

$\Rightarrow x^3 = 100$

So, the price of diamond after it is broken

$= x^3 + 8x^3 + 27x^3 + 64x^3 = 100x^3$ = Rs. 10000

So, decrease in price = 100000 – 10000

= 90000

∴ Percentage decrease in price = 90%

49. **Answer: B**

Solution

The total population of city L = 8x

The total population of city M = 9x

The literate population of city L = 4y

The literate population of city M = 5y

The illiterate population of city L = 750 × 8/15 = 400

The illiterate population of city M = 750 – 400 = 350

8x – 4y = 400 ..... (1)

9x – 5y = 350 .....(2)

(2) × 5 – (1) × 4

40x - 36x = 2000 - 1400

4x = 600

x = 150

The total population of city L = 8 × 150 = 1200.

50. **Answer: E**

Solution

5x – 2x = 30

x = 10

Ratio of the number of red balls from A and B is 3 : 5, 3y, 5y

There is more than one possible value for y.

Hence, we cannot find the answer.

SIMPLE INTEREST & COMPOUND INTEREST SOLUTIONS

1. **Answer: E**

   Solution

   Let the sum be P. Using the formula for compound interest, we have:

   $P(1 + r/100)^2 - P = 6300$

   $P(1 + 10/100)^2 - P = 6300$

   Simplifying this equation and solving for P, we get:

   P = Rs 30,000

2. **Answer: C**

   Solution

   Let the simple interest rate per annum be R. Then, we have:

   SI = P x R x T/100

   5000 × 10 × R /100=5000

   Solving for R, we get r = 10%.

   ∴ The answer is 10%

3. **Answer: C**

   Solution

   Using the formula for simple interest, we have:

   SI = P x R x T

   where P is the principal, R is the rate of interest per annum and T is the time in years.

   From the given information, we have:

   P = Rs. 2000

   R = 8%

   T = 5 years

   So, the total amount after 5 years is:

   Total amount = P + SI = 2000 + 8% x 2000 x 5 = Rs. 2800

4. **Answer: A**

   Solution

   Since the amount doubles itself in 5 years at a certain rate of simple interest, the rate of interest per annum is 100/5 = 20%.

   Let the initial amount be Rs. P. Then, the required time period is given by:

   $P(1 + 20/100)^T = 5P$

   Simplifying, we get:

   $(1 + 20/100)^T = 5$

   Solving we get, T = 20 years

5. **Answer: D**

   Solution

   Using the formula for simple interest, we get:

   SI = PRT/100

   Where P is the principal, R is the rate of interest per annum, T is the time in years, and SI is the simple interest earned.

   Substituting the given values, we get:

   SI = 43,400 - 35000 = 8400

   T = 3 years

   P = 35000

   Substituting these values in the formula, we get:

   8400 = (35000 × R × 3)/100

   Simplifying, we get:

   R = 8%

   ∴ the rate of interest per annum is 8%.

6. **Answer: E**

   Solution

   Let the principal be P. Using the formula for simple interest, we have:

   P + P(r/100) x 5 = 2P

   Simplifying this equation and solving for r, we get:

   r = 20%

   ∴ the answer is 20%.

7. **Answer: A**

   Solution

   Let the sum be P. Using the formula for simple interest, we have:

   P x 15/100 x 3 = 2,700

   P x 15/100 = 900

   Simplifying this equation and solving for P, we get:

   P = Rs 6,000

   ∴ the answer is Rs 6,000.

8. **Answer: C**

   Solution

   to solve this question, we can apply the net% effect formula,

   $\text{Net\% effect} = x + y + \frac{xy}{100}\%$

   Here, x = y = 5% (because rate of interest is same for both the years)

   By the net% effect, we get effective rate of interest

   $= 5 + 5 + \frac{5 \times 5}{100}\% = 10.25\%$

   ∴ 10.25% of 35000 = 10.25 × 350 = ₹ 3587.5

9. **Answer: C**

   Solution

   To solve this question, we can apply a short trick approach,

$$\text{Sum} = \frac{\text{Difference} \times 100^2}{r^2}$$

Given, Difference = ₹ 840, r = 20%

By the short trick approach, we get

$$\text{Sum} = \frac{840 \times 100^2}{20^2} = ₹\,21000$$

10. **Answer: A**

Solution

Required gain = 8400 × 8/100 × 2 – 8400 × 6/100 × 2

= 1334 – 1008

= Rs. 336

11. **Answer: E**

Solution

In the question we don't have any information regarding principal and the rate of interest.

So, we cannot find the solution of this question.

12. **Answer: A**

Solution

SI = 5600 × 18 × 2/100 = 2016

CI = 4200 × $(1 + 9/100)^2$ – 4200 = Rs. 790

Difference = 2016 – 790 = Rs.1226

13. **Answer: E**

Solution

S.I. for 1 year = Rs. (762 – 716) = Rs. 46

S.I. for 3 years = Rs. (46 x 3) = Rs. 138.

Principal = Rs. (716 – 138) = Rs. 578.

14. **Answer: B**

Solution

Time = 100 × 279 / 1550 × 4.5 = 4 years

15. **Answer: C**

Solution

Let rate = R% and time = R years.

Then, 4000 × R× R/100 =2560

$40R^2 = 2560$

$R^2 = 64$

R = 8

16. **Answer: D**

Solution

The amount invested by Rohan = Rs.3500

3500 × 35 × n/100 = 7 × 3500

n = 20

17. **Answer: A**

Solution

Difference = $P(R/100)^2$

480 = 12000 × $(R/100)^2$

R^2 = 800 × 5

R = 20%

Interest obtained by A = 12000 × 20 × 2/100 = Rs.4800

18. **Answer: D**

Solution

384= (15000 × r^2)/100^2

384×100^2/15000=r^2

r^2=256

r=16%

19. **Answer: B**

Solution

Let the sum be P. Using the formula for compound interest, we have:

$P(1 + 5/100)^3$ = 11,040

Simplifying this equation and solving for P, we get:

P = Rs. 9,000

20. **Answer: C**

Solution

Let the sum be P. Using the formula for simple interest, we have:

P × 10/100 × 2 = 1,500

Simplifying this equation and solving for P, we get:

P = Rs 7,500

21. **Answer: A**

Solution

The Simple Interest after three years @ 10% is 30%.

The Compound Interest after 3 years @ 10% will be 1.1 × 1.1 × 1.1 = 1.331

Cumulative rate of Interest is 33.1%.

Here, the difference after 3 years is 3.1% and, in the question, it is given to be Rs. 1860.

Thus, the Principal is 1860 × (100/3.1) = Rs. 60000

22. **Answer: A**

Solution

Let the sum be Rs.100. Then,

S.I. for first 6 months

= Rs. [100 × 20 × 1 / 100 × 2] = Rs.10

S.I. for last 6 months = Rs. [110 × 20 × 1 / 100 × 2] = Rs.11

So, amount at the end of 1 year = Rs. (100 + 10 + 11) = Rs.121

So, effective rate = (111 – 100) = 21%

23. **Answer: D**

Solution

Principal = Rs. [100 × 2800 / 14 × 5] = Rs.4000

24. **Answer: B**

Solution

S.I. = Rs. (21240 – 18000) = Rs.3240

Rate = [(100 × 3240) / (18000 × 4)]%

= 4.5%

25. **Answer: C**

Solution

Then, $[P (1+12/100)^2 - P] = 636$

$P [(112/100)^2-1] = 636$

P = (636 × 100/25.44) =2500

Hence sum =2500

So, SI =Rs (2500 × 4 × 6/100) = 600

26. **Answer: A**

Solution

As we have to calculate the sum for half time, both time period is same, and hence

a:b = b:c

10000:x = x:15,376

x = Rs 12,400

27. **Answer: D**

Solution

Given that:

Simple interest for 5 years = Rs, 1000

∴ SI for 1 year = Rs, 200

∴ SI for 3 years = Rs. 600

Now, if the principal is made four times, the interest will also become four times.

∴ SI for next 2 years = Rs, 400 x 4 = Rs, 1600

Hence, total interest after 10 years = 600 + 1600 = Rs, 2200

28. **Answer: D**

Solution

Amount = simple interest + principal

⇒ 22720 = simple interest + 16000

⇒ simple interest = 22720 – 16000

= Rs 6720

if r % be the rate of interest,

$$SI = \frac{\text{Principal} \times \text{rate\%} \times \text{time}}{100}$$

$$6720 = \frac{16000 \times r \times 3}{100}$$

∴ r = 14%

2% more interest that is 16% interest.

$$SI = \frac{16000 \times 16 \times 3}{100} = \text{Rs. } 7680$$

∴ amount he will get is Rs 16000 + Rs 7680 = Rs 23680

29. **Answer: B**

Solution

Sum=512; Amount=729

as many years, put that many root i.e.,

$\sqrt[3]{512}: \sqrt[3]{729}$ = 8:9

rate = (9-8)/8 × 100 =12.5%

30. **Answer: A**

Solution

n half yearly ➔ Time-double; Rate= half

Rate=6%; Time=4 years; Sum = Rs 34,000

$A = P [1 + (R / 100)]^n$

$A=34000 [1 + (6 / 100)]^4$ =42,924

31. **Answer: C**

Solution

Amount with CI = $32200 (1 + 5/100)^2$ = Rs. 35500.5

∴ CI = 35500.5 – 32200 = Rs. 3300.5

32. **Answer: A**

Solution

Using the formula: Difference = $P (R/100)^2$

$1728 = P [24/100]^2$

On Solving, P = Rs 30000

33. **Answer: C**

Solution

Last year interest = 4259.2 - 3872 = Rs 387.2

∴ Rate% = (387.2 × 100)/(3872 × 1)

R% = 10%

34. **Answer: A**

Solution

We know that A = CI + P

A = 566 + 70 = 636

Now going by the formula: $A = P [1+(R/100)]^n$

$636 = 566 [1+(R/100)]^2$

$636/566 = [1+(R/100)]^2$

On solving, R = 6%

35. **Answer: C**

Solution

6% is the rate of interest. 33.33% deducted mean rate of Interest 4%

SI = 14000 × 4 × 6/100=3360

The amount at the end of 5 years = 14000 + 3360 = 17360

36. **Answer: D**

Solution

Let the savings be P and Q and rates of SI be 14x and 16x, respectively.
Then, P × 14x × 1/2 × 1/100 = Q × 16x × 1/2 × 1/100
14P = 16Q
P/Q = 16/14 = 8/7
P:Q = 8:7

37. **Answer: E**
Solution
Required ratio=S1:S2
S1 = 13000 × 6 × 2/100 = Rs.1560
And S2 = 13000 × 5 × 4/100 = Rs.2600
∴ S1 : S2 = 1560 : 2600 = 3 : 5

38. **Answer: D**
Solution
When we solve this question, we find that we have two variables P (Principal) and R (Initial assumed rate of interest) in the R.H.S. of the SI equation.
∴ The correct answer can't be determined.

39. **Answer: B**
Solution
Compound interest for 1st year = PR/100 = 20,000 × 8/100 = Rs. 1,600
Amount at the end of 1st year = P + CI for 1st year = Rs. 21,600
Compound interest for 2nd year = Amount at the end of 1st year × R/100 =
21,600 × 8/100 = Rs. 1,728
Amount at the end of 2nd year = Amount at the end of 1st year + CI for 2nd year = Rs. 23,328
Compound interest for 3rd year = Amount at the end of 2nd year × R/100 = 23,328 × 8/100 = Rs. 1,866.24
∴ the compound interest earned at the end of the third year is Rs. 5194

40. **Answer: E**
Solution
The loan is to be repaid in 2 equal annual instalments.
Let the amount of each instalment be Rs. X.
Amount after 1 year= 10,800
Then, the amount of the loan after the first instalment is paid = Rs. (10,800 – X).
The amount of the loan after the second instalment is paid = Rs. (10,800 – X) × (1 + 8/100) = Rs. (10,800 – X) × 1.08
Now, (10,800 – X) × 1.08 = X
Solving this equation, we get X = Rs. 5607
∴ The amount of each instalment is Rs 5607

41. **Answer: E**
Solution
The amount of interest due for the first two years = 20,000 × $(1 + 10/100)^2$ = Rs. 24,200
The amount remaining after the first two years = 24,200 – 10,000 = Rs. 14,200
The amount due after the next two years = 14,200 × $(1 + 10/100)^2$ = Rs 17,182
∴ the amount he has to pay after another two years to clear the loan is Rs. 17,182

42. **Answer: D**
Solution
The interest for the first year = 60,000 × 12/100 = Rs. 7,200
The amount remaining after the first year = 60,000 + 7,200 – 20,000 = Rs. 47,200
The interest for the second year = 47,200 × 12/100 = Rs. 5,664
The amount remaining after the second year = 47,200 + 5,664 – 30,000 = Rs. 22,864
The interest for the third year = 22,864 × 12/100 = Rs. 2,743.68
The amount due at the end of the third year = 22,864 + 2,743.68 = Rs. 25,607.68

43. **Answer: A**
Solution
Principal = Rs. 85,000, Rate = 15.66% =47/3
SI = P × R × T /100 = 85000 × 47 × 3.5/3 X100
= 46,588.33
Amount = P + SI = 85000 + 46,588.33 = Rs. 1,31,588

44. **Answer: B**
Solution
Rs. 12,000 lent at simple interest becomes Rs. 12,800 in two years' time.
Hence, the extra Rs. 800 paid at the end of the period is the simple interest. This amount of Rs. 12,800 includes the original principal of Rs. 12,000 as well. So, the additional amount is the
As SI = P × R × T/100, R = 100 × SI/ P × T
R = 100 × 800 /12000 × 2 = 3.33%
Hence, simple interest on Rs 20,000 for 5 yrs = 20,000 x 0.0333 x 5 = 3,330
∴ amount to be paid back after 5 years =20,000 + 3,330 =23,330

45. **Answer: B**

Solution

P × 18 × 4 /100 = P × 22 × 2 /100 + 336

72P / 100 = 44P /100 + 33600/100

28P =33600

On solving we get, P = 1200

Required interest = 1200 × 5 × 15 /100 = 900

46. **Answer: C**

Solution

Sum = Rs. 64,000

∴ CI for 1st year = $\frac{64000 \times 5}{100} = \text{Rs. } 3200$

∴ A = 64,000 + 3200 = Rs. 67,200

let the amount repaid be Rs. x

Then, the sum at the beginning of the 2nd year = 67,200 – x

⇒ 35,700 = 1.05 × (67200 – x) × 1

⇒ x = Rs. 33,200.

47. **Answer: B**

Solution

principal amount (P) = Rs. 15,000,

total amount (A) = Rs. 17,496 (Rs. 15,000 + Rs. 2,496),

number of years (t) = 2

r = ?

$A = P(1 + r/n)^{nt}$

$A/P = (1 + r/n)^{nt}$

$17,496/15,000 = (1 + r/n)^{2n}$

$1.1664 = (1 + r/n)^{2n}$

$\sqrt{1.1664} = 1 + \frac{r}{n}$

$1 + \frac{r}{n} = \sqrt{1.1664}$

$\frac{r}{n} = \sqrt{1.1664} - 1$

$r = n \times \sqrt{1.1664} - 1$

Let's assume the interest is compounded annually (n = 1):

$r = 1 \times \sqrt{1.1664} - 1$

$r \approx \sqrt{1.1664} - 1$

$r \approx 1.079 - 1$

$r \approx 0.079$

So, if the interest is compounded annually, Raj is getting an approximate interest rate of 7.9% ≈ 8.

48. **Answer: A**

Solution

$A = P(1 + r/n)^{nt}$

Plugging in these values into the formula:

$A = 24000(1 + 0.2/2)^{2 \times 2}$

$= 24000(1 + 0.1)^4$

$= 24000(1.1)^4$

$\approx 24000(1.4641)$

≈ 35138.40

The final amount (including the principal and interest) after two years is approximately Rs. 35138.40.

To calculate the compound interest accrued, we subtract the principal amount from the final amount:

Compound interest = A – P

= 35138.40 – 24000

≈ Rs. 11138.40

∴ the compound interest accrued on an amount of Rs. 24000 at the rate of 20% per annum compounded half-yearly for two years is approximately Rs. 11138.40.

49. **Answer: D**

Solution

To calculate the compound interest on Rs. 4000 in 2 years at 8% per annum, compounded half-yearly, we need to use the formula:

$A = P(1 + r/n)^{nt}$

In this case:

P = Rs. 4000

r = 8% or 0.08 (in decimal form)

n = 2 (since interest is compounded half-yearly)

t = 2 (since the investment is for 2 years)

Let's calculate the compound interest:

$A = 4000 \times (1 + 0.08/2)^{2 \times 2}$

$A = 4000 \times (1 + 0.04)^4$

$A = 4000 \times 1.04^4$

$A \approx 4000 \times 1.16985856$

$A \approx 4679.43$

Now, let's calculate the compound interest:

Compound Interest = Total amount after interest – Principal amount

Compound Interest = 4679.43 – 4000

Compound Interest ≈ Rs. 679.43

∴ the compound interest on Rs. 4000 in 2 years at 8% per annum, compounded half-yearly, is approximately Rs. 679.43.

50. **Answer: A**

Solution

$A = P(1 + r/n)^{nt}$

In this case, the given information is:

Simple interest = Rs. 1800

Principal amount (P) = ?
Annual interest rate (r) = 10% = 0.10
Number of years (t) = 4
To find the principal amount, we can use the simple interest formula:
SI = P × r × t
1800 = P × 0.10 × 4
1800 = 0.4P
P = 1800 / 0.4
P = 4500
Now, we can calculate the compound interest using the compound interest formula:
$A = P(1 + r/n)^{nt}$
$A = 4500(1 + 0.10/1)^{1 \times 4}$
$A = 4500(1 + 0.10)^4$
$A = 4500(1.10)^4$
$A = 4500(1.4641)$
A = 6588.45
∴ the amount by taking compound interest on the same sum for the same period at the same rate is Rs. 6588.45.

51. **Answer: C**

Solution

$P\left(1+\frac{r}{100}\right)^5 = 3P$
$\therefore \left(1+\frac{r}{100}\right)^5 = 3$ ---(i)
Let $P\left(1+\frac{r}{100}\right)^n = 27P$
$(1+\frac{R}{100})^n = 27 = 3^3 = \{(1+\frac{R}{100})^5\}^3$ → Using (i)
$\left(1+\frac{R}{100}\right)^n = \left(1+\frac{R}{100}\right)^{15}$
∴ n = 15
Thus, the required time = 15 years.

52. **Answer: A**

Solution

Principal amount → Rs. 72,000
Rate → 10%
Time = $\left(2+\frac{1}{3}\right)$ years.
$A = P\left(1+\frac{R}{100}\right)^{\frac{7}{3}}$
$A = 600000\left(1+\frac{10}{100}\right)^{\frac{7}{3}}$
$\therefore A = 600000\left(\frac{11}{10}\right)^2 \times \left(1+\frac{10}{3\times 100}\right)$
$\therefore A = 600000 \times \left(\frac{121}{100} \times \frac{31}{30}\right) = 750200$

53. **Answer: D**

Solution

$CI = 10000\left(1+\frac{8}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right) - 10000$
$\therefore CI = 10000\left[\left(\frac{27}{25}\right)\left(\frac{11}{10}\right)\left(\frac{28}{25}\right)\right] - 1$
$\therefore CI = 10000\left[\frac{27\times 11\times 28}{6250} - 1\right]$
$\therefore CI = 10000\left[\frac{27\times 11\times 28 - 6250}{6250}\right] = 8 \times \frac{2066}{5}$
$= Rs.\ 3305$

54. **Answer: C**

Solution

$A = 20000\left(1+\frac{10}{100}\right)\left(1+\frac{15}{100}\right)^2$
$\therefore A = 20000\left(\frac{11}{10}\right)\left(\frac{20+3}{20}\right)^2$
$\therefore A = 20000\left(\frac{11}{10}\right)\left(\frac{23}{20}\right)\left(\frac{23}{20}\right) = 10 \times \frac{11\times 23\times 23}{2}$
$= Rs.\ 29095$

55. **Answer: A**

Solution

The simple interest on a principal of Rs 10,000 at 8% per annum for 2 years is (10,000 x 8% x 2) = Rs 1,600. The compound interest is calculated as follows:
Year 1: Rs 10,000 + (8% x Rs 10,000) = Rs 10,800
Year 2: Rs 10,800 + (8% x Rs 10,800) = Rs 11,664
The compound interest for 2 years is Rs 11,664 – Rs 10,000 = Rs 1,664.
∴ the difference between the simple interest and compound interest is
Rs 1,664 – Rs 1,600 = Rs 64.

56. **Answer: B**

Solution

The simple interest on a principal of Rs 5,000 for 3 years is (5,000 × r × 3), where r is the rate of interest. The compound interest on the same principal for 2 years at 10% per annum is calculated as follows:
Year 1: Rs 5,000 + (10% × Rs 5,000) = Rs 5,500
Year 2: Rs 5,500 + (10% × Rs 5,500) = Rs 6,050
The compound interest for 2 years is Rs 6,050 – Rs 5,000 = Rs 1,050.
Equating this to the simple interest, we get:
5,000 × r × 3 = 1,050
r = 7%
∴ the answer is 7%.

57. **Answer: D**

Solution

Using the formula for simple interest, we have:

SI = P × R × T/100

where P is the principal, R is the rate of interest per annum and T is the time in years.

From the given information, we have:

SI = 2420 – 2000 = 420

So, the rate of interest per annum is:

R = SI / (P × T) = 420 / (2000 × 2) = 0.105 or 10.5%

Using the same rate of interest, we can find the total amount at the end of 5 years as:

Total amount = P + SI = 2000 + 10.5% × 2000 × 5 = Rs. 3050

58. **Answer: B**

Solution

Let P be the principal amount. Then, we have:

$P(1+r/100)^4 = 2P$

Solving for r, we get r = 41.4%

Now, let the required time be t years. Then, we have:

$P(1+r/100)^t = 8P$

Solving for t, we get t = 12 years.

59. **Answer: E**

Solution

S.I. for 1 year (calculated on half yearly basis)

$= \frac{25000 \times 10 \times 2}{100} = 5000$

C.I. for 1 year (calculated on half yearly basis)

$= 25000\left(1+\frac{10}{100}\right)^2 - 25000$

$= 25000 \times \frac{121}{100} - 25000 = 30250 - 25000 = 5250$

Difference = 5250 – 5000 = Rs. 250.

60. **Answer: A**

Solution

Applying the net% effect formula to calculate the net CI rate for 2 years, we get

$= 10 + 10 + \frac{10 \times 10}{100} = 21\%$

Now, 21% of 10000 = 2100

Sum of SI is half of CI = $\frac{2100}{2} = 1050$

As we know, Sum = $\frac{SI \times 100}{RT}$

$\therefore \text{Sum} = \frac{1050 \times 100}{2 \times 15} = ₹\,3500$

61. **Answer: E**

Solution

Applying the net% effect formula to calculate the net CI rate for 2 years, we get

$= 15 + 15 + \frac{15 \times 15}{100} = 32.25\%$

Now, 32.25% of 10000 = 3225

Sum of SI is same as CI = 3225

$\text{Sum} = \frac{SI \times 100}{RT} = \frac{3225 \times 100}{5 \times 10} = ₹\,6450$

62. **Answer: D**

Solution

Applying the net% effect formula to calculate the net CI rate for 2 years, we get

$= 15 + 15 + \frac{15 \times 15}{100} = 32.25\%$

Now, 32.25% of 20000 = 6450

Sum of SI is same as CI = 6450

As we know, Sum = $\frac{SI \times 100}{RT}$

$\therefore \text{Sum} = \frac{6450 \times 100}{3 \times 25} = ₹\,8600$

63. **Answer: B**

Solution

$\text{Net\% Effect} = x + y + \frac{xy}{100}\%$

Applying the net% effect formula to calculate the net CI rate for 2 years, we get

$= 20 + 20 + \frac{20 \times 20}{100} = 44\%$

Now, 44% of 20000 = 8800

Sum of SI is half of CI = $\frac{8800}{2} = 4400$

As we know, Sum = $\frac{SI \times 100}{RT}$

$\therefore \text{Sum} = \frac{4400 \times 100}{5 \times 12} = ₹\,7333$

64. **Answer: D**

Solution

$\text{Net\% Effect} = x + y + \frac{xy}{100}\%$

Here, x = y = 18% (because rate of interest is same for both the years)

By the net% effect, we get effective rate of interest

$= 18 + 18 + \frac{18 \times 18}{100} = 39.24\%$

∴ 39.24% of 75000 = 10.25 × 750 = ₹ 29,430

65. **Answer: E**

Solution

$\text{Net\% Effect} = x + y + \frac{xy}{100}\%$

Here, x = y = 8% (because rate of interest is same for both the years)

By the net% effect, we get effective rate of interest

$= 8 + 8 + \frac{8 \times 8}{100} = 16.64\%$

∴ 16.64% of 15000 = 16.64 × 150 = ₹ 2496

66. **Answer: A**

Solution

P = ₹ 15000; R = 9%; n = 2 years

$CI = P\left(1+\frac{R}{100}\right)^n - P$

$\therefore CI = 15000\left(1+\frac{9}{100}\right)^2 - 15000$

$\therefore CI = 15000 \times \frac{109}{100} \times \frac{109}{100} - 15000$

= 14257.20 – 12000 = ₹ 2821.5

67. **Answer: C**

Solution

To solve this question, we can apply a short trick approach,

$\text{Sum} = \frac{\text{Difference} \times 100^2}{r^2}$

Given, Difference = ₹ 196, r = 7%

By the short trick approach, we get

$\text{Sum} = \frac{196 \times 100^2}{7^2} = ₹\ 40000$

68. **Answer: E**

Solution

To solve this question, we can apply a short trick approach,

$\text{Sum} = \frac{\text{Difference} \times 100^2}{r^2}$

Given, Difference = ₹ 512, r = 16%

By the short trick approach, we get

$\text{Sum} = \frac{512 \times 100^2}{16^2}$ ₹ 20000

69. **Answer: C**

Solution

$P\left(1+\frac{R}{100}\right)^4 = 2P$

$\left(1+\frac{R}{100}\right)^4 = P$ ---(i)

After 20 years,

$\left(1+\frac{R}{100}\right)^{20} = \left[\left(1+\frac{R}{100}\right)^4\right]^5 = 2^5 = 32$

Thus, the amount becomes 32 times.

So, amount = 312 × 32 = ₹ 9984

70. **Answer: A**

Solution

Let the original sum borrowed be P.

The interest for the first year at 10% is (1/10) * P.

∴ Amount = P + (1/10)P = (11/10)P = 1.1P

After paying off Rs. 6,500, the remaining balance is (1.1P - 6,500).

∴ Interest for the 2nd year is $\frac{(1.1P-6500)\times 12}{100}$

Given that interest for the second year is (3/4)th of the interest for the first year.

$\therefore \frac{3}{4} \times \frac{10P}{100} = \frac{(1.1P-6500)\times 12}{100}$

∴ 17.6P – 104000 = 10P

∴ 7.6P = 104000

∴ P = 13684.21 ≈ 13684

Therefore, the answer is (A)

71. **Answer: D**

Solution

Let the first sister be given Rs. P

→ Money with second sister = Rs. 2000 – P

Now, according to the question,

$P[1 + (6 / 100)]^3 = (2000 – P)[1 + (6 / 100)]^5$

$\therefore P(1.06)^3 = (2000 – P)(1.06)^5$

∴ 0.8899 P = 2000 – P

∴ 1.8899 P = 2000

∴ P = 1058.25

∴ share of first sister = Rs. 1058.25

Share of second sister = Rs. 941.75

72. **Answer: E**

Solution

According to the question,

25000 × [(100 + x)/100] + [(32000 × (x + 3))/100] = 62520

25000 + 250x + 320x + 960 = 62520 – 32000

570x = 30520 – 25960

570x = 4560

x = 8

Rate of Interest for S.I = x + 3 = 11 %

73. **Answer: C**

Solution

Let us take one part be x and another one be 48000 – x

According to the question,

X [(1 + 10/200)2 – 1) + [(48000 – x) × 15 × 1]/100 = 5490

X [(210/200)2 – 1)] + 7200 – (15x/100) = 5490

(41x/400) + 7200 – (15x/100) = 5490

(41x/400) – (15x/100) = 5490 – 7200

-19x/400 = -1710

X = 1710 × (400/19) = 36000

The amount invested in S.I = 48000 – x = 48000 – 36000

= Rs. 12000

74. **Answer: D**

Solution

Interest earned by Suyash in the 2nd year

$= 6000 \times \left[\left\{1+\left(\frac{30}{100}\right)\right\}^2 - 1\right] - \left(\frac{6000 \times 30 \times 1}{100}\right)$

$= 6000 \times \left(\frac{69}{100}\right) - 1800 = 4140 - 1800 = \text{Rs. } 2340$

Interest earned by Suyash in the 3rd year

$$= 6000 \times \left[\left\{1 + \left(\frac{30}{100}\right)\right\}^3 - 1\right] - 6000 \times \left[\left\{1 + \left(\frac{30}{100}\right)\right\}^2 - 1\right]$$

$$= 6000 \times \left(\frac{1197}{1000}\right) - 6000 \times \frac{69}{100} = 7182 - 4140 = Rs.3042$$

∴ required difference = 3042 – 2340 = Rs. 702

75. **Answer: D**

Solution

The first Rs. 10000 would become $10000(1.2)^6$ after 6 years, the second will become $10000(1.2)^5$.

The third will become $10000\ (1.1)^4$, the fourth will become $10000\ (1.1)^3$, the fifth will become $10000(1.2)^2$ and the sixth will become 10000 (1.2).

Total amount = $10000\ [(1.2) + (1.2)^2 + (1.2)^3 + (1.2)^4 + (1.2)^5 + (1.2)^6]$

= $(10000)\ (1.2)\ [1 + (1.2) + (1.2)^2 + (1.2)^3 + (1.2)^4 + (1.2)^5]$

= $12000\ (1.2)^6 – 1/1.2 – 1$

= 12000 (9.9295)

= 1,19,154

PARTNERSHIPS & MIXTURES SOLUTIONS

1. **Answer: A**

   Solution

   Ratio of investment of Popatlal to Jethalal = 5:1 = Ratio of Profit

   Share of Popatlal in profit = 5/(5+1) × 96000

   = 5/6 × 96000

   = 80000

2. **Answer: B**

   Solution

   Ratio of investment of A to B = 1 : 8 = Ratio of Profit

   Share of A in profit = 1/(1+8) × 9000 = 1/9 × 9000 = 1000

3. **Answer: C**

   Solution

   Ratio of Investment × Time = Ratio of Profit

   ∴ (A's investment × Time) : (B's investment × Time) = Profit of A : Profit of B

   (Ashitosh's Investment × Time) : (Rohan 's Investment × Time) = Ashitosh's Profit : Rohan's Profit

   ∴ 30000 × 12 : 40000 × 8

   = Ashitosh's Profit : Rohan's Profit

   ∴ Ashitosh's Profit : Rohan's Profit = 9:8

   They make a profit of Rs. 2,55,000/-.

   Rohan 's share in this profit

   = 8/17 × 255000 = 1,20,000.

4. **Answer: B**

   Solution

   Let investment of C be Rs. 100

   So, investment of B = half of C

   = 1/2 of Rs. 100 = Rs. 50

   Investment of A = 50% more than B

   = 50% more than Rs. 50

   = Rs. 75

   Ratio of investment of A, B, and C = 75 : 50 : 100 = 3:2:4

   C's investment = 4 / (3+2+4) × 3276 = 1456.

5. **Answer: B**

   Solution

   Let investment of Sujay be Rs. 100

   So, investment of Pramod = 50% more than Sujay = 3/2 of Rs. 100 = Rs. 150

   Investment of Harshad = 50% more than Pramod = 50% more than Rs. 150 = Rs. 225

   Ratio of investment of Harshad, Pramod, and Sujay = 225 : 150 : 100 = 9:6:4

   Pramod's investment = 6/(9+6+4) × 1596 = 504

6. **Answer: A**

   Solution

   Ratio of Profit of Priya to Riya = 5:2

   Priya's Share = Rs. 3510 = 5/(5+2) × (90% Total Profit)

   → 10% given to hospital

   3510 = 5/7 × 90/100 × Total Profit

   Total Profit = Rs 5460

7. **Answer: A**

   Solution

   Let m be multiplier of the ratio = 4m:5m:2m

   Total of the number = 154 × 3 = 11m

   m = 42

   The ratio of 20% of the first number to 25% of the second number to 30% of the third number = 20 × 4 : 25 × 5 : 2 × 30

   = 16:25:12

8. **Answer: D**

   Solution

   Ratio of salaries of A, B and C → 2 : 3 : 5

   Let salary be 200, 300, and 500 respectively.

   Increments of 30%, 10% and 20%

   are allowed respectively

   New salaries = 260:330:600

   Ratio = 26:33:60

9. **Answer: A**

   Solution

   Total initial investment

   = Rs 10,000 + Rs 15,000 = Rs 25,000

   Shiv's initial investment ratio = 10,000/25,000 = 2/5

Tushar's initial investment ratio

= 15,000/25,000 = 3/5

Shiv's share of the profit

= (2/5) x 7,500 = 3,000

Tushar's share of the profit

= (3/5) x 7,500 = 4,500

10. **Answer: C**

Solution

2/5 × A + 40 = 2/7 × B + 20 = 9/17 × C + 10 = x

(5/2) (x-40) + (7/2) (x-20) + (17/9) (x-10) = 600

∴ x = 100

Ajay's share = 5/2 × (100-40) = 150

11. **Answer: B**

Solution

A invested = 30000

B invested = 45000

C invested = 60000

Their investment ratio is 2:3:4, they decide to distribute the profit in the ratio of the cube of the capital of each partner =8:27:64

B's share of the profit = 27/99 × 88000

= 24000

12. **Answer: C**

Solution

Let investment of Shweta and Sahil be 3P and 4P respectively.

And also, Shweta and Sahil invested for a months and b months respectively

(3P × a) / (4P × b) = 2800/1400 = 2/1

a : b = 8 : 3

13. **Answer: A**

Solution

Ratio between profit share of A to B = 15000 × 12: 27000 × 6 = 10: 9

Let profit of A and B are Rs. 10x and 9x respectively

Required percentage = (10x - 9x)/10x × 100 = 10% less.

14. **Answer: B**

Solution

Let the sum of money among her four children-A, B, C, D be 3x, 5x, 7x, 11x respectively.

The share of A and C = 3x + 7x = 10x = 62,800

x = 6280

The total amount received by C and D

= 7x + 11x = 18x

= 18 × 6280 = 1,13,040

15. **Answer: A**

Solution

Let the sum of money among her four children-Aman, Siya, Sonia, Srushti be 4x, 3x, 8x, 7x respectively.

The share of Sonia and Srushti =

8x + 7x = 15x = 75,000

x = 5000

the difference in the total amount received by Siya and Aman

= 4x - 3x = x = 5000

16. **Answer: B**

Solution

1/3rd of Amit's share = 1/4th of Badal's share = 1/5th of Charu's share

= k (constant)

Amit : Badal : Charu = 3:4:5

Amit's share = 3/12 × 2400 = 600

17. **Answer: B**

Solution

Anand and Bikram invest Rs 24,000/-and Rs 64,000/- respectively

Chetan invests Rs 8,000/- less than Bikram = 64000-8000 = 56000

Ratio of Anand : Bikram : Chetan

= 24,000 : 64,000 : 56000 = 3:8:7

Chetan gets Rs. 63,000 as a profit

7x = 63000

x = 9000

Total profit = 18x = 18 × 9000 = 162000

18. **Answer: D**

Solution

In the mixture quantity of milk are

8/11 × 88 = 64

In the mixture quantity of water are

3/11 × 88 = 24

Quantity of water is added by

64 – 24 = 40

19. **Answer: A**

Solution

Quantity of milk & water be

5/7 × 42, 2/7 × 42

Milk = 30 Litre, Water = 12 Litre

Let x litre water be added

30/(12+x) = 15:13

x = 14

20. **Answer: D**

Solution

Quantity of water remained in Container = 3/8 × 40 = 15 lit

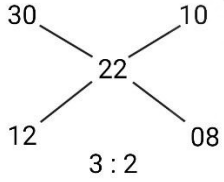
New quantity of water = 15 + 20 = 35 lit

21. **Answer: B**

Solution

Using allegation we can solve it,

30% sugar in first juice and 10% sugar in other juice.



22. **Answer: D**

Solution

Current alcohol quantity = 9/20 × 120 = 54

Let A be alcohol added.

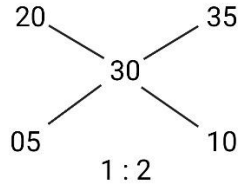
54 + A = (3/4) × (120+A)

A = 144 Litres = This is the additional quantity of alcohol to be added.

23. **Answer: C**

Solution

By the rule of allegation:



24. **Answer: D**

Solution

Let's assume the total investment made in the business be "x".

Govind's investment = (2/9)×x

Krishna's investment = (3/9)×x

Vasudev's investment = (4/9)×x

Now, they earn a profit of 13230 at the end of the year, which is to be divided among them in the ratio of their investments.

Vasudev's share = (4/9)×13230 = 5880

25. **Answer: C**

Solution

Suppose B joined for x months. Then,

$\frac{85000\times12}{42500\times x} = \frac{3}{1}$

∴ x = 8

So, B joined for 8 months

26. **Answer: D**

Solution

Jiggy's and Riya's initial investment is 1200 each

After 6 months Jiggy's investment doubles = 1200 × 2 = 2400

and

Riya's investment reduces by 200 = 1000

Jiggy's share of profit = 1200 × 6 + 2400 × 6 = 3600 × 6

Riya's share of profit = 1200 × 6 + 1000 × 6 = 2200 × 6

Ratio of profit of Jiggy and Riya =

3600 × 6 : 2200 × 6 = 18 : 11

27. **Answer: B**

Solution

Let B invested for x months

The ratio of their share = 5 × 12 : 6 × x : 4 × 12 = 60 : 6x : 48

B's share is 25% so,

6x ÷ (60 + 6x + 48) = 25%

24x = 108 + 6x

x = 6

28. **Answer: D**

Solution

Bhumika's investment = Rs. 6900

Namrata's investment = Rs. 6900

Snehal's investment = Rs. 13800

Total investment = Rs. (6900 + 6900 + 13800) = Rs. 27600

Bhumika = 12 months

Namrata = 8 months (4 months with Bhumika + 4 months after joining)

Snehal = 4 months (as she joined 4 months after Namrata)

Total time period = 12 + 8 + 4 = 24 months

Bhumika's share = (6900 × 12) / 27600 = 3 Namrata's share = (6900 × 8) / 27600 = 2 Snehal's share = (13800 × 4) / 27600 = 2

The profit-sharing ratio of Bhumika, Namrata, and Snehal is 3:2:2.

29. **Answer: C**

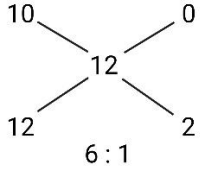
Solution

SP = Rs. 14 per liter

CP = 14/(7/6) = Rs. 12 per liter

CP of water will be zero as it is free.

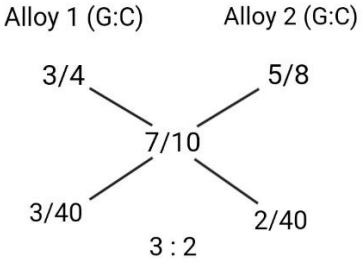
By the rule of allegation:



30. **Answer: A**

Solution

By the rule of allegation:



31. **Answer: C**

Solution

60 liters are replaced from 240 liters

After 1st replacement = 180/240 = 3/4

This operation repeated two more times

After 2nd replacement = $(3/4)^2$ = 9/16

After 3rd replacement = $(3/4)^3$ = 27/64

the ratio of milk and water in resulting mixture = 27/(64-27) = 27/ 37

32. **Answer: B**

Solution

50 liters are replaced from 150 liters

After 1st replacement = 100/150 = 2/3

This operation repeated three more times

After 2nd replacement = $(2/3)^2$

After 3rd replacement = $(2/3)^3$

After 4th replacement = $(2/3)^4$ = 16/81

The quantity of milk left in the final solution = 16/81 x 150 = 29.6 i.e., 30 (approx.)

33. **Answer: C**

Solution

Let total initial mixture in vessel = 4x

So, milk in vessel = 3x

And water in vessel = x

(3x - 16 × (3/4)) - (x - 16 × (1/4)) = 62

2x - 8 = 62

x = 35

So, initial mixture in vessel

= 4x = 4 × 35 = 140

34. **Answer: D**

Solution

To solve this problem, we need to calculate the total investment made by each person and then divide the profits according to the investment made.

Chindi's total investment = 6 × 2000 = 12000.

Chaman's total investment is 12 × 2000 = 24000.

Champu's total investment is 6 × 6000 = 36000.

Therefore, the profit-sharing ratio of Chaman: Chindi: Champu = 24000:12000:36000 = 2:1:3

35. **Answer: D**

Solution

Total investment = 6400 + 9600 + 11200 = 27200

Total profit = 25% of 27200

= (25/100) × 27200 = 6800

Chota boiler's share = (Chota boiler's investment / Total investment) × Total profit

Chota boiler's share

= (11200 / 27200) × 6800

Chota boiler's share = 2800

Chota boiler's profit= 2800 × 12 = 33600

36. **Answer: B**

Solution

Explanation:

Let the quantity of the wine in the case originally be x litres

Then, quantity of wine left in cask after 4 operations

$= x\left(1-\frac{8}{x}\right)^4$ litres

$\therefore \left[\frac{x\left(1-\frac{8}{x}\right)^4}{x}\right] = \frac{16}{81}$

$\left(1-\frac{8}{x}\right)^4 = \left(\frac{2}{3}\right)^4$

x = 24

37. **Answer: C**

Solution

Let's assume that the merchant mixes x kg of the first category of rice (priced at Rs. 48/kg) and y kg of the second category of rice (priced at Rs. 36/kg) to get a total mixture of (x+y) kg.

We know that the merchant sells the mixture for Rs. 45/kg at a profit of 12.5%.

∴ Cost price of mixture = Selling price / (1 + profit%) = 45 / (1 + 0.125) = 40

The cost price of the mixture is the sum of the cost prices of the two types of rice:

40(x+y) = 48x + 36y

8x = 4y

x/y = 1/2

Therefore, the ratio of mixing the two types of rice is 1:2.

So, the merchant mixes 1 kg of the first category of rice with 2 kg of the second category of rice to get a mixture of 3 kg.

38. **Answer: B**

Solution

Let's assume the milkman needs to mix x liters of pure milk from the pure milk container with the 30 liters of water to make the desired mixture containing 40% milk.

total volume of the mixture = (x + 30) liters.

We want the mixture to contain 40% milk, which means that 40% of the total volume of the mixture should be milk.

We can set up an equation to solve for x:

x / (x + 30) = 0.4

Multiplying both sides by (x + 30), we get:

x = 0.4(x + 30)

x = 0.4x + 12

0.6x = 12

x = 20

Therefore, the milkman should mix 20 liters of pure milk with 30 liters of water to make a mixture containing 40% milk.

39. **Answer: C**

Solution

Amount of water in the original mixture

= 10% of 50 = 5 litres

Now let's assume that we need to add 'x' litres of water to the mixture to make it 20% water.

So, the total amount of water in the final mixture will be:

5 + x litres

The total volume of the final mixture will be: 50 + x litres

According to the problem, the final mixture should be 20% water. So, we can write:

(5 + x) / (50 + x) = 20/100

5 + x = 10 + 0.2x

0.8x = 5

x = 6.25

Therefore, 6.25 litres of water should be added to the original mixture to make it 20% water.

40. **Answer: D**

Solution

Let the tea leaves costing Rs. 250/kg be mixed with tea leaves costing Rs. 400/kg in the ratio of x : y.

Then, the cost price of the mixture per kg can be expressed as:

(250x + 400y)/(x + y)

Given that Mr. Vinod Chandak sells the mixture at a price of Rs. 384/kg at a profit of 20%, the selling price per kg can be expressed as:

120% of cost price = 1.2×(250x + 400y)/(x + y) = 384

Simplifying the above equation, we get: 250x + 400y = 320(x + y)

70x = 80y

x/y = 8/7

Therefore, Mr. Vinod Chandak mixes the tea leaves costing Rs. 250/kg and Rs.

400/kg in the ratio of 8:7

41. **Answer: E**

Solution

Overall investment of Aditya is 9,00,000 × 12

Overall investment of Rohan is 12,00,000 × 9

Let Jayesh work for x months

Overall investment of Jayesh is 36,00,000 × x

Ratio of profit share of Aditya, Rohan and Jayesh

= 9,00,000 × 12 : 12,00,000 × 9 : 36,00,000 × x

= 108 : 108 : 36x

= 3 : 3 : x

Their profit share given is 1 : 1 : 2

ATQ,

3 : 3 : x = 1 : 1 : 2

Thus, x = 6

∴ Jayesh joined 3 months after Rohan joined.

42. **Answer: C**

Solution

The ratio of their initial investments is 9:11.

The revenue given is = 35,00,000

Prasanna draws a monthly salary of 20,000 i.e., 2,40,000 per year.

So the net revenue is = 32,60,000

We have been given that profit is 30% of the revenues.

Hence, profit earned by the company will be 32,60,000 × 30 /100 = Rs. 9,78,000

Amount earned by Parth for his consultancy services will be = 9,78,000 × 15/100 = Rs. 14,67,000

Hence, the remaining revenue amount = Rs. (32,60,000 – 14,67,000) = Rs. 17,93,000

Hence, amount received by Prasanna will be 17,93,000 × 9/20 = Rs. 8,06,850

Thus, amount received by Parth will be Rs. (17,93,000–8,06,850) = Rs. 9,86,150

Thus, total amount received by Prasanna will be Rs. (2,40,000 + 8,06,850) = Rs. 10,46,580

Total amount received by Parth = Rs. (14,67,000 + 9,86,150) = Rs. 24,53,150

Hence, the required difference is Rs. (24,53,150 – 10,46,580) = Rs. 14,06,300

43. **Answer: D**

Solution

Thube invests Rs. 5500 initially.

Three months later, he halves his investment, which means he invests = Rs. 5500/2 = Rs. 2750.

Three more months later, he quadruples his investment, which means he invests
= Rs.2750 × 4 = Rs. 11000.
Total investment = Rs. 5500 × 3 + Rs. 2750 × 3 + Rs. 11000 × 6 = Rs. 90,750
Profit percentage = 33.33%
Profit = (Profit percentage/100) × Total investment
Profit = (33.33/100) × 90,750
Profit = 30,250
∴ Thube earns a profit of Rs. 30,250

44. **Answer: C**

Solution

Lord Rajale invests 1000 per month for the first 6 months, so his total investment for
the first 6 months is: 1000 × 6 = 6000
For the next 3 months, he increases his per month installment by 50%, so his per
month investment becomes:
1000 × 1.5 = 1500
His total investment for the next 3 months is:
1500 × 3 = 4500
For the last 3 months, he further increases his installments by 50%, so his per month
investment becomes:
1500 × 1.5 = 2250
His total investment for the last 3 months is:
2250 × 3 = 6750
Therefore, his total investment for the entire year is:
6000 + 4500 + 6750 = 17250
If he earns 25% profit on the total investment at the end of the year, his profit is:
0.25 × 17250 = 4312.50
Therefore, Lord Rajale's profit at the end of the year is 4312.50

45. **Answer: E**

Solution

Riddhi's investment for first 3 months = 5000 × 3
Mansi's investment for first 3 months = 3000 × 3
Three months later,
Riddhi's investment for 3 months = 7500 × 3
Mansi's investment for 3 months = 2700 × 3
Three more months later,
Riddhi's investment for 3 months = 3750 × 3
Mansi's investment for 3 months = 5400 × 3
Overall investment ratio of Riddhi and Mansi for the period of 9 months
= 5000 × 3 + 7500 × 3 + 3750 × 3 : 3000 × 3 + 2700 × 3 + 5400 × 3
= (5000 + 7500 + 3750) × 3 : (3000 + 2700 + 5400) × 3
= 16250 : 11100
= 325 : 222
∴ Profit sharing ratio of Riddhi and Mansi at the end of 9 months = 325 : 222

46. **Answer: C**

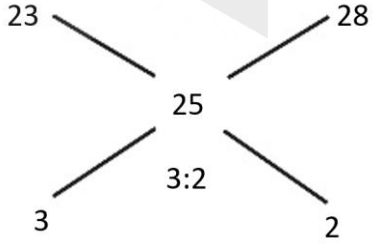
Solution

Using Options,
We can take 1 unit of Rs. 100/ kg, 1 unit of Rs. 200/ kg, 4 units of Rs. 300/ kg.
∴ we get a mixture worth Rs. $\frac{100+200+1200}{6} = Rs.250/kg$

47. **Answer: E**

Solution

SP = 30, Profit = 20% so CP = (5/6) × 30 = 25



∴ Proportion of 23 Rs/lt juice to 28 Rs/lt juice comes to 3:2, thus fraction of 23 Rs/lt juice in the mocktail = 3:5

48. **Answer: C**

Solution

Let's assume that Kantaram buys x litres of pure milk. Since he adds water to it, the total volume of the mixture will be greater than x litres.

Let's assume that he adds y litres of water to x litres of milk to make a (x + y) litre mixture.
Selling price of 1 litre of mixture = Rs. 16 (given)
Profit percentage = 60%
Cost price of 1 litre of mixture = Selling price of 1 litre of mixture / (1 + Profit percentage/100) = 16/(1+60/100) = Rs. 10
We know that Kantaram buys 1 litre of milk at Rs. 15, so the cost price of x litres of milk would be Rs. 15x.
Since the total cost price of the mixture is Rs. 10 per litre, the cost price of x litres of milk and y litres of water would be:
15x + 0y = 10(x+y)
Simplifying this equation, we get:
5x = 10y
x/y = 2/1
Therefore, the ratio of water to milk in the mixture is 1:2.
So, for every 2 litres of milk, Kantaram adds 1 litre of water to make a 3 litre mixture, which he sells at a profit of 60%.

49. **Answer: A**

Solution

Shambhu invested Rs.50,000 for 12 months, Rs. (50000 + 20000) for 12 months and
Rs. (50000 + 20000 + 20000) for 12 months. i.e., she invested Rs.50,000 for 12 months, Rs.70000 for 12 months and Rs.90000 for 12 months.
Shankar invested Rs. 70000 for 2 years; i.e., Rs.70000 for 24 months
And, Sanap invested Rs.70000 for 1 year; i.e., Rs. 70000 for 12 months.
Their investing ratio:
Shambhu : Shankar : Sanap
= (50,000 × 12 + 70000 × 12 + 90000 × 12):(70000 × 24):(70000 × 12)
= (25,20,000):(16,80,000):(8,40,000) = 252:168:84
= 3:2:1
Total profit for 3 years = Rs.3,00,000
Therefore, Shankar's share
= Rs. (3,00,000 × 2 /(3+2+1))
= Rs. (3,00,000 × 2/6) = Rs.1,00,000

50. **Answer: A**

Solution

Jacky's investment = 25000 × 12 × 1.2 × 1.2 = 432000
Jinnie's investment = 24000 × 12 × 1.25 × 1.25 = 450000
The ratio of profit of Jacky and Jinnie =
Total investment of Jacky / Total investment of Jinnie
= 432000 / 450000
= 0.96
Therefore, the ratio of profits of Jacky and Jinnie is 0.96

TIME & WORK SOLUTIONS

1. **Answer: E**
   Solution
   Let leak can empty the full tank in x hours
   1/x = 1/4 – 1/12 = 1/6
   the leak alone can empty the full tank in 6 hours.
   Hence option 5.
2. **Answer: B**
   Solution
   Let Ajay complete the remaining work in x days.
   (x+7) / 16 + (7/28) = 1
   (x+7) / 16 = 3/4
   X = 5 days
   Hence option 2.
3. **Answer: C**
   Solution
   (M1D1) / W1 = (M2D2) / W2
   (150 × 25) /3800 = (M2 × (25/2)) / (3800 × 2)
   M2 = 600
4. **Answer: D**
   Solution
   Work done by (P + Q) + (P + R) + (R + Q) in one day
   1/10+1/15+1/30 = 1/5
   Work done by (P + Q + R) in one day 1/10
   Time taken will be 10days.
5. **Answer: B**
   Solution
   Time taken to fill the tank = 8 h.
   Part of tank filled in 8 h = 1
   Part of tank filled in 1 h = 1/8 = 12.5%
6. **Answer: B**
   Solution
   Time taken to empty a cistern = 9h
   Time taken to empty 2/3 part of a cistern = 9 × (2/3)
   = 6h
7. **Answer: C**
   Solution
   Working efficiencies are in the ratio 6: 13
   ∴ ratio of time taken by them = 13: 6
8. **Answer: E**
   Solution
   Working efficiencies are in the ratio 6: 15
   ∴ ratio of time taken by them = 15:6 or 30:12
9. **Answer: C**
   Solution
   Work done in 1 day will be = 1/30 + 1/10 – 1/50
   = (5+15–3) / 150 = 17 / 150
   Time taken to complete the work
   = 150 /17 = 8 14 / 17.
10. **Answer: A**
    Solution
    Let total work be 60 units (LCM)
    So, efficiency of Vijay and Sachin be 4 units/day and 3 units/day respectively.
    4-day work of Vijay and Vijay = (4 + 3) × 4 = 28 units
    Remaining work = 60 – 28 = 32 units
    Remaining fraction = 32 / 60 = 8 / 15
11. **Answer: B**
    Solution
    ratio of time taken by A and B = 10:15 = 2:3
    Working efficiencies are in the ratio = 3: 2
    A will be paid = 3/5 × 1000 = 600
12. **Answer: D**
    Solution
    ratio of time taken by Sumit and Dhiraj = 30:18 = 5:3
    Working efficiencies are in the ratio = 3: 5
    Dhiraj will be paid = 5/8 × 1640 = 1025
13. **Answer: C**
    Solution
    Let total work = 15 × 48 = 720 units
    Required women = 720 × 1/3 × 1/12 = 20
14. **Answer: B**
    Solution
    Let total work = 18 × 56 = 1008 units
    Required women = 1008 × 5/9 × 1/14 = 20
15. **Answer: A**
    Solution
    $M_1D_1 = M_2D_2$
    $12 \times 10 = 10 \times D_2$
    $D_2 = 12$
16. **Answer: C**
    Solution
    $M_1D_1H_1 = M_2D_2H_2$
    $15 \times 4 \times 20 = 12 \times 25 \times H_2$
    $H_2 = 4$
17. **Answer: C**
    Solution:
    Pipe P fills in 4h → 1h work = 1/4
    Pipe Q fills in 6h → 1h work = 1/6

From 8 AM to 9 AM, only P works → fills 1/4 of the tank

Remaining = 1 – 1/4 = 3/4

From 9 AM, both P and Q work → Combined rate = 1/4 + 1/6 = 5/12

Let time after 9 AM to fill the rest be x hours:

$\frac{5}{12}x = \frac{3}{4} \Rightarrow x = \frac{3}{4} \times \frac{12}{5} = \frac{36}{20} = 1.8$ hr $= 1hr48min$

Tank full at 9:00 AM + 1 hr 48 min = 10:48 AM

18. **Answer: A**

Solution

Kishore's rate of working is 10 per cent per day while Sanjay's rate of working is 5 per cent per day. In 5 days, they will complete 75 per cent work. Thus, the last 25 per cent would be done by Sanjay alone. Working at the rate of 5 per cent per day, Sanjay would do the work in 5 days

19. **Answer: C**

Solution

Veer does ½ work in 12 days, so his rate is:

$$\frac{1}{2} \div 12 = \frac{1}{24} \text{ work per day}$$

Aryan does ⅓ work in 8 days, so his rate is:

$$\frac{1}{3} \div 8 = \frac{1}{24} \text{ work per day}$$

Combine their rates

Veer's rate = $\frac{1}{24}$

Aryan's rate = $\frac{1}{24}$

Together, their rate is:

$$\frac{1}{24} + \frac{1}{24} = \frac{2}{24} = \frac{1}{12}$$

So, together they complete 1/12 of the work per day, which means they can complete the entire work in 12 days.

20. **Answer: B**

Solution

Let Ashish take 3t days, Veer take 2t days and Sameer take 6t days in order to complete the work.

Then we get

1/3t + 1/2t + 1/6t = 1/2

t = 2

Sameer will take 6t = 6 × 2 = 12 days

21. **Answer: C**

Solution

Murali being twice as good a workman as Kartik, you can solve the following equation to get the required Answer: 1/M + 1/2M = 1/18. Solving will give you that Kartik takes 54 days.

22. **Answer: B**

Solution

Shruti being twice as good a workman as Srushti, you can solve the following equation to get the required Answer: 1/Shruti + 1/2 Shruti = 1/22. Solving will give you that Shruti takes 33 days.

23. **Answer: D**

Solution

Interpret the starting statement as: Harshad takes 20 days and Anand takes 60 days. Hence, the Answer will be got by: (1/20 + 1/60) × n = 1

n = 15 days

24. **Answer: A**

Solution

Interpret the starting statement as: Karan takes 25 days and Chetan takes 75 days. Hence, the Answer will be got by: (1/25 + 1/750) × n = 1

n = 18 3/4 days

25. **Answer: D**

Solution

Interpret the starting statement as:

Akshay and Salman efficiency ratio will be 3: 2.

Their Time ratio will be 2: 3.

Akshay takes 60 days and Salman takes 90 days.

Hence, the Answer will be got by: (1/60 + 1/90) × n = 1

n = 36 days

26. **Answer: A**

Solution

Komal + Anju + Maya = 1 --- (1)

Komal + Anju = 26/33

Anju + Maya = 23/33

Komal + 2 Anju + Maya = 49 / 33 --- (2)

Equation (2) – (1),

Anju = 16 / 33

Komal = 10 / 33

Komal be paid = (10 / 33) × 825 = 250

27. **Answer: B**

Solution

Interpret the starting statement as:

Jay and Vijay efficiency ratio will be 7: 4.

Their Time ratio will be 4: 7.

Jay takes 44 days and Vijay takes 77 days. Hence, the Answer will be got by: (1/44 + 1/77) × n = 1
n = 28 days

28. **Answer: E**

Solution

Since the ratio of money given to Raju and Shyam is 2:3,
Their work done would also be in the same ratio.
Thus, their time ratio would be 3:2 (inverse of 2:3).
So, if Raju takes 12 days, Shyam would take 8 days and the total number of days required (t) would be given by the equation: (1/12 + 1/8) t = 1
t = 24/5 = 4.8 days

29. **Answer: A**

Solution

Ravi's share: Anil's share = 3: 2
Ravi's time = 10 days, so Ravi's rate = $\frac{1}{10}$ work/day
Let Anil's time = x days, Anil's rate = $\frac{1}{x}$ work/day
Ratio of rates $\frac{1/10}{1/x} = \frac{3}{2} \Rightarrow \frac{x}{10} = \frac{3}{2} \Rightarrow x = 15$ days
Combined rate = $\frac{1}{10} + \frac{1}{15} = \frac{3}{30} + \frac{2}{30} = \frac{5}{30} = \frac{1}{6}$
Combined time = $\frac{1}{1/6} = 6$ days

30. **Answer: D**

Solution

Let the total work be LCM (8,12,24) = 24 units.
Rohan's work rate = 24/8 = 3 units per day
Kunal's work rate = 24/12 = 2 units per day
Charan's work rate = 24/24 = 1 unit per day
After 2 days, Rohan, Kunal, and Charan complete 2 × (3+2+1) = 12 units of work, and 12 units are left.
Now Rohan and Kunal work together and complete 12 units in 12/ (3+2) = 2.4 days.

31. **Answer: B**

Solution

Let the total work be LCM (15,20) = 60 units.
Mayur's work rate = 60/15 = 4 units per day
Ganesh's work rate = 60/20 = 3 units per day
In each 2-day cycle, Mayur and Ganesh complete a total of 7 units of work (4 + 3).
Therefore, the work will be completed on the 17th day.
So, the correct Answer is option B. 17 days.

32. **Answer: C**

Solution

Let the total work be LCM (10,15) = 30 units.
Sourav 's work rate = 30/10 = 3 units per day
Vishal 's work rate = 30/15 = 2 units per day
In each 2-day cycle, Sourav and Vishal complete a total of 5 units of work (3 + 2).
So, in 12 days (6 cycles), they would have completed 30 units of work.
Therefore, the work will be completed in 12 days
Hence option C.

33. **Answer: C**

Solution

Sameer 's work rate = 1/15
Aryan 's work rate = 1/18
In each 2-day cycle, Sameer and Aryan complete a total of 1/15 + 1/18 = 11/90 units of work.
In 6 days, they complete 3 cycles and a total of 3 × (11/90) = 11/30 units of work.
So, the work left is 1 - 11/30 = 19/30.

34. **Answer: A**

Solution

A's work rate = 1/16
B's work rate = 1/12
In each 2-day cycle, A and B complete a total of 1/16 + 1/12 = 7/48 units of work.
In 13.75 days, the whole work, be done.
Therefore, the work will be completed in 13.75 days.

35. **Answer: B**

Solution

(A+B) together can complete the work in 6×3=18 days Let number of days taken by B be 'n' days to complete the entire work alone
1 /30 + 1/ n = 1 /18
1 /n = 1/18 – 1/30 = 12 / (18 × 30) = 1/45
B takes 45 days to complete the work alone So 4/ 5 th of work can be done by B in 36 days

36. **Answer: A**

Solution

Let 'k 'be the time from till when Girish left the work.
Let the total amount of work done be = 150 units
So, Rate of doing work by Pramod & Girish are 10 units/day& 6 units/day respectively.
As per the statement equation becomes
amount of work done by Pramod + amount of that by Girish = 150 units i.e.
10(k + 7) + 6k = 150;
16k=150-70;

k = 80/16 = 5 days.

37. **Answer: C**

Solution

Let the total work be W and one worker's efficiency be x.

8 workers can complete the work in 20 days, so 8x = W/20.

The efficiency of one worker is x = (W/20)/8 = W/160.

The efficiency of 6 workers working together is 6x = 6(W/160) = 3W/80.

Therefore, the time taken for 6 workers working together to complete the same road is (W/(3W/80)) = 80/3 = 26 2/3 days

38. **Answer: C**

Solution

Let soldiers would be able to carry on the remaining food for X more days.

500 × 30 – 500 × 20 = (500 + 500) X

X = 5 days

39. **Answer: D**

Solution

We know that the year 2000 was a leap year. So, the month of February will have 29 days, and March will have 31 days.

∴ Total number of days = 29 + 31 = 60 days.

Let soldiers would be able to carry on the remaining food for X more days.

1200 × 60 – 1200 × 30 = (1200 + 300) X

∴ X = 24 days

40. **Answer: B**

Solution

Let worker would be able to carry on the remaining work for X more days.

100 × 25 – 100 × 5 = (100 - 60) X

∴ X = 50 days

41. **Answer: B**

Solution

Let the total work be 120 units (LCM)

So, the efficiency of Satish + Surya = 5 units/day

the efficiency of Surya + Sameer = 8 units/day

the efficiency of Satish + Sameer = 6 units/day

∴ the efficiency of Satish + Surya + Sameer = (5+8+6) /2 = 19 /2 units/day

So, the efficiency of Surya = 19/ 2 – 6 = 7/ 2 units/day Let the time taken by Surya to complete the remaining work be x days.

19 /2 × 6 + 7 /2 × x = 120

∴ x = 18 days

42. **Answer: C**

Solution

Let the total work be 120 units (LCM)

So, the efficiency of Aman, Binod and Chintu be 20 units/day, 8 units/day and 5 units/day respectively.

1day work of Aman, Binod, Chintu and Dhiraj = 40 units

So, the efficiency of Dhiraj = 40 – (20 + 8 + 5) = 7 units/day

Wage of Dhiraj = (7/40) × 1200 = 210

43. **Answer: D**

Solution

Understand this problem as,

Gopal can do a work in 5 days (Mon - Fri) while Madhav finishes it in 7 days.

Ratio of days of Gopal to Madhav = 5:7

So, their share of income will be → Gopal 's Income: Madhav 's income = 7:5

∴ Madhav 's income = 5/(5+7) × 720 = 300

44. **Answer: A**

Solution

Raman's 1 day work = 1/15

Raman + Vaman)'s 1 day work = 1/10

1 day work of Vaman = 1/10 – 1/15 = 1/30

Ratio of 1 day work of Raman and Vaman is given by Raman: Vaman = 2:1

If you work more, you get proportionately more money

Share of Raman: Share of Vaman = 2: 1

Share of Raman = 2/3 × 1155 = 770

45. **Answer: A**

Solution

Let the total work be LCM of (24, 36 and 12) = 72 units

Number of units of work done by Aman alone in one day = 72/24 = 3 units

Number of units of work done by Bilal alone in one day = 72/36 = 2 units

Number of units of work done by Aman, Bilal and Chirag together in one day = 72/12 = 6 Units

Number of units of work done by Chirag alone in one day = 6-3-2=1 unit

So, time taken by Chirag alone to complete the work = 72/1 = 72 days
So, per day wage of Chirag = 1800/72= Rs. 25

46. **Answer: B**

Solution

Let the total work = 360 units (LCM of 60, 90 and 72)
Amount of work done by A alone in one day = 360/60 = 6 units
Amount of work done by B alone in one day = 360/90 = 4 units
Amount of work done by C alone in one day = 360/72 = 5 units
Amount of work done by A, B and C together in 10 days = 10(6+4+5) =150 units
Amount of work done by B and C together in 15 days = 15 × (4+5) =135 units
Remaining work 360–150–135 = 75 units
So, the time taken by C alone to complete 75 units work = 75/5 =15 days
C worked for 10+15+15 = 40 days

47. **Answer: C**

Solution

Tank filled by Pipe P, Q and R together in 1 hour = 1/6 = 1/P +1/Q +1/R ---(1)
3/R + 8(1/P+1/Q) = 1---(2)
8(1/P +1/Q +1/R) = 8/6---(3)
Equating (2) & (3)
1/R = 1/15
R take to fill the tank alone in 15 hours

48. **Answer: B**

Solution

Let Pipe A, B and C fill the tank individually in A, B and C hours respectively.
Tank filled by Pipe A, B and C together in 1 hour = 1/4 = 1/A +1/B +1/C
Tank filled by Pipe A and B together in 1 hour = 1/6 = 1/A +1/B
Tank filled by C in 1 hour = 1/4 - 1/6 = 1/12
But A is twice as fast as B. Hence to do same work, time taken by A is half the time taken by B.
∴ A = ½B
1/(½B) + 1/B = 1/6
1/B = 1/18
Tank filled by B and C in one hour = 1/18+1/12= 5/36
Tank can be filled in 36/5 hours.

49. **Answer: B**

Solution

Let the tank get empty in T hours counting from 12 pm.
X is on for T hours and work done by X = Work in 1 hour × T hours = T / 1.5 = 2T/3
Similarly, Y starts at 1 pm i.e., it's on for (T-1) hours & work done is = (T-1)/2
Similarly, Z starts at 2 pm i.e. for (T-2) hours & work done is = (T-2)/(1/2) = 2(T-2)
Initially tank is empty and after T hours too, it is empty. So, total work done is 0.
2T/3 + (T-1)/2 - 2(T-2) = 0
T = 21/5 = 4.2 hours = 4 hours 12 min
This time is needed for tank to get empty.
Exact time will be 4 hours 12 min from 12 pm = 4:12 pm

50. **Answer: C**

Solution

10 hours. Let the capacity of tank be = 60 liters
1 + 2 + 3 inlets rate of filling the tank = 60/12 = 5 liters/hour --- (i)
2+ 3 + 4 inlets rate of filling the tank = 60/15 = 4 liters/hour --- (ii)
1 + 4 inlets rate of filling the tank = 60/2 = 3 liters/hour --- (iii)
Adding Eq A & C we get 2(1) + 2 + 3 + 4 = 8 liters/hour
So, 2(1) = 8 – 4 = 4
2(1) = 4;
1 = 2 liters/hour
So, time taken by all four inlets is= 60/6 = 10 hours

TIME, SPEED & DISTANCE

1. **Answer: D**

   Solution

   Distance of the car from Jigar = 500 m

   Time taken by the car to cover the distance = 20 seconds

   Speed of the car = 25m/sec

   Viz (25x18)/5 = 90km/hr

2. **Answer: C**

   Solution

   total distance travelled= 7+7= 14 km

   Total time taken= $\frac{30}{60} = 0.5 \text{ hrs}$

   Average speed= $\frac{14}{0.5} = 28 \text{ kmph}$

3. **Answer: A**

   Solution

   speed of unicycle = 18 ×1000/3600 = 5 m/sec

4. **Answer: B**

   Solution

   Speed of the train= $72 \times \frac{5}{18} = 20\text{m/sec}$

   distance travelled by the train= $25 \times 20 = 500\text{meters}$

   length of the tunnel = 300 m

   Hence, length of tunnel= 500-300=200 m

5. **Answer: A**

   Solution

   Let the distance between points A and B be x km.

   The time taken by the man to cycle from A to B is x/20,

   while the time taken to return is x/10.

   The total time taken is given as 15 hours, so we can write:

   x/20 + x/10 = 15

   3x/20 = 15

   x = 100 km

6. **Answer: D**

   Solution

   Let the original speed of the man be x km/hr.

   We know that the time taken to cover a distance of 60 km at this speed is equal to the time taken to cover the same distance at a speed of (x + 10) km/hr minus 1 hour. We can write this as:

   60/x = 60/(x+10) - 1

   60/x - 60/(x+10) = 1

   600 = x(x+10)

   x^2 + 10x - 600 = 0

   ∴ x = 20 km/hr

7. **Answer: D**

   Solution

   we have been given that the ratio of the speeds of the two people is 1:2

   hence the ratio of the distance travelled by the two people is 2:1

8. **Answer: D**

   Solution

   We know that the sound follows the flash of lightning, so we need to find the time it takes for sound to reach us after the lightning strikes. This is the time between seeing the flash and hearing the thunder.

   According to the problem statement, this time is 10 seconds.

   Using the formula above, we can calculate the distance between us and the thundercloud:

   distance = speed x time

   distance = 330 x 10 = 3300 meters

   Therefore, the thundercloud is at a distance of 3300 meters from us.

9. **Answer: C**

   Solution

   since train takes 10 seconds to cover it's own length, the additional time of 15 seconds is what is needed to cover the bridge of 300m length.

   Thus for 200 m the additional time will be 10 seconds.

   Thus, the train will take total 20 seconds to cover aa bridge of length 200 m.

10. **Answer: D**

    Solution

    time taken to travel 50 meters= time taken to cross the 50-meter-long platform- time taken to cross the standing man

    therefore, time taken to travel 50 meters = 14-10 seconds = 4 seconds

    Speed = $\frac{\text{distance}}{\text{time}} = \frac{50}{1000} \times \frac{1800}{10}$ = 45 km/ hr

11. **Answer: C**

Solution

Time taken to cover 20 km at the speed of 5km/hr = 4 hours.

Fixed time = 4 hours – 40 minutes = 3 hour 20 minutes

Time taken to cover 20 km at the speed of 8 km/hr = 20/8 = 2 hours 30 minutes

Required time = 3 hours 20 minutes – 2 hours 30 minutes = 50 minutes

12. **Answer: A**

Solution

Speed of the train can be calculated using (425+200)/5 = 125 m/s

If the man is walking at the speed of 5 m/s, the relative speed of the Train and the man is 130 m/s.

So to cover a distance of 260m the time taken will be 260/130 = 2.0 s

13. **Answer: A**

Solution

If we assume that the original speed was 4x, the person assumed that their speed is 5x.

Ratio of time is opposite of ratio of speed. This the ratio of original time to assumed time will be 5:4.

If we know that assumed time was 100 mins, the original time taken will be 100 x 5 / 4 = 125 mins.

14. **Answer: A**

Solution

Their relative speed is 2+2.5 = 4.5 kmph

So, time taken to be 18 km apart is 18/4.5 = 4 hours.

15. **Answer: A**

Solution

Length of the train = 120 m

Time taken to cross a man standing on a platform = 10 seconds

We know that speed = distance / time.

So, the speed of the train is:

Speed = 120 m / 10 s

Speed = 12 m/s

Therefore, the speed of the train is 12 meters per second.

16. **Answer: A**

Solution

If ratio of speeds is 5:6, the ratio of time should be 6t:5t

But we know that 6t-5t = 12 minutes

Thus 5t = 50 mins

So, the person is travelling at 6 kmph for 60 mins to reach on time. Thus, the distance is 6*1 = 6 km.

17. **Answer: C**

Solution

Let the distance of destination be D km

Let the speed of A = 3x km/hr

then speed of B = 4x km/hr

According to question, D/3x-D/4x=1/2

Therefore, D = 2 hours

18. **Answer: D**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 36 \times \frac{1000}{3600} = 10 \text{ m/sec}$

19. **Answer: C**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 50 \times \frac{1000}{3600} = 13.89 \text{ m/sec}$

20. **Answer: A**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 72 \times \frac{1000}{3600} = 20 \text{ m/sec}$

21. **Answer: C**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 325.8 \times \frac{1000}{3600} = 90.5 \text{ m/sec}$

22. **Answer: D**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 29 \times \frac{1000}{3600} = 8.05 \frac{\text{m}}{\text{sec}} \sim 8 \text{ m/sec}$

23. **Answer: E**

Solution

Kmph to m/sec conversion happens when we multiply kmph value by $\frac{1000}{3600}$

$\therefore 999 \times \frac{1000}{3600} = 277.5 \text{ m/sec}$

24. **Answer: C**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 900 \times \frac{3600}{1000} = 3240 \text{ km/hr}$

25. **Answer: B**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 250 \times \frac{3600}{1000} = 900 \text{ km/hr}$

26. **Answer: E**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 144 \times \frac{3600}{1000} = 518.4 \text{ km/hr}$

27. **Answer: D**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 625 \times \frac{3600}{1000} = 2250 \text{ km/hr}$

28. **Answer: C**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 50 \times \frac{3600}{1000} = 180 \text{km/hr}$

29. **Answer: D**

Solution

m/sec to km/hr conversion happens when we multiply m/sec value by $\frac{3600}{1000}$

$\therefore 180 \times \frac{3600}{1000} = 648 \text{ km/hr}$

30. **Answer: B**

Solution

Let's assume that Sanjana takes x minutes to walk to the store.

According to the problem,

driving makes her 5/2 times faster, which means she can cover the same distance in (2/5) times the time it takes to walk.

So, the time taken by Sanjana to drive to the store is (2/5)x.

It is given that she takes 3 minutes less to get to the store by driving.

So, we can write the following equation: (2/5)x + 3 = x

Simplifying the equation, we get: 3 = (3/5)x => x = 5 minutes

Therefore, it takes Sanjana 5 minutes to walk to the store

31. **Answer: E**

Solution

To find the average speed, we need to calculate the total distance covered by Chandak and the total time taken.

Total distance = 360 km + 100 km + 600 km = 1060 km Total time = 4 hours + 5 hours + 6 hours = 15 hours

Therefore, the average speed of Chandak is:

Average speed = total distance / total time = 1060 km / 15 hours ≈ 70.67 km/h

So, the average speed of Chandak is approximately 70.67 km/

32. **Answer: D**

Solution

To find the average speed of the train throughout the journey, we need to first calculate the total distance covered and the total time taken.

Distance covered in the first part of the journey = 700 km Time taken in the first part of the journey = 7 hours Distance covered in the second part of the journey = 540 km Time taken in the second part of the journey = 6 hours Time taken for the breakdown = 3 hours

Total distance covered = 700 km + 540 km = 1240 km Total time taken = 7 hours + 3 hours + 6 hours = 16 hours

Average speed of the train throughout the journey = Total distance covered / Total time taken = 1240 km / 16 hours = 77.5 km/hour

Therefore, the average speed of the train throughout the journey was 77.5 km/

33. **Answer: B**

Solution

The total distance covered by Nandan is 9000 km, and he rode for 6 days, with 8 hours of riding each day.

Therefore, the total riding time is:

6 days x 8 hours/day = 48 hours

The average speed of Nandan can be calculated by dividing the total distance by the total riding time:

Average speed = Total distance ÷ Total riding time

Average speed = 9000 km ÷ 48 hours

Average speed = 187.5 km/hour

Therefore, the average speed of Nandan is 187.5 km/hour

34. **Answer: D**

Solution

Let the original speed of Chindi be "x" km/hr and the new speed be "y" km/hr.

According to the problem statement,

Distance covered by Chindi in 5 hours at his original speed = 30 km (length of the marathon)

Therefore, the original speed of Chindi can be calculated as:

Distance/Time = 30/5 = 6 km/hr

Now, let's find out the distance covered by Chindi in 6 hours at his new speed:

Distance = Speed × Time Distance = y × 6 km = 6y km

According to the problem statement, Chindi completes the marathon of 30 km in 6 hours at his new speed. So, we can set up the following equation:

6y = 30

Solving for "y", we get:

y = 5 km/hr

So, the ratio of Chindi's original speed to his new speed can be calculated as:

x/y = 6/5

Therefore, the ratio of the original speed to the new speed is 6/5

35. **Answer: D**

Solution

To find Rohan's average questions per minute, we need to calculate the total number of questions he attempted and the total time taken by him to attempt those questions.

Total number of questions attempted by Rohan = Number of A type questions + Number of B type questions = 150 + 45 = 195

Total time taken by Rohan = Time taken to complete A type questions + Time taken to complete B type questions

= 85 minutes + 35 minutes = 120 minutes

Now, we can find Rohan's average questions per minute as follows:

Average questions per minute = Total number of questions attempted / Total time taken = 195 / 120 = 1.625

Therefore, Rohan's average questions per minute is 1.625.

36. **Answer: A**

Solution

Let the speed of cat B be x m/sec.

Since both cats meet after 4 seconds, we can say that the total distance covered by both cats is equal to the distance between them, which is 200 meters.

Distance covered by cat A in 4 seconds = 30 m/sec × 4 sec = 120 meters Distance covered by cat B in 4 seconds = x m/sec × 4 sec = 4x meters

Therefore, we can write the equation:

120 + 4x = 200

Simplifying the equation, we get:

4x = 80

x = 20

Hence, the speed of cat B is 20 m/sec.

Therefore, the correct option is (a) 20 m/sec

37. **Answer: C**

Solution

The estimated time by Ganesh for Kanha to reach Pune is 11:00 am - 6:00 am = 5 hours.

However, Kanha reaches Pune at 10:00 am, which means he takes only 4 hours to travel from Nashik to Pune.

Let's first calculate Kanha's actual speed:

Distance = 250 km

Time = 4 hours

Speed = Distance/Time = 250/4 = 62.5 km/hr

Now, let's calculate the speed estimated by Ganesh:

Distance = 250 km

Time = 5 hours

Speed = Distance/Time = 250/5 = 50 km/hr

Therefore, the ratio of the speed estimated by Ganesh to the actual speed of Kanha is:

50/62.5 = 4/5

Hence, the required ratio is 4:5

38. **Answer: A**

Solution

Let the speed of train A be x km/hr and the speed of train B be y km/hr.

Both trains start at 6:00 am and meet at a distance of 150 kms from A, which means that train A has traveled 150 kms and train B has traveled 120 kms (270 - 150) when they meet

Distance = 120 km

Time = 3 hours

Speed = $\frac{\text{distance}}{\text{time}} = \frac{120}{3}$ = 40 kmph

39. **Answer: B**

Solution

Let the distances travelled by Mridul Sharma in the three sections be 8x, 10x, and 7x, respectively.

Total distance travelled = 8x + 10x + 7x = 25x

Time taken to travel by air = (8x) / 200 = 2x / 25

Time taken to travel by train = (10x) / 125 = 2x / 25

Let the time taken to travel by bike be 't'. Then, distance travelled by bike = 7x and speed = 25 kmph.

Therefore, time taken to travel by bike = (7x) / 25 = 0.28x

Total time taken = (2x / 25) + (2x / 25) + 0.28x = 0.08x + 0.28x + 0.28x = 0.64x

We know that the total distance travelled is 625 km.

Therefore, 25x = 625, which gives x = 25.

Substituting x = 25 in the equation for time taken to travel by bike, we get:

Time taken to travel by bike = 0.28x = 0.28 * 25 = 7 hours.

Therefore, the answer is option (b) 7 hours

40. **Answer:** B

Solution

90 km = 12 × 7km + 6 km.

To cover 7 km total time taken = $\frac{7}{18}$hours+ 6 min. = 88 3 min.

So, (12 × 7 km) would be covered in $12 \times \frac{88}{3}$ min. and remaining 6km is $\frac{6}{18}$hoursor 20 min

Total time = $\frac{1056}{3} + 20 = 6$ hours 12 minutes.

41. **Answer: C**

Solution

let the distance between school and house be "x" km

according to the question

$\frac{x}{2.5} - \frac{x}{3.5} = \frac{1}{5}$

$\frac{4x}{35} = \frac{1}{5}$

X= 1.75

42. **Answer: A**

Solution

assume the time taken as t

according to the question 60t= 45(t+5.5)

$(60t - 45t) = 45 \times 5.5$

T= 16.5 hours

Distance=$16.5 \times 60 = 990$km

43. **Answer: A**

Solution

$\text{speed} = \frac{\text{distance}}{\text{time}}$

According to the question

$x = \frac{d}{12}$

12x = d

Since speed is doubled new speed= $2x$

Time is halved hence time= 6 hours

$\text{distance} = 6 \times 2x = 12x$

$\therefore$ new distance $= 12x$

44. **Answer: C**

Solution

Kundan	Chandan	Madan
1000	900	
	1200	1000
12000	10800	9000

Taking LCM of 900 and 1200 we get the final ratio of 12000 : 10800 : 9000

∴ in 12000 meters race Kundan beats Madan by 3000 meters

Hence, in 6000 meters race Kundan beats Madan by $\frac{3000}{2} = 1500$ m

45. **Answer: B**

Solution

To find the length of the train, we can use the concept of relative speed.

Let's assume the length of the train is 'x' meters.

When the train passes the first bridge of length 800 m, it takes 100 seconds. This means that the total distance covered by the train and the length of the bridge is equal to the speed multiplied by time:

x + 800 = speed * 100 ---(1)

Similarly, when the train passes the second bridge of length 350 m, it takes 50 seconds:

x + 350 = speed * 50 ---(2)

We have two equations (1) and (2) with two unknowns (x and speed). We can solve these equations to find the value of 'x', which represents the length of the train.

First, let's simplify the equations by dividing both sides by their respective time values:

x + 800 = 100 × speed ---(3)

x + 350 = 50 × speed ---(4)

Now, we can solve equations (3) and (4) simultaneously. Subtract equation (4) from equation (3):

(x + 800) - (x + 350) = (100 × speed) - (50 × speed)

Simplifying further:

800 - 350 = 100 × speed - 50 × speed

450 = 50 × speed

Divide both sides by 50:

speed = 450 / 50 = 9 m/s

Now that we have the value of the speed, we can substitute it into equation (1) to find the length of the train:

x + 800 = 100 × 9

x + 800 = 900

Subtract 800 from both sides:

x = 900 - 800

x = 100

Therefore, the length of the train is 100 meters.

46. **Answer: B**

Solution

To find the length of the train, we can use the concept of relative speed.

Let's assume the length of the train is 'x' meters.

In the first case, when the train passes a bridge of length 500 meters in 100 seconds, the total distance covered by the train and the bridge is (x + 500) meters. The time taken to cover this distance is 100 seconds.

Therefore, the speed of the train is (x + 500) / 100 meters per second.

In the second case, when the train passes a bridge of length 250 meters in 60 seconds, the total distance covered by the train and the bridge is (x + 250) meters. The time taken to cover this distance is 60 seconds.

Therefore, the speed of the train is (x + 250) / 60 meters per second.

Since the speed of the train is the same in both cases, we can equate the two expressions:

(x + 500) / 100 = (x + 250) / 60

Now, we can solve this equation to find the value of 'x', which represents the length of the train.

Cross-multiplying the equation:

60(x + 500) = 100(x + 250)

60x + 30000 = 100x + 25000

40x = 5000

x = 125

Therefore, the length of the train is 125 meters.

47. **Answer: C**

Solution

To find the speed of the train, we need to calculate the relative speed between the train and the man.

The length of the train is given as 240 m, and the time taken to cross the man is given as 10 seconds.

First, let's convert the speed of the man from km/h to m/s. We know that 1 km/h is equal to 1000 m/3600 s, so:

Speed of the man = 3 km/h = (3 × 1000) m/3600 s = 3000/3600 m/s = 5/6 m/s

The relative speed between the train and the man is the sum of their speeds because they are moving in opposite directions. So, the relative speed is:

Relative speed = Speed of the train + Speed of the man

We can calculate the relative speed using the formula: distance/time. The distance covered by the train while crossing the man is the sum of the lengths of the train and the man (240 m + 0 m = 240 m).

Therefore:

Relative speed = Distance/Time = 240 m/10 s = 24 m/s

Now, let's convert the relative speed from m/s to km/h:

Relative speed = 24 m/s = (24 × 3600)/1000 km/h = 83.4 km/h

Therefore, the speed of the train is 83.4 km/h.

48. **Answer: C**

Solution

Let the speed of train be x kmph and its length be y km. When the train crosses a man, it covers its own length

According to the question,

$\frac{y}{(x-3)\times\frac{5}{18}} = 10$

$= 18y = 10 \times 5(x-3)$

$= 18y = 50x - 150$ ⋯ (i)

And, $\frac{y}{(x-5)\times\frac{5}{18}} = 11$

$= 18y = 55(x-5)$

$18y = 55x - 275$ ⋯(ii)

From eqn i and ii

$55x - 50x = 275 - 150$

$5x = 125$

$x = 5$

49. **Answer: D**

Solution

Relative speed of train = (36 – 9) kmph = 27 kmph

$= 27 \times \frac{5}{18}$ m/sec

$=\frac{15}{2}$ m/sec

Required time = $\frac{\text{Length of the train}}{\text{Relative speed}}$

$= \frac{150\times2}{15} = 20$ seconds

50. **Answer: A**

Solution

To find the speed of the train, we can use the concept of relative speed. The relative speed is the combined speed of the train and the man, as they are moving in opposite directions.

Let's break down the information given:

Length of the train (l) = 100 meters

Time taken to pass the man (t) = 7.2 seconds

Speed of the man (v) = 5 km/hr

First, let's convert the speed of the man from km/hr to m/s to match the units of the length and time given in meters and seconds:

Speed of the man (v) = 5 km/hr = (5 * 1000) m/3600 s = 5000/3600 m/s ≈ 1.39 m/s

Now, we can calculate the relative speed (s) using the formula:

Relative speed (s) = (l/t)

Substituting the given values:

Relative speed (s) = (100/7.2) m/s ≈ 13.89 m/s

To find the speed of the train, we need to subtract the speed of the man from the relative speed:

Speed of the train = Relative speed – Speed of the man

Speed of the train = 13.89 m/s – 1.39 m/s = 12.5 m/s

Finally, let's convert the speed of the train from m/s to km/hr:

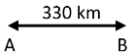
Speed of the train = 12.5 m/s = (12.5 * 3600) m/1000 s = 45 km/hr

Therefore, the speed of the train is approximately 45 km/hr.

51. **Answer: C**

Solution

Distance travelled by first train in one hour = 60 × 1 = 60km



Therefore, distance between two train at 9 a.m. = 330 – 60 = 270 km

Now, Relative speed of two trains = 60 + 75 = 135 km/hr

Time of meeting of two trains =$\frac{270}{135}$ = 2 hrs.

Therefore, both the trains will meet at 9 + 2 = 11 A.M

52. **Answer: A**

Solution

According to the question,

$\frac{12}{u+v} + 6 = \frac{12}{u-v}$ And $\frac{12}{u+v} + 1 = \frac{12}{u-v}$

By solving above equation,

Then v = 8/3 miles/hr

53. **Answer: B**

Solution

Let "up" be speed of boat Jiggy in still water, "uq" be speed of boat in still water and vp be speed of current. According to the question,

$$\frac{80}{up+vp} + \frac{80}{up-vp} = \frac{30}{1}$$

$$\frac{80}{uq+vp} + \frac{80}{uq-up} = \frac{9}{1}$$

Also, it is given uq=3up, vp = vq which is already used.

Then by putting the values and solving both equation We get,

speed of boat Q, uq= 18 kmph

54. **Answer: A**

Solution

Let speed of boat = u and speed of stream be v

According to the question,

$$\frac{40}{u-v} + \frac{55}{u+v} = \frac{13}{1}$$

$$\frac{30}{u-v} + \frac{44}{u+v} = 10$$

On solving we get

x = 1/5 and y = 1/11

Then we get u = 8 kmph And v =3 kmph

55. **Answer: D**

Solution

Let the speed of stream be 'u'

∴ Speed to row upstream will be '18-u' and Speed to row downstream becomes '18+u'

Let the time taken to row downstream be 'x'

∴ Time taken to row upstream will be 3x

If distance- 'd' ,

Given 18+u = d/t

18-u = d/3t

∴(18+u)t = (18-u)3t

18+u = 54-3u

4u = 36

u = 9

∴ Speed of stream is 9kmph

56. **Answer: D**

Solution

Let distance covered by Chirag = 3z

Distance covered by Aman = 2z

Speed of Aman = x

Speed of Chirag = 1.2x

Time = distance/ speed

Aman : Chirag = 2z/x : 3z/1.2x = 2 : 2.5

Time taken by Aman = 2 × 2 = 4hr

Time taken by Chirag = 2.5 × 2 = 5hr

Chirag reach at point B = 11:00 + 5hr = 4:00 p.m

57. **Answer: B**

Solution

Let, total distance = 4x Let,

speed of train in second part = y ⇒ Speed of train in first part = 2y

Distance covered by train in first part = 3x

Distance covered by train in second part = x

ATQ,

$$64 = \frac{4x}{\frac{3x}{2y} + \frac{x}{y}}$$

Solving this we get

2y = 80 kmph

Speed of train in first part = 2y = 80 kmph

58. **Answer: A**

Solution

Using Rule 2,

Remaining distance = (3584 – 1440 – 1608) km = 536 km.

This distance is covered at the rate of 536/8 = 67 kmph.

Average speed of whole journey = 3584/56 = 64 kmph

Required difference in speed = (67 – 64) kmph i.e., 3 kmph more

59. **Answer: A**

Solution

$\frac{600}{80} + \frac{800}{40} + \frac{500}{400} + \frac{100}{50} = \frac{248}{8}$

Average speed= $\frac{600+800+500+100}{\frac{246}{8}}$

$= 65\frac{5}{123}$ km/hr

60. **Answer: B**

Solution

Working hours per day= 24 – 9 = 15 hrs.

Total working hours for 40 days = 15 × 40 = 600 hrs.

On doubling the distance, the time required becomes twice but on walking twice as fast, the time required gets halved. Therefore, the two together cancel each other with respect to time required. Increasing rest to twice reduces walking hours per day to 24 – (2 × 9) = 6 hrs.

Total number of days required to cover twice the distance, at twice speed with twice the rest.

600/6=100 days

61. **Answer: D**

Solution

Let's say Jigar's usual speed is "s" and the distance he traveled is "d".

According to the problem, if he travels at 5/6th of his usual speed, his speed would be (5/6)*s.

Let's assume that Jigar takes "t" hours to travel the distance "d" at his usual speed "s".

Then, the time taken by him to travel the same distance "d" at 5/6th of his speed would be (t + 1/2) hours (as he takes an extra 30 minutes or 1/2 hour to complete the journey).

We can use the formula:

distance = speed * time

Using this formula for both cases, we get:

d = s × t

d = (5/6) × s × (t + 1/2)

Now, we can substitute the value of d from the first equation into the second equation:

s × t = (5/6) × s × (t + 1/2)

Simplifying this equation:

6t = 5(t + 1/2)

6t = 5t + 5/2

t = 5/2

Therefore, Jigar takes 5/2 hours or 2.5 hours to complete the journey at his usual pace.

2.5 hours= 150 min

62. **Answer: B**

Solution

Let the distance between Sudhanshu's school and his home be d, and let his regular speed be s.

According to the problem, Sudhanshu took 20 minutes longer to complete the trip at 3/4th of his regular speed. This means that if he had traveled at his regular speed s, he would have taken 20 minutes less to complete the trip. We can use this information to set up an equation relating the distance, speed, and time:

d = (3/4)s(t + 20) (since Sudhanshu traveled at 3/4th of his speed and took 20 minutes more)

d = st (since Sudhanshu would have traveled at his regular speed if he was not lazy)

Setting these two equations equal to each other, we get:

(3/4)s(t + 20) = st

Simplifying and solving for t, we get:

3(t + 20) = 4t

3t + 60 = 4t → t = 60

Therefore, if Sudhanshu had walked at his regular speed, it would have taken him 60 minutes (1 hour) to complete the journey. So, the answer is option B)

60 min

63. **Answer: A**

Solution

Let the time spent by Vinod on 6 lane road be x hours and the time spent by Vinod on 4 lane road be y hours.

Let's simplify the equation 120x + 90y = 720.

We can divide both sides by 30 to get:

4x + 3y = 24

y = (24 – 4x)/3

We know that x + y = 7 (total time taken).

Therefore, x + (24 – 4x)/3 = 7

3x + 24 – 4x = 21 → x = 3

Therefore, y = 4 (using y = (24 – 4x)/3)

The ratio of time spent on 6 lane road to time spent on 4 lane road is x:y = 3:4.

64. **Answer: D**

Solution

The man travels at a speed of 60 km/h for the first half of the journey. The total time taken for the first half can be calculated as:
Time = (1/2) × Total Distance / Speed = (1/2) × x/60
The man travels at a speed of 45 km/h for the second half of the journey. The total time taken for the second half can be calculated as:
Time = (1/2) × x/45
Given that the total travel time is 5 hours 15 minutes, we can convert it to hours:
Total Time = 5 hours + 15 minutes / 60
Total Time = 5 + (15/60)
Total Time = 5.25 hours
Now, we can set up the equation using the information above:
(1/2) × x/60 + (1/2) × x/45 = 5.25
180 × [(1/2) × x/60 + (1/2) × x/45] = 180 × 5.25
Simplifying the equation:
3x + 4x = 1890
7x = 1890
x = 1890 / 7 = 270
Therefore, the total distance travelled by the man is 270 km.

65. **Answer: A**

Solution

Let's assume the total distance is 3D and the total time taken is 3T.
$S_1 = 2D/T$
But we know $S_1 = 40$
Thus $2D/T = 40 \rightarrow D/T=20$
Now $S_2 = D/2T = 20/2 = 10$ kmph.
Thus the person must travel the remaining distance at 10kmph to reach on time.

66. **Answer: E**

Solution

Let's assume the speed of the boat in still water to be S_b and the speed of the stream to be S_s
Now the downstream speed= Speed pf the boat in still water+ speed of the stream
$S_{down} = S_b + S_s$ ------(1)
Similarly upstream speed= Speed of the boat in still water–speed of stream
$S_{up} = S_b - S_s$ ------(2)
From (1)&(2)
$S_b = \frac{(S_{up}+S_{down})}{2}$
$S_b = \frac{16+14}{2} = 15$ kmph
$S_s = 16 - 15 = 1$ kmph

67. **Answer: C**

Solution

In 1 minute the monkey climbs 12 metres but then he takes 1 minute to slip down 5 metres. So, at the end of 2 minutes the net ascending of the monkey is 12 – 5 = 7 metres.
So, to cover 63 metres the above process is repeated 63/7 = 9 times.
Obviously, in 9 such happenings the monkey will slip 8 times, because on 9th time, it will climb to the top.
Thus, in climbing 8 times and slipping 8 times, he covers 8 × 7 = 56 metres.
Time taken to cover 56 metres = $\frac{56\times2}{7}$=16 minutes
Remaining distance = 63 – 56 = 7 metres Time taken to ascend 7 metres = $\frac{7}{12}$ minutes
Total time= $16+\frac{7}{12} = 16\frac{7}{12}$

68. **Answer: C**

Solution

Let the speed of the second train be x km per hr.
Then the speed of the first train is x + 5 km per hr.
Let O be the position of the railway station from which the two trains leave.
Distance travelled by the first train in 2 hours = OA = 2 (x + 5) km.
Distance travelled by the 2nd train in 2 hours= OB = 2x km.
By Pythagoras theorem, $AB^2 = OA^2 + OB^2$
$50^2 = [2 (x + 5)]^2 + [2x]^2$
$2500 = 4 (x + 5)^2 + 4x^2$
$2500 = 4 (x^2 + 10x + 25) + 4x^2$
$8x^2 + 40x – 2400 = 0$
$X^2 + 5x – 300 = 0$
$X^2 + 20x – 15x – 300 = 0$
$x (x + 20) – 15 (x + 20) = 0$
$(x – 15) (x + 20) = 0$

x = 15, – 20 But x cannot be negative

x = 15

The speed of the second train is 15 km per hr. and the speed of the first train is 20 km per hr.

69. **Answer: B**

Solution

Let's assume that Chinki travels at a speed of 'x' while going to school and at a speed of 'y' while returning home.

According to the problem statement, we know that:

While going to school, Chinki travels at a speed of 7/10 th of her speed while returning home. So, her speed while going to school = 7/10 * y = (7/10)y

Chinki needs 21 minutes extra while going to school as compared to while returning home. This means that her total time taken while going to school is 21 minutes more than her total time taken while returning home. So, time taken while going to school – time taken while returning home = 21 minutes

Now, let's use the formula:

Distance = Speed × Time

We know that the distance covered by Chinki while going to school is the same as the distance covered by her while returning home. So, we can equate the distances:

Speed while going to school * Time taken while going to school = Speed while returning home * Time taken while returning home

(7/10)y × (t + 21) = y × t [where t is the time taken by Chinki while returning home]

Simplifying this equation, we get:

7y(t + 21) = 10yt

7yt + 147y = 10yt

3yt = 147y → t = 49 minutes

∴ Chinki takes 49 minutes to return home

70. **Answer: C**

Solution

Let's assume Prasanna's original speed is 'S' and the distance to the ice-cream parlour is 'D'.

When Prasanna drives at 2/3 of his original speed, his new speed becomes (2/3)S. According to the problem, he takes 20 mins more to reach the parlour at this speed than he would if he were driving at his original speed.

Let's calculate the time taken by Prasanna to reach the ice-cream parlour at his original speed:

Time taken = Distance / Speed Time taken = D/S

Now, let's calculate the time taken by Prasanna to reach the ice-cream parlour at $(2/3)^{rd}$ speed:

Time taken = Distance / Speed Time taken = D / (2/3)S = (3/2)(D/S)

According to the problem, the time taken at (2/3)S speed is 20 mins more than the time taken at the original speed. So we can set up the following equation:

(3/2)(D/S) – (D/S) = 20 mins

Simplifying this equation, we get:

D/S = 40 mins

Now, we can substitute this value of D/S in the equation for the time taken at the original speed:

Time taken = D / S Time taken = (40 mins)

71. **Answer: A**

Solution

Let's assume that the length of each train is 'L' and the speed of the slower train is '20 m/s'. Let's call the speed of the faster train 'x'.

When the two trains are moving in the same direction, the relative speed of the faster train with respect to the slower train is:

x – 20 m/s

Since the faster train overtakes the slower train in 1 minute (or 60 seconds), we can set up the following equation based on their relative speed:

60(x – 20) = 2L (since the faster train travels the length of the slower train and its own length)

Simplifying this equation, we get:

L = 30(x – 20)

Now, let's consider what happens when the two trains are moving in opposite directions. Their relative speed is:

x + 20 m/s

Since they cross each other in 20/3 seconds, the total distance they cover is:

2L (since they travel the sum of their lengths)

So, we can set up the following equation based on their relative speed:
(20/3)(x + 20) = 2L
Simplifying this equation, we get:
L = 10/3 (x + 20)
Now we can equate the two expressions we have for x and solve for L:
10/3 (x + 20) = 30(x – 20)
(x + 20) = 9(x – 20)
9x – 180 = x + 20
8x = 200 → x = 25 m/s
Therefore, the speed of the faster train is 25 m/s

72. **Answer:** A

Solution

Let the speed of the boat in still water be 'b' km/h and the speed of the stream be 'c' km/h.
When the boat travels downstream, the effective speed is the sum of the speed of the boat and the speed of the stream. Hence, the distance traveled downstream in 4 hours is given by:
60 = (b + c) × 4
Simplifying the above equation, we get:
b + c = 15 ------(1)
When the boat travels upstream, the effective speed is the difference between the speed of the boat and the speed of the stream. Hence, the distance traveled upstream in 5 hours is given by:
60 = (b - c) × 5
Simplifying the above equation, we get:
b - c = 12 ------(2)
Solving equations (1) and (2) simultaneously, we get:
b = 13.5 km/h and c = 1.5 km/h
∴ the speed of the boat in still water is 13.5 km/h and the speed of the stream is 1.5 km/h

73. **Answer:** C

Solution

Let the speed of the man be 'm' kmph and the distance he covers be 'd' km.
Speed of the boat upstream = (m - 2) kmph
Speed of the boat downstream = (m + 2) kmph
Given, time taken to row upstream = 6 hours
Therefore, d/(m - 2) = 6 or d = 6(m - 2)
Also, time taken to row downstream = 4 hours
Therefore, d/(m + 2) = 4 or d = 4(m + 2)
Equating both the expressions of 'd', we get:
6(m - 2) = 4(m + 2)
6m - 12 = 4m + 8
2m = 20 m = 10
∴ the speed of the man in still water is 10 kmph

74. **Answer:** C

Solution

Let the speed of the boat in still water be x km/h and the speed of the stream be y km/h.
When the boat is traveling downstream, its effective speed is (x + y) km/h, and when it is traveling upstream, its effective speed is (x-y) km/h.
According to the problem statement, the boat takes 2 hours to travel 40 km downstream, so we have:
40 = (x + y) × 2
Simplifying, we get:
x + y = 20
Similarly, the boat takes 3 hours to travel 40 km upstream, so we have:
40 = (x-y) × 3
Simplifying, we get:
x-y = 40/3
Now, we can solve these two equations simultaneously to find the values of x and y. Adding the two equations, we get:
2x = 20 + 40/3
Simplifying, we get:
x = 50/3
Substituting this value of x into either of the two equations, we get:
y = 10/3
∴ the speed of the boat in still water is 50/3 km/h, and the speed of the stream is 10/3 km/h

75. **Answer:** C

Solution

Downstream = (1/10 × 60) = 6 km/hr
Upstream = 2 km/hr
Speed in still water = ½ (6+2) = 4 km/hr
So, the time is taken by the boat to go 5km in stationary water = 5/4 hrs = 1 ¼ hrs = 1 hr 15 minutes.