CAT 2022 QA Mock 1 - 22

1. **An alloy is prepared by mixing three metals X, Y, and Z in the proportion 4:5:8 by volume. The weights of the same volume of the metals X, Y, and Z are in the ratio 3:2:7. In 156 kg of the alloy, the weight (in kg) of the metal Z is _.**

A 102 kg

B 84 kg

C **112 kg**

D 104 kg

Solution

Ratio of volumes of X, Y, X in the Alloy = 4:5:8

Ratio of weights of the same volumes or density of A, B, and C = 3:2:7

Ratio of weights of X, Y, and Z in the alloy = 3 × 4:5 × 2:8 × 7 = 12:10:56

Total weight of alloy = 156 kg

Weight of metal Z=$\frac{56}{12+10+56} \times 156 = 112\ kg$

2. **Leaving home at the same time, Anu reaches gym at 10:20 a.m. if she travels at 10 km/h, and at 9:38 am if she travels at 20 km/h. Leaving home at 9:00 a.m., at what speed (in km/h) must she travel so as to reach office exactly at 10 a.m.?**

A **14**

B 10

C 12

D 16

Solution

Let the distance between home and office be d km.

According to the question, we can write the following:

$$\frac{d}{10}-\frac{d}{20}=\frac{42}{60}$$

=> $\frac{d}{20}=\frac{42}{60}$

=> d =14 km

Now he should reach the office in 1 hour.

d = 14 km

t = 1 h

Required speed =14 km/hr

3. **Let X, Y, and Z be three positive integers such that the sum of X and the mean of Y and Z is 15. In addition, the sum of Y and the mean of X and Z is 20. Then, the sum of X and Y is __.**

A 10

B **12**

C 8

D 16

Solution

The given equations are the following:

$X + \frac{Y+Z}{2} = 15$ => 2X+Y+Z=30 ...(1)

$Y + \frac{X+Z}{2} = 20$ => 2Y+X+Z=40 ...(2)

Subtracting equation (1) from equation (2), we get the following:

Y – X = 10 ....(3)

Putting X = 1, we will get Y = 11; this is the minimum value of Y.

If X = Z = 1, then, from (1), we will get Y= 27 = max value of Y

But for X = 1, we were already getting Y = 11.

Hence, X = Z = 1 is not possible.

=> 2X+Y+Z=30

From this, by putting X = 1 and Y =11, we get Z = 17

So, the only possible solution is X = 1, Y = 11, and Z =17.

X + Y = 12

4. A solid right circular cone of height 35 cm is cut into two pieces parallel to its base at a height of 21 cm from the base. If the difference in volume of the two pieces is 545 cc, the volume, in cc, of the original cone is _.

A 676

B 900

C 729

D **625**

Solution

Height of original cone = 35 cm

Height of smaller cone = 35 – 21 = 14 cm

Ratio of height of original cone and smaller cone = 35:14 = 5:2

Let radius of original code = R cm.

Radius of smaller cone = r cm.

Using the similarity of triangles, we get the following:

The ratio of the radius of original cone to that of the smaller cone is

$\frac{R}{r} = \frac{5}{2}$

Ratio of volumes =$(\frac{5}{2})^3 = 125 : 8$

Let the volume of the original cone be 125k.

And the volume of the smaller cone = 8k

Volume of frustum = (125 – 8)k = 117k

Given,

117k – 8k = 225

109k = 545 = 109 × 5

⇒ k = 5

Volume of original cone = 125k = 125 × 5 = 625 cc

5. **Two persons are walking beside a railway track at respective speeds of 5 and 10 km per hour in the same direction. A train came from behind them and crossed them in 50 and 60 seconds, respectively. The time, in seconds, taken by the train to cross an electric post is nearest to _.**

A 39

B 43

C 41

D 35

Solution

Let the length of the train be x metres and the speed of the train be s km/h.

As they are moving in the same direction, relative speed between the train and the first person = (s – 5) km/h

Similarly, relative speed between the train and the second person = (s – 10) km/h [because they are moving in the same direction]

Since the distance (length of train) is same in both the cases, we can write the following :

$$\frac{S_1}{S_2} = \frac{T_2}{T_1}$$

Substituting these values, we get:

$\frac{S-5}{S-10} = \frac{60}{50}$

$\frac{S-5}{S-10} = \frac{6}{5}$

$5S - 25 = 6S - 60$

$S = 35\ km/hr$

Let the time taken by the train to cross an electric post be ‘t’.

We can write the following:

$\frac{S-5}{S} = \frac{t}{50}$

$\frac{30}{35} = \frac{t}{50}$

$t \approx 43\ sec$

6. **If x, y, and z are positive integers such that xy = 150, yz = 80, and z < 9, then the smallest possible value of x + y + z is __.**

A 37

B 33

C 40

D 35

Solution

It is given that,

$xy = 150$, $yz = 80$

Since x, y, z are positive integers and $z < 9$, we can get z as 8 or 6 or 4 or 3 or 2 or 1.

Case	**x**	**y**	**z**
1	1.875	80	1
2	3.75	40	2
3	7.5	20	4
4	9.375	16	5

Case	**x**	**y**	**z**
6	15	10	8

Since all values should be integers, we can say that the cases except 6 are to be ignored.

Hence,

x+y+z=33

7. **The mean of all 4-digit odd natural numbers of the form 'xxyy', where a > 0, is approximately, __.**

A 5544

B 5550

C **5553**

D 5558

Solution

The number 'xxyy' means 1000x + 100x + 10y + y = 11(100x + y).

Now, x can be 1,2,3…9 and y can be 1, 3, 5, 7, 9.

So, we can form the following table :

The first row represents the values of 'y' and the first column represents the values of 'x'

	1	**3**	**5**	**7**	**9**	**Total**
1	1111	1133	1155	1177	1199	5775
2	2211	2233	2255	2277	2299	11275
3	3311	3333	3355	3377	3399	16675

	1	**3**	**5**	**7**	**9**	**Total**
4	4411	4433	4455	4477	4499	22275
5	5511	5533	5555	5577	5599	27775
6	6611	6633	6655	6677	6699	33275
7	7711	7733	7755	7777	7799	38775
8	8811	8833	8855	8877	8899	44275
9	9911	9933	9955	9977	9999	49775
						249875

We can see that there are 5 values of ‘y’ and 9 values of ‘x’.

Hence, there are 45 values in total.

So, average = $\frac{sum}{45} = \frac{249875}{45} = 5553$.

8. **In a group of people, 32% of the members are young, while the rest are old. If 70% of the members are literates, and 40% of the literates are young, then the percentage of old people among the illiterates is nearest to __.**

A **87**

B 67

C 84

D 77

Solution

From the given data:

	Young	**Old**	**Total**
Literates	28	42	70
Illiterates	4	26	30
Total	32	68	100

We have filled in the values from the given data.

So, the required percentage = $\frac{26}{30} \times 100 \approx 87\%$

9. A straight road connects points X and Y. Bike 1 travels from X to Y and Bike 2 travels from Y to X, both leaving at the same time. After meeting each other, they take 50 minutes and 32 minutes, respectively, to complete their journey. If Bike 1 travels at the speed of 80 km/h, then the speed of Bike 2, in km/hr, is __.

A **100**

B 80

C 70

D 90

Solution

Let the two cars meet at point Z and the time they take to meet is ‘t’ min. Also, assume the speed of bike 1 to be S1 and that of bike 2 to be S2. [in suitable units]

Time taken by bike 1 to travel from X to Z = t min

Time taken by bike 2 to travel from Z to Y = 30 min

Since distance is same in both cases, we can write the following:

$\frac{S1}{S2} = \frac{32}{t}$......(1)

Similarly, we can write the following:

Time taken by bike 1 to travel from Z to Y = 50 min

Time taken by bike 2 to travel from Y to Z = t min

Since distance is same in both the cases, we can write the following:

$\frac{S1}{S2} = \frac{t}{50}$......(2)

From (1) and (2), we get the following:

$$\frac{32}{t} = \frac{t}{50}$$

=>$t = 40\ min$

Putting t = 30 and S1 = 80 in the first equation, we get the following:

$$\frac{80}{S2} = \frac{32}{40}$$

$S2 = 100\ km/hr$

10. **A person spent Rs. 105000 to purchase a tablet and a mobile phone. He sold the tablet at 25% profit and the mobile phone at 10% loss. If he made a 5% profit overall, then the purchase price, in rupees, of the tablet is __.**

A 40000

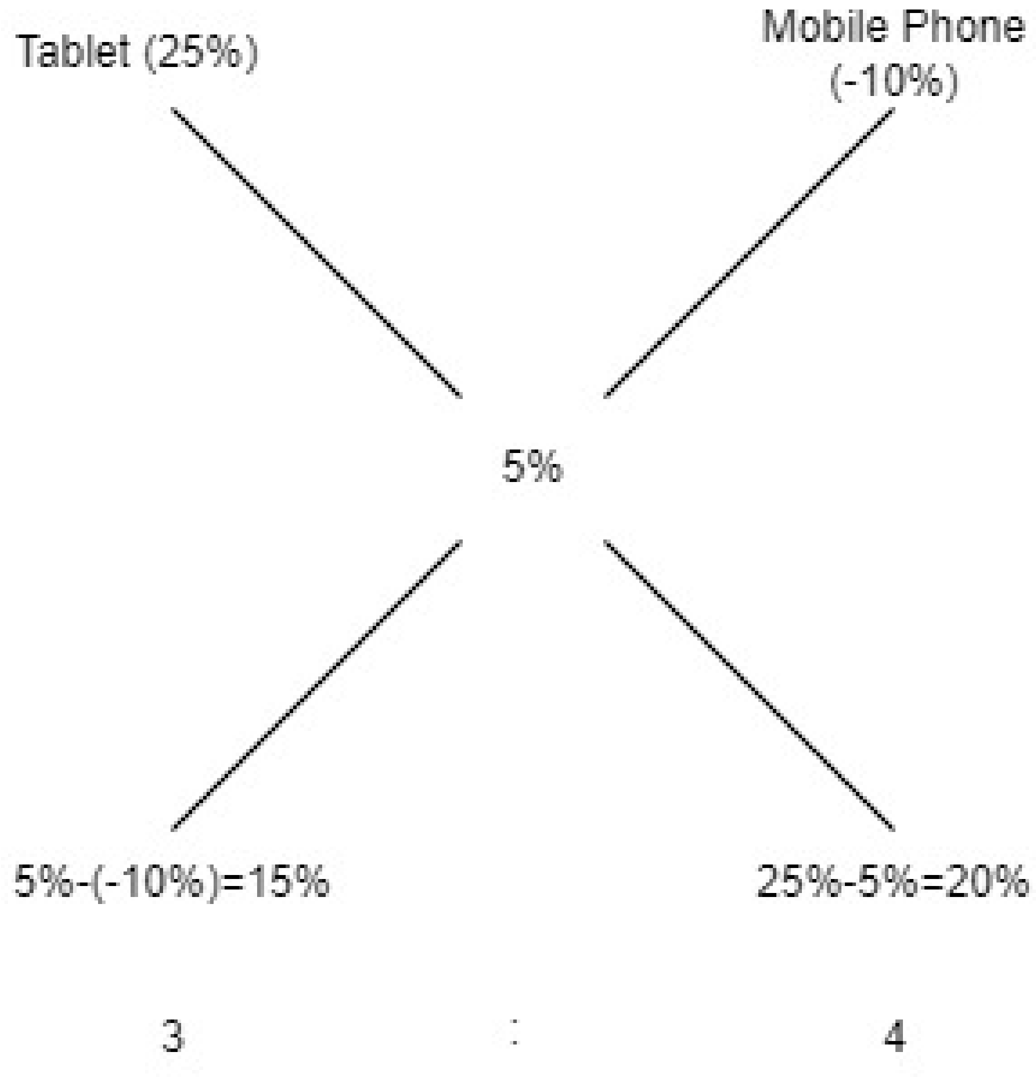
B 25000

C **45000**

D 50000

Solution

Using allegations, we can find the ratio of the cost prices of the two articles.



Tablet:Mobile phone = 3:4

Cost price of Tablet =$\frac{3}{7} \times 105000 = Rs. 45000$

11. **If f(10 + a) = f(10 – a) for every real a, and f(a) = 0 has four distinct real roots, then the sum of these roots is __.**

A 25

B 30

C **40**

D 50

Solution

Given,

$f(10 + a) = f(10 - a)$

Let $a = 10 - b$

Putting this value, we get the following: $f(20 - b) = f(b)$ ….(1)

Now let x and y be two of the four roots of $f(a) = 0$. ⇨ $f(x) = f(y) = 0$

Substituting $b = x$ in equation (1), we get the following:

$f(20 - x) = f(x) = 0$

This means $20 - x$ is the root of the given equation.

Similarly, if y is a root, then $(20 - y)$ is also a root of the given equation.

Hence, the four roots of the given equation are x, y, $20 - x$, and $20 - y$.

Sum of roots $= x + y + 20 - x + 20 - y = 40$.

12. **Sachi invested Rs. 25000 at 4% simple annual interest, and exactly after two years, Jis invested Rs. 12000 at 10% simple annual interest. How many years after Sachi's investment will their balances, i.e., principal plus accumulated interest, be equal?**

A 77

B 66

C 55

D 44

Solution

We can draw the following table:

Name	Principal	Rate	Year	Interest	Amount
Sachi	25000	4	T	1000T	25000+1000T
Jis	12000	10	T-2	1200(T-2)	12000+1200(T-2)

So, 25000+1000T = 12000+1200(T-2)

13000 = 200T-2400

⇨ 15400 = 200T

⇨ T = 77

13. **How many 3-digit numbers are there, for which the product of their digits is more than 4 but less than 9?**

A 20

B **25**

C 28

D 22

Solution

Let us assume the three digit number is XYZ.

Since 4 < $X \times Y \times Z$ < 9, the product of the digits can be 5,6,7 or 8.

Case	**Product**	**X**	**Y**	**Z**	**No. of numbers**
1	5	1	1	5	$\frac{3!}{2!} = 3$
2	6	1	1	6	3
3	6	1	2	3	3!=6
4	7	1	1	7	3
5	8	1	1	8	3

Case	Product	X	Y	Z	No. of numbers
6	8	1	2	4	3!=6
7	8	2	2	2	1
Total					25

14. **A solution of volume 60 litres has alcohol and water in the proportion 5:7. Water is added to the solution to change this proportion to 5:11. If 32 litres of this diluted solution is taken out, how many litres of alcohol must be added to the remaining solution to bring the proportion to 2:3?**

A **7 litres**

B 10 litres

C 5 litres

D 12 litres

Solution

For the initial solution,

Total volume = 60 litres

Volume of alcohol = $\frac{5}{12}\ of\ 60 = 25\ litres$

Volume of water = $\frac{7}{12}\ of\ 60 = 35\ litres$

Now we add water to change the proportion to 5:11

So, the volume of alcohol will not change.

Volume of alcohol in the new solution = 25 litres

Since water:alcohol = 11:5

=> Volume of new solution=25 $\times\ \frac{16}{5} = 80\ litres$

So, water added = 80-60 = 20 litres.

Volume of water in new solution = 55 litres.

Now 32 litres of the solution is removed. So, remaining volume of solution = 48 litres.

Volume of alcohol remaining = $25-\frac{5}{16}\times 32=15\,litres$

Volume of water remaining = $55-\frac{11}{16}\times 32=33\,litres$

To make ratio 2:3, amout of alcohol must be, $\frac{2}{3}\times 33=22\,litres$

So, volume of alcohol added = 22-15 = 7 litres.

15. **A circle is inscribed in a rhombus with diagonals 24 cm and 32 cm. The ratio of the area of the circle to the area of the rhombus is _.**

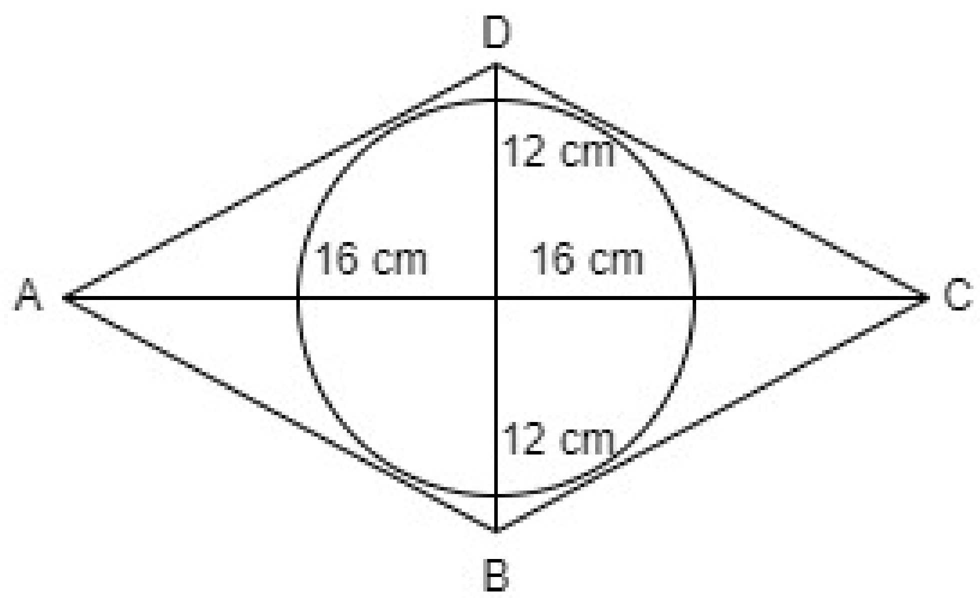
A $\frac{4\pi}{25}$

B $\frac{6\pi}{25}$

C $\frac{3\pi}{25}$

D $\frac{2\pi}{25}$

Solution



We know that diagonals of the rhombus bisect each other at 90^0 .

Therefore, using Pythagoras' theorem, we can write the following:

Side of rhombus $=\sqrt{(\frac{24}{2})^2+(\frac{32}{2})^2}=20\ cm$

Area of rhombus $=\frac{1}{2}\times 24\times 32=384\ cm^2$

Also, area of rhombus = $s \times r$, where ‘s’ is the semi-perimeter and ‘r’ is the radius of the incircle.

384 = 40 $\times$ r

r = $\frac{48}{5}$ cm

$$\frac{Area\ of\ circle}{Area\ of\ rhombus} = \frac{\pi(\frac{48}{5})^2}{384} = \frac{6\pi}{25}$$

16. **If** $\log_4 7 = (log_4 x)(log_8(\sqrt[3]{7}))$**, then x equals __.**

A 8

B 64

C **512**

D 256

Solution

$\log_4 7 = (log_4 x)(log_8(\sqrt[3]{7}))$

=>$\log_4 7 = \log_4 x \times \log_8 7^{(\frac{1}{3})}$

=>$\frac{\log 7 \times \log 8}{\frac{1}{3}\log 7} = \log x$

=>$3 \log 8 = \log x$

=>$\log(8^3) = \log x$

=>$x = 8^3 = 512$

17. **If $x = (512)^{5+2\sqrt{6}}$, then which of the following equals 16?**

A $\frac{x^{\frac{5}{2}}}{x^{\sqrt{6}}}$

B $\frac{x^{\frac{5}{2}}}{x^{2\sqrt{6}}}$

C $\frac{x^{\frac{5}{2}}}{2x^{\sqrt{6}}}$

D None of these

Solution

$x = (512)^{5+2\sqrt{6}}$

Taking both sides power, we get the following:

$x^{5-2\sqrt{6}} = (512)^{(5+2\sqrt{6})(5-2\sqrt{6})}$

Simplifying this, we can write the following:

$x^{5-2\sqrt{6}} = (16^2 \times 2)^{(5+2\sqrt{6})(5-2\sqrt{6})}$

=> $x^{5-2\sqrt{6}} = (16^2 \times 2)^1$

=> $16 = \frac{1}{2}(x^{5-2\sqrt{6}})^{(\frac{1}{2})}$

=> $16 = \frac{x^{\frac{5}{2}}}{2x^{\sqrt{6}}}$

18. A train travelled at one-fourth of its usual speed, and hence reached the destination 54 minutes after the scheduled time. On its return journey, the train initially travelled at its usual speed for 10 minutes but then stopped for 5 minutes for an emergency. The percentage by which the train must now increase its usual speed so as to reach the destination at the scheduled time, is nearest to _.

A 77%

B **167%**

C 133%

D 233%

Solution

Let the scheduled time be T.

If the speed is $\frac{1}{4}$ of the usual speed, then the time should be 4 times the initial time taken.

So, new time = 4T

4T – T = 54

$\Rightarrow$ T = 18 min

On the return journey, the train travelled at its usual speed for 10 min.

So, the remaining distance should be covered in 8 min at the usual speed.

Since 5 min are wasted, the distance should be covered in 3 min.

The remaining time is $\frac{3}{8}$ of the usual time.

So, the speed should be $\frac{8}{3} = 266.67\%$ of the usual speed.

So, the speed should increase by 167% approx.

19. If $\frac{y^{\frac{5}{2}}}{y^{\frac{3}{2}}} = (1024)^{7+2\sqrt{12}}$**, then which of the following is equal to 32?**

A $\frac{y^{\frac{7}{2}}}{4y^{\sqrt{12}}}$

B $\frac{y^{\frac{5}{2}}}{y^{\sqrt{12}}}$

C $\frac{y^{\frac{7}{2}}}{y^{2\sqrt{12}}}$

D $\frac{y^{\frac{7}{2}}}{y^{\sqrt{12}}}$

Solution

$$\frac{y^{\frac{5}{2}}}{y^{\frac{3}{2}}} = (1024)^{7+2\sqrt{12}}$$

Simplifying,

$$y^{\frac{5}{2}-\frac{3}{2}} = (1024)^{7+2\sqrt{12}}$$

$$y = (1024)^{7+2\sqrt{12}}$$

Taking both sides power, we get the following:

$$y^{7-2\sqrt{12}} = (1024)^{(7+2\sqrt{12})(7-2\sqrt{12})}$$

Simplifying this, we can write the following:

$$y^{7-2\sqrt{12}} = (32^2)^1$$

$$32 = (y^{7-2\sqrt{12}})^{\frac{1}{2}}$$

$$32 = \frac{y^{\frac{7}{2}}}{y^{\sqrt{12}}}$$

20. **In a sports meet, 45% of total participants are participating in junior category and remaining are in senior category. If 40% of total participants are girls and 60% of girls belongs to junior category, then percentage of boys in senior category will be appoximately_?**

A 67

B 65

C 56

D 49

Solution

From the given data:

	Junior	**Senior**	**Total**
Girls	24	16	40
Boys	21	39	60
Total	45	55	100

We have filled in the values from the given data.

So, the required percentage = $\frac{39}{60} \times 100 = 65\%$

21. **Three outlet taps X,Y and Z along with two inlet pipes A and B are connected to a tank. Pipe A can fill tank alone in 10 minutes and pipe B is twice as efficient as of pipe A. Tap X can empty the tank alone 30 minutes whereas tap Z can empty the tank alone in 20 minutes. Tap Y takes three times as of tap Z to empty tank. Find how much time it will take to fill the tank if pipes A and B and taps X,Y and Z opened together.**

A 10 minutes

B 6 minutes

C **5 minutes**

D 12 minutes

Solution

Time taken by pipe A to fill tank = 10 minutes.

Since, pipe B is twice efficient as of pipe A, time taken by pipe B to fill tank = 5 minutes.

Time taken by tap X to empty tank = 30 minutes.

Time taken by tap Z to empty tank = 20 minutes.

Since, tap Y takes three times as of tap Z, time taken by tap Y to empty tank = 60 minutes.

So, total work done in one minute by all pipes and taps together in one minute $= \frac{1}{10} + \frac{1}{5} - \frac{1}{30} - \frac{1}{20} - \frac{1}{60} = \frac{6+12-2-3-1}{60} = \frac{12}{60}$

So, time taken to fill the tank $= \frac{60}{12} = 5\ minutes$

22. **The sum of perimeter of a rectangle and square is 80 cm and 25R = 24S where, R is the area of rectangle and S is the are of the square. If breadth of the rectangle is 8 cm , the find the perimeter of a circle of radius equal to 4 cm more than side of square.**

A 105 cm

B 44 cm

C 176 cm

D **88 cm**

Solution

Let the sides of the rectangle be, l and b.

Let the side of square be, a.

Therefore, $2(l + b) + 4a = 80$

R = $l \times b$

S = a^2

Therefore,

$25 \times l \times b = 24a^2$

Given, b = 8 cm.

$25 \times l \times 8 = 24a^2$

$l = \frac{3a^2}{25}$

So, $2l + 16 + 4a = 80$

$\frac{6a^2}{25} + 4a - 64 = 0$

$6a^2 + 100a - 1600 = 0$

On solving, a=10 cm.

Therefore, radius of circle = 14 cm.

So, perimeter of circle = $2 \times \frac{22}{7} \times 14 = 88\ cm$