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Important Maths Questions for SSC exams

PDF Set - 1

Directions: Read the following questions carefully and choose the right answer.

1. Vasant can do a piece of work in 24 days. He works at it alone for 4 days and his friend Ritu alone finishes the remaining work in 25 days. Both of them together can complete the work in:

- A. 18 days
B. 15 days
C. $13\frac{1}{3}$ days
D. $16\frac{1}{3}$ days

2. ABCD is a trapezium in which $AD \parallel BC$ and $AB = DC = 10$ m. Find the distance of AD from BC is

- A. 52 m
B. 102 m
C. 62 m
D. 42 m



3. In a particular school, out of total 640 boys that include all the age-groups, 60% of the boys below 18 were enrolled. Out of them, 50% attended the school irregularly. If 120 boys among them were regular, how many boys were there in the school who are above 18?

- A. 400
B. 240
C. 600
D. 440

4. A and B are partners in a business. They invest in the ratio of 4 : 9, at the end of 6 months A withdraws. If they receive profits in the ratio of 4 : 9, then find how long B's investment was used.

- A. 12 months
B. 9 months
C. 6 months
D. 8 months

5. The cost price of a table and a chair together is Rs. 690. If the table costs 30% more than the chair, then find the cost price of the table and the chair respectively.

- A. Rs. 390 and Rs. 300
B. Rs. 300 and Rs. 390
C. Rs. 480 and Rs. 210
D. Rs. 400 and Rs. 290

6. A Shopkeeper has 660 Kesar Petha and 510 Paan Petha. He wants to arrange them in such a manner that each stack has the same number, and they take the least area of the tray. What is the number of Pethas that can be place in each stack for this purpose?

- A. 10
B. 35
C. 30
D. 25

7. Sindbad rows 24 km against the flow of water and 54 km with the flow of water in 6 hours. He can also row 36 km against the flow and 48 km with the flow in 8 hours. What is his speed in still water?

- A. 18.75 kmph
B. 19.25 kmph
C. 17.65 kmph
D. 15.55 kmph

8. If $x = 2$ then the value of $x^3 + 27x^2 + 243x + 631$ is:

- A. 1211
B. 1231
C. 1233
D. 1321

9. One of the angles of a triangle is two-third of the sum of the adjacent angles of a parallelogram. The remaining angles of the triangle are in the ratio of 5 : 7. What is the value of the second largest angle of the triangle?

- A. 40
B. 35
C. 25
D. None of these

10. If $8 \sin x = 4 + \cos x$, the values of $\sin x$ are:

- A. $\frac{3}{5}, -\frac{5}{13}$
B. $-\frac{3}{5}, \frac{5}{13}$
C. $-\frac{3}{5}, -\frac{5}{13}$
D. $\frac{3}{5}, \frac{5}{13}$

11. Mr. Sinha distributes a certain sum of money among his five sons, one daughter and his wife in such a way that each son gets double the amount of his daughter and the wife gets double the amount of each son. If each son gets Rs. 15000, what was the total amount distributed?

- A. Rs. 123000
B. Rs. 112500
C. Rs. 138500
D. Rs. 132500

12. Abhishek Jain typed 50 pages at the rate of 30 pages per hour on Sunday. On Monday, he could only type 50 extra pages at the rate of 20 pages per hour. What has his average rate of typing been overall. Calculate in pages per hour?

- A. 30
 B. 24
 C. 48
 D. 35

13. In covering a distance of 30 km Amit takes 2 hours more than Suresh, If Amit doubles his speed, he would take 1 hour less than Suresh. Amit's speed is :

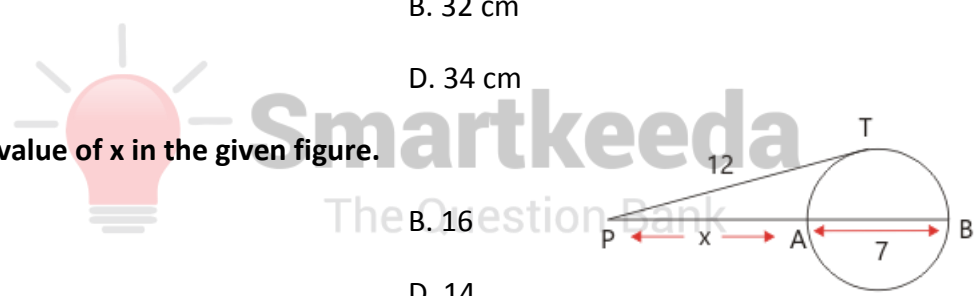
- A. 5 km/hr
 B. 7.5 km/hr
 C. 6 Km/hr
 D. 6.25 km/hr

14. What would be the measure of the diagonal of a square whose area is equal to 578 sq cm?

- A. 38 cm
 B. 32 cm
 C. 42 cm
 D. 34 cm

15. Find the value of x in the given figure.

- A. 9
 B. 16
 C. 7
 D. 14



16. if $\cot\left(\frac{\pi}{2} - \theta\right) = \sqrt{3}$, then the value of $\sin \theta - \cos \theta = ?$

- A. $\frac{1}{2}$
 B. $\frac{\sqrt{3}}{2}$
 C. $\frac{\sqrt{3} + 1}{2}$
 D. $\frac{\sqrt{3} - 1}{2}$

17. A sum of money at compound interest amounts to fifth-fold itself in 7 years. In how many years will it be 25 times itself?

- A. 14 years
 B. 8 years
 C. 6 years
 D. 3 years

18. A balloon is connected to a meteorological station by a cable of length 200 m, inclined at 60° to the horizontal. Find the height of the balloon from the ground. Assume that there is no slack in the cable.

- A. 173.2 m
B. 143.8 m
C. 163.5 m
D. None of these

19. A ladder is placed against a wall such that its foot is at a distance of 2.5 m from the wall and its top reaches a window 6 m above the ground. Find the length of the ladder.

- A. 8.5 m
B. 6.5 m
C. 4.5 m
D. 2.5 m

20. If $2^{2x-1} = \frac{1}{8^{x-3}}$, then the value of x is

- A. 3
B. 2
C. 0
D. -2

21. There are 45 personnel in an army camp. If the number of personnel increases by 9, the expenses of mess increase by Rs. 54 per day, while the average expenditure per person diminishes by 1. Find the original expenditure of the mess.

- A. Rs. 420
B. Rs. 540
C. Rs. 260
D. Rs. 640

22. The ratio of quantity of water in fresh fruits to that of dry fruits is 7 : 2. If 400 kg of dry fruits contain 50 kg of water then find the weight of the water in same fruits when they were fresh?

- A. 175 Kg
B. 100 Kg
C. 150 Kg
D. 125 Kg

23. If the ratio of simple interest and principal is $8 : 25/2$ and rate of interest is equal to the time invested then find the time of investment?

- A. 12 years
B. 16 years
C. 10 years
D. 8 years

24. 4 men can develop a mobile app in 3 days. 3 women can develop the same app in 6 days, whereas 6 boys can develop it in 4 days. 3 men and 6 boys worked together for 1 day. If only women were to finish the remaining work in 1 day, how many women would be required?

- A. 9
B. 12
C. 8
D. 10

25. A student rides on a bicycle at 5 km/hr and reaches his school 3 minute late. The next day he increased his speed to 7 km/hr and reached school 3 min early. Find the distance between his house and the school.

- A. 3 km
B. 2.75 km
C. 5 km
D. None of these

26. An E-commerce website offers cashback of 15% on the marked price of a certain item and earns a profit of 19% on it. If the difference between the cashback offered and the profit earned is Rs. 150, find the cost price of the item.

- A. Rs. 5000
B. Rs. 7500
C. Rs. 6000
D. Rs. 8000

27. The curved surface area and the total surface area of a cylinder are in the ratio 1 : 3. If total surface area is 616 cm^2 then find the volume of water which it can store.

- A. $\frac{4312}{3\sqrt{3}} \text{ cm}^3$
B. $\frac{4310}{3\sqrt{3}} \text{ cm}^3$
C. $\frac{4300}{3\sqrt{3}} \text{ cm}^3$
D. $\frac{432}{3\sqrt{3}} \text{ cm}^3$

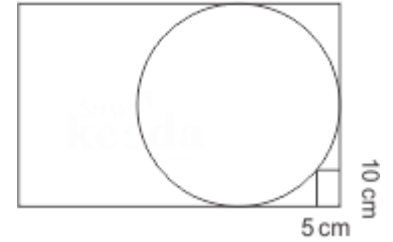
28. There is a piece of land 10,000 metre square which is to be sold at the rate of Rs. 2000 per square metre. If a man has Rs. 2,50,000 with him, find the percentage of land that he can purchase with this amount.

- A. 1.04%
B. 2.1%
C. 1.25%
D. 3.1%

29. If $\frac{x^{12} + x^3}{x^6} = 0$, find $x^{36} + \frac{1}{x^{36}}$

- A. 1
B. 2
C. 0
D. -1

30. In the following figure, a circle is placed in a rectangle with another rectangle of dimension 10 cm × 5 cm whose one vertex coincides with vertex of bigger rectangle and opposite vertex lies on circumference of circle. Find the radius of circle.



- A. 25 cm
B. 35 cm
C. 40 cm
D. 20 cm

31. If $x^4 + \frac{1}{x^4} = 322$, and $x > 1$ then the value of $x^3 - \frac{1}{x^3}$ is

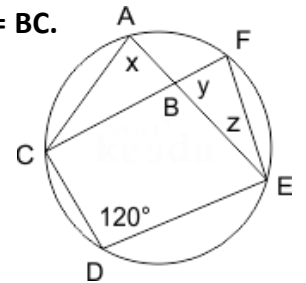
- A. 76
B. 54
C. 66
D. 36

32. Find the value of $\sin^2 10^\circ + \sin^2 20^\circ + \sin^2 30^\circ + \dots + \sin^2 80^\circ$.

- A. 2
B. 3
C. 1
D. 4

33. In the given figure, triangle ABC is an isosceles triangle such that $AB = BC$. Find x , y and z if angle CDE is 120° .

- A. $x = 60^\circ, y = 60^\circ, z = 60^\circ$
B. $x = 30^\circ, y = 40^\circ, z = 60^\circ$
C. $x = 40^\circ, y = 60^\circ, z = 60^\circ$
D. $x = 50^\circ, y = 40^\circ, z = 60^\circ$



34. Find the value of $\frac{16}{\sqrt{3}} (\cos 50^\circ \cos 10^\circ \cos 110^\circ \cos 60^\circ)$

- A. 1
B. 2
C. -1
D. -2

35. If the rate of income tax increases by 18%, net income decreases by 2%. What was the rate of income tax?

- A. 10
B. 20
C. 15
D. 12

36. If $x + y + z = 6\sqrt{3}$ and $x^2 + y^2 + z^2 = 36$. Find $x : y : z$.

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

37. The speed of boat is 10 km/hr in still water and speed of current is 4 km/hr. A man covered 12 km upstream, took some rest and then covered 14 km downstream. Find the period of time for which he took rest if he took 4 hrs to cover his complete journey.

- A. 0.5 hr
 B. 1 hr
 C. 1.5 hr
 D. 1.25 hr

38. If R and r are respectively the circumradius and in radius of triangle having sides 40 cm, 41 cm and 9 cm, then find the value of 2 (R + r).

- A. 40
 B. 49
 C. 45
 D. 44

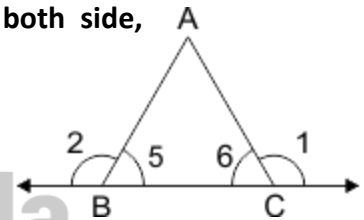
39. In the given figure, the side BC of ΔABC is produced on both side, then $\angle 1 + \angle 2$ is equal to

- A. $\angle A + 180^\circ$
 B. $180^\circ - \angle A$
 C. $2\angle A + 180^\circ$
 D. $\angle A + 90^\circ$



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40. Find the value of $\cos^2 \theta \left(\sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}} + \sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} \right)$

- A. $\cos \theta$
 B. $\frac{\cos \theta}{2}$
 C. $2 \cos \theta$
 D. $\sqrt{2} \cos \theta$

Directions (41 – 44): Study the following table chart carefully and answer the questions given beside.

Data related to 5 companies which produces specific quantity of products (in lakhs) during the given years is mentioned in the table below.

Companies	2000	2001	2002	2003
A	35	10	60	5
B	20	20	30	50
C	40	23	70	40
D	31	30	10	20
E	31	41	20	10

41. In which year all the companies together produces the maximum products.

A. 2000

B. 2001

C. 2002

D. 2003

42. Production of B & C together in year 2000 is what percent of Production by D and E in year 2003?

A. 200%

B. 150%

C. 125%

D. 50%

43. What is the ratio of production by A & D in 2001 to the Production by B & E in 2003?

A. 2 : 5

B. 2 : 3

C. 3 : 2

D. 5 : 2

44. If the profit generated on selling one product produced by A is Rs. 4.5, then find the total profit earned on selling all the products of A in all year together.

A. 495 lakhs

B. 395 lakhs

C. 475 lakhs

D. 375 lakhs



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Correct answer:

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



Explanation:

1. Approach I:

It's given that Vasant can do the work in 24 days.

$$\therefore \text{Vasant's efficiency of 4 days} = \frac{4}{24} = \frac{1}{6} \text{ part}$$

$$\therefore \text{Remaining work} = 1 - \frac{1}{6} = \frac{5}{6}$$

$$\therefore \frac{5}{6} \text{ work is to be completed by Ritu in 25 days.}$$

$$\therefore \text{The whole of work is completed by Ritu in} = \frac{6}{5} \times 25 = 30 \text{ days}$$

\therefore Combined efficiency of both of them

$$= \frac{1}{24} + \frac{1}{30} = \frac{5+4}{120} = \frac{9}{120}$$

\therefore Hence both Vasant and Ritu can complete the work in

$$\frac{120}{9} = 13\frac{1}{3} \text{ days}$$

Approach II:

Let Ritu finishes the work alone in x days.

As per the given information the efficiency equation will be as follows:

$$\frac{4}{24} + \frac{25}{x} = 1$$

$$\frac{25}{x} = \frac{5}{6}$$

$$\therefore x = 30$$

\therefore Time taken by both of them together = AB

$$A + B$$

Where, A is the time taken by Ritu to finish the work

And, B is the time taken by Vasant to finish the work.

$$\text{Time taken} = \frac{30 \times 24}{30 + 24} = \frac{30 \times 24}{54} = \frac{120}{9}$$

∴ Hence both Vasant and Ritu can complete the work in

$$\frac{120}{9} = 13\frac{1}{3} \text{ days}$$

Hence, option C is correct.

2. Let's draw a perpendicular line from D to BC at E.

From ΔDEC ,

$$\sin 45^\circ = \frac{DE}{CD} = \frac{DE}{10}$$

$$\Rightarrow \frac{1}{2} = \frac{DE}{10}$$

$$\therefore DE = \frac{10}{2} \text{ m or } 5 \text{ m}$$

Hence, option A is correct.

3. Let total boys below 18 are 100.

100 (boys below 18)

↓ (60% of them enrolled)

60

↓ 50% of 60 (irregular ones)

30 (regular)

Now, putting the values in proportion, we get



$$30 : 100 :: 120 : x$$

$$\therefore x = \frac{120 \times 100}{30} = 400 \text{ boys}$$

Therefore, the number of boys above 18 = 640 - 400 = 240

Hence, option B is correct.

4. Ratio of profit = 4 : 9

$$\text{Now, } \frac{\text{Share of A's investment} \times \text{Time}}{\text{Share of B's investment} \times \text{Time}} = \frac{\text{Profit of A}}{\text{Profit of B}}$$

Let the required time of B's investment = x

$$\Rightarrow \frac{4 \times 6}{9 \times x} = \frac{4}{9}$$

$$\text{or, } x = \frac{4 \times 6 \times 9}{4 \times 9} = 6$$

Thus, B invests the amount for 6 months.

Hence, option C is correct.

5. Let the price of chair be 100, then

table will be 130% of 100 = 130

Therefore, according to question,

$$100 + 130 = 230 \equiv 690/-$$

$$\therefore 1 \equiv 3/-$$

$$\therefore 100 \equiv \text{Rs. } 300 \text{ \& } 130 \equiv \text{Rs. } 390.$$

Hence, option A is correct.

6. The area of the tray that is used up in stacking of the Pethas will be the least area, if the shopkeeper stacks the maximum and the same number of Pethas in each stack.

Therefore, the number of stacks will be the least if the number of Pethas in each stack is equal to the HCF of 660 and 510.

Thus, the HCF of 660 and 510 is 30.

Therefore the maximum number of Pethas in each stack is 30.

Hence, option C is correct.

7. Let the speed against the flow of water be x kmph and with the flow be y kmph.

$$\text{Then, } \frac{24}{x} + \frac{54}{y} = 6 \quad \dots(\text{i})$$

$$\text{Again, } \frac{36}{x} + \frac{48}{y} = 8 \quad \dots(\text{ii})$$

Now, suppose $\frac{1}{x} = u$ and $\frac{1}{y} = v$

$$\text{Then, } 24u + 54v = 6 \text{ or } 4u + 9v = 1 \quad \dots(\text{iii})$$

$$36u + 48v = 8 \text{ or, } 9u + 12v = 2 \quad \dots(\text{iv})$$

Solving eqn. (iii) and (iv), we get

$$u = \frac{2}{11} = \frac{1}{x}$$

$$\therefore x = \frac{11}{2} = 5.5 \text{ kmph}$$

Putting the value of u in eqn. (iii), we get

$$\therefore 9v = 1 - \frac{8}{11} = \frac{3}{11}$$

$$\therefore v = \frac{1}{11} = \frac{1}{y} \Rightarrow y = 11 \text{ kmph}$$

$$33 \text{ y}$$

Therefore, speed of Sindbad in still water

$$= \frac{33 + 5.5}{2} = 19.25 \text{ kmph}$$

Hence, option B is correct.

8. Given equation,

$$f(x) = x^3 + 27x^2 + 243x + 631$$

$$\Rightarrow x(x^2 + 27x + 243) + 631$$

Now, put the value of $x = 2$

$$\Rightarrow 2(2^2 + 27 \times 2 + 243) + 631$$

$$\Rightarrow 2(4 + 54 + 243) + 631$$

$$\Rightarrow 2(301) + 631 = 602 + 631 = 1233.$$

Hence, option C is correct.

9. Sum of adjacent angles of a parallelogram = 180°

\therefore One of the angles of the triangle

$$= \frac{2}{3} \times 180^\circ = 120^\circ$$

$$\text{Sum of the remaining two angles} = (180^\circ - 120^\circ) = 60^\circ$$

And the ratio of the remaining two angles is 5 : 7

$$\text{Second largest angle} = \frac{7}{12} \times 60^\circ = 35^\circ$$

Hence, option B is correct.

10. $8 \sin x - 4 = \cos x \Rightarrow 8 \sin x - 4 = \sqrt{1 - \sin^2 x}$

$$\Rightarrow 1 - \sin^2 x = (8 \sin x - 4)^2$$

$$\Rightarrow 1 - \sin^2 x = 64 \sin^2 x + 16 - 64 \sin x$$

$$\Rightarrow 65 \sin^2 x - 64 \sin x + 15 = 0$$

$$\Rightarrow 65 \sin^2 x - 39 \sin x - 25 \sin x + 15 = 0$$

$$\Rightarrow 13 \sin x (5 \sin x - 3) - 5 (5 \sin x - 3) = 0$$

$$\Rightarrow (5 \sin x - 3) (13 \sin x - 5) = 0$$

$$\Rightarrow \sin x = \frac{3}{5} \text{ or } \sin x = \frac{5}{13}$$

Hence, option D is correct.

11. Following the information given in the question, we get

5 sons get $15000 \times 5 = \text{Rs. } 75000$

\therefore 1 daughter gets $15000 \div 2 = \text{Rs. } 7500$

\therefore Wife gets $= 15000 \times 2 = \text{Rs. } 30000$

Total amount $= 75000 + 7500 + 30000 = \text{Rs. } 112500/-$

Hence, option B is correct.

12. As per the question,

$$\text{No. of hours Abhishek typed on Sunday} = \frac{50}{30} = \frac{5}{3}$$

$$\text{No. of hours Abhishek typed on Monday} = \frac{50}{20} = \frac{5}{2}$$

$$\text{Total hours of typing} = \frac{5}{3} + \frac{5}{2} = \frac{25}{6}$$

$$\text{Total pages typed} = 50 + 50 = 100$$

$$\text{Average rate of typing} = \frac{100}{\frac{25}{6}} = 6 \times 4 = 24$$

Hence, Abhishek Typed 24 pages per hour.

Hence, option B is correct.

13. Let Amit's speed = x km/hr and Suresh's speed = y km/hr.

$$\frac{30}{x} - \frac{30}{y} = 2 \text{ \& } \frac{30}{y} - \frac{30}{y} = 1.$$

putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, these questions become.

$$15u - 15v = 1 \text{ and } -15u + 30v = 1$$

On solving these equations, we get $u = \frac{1}{5}$ & $v = \frac{2}{5}$

$$\therefore \frac{1}{x} = \frac{1}{5} \text{ and } \frac{1}{y} = \frac{2}{15}, \text{ So, } x = 5 \text{ \& } y = \frac{15}{2}$$

Hence, Amit's speed = 5 km/hr.

Hence, option A is correct.

14. \therefore Area of a square $\frac{1}{2} (\text{diagonal})^2$

$$\therefore (\text{Diagonal})^2 = 2 \times 578 = 1156$$

$$\text{Diagonal} = \sqrt{1156} = 34 \text{ cm}$$

Hence option D is correct.



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15. Since, PT is a tangent and PAB is a secant to the circle.

$$\therefore PT^2 = PA \cdot PB$$

$$144 = x(x+7)$$

$$\Rightarrow x^2 + 7x - 144 = 0$$

$$\Rightarrow (x + 16)(x - 9) = 0$$

$$\Rightarrow x = 9 (\because x = -16 \text{ is not possible.})$$

Hence, option A is correct.

16. $\cot\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$

$$\cot\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \cot 30^\circ$$

$$\text{or, } 90^\circ - \frac{\theta}{2} = 30^\circ$$

$$\text{or, } \frac{\theta}{2} = 60^\circ$$

$$\therefore \theta = 120^\circ$$

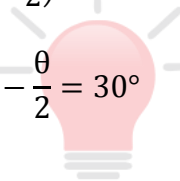
$$\text{Now, } \sin\theta - \cos\theta = \sin 120^\circ - \cos 120^\circ$$

$$= \sin(90^\circ + 30^\circ) - \cos(90^\circ + 30^\circ)$$

$$= \cos 30^\circ + \sin 30^\circ$$

$$= \frac{\sqrt{3}}{2} + \frac{1}{2} = \frac{\sqrt{3} + 1}{2}$$

Hence, option C is correct.



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17. Approach I:

To find the time we can apply the shortcut approach

$$m^{1/T_1} = n^{1/T_2}$$

Here m and n represent the number of times the given sum is becoming, in the first and the second case respectively.

T_1 & T_2 are the numbers of years in the first and the second case respectively.

Here, $m = 5$ and $n = 25$

$T_1 = 7$ years and $T_2 = ?$

Putting the values, we get

$$5^{1/7} = 25^{1/T_2} = (5^2)^{1/T_2} = 5^{2/T_2}$$

$$\therefore \frac{1}{7} = \frac{2}{T_2}$$

$$\therefore T_2 = 14 \text{ years}$$



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Approach II:

Let the sum be Rs P .

In the first case,

$$\therefore P \left(1 + \frac{R}{100}\right)^7 = 5P$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^7 = 5 \dots (i)$$

In the second case,

$$P \left(1 + \frac{R}{100}\right)^n = 25P$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = 25 = (5)^2 = \left[\left(1 + \frac{R}{100}\right)^7\right]^2 \text{ [sing (i)]}$$

$$\Rightarrow \left(1 + \frac{R}{100}\right)^n = \left(1 + \frac{R}{100}\right)^{14}$$

$\therefore n = 14$ years

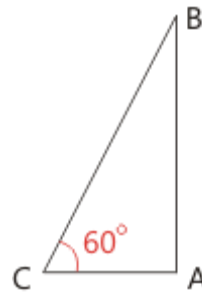
Hence, option A is correct.

- 18.** Let B be the balloon and AB be the vertical height. Let C be the meteorological station and CB be the cable.

Then, BC = 200 m and $\angle ACB = 60^\circ$

$$\text{Then, } \frac{AB}{BC} = \sin 60^\circ = \frac{\sqrt{3}}{2} \Rightarrow \frac{AB}{200} = \frac{\sqrt{3}}{2}$$

$$\Rightarrow AB = \left(\frac{200 \times \sqrt{3}}{2}\right) m = 173.2 m.$$



Hence, option A is correct.

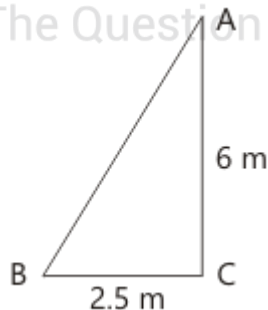
- 19.** Let AB = Ladder

$$\text{in } \triangle ABC, AB^2 = BC^2 + AC^2$$

$$= (2.5)^2 + (6)^2 = 42.25$$

$$\therefore AB = \sqrt{42.25} = 6.5 m$$

Hence, option B is correct.



- 20.** $2^{2x-1} = \frac{1}{8^{x-3}} = 8^{3-x} = 2^{3(3-x)} = 2^{9-3x}$

$$\Leftrightarrow 2x - 1 = 9 - 3x \Leftrightarrow x = 2$$

Hence, option B is correct.

21. Let the average expenditure per personnel = Rs. x

\Rightarrow Original total expenses = Rs. $45x$

Now total expenses = Rs. $(45x + 54)$

& new average expenditure per personnel = Rs. $(x - 1)$

$$\therefore \frac{45x + 54}{45 + 9} = \frac{45x + 54}{54} = (x - 1)$$

$$\Rightarrow 45x + 54 = 54x - 54$$

or, $x = 12$

\therefore The original expenditure = $45 \times 12 = \text{Rs. } 540$

Hence, option B is correct.

22. Here, the weight of water in 400 kg of dry fruits is 50 kg.

So, the weight of fruits alone = $(400 - 50) \text{ kg} = 350 \text{ Kg}$

Here, Ratio of water in fresh fruits to the dry fruit = $7 : 2$

$$\Rightarrow 2 = 50 \text{ Kg}$$

$$\therefore 1 = 25 \text{ kg}$$

So, the water in fresh fruits = $7 \times 25 = 175 \text{ kg}$

Hence, option A is correct.

23. Let the rate of interest be $r\%$ per annum.

We have ratio of simple interest to principal is = $16 : 25$

then $SI = 16x$ and Principal $25x$

And, rate of interest = time = r

$$\Rightarrow 16x = \underline{25x \times r \times r}$$

100

$$\Rightarrow r^2 = 16 \times 4$$

$$\therefore r = 8$$

Here, the time of investment is 8 years.

Hence, option D is correct.

24. \therefore 4 men can develop a mobile app in 3 days.

$$\therefore 3 \text{ men can develop it in } \frac{3 \times 4}{3}$$

$$= 4 \text{ days}$$

6 boys can develop the mobile app in 4 days

App work done by 3 men and 6 boys in one day

$$= \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

$$\therefore \text{Remaining work} = 1 - \frac{1}{2} = \frac{1}{2} \text{ of the work}$$

\therefore 3 women can develop the app in 6 days

\therefore 18 women can develop the work in 1 day

Hence, to finish $1/2$ app development in 1 day by women

$$\text{We require only} = 18 \times (1/2) = 9 \text{ women}$$

Hence, option A is correct.

25. We know when distance remains constant then product of time and speed will also be same.

Let the time at which a student should reaches his school be t hrs.

Therefore we have,

$$5 \left(t + \frac{3}{60} \right) = 7 \left(t - \frac{3}{60} \right)$$

On solving above equation ,we get

$$300t + 15 = 420 t - 21$$

$$t = \frac{36}{120} \text{hrs.}$$

$$t = \frac{3}{10} \text{hrs.}$$

Distance = Speed \times time

Distance

$$= 5 \left(\frac{3}{10} + \frac{3}{60} \right)$$

$$= 1.75 \text{ km}$$

Hence, option D is correct.

- 26.** Let the cost price of the article be Rs. x.

Then, SP of the article = $1.19x$

And, MP of the article =

$$\frac{1.19x}{1 - 0.15} = \frac{1.19x}{0.85} = 1.4 x$$

Difference = Discount offered – profit earned = 150

Then, $1.4x \times 0.15 - 0.19x = 150$

or, $0.21x - 0.19x = 150$

or, $0.02x = 150$

or, $x = 7500$

\therefore Cost price of the item = Rs. 7500

Hence, option B is correct.

27. We have ,

$$\frac{2\pi rh}{2\pi rh + 2\pi r^2} = \frac{1}{3}$$

Solving this we get ,

$$4\pi rh = 2\pi r^2$$

$$2h = r \dots\dots\dots \text{equation A}$$

$$2\pi rh + 2\pi r^2 = 616 \dots\dots\dots \text{equation B}$$

From A and B, we get

$$\pi r^2 + 2\pi r^2 = 616$$

$$3\pi r^2 = 616$$

$$r^2 = 616 \times \frac{7}{22} \times \frac{1}{3}$$

$$r^2 = 28 \times \frac{7}{3}$$

$$r = \frac{14}{\sqrt{3}} \text{ cm}$$

Using equation A ,we get

$$h = \frac{7}{\sqrt{3}} \text{ cm}$$

Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{14}{\sqrt{3}} \times \frac{14}{\sqrt{3}} \times \frac{7}{\sqrt{3}} = \frac{4312}{3\sqrt{3}} \text{ cm}^3$$

Hence, option A is correct.



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28. Piece of land purchased by man

$$= \frac{250000}{2000} = 125 \text{ m}^2$$

∴ Percentage of land that he can purchase with this amount

$$= \frac{125 \times 100}{10000} \% = \frac{5}{4} \% = 1.25\%$$

Hence, option C is correct.

29. $\frac{x^{12} + x^3}{x^6} = 0$

$$\frac{x^{12}}{x^6} + \frac{x^3}{x^6} = 0$$

$$x^6 + \frac{1}{x^3} = 0$$

$$x^6 = -\frac{1}{x^3}$$

$$x^9 = -1$$

$$x^{9 \times 4} = (-1)^4$$

$$x^{36} = 1$$

Therefore,

$$x^{36} + \frac{1}{x^{36}} = 1 + 1 = 2$$

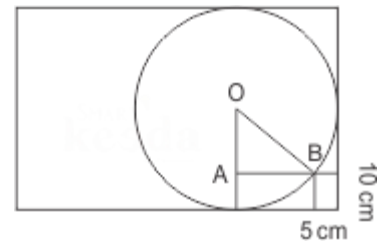
Hence, option B is correct.

30. Let the radius of the circle is 'r'.

We have, $AB = r - 5$

$OA = r - 10$

We have, triangle OAB is a right angled triangle at A.



Therefore using Pythagoras theorem, we get

$$OB^2 = OA^2 + AB^2$$

$$r^2 = (r - 10)^2 + (r - 5)^2$$

$$r^2 = r^2 + 100 - 20r + r^2 + 25 - 10r$$

$$r^2 - 30r + 125 = 0$$

Solving above equation we get

$$r = 25, 5$$

Since r is clearly bigger than 5 cm, we can take the radius of the circle as 25 cm.

Therefore r = 25 cm.

Hence, option A is correct.

31. $x^4 + \frac{1}{x^4} = 322$ [$x > 1$] given

We know that, $[(a + b)^2 = a^2 + b^2 + 2ab]$ Or, $[(a + b)^2 - 2ab = a^2 + b^2]$

$$\text{So, } \left(x^2 + \frac{1}{x^2}\right)^2 - 2 \times x^2 \times \frac{1}{x^2}$$

$$= x^4 + \frac{1}{x^4}$$

$$\text{Or, } \left(x^2 + \frac{1}{x^2}\right)^2 = 322 + 2$$

$$\left(x^2 + \frac{1}{x^2}\right)^2 = \pm 18$$

$$\text{Also, } \left(x^2 - \frac{1}{x^2}\right)^2 + 2 \times x^2 \times \frac{1}{x^2}$$

$$= x^2 + \frac{1}{x^2}$$



$$\left(x^2 - \frac{1}{x^2}\right)^2 + 2 = 18$$

$$[\because (a - b)^2 + 2ab = a^2 + b^2]$$

$$\left(x - \frac{1}{x}\right) = \pm 4$$

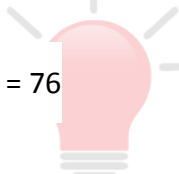
Now, Cubbing both sides, we get

$$x^3 - \frac{1}{x^3} - 3 \times x \times \frac{1}{x} \left(x - \frac{1}{x}\right) = 64$$

$$\text{Or, } x^3 - \frac{1}{x^3} - 3(4) = 64$$

$$x^3 - \frac{1}{x^3} = 12 + 64$$

$$\left(x^3 - \frac{1}{x^3}\right) = 76$$



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Hence, option A is correct.

32. We can rewrite above equation as

$$\sin^2 10 + \sin^2 80 + \sin^2 20 + \sin^2 70 + \sin^2 30 + \sin^2 60 + \sin^2 40 + \sin^2 50 \dots$$

equation (A)

$$\text{We know that } \sin^2 x + \sin^2 (90 - x) = 1$$

Therefore equation A becomes

$$1 + 1 + 1 + 1 = 4$$

Hence, option D is correct.

33. Method I :

Since quadrilateral CDEF is Cyclic quadrilateral, therefore

$$\angle CDE + \angle CFE = 180^\circ$$

Therefore ,

$$\angle CFE = 180^\circ - 120^\circ = 60^\circ$$

We know that

Angles formed from two points on the same arc are equal .

Therefore

$$x = \angle CAE = 60^\circ$$

Since $AB = BC$

$$\text{Thus } x = \angle ACB = 60^\circ$$

By angle sum property of triangle ABC, we have

$$x + x + \angle ABC = 180^\circ$$

$$\angle ABC = 180 - 2x$$

$$\angle ABC = 180 - 120 = 60^\circ$$

$\angle ABC = y = 60^\circ$ as vertically opposite angles are same.

Using angle sum property in ΔFBE ,we get

$$60^\circ + 60^\circ + z = 180^\circ$$

$$\text{Thus } z = 60^\circ$$

Method II :

In this question, CDEF will be a cyclic quadrilateral.

Therefore, the sum of the opposite angle i.e. angle CDE=angle CFE=180°

$$120^\circ + \angle CFE = 180^\circ$$

$$\angle CFE = 180 - 120 = 60^\circ$$

Now, if we take CE a chord then we know that the angle made by the same chord on any point of the circumference is equal therefore

$$\angle CFE = \angle CAE = 60^\circ = X \text{ ----- (i)}$$

Again, according to the question, $AB = BC$ therefore $x = \angle ACB = 60^\circ$

In triangle ABC, $\angle X + \angle ACB + \angle ABC = 180^\circ$

$$60 + 60 + \angle ABC = 180$$

$$\angle ABC = 180 - 120 = 60^\circ \text{ ----- (ii)}$$

Now, AE and CF intersect each other at B

Therefore, $\angle ABC = \angle FBE = Y = 60^\circ$ ----- (iii) (from the equation I, $\angle ABC = 60^\circ$)

Now in the triangle FBE, $\angle FBE + \angle BEF + \angle BFE = 60 + 60 + Z = 180$

By solving, $z = 60^\circ$

Therefore, $x = y = z = 60^\circ$

Hence, option A is correct answer.

34. We have $\cos x \cos(60 - x) \cos(60 + x) = \cos x (\cos x \cos 60 + \sin x \sin 60) (\cos x \cos 60 - \sin x \sin 60)$

$$= \cos x (\cos^2 x \cos^2 60^\circ - \sin^2 x \sin^2 60^\circ)$$

$$= \cos x \left(\frac{1}{4} \cos^2 x - \frac{3}{4} \sin^2 x \right)$$

$$= \frac{1}{4} (\cos^3 x - 3 \cos x (1 - \cos^2 x))$$

$$= \frac{1}{4} (4 \cos^3 x - 3 \cos x)$$

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

Thus,

$$\cos x^\circ \cos(60 - x)^\circ \cos(60 + x) = \frac{1}{4} \cos(3x)$$

Therefore,

$$\cos 50^\circ \cos 10^\circ \cos 110^\circ = \frac{1}{4} \cos 150^\circ$$

$$= \frac{1}{4} \left(-\frac{\sqrt{3}}{2}\right) = -\frac{\sqrt{3}}{8} \quad \dots \text{eq A}$$

$$\text{Also } \cos 60^\circ = \frac{1}{2} \quad \dots \text{eq B}$$

Put values of eq.A and Eq.B in

$$\frac{16}{\sqrt{3}} (\cos 50^\circ \cos 10^\circ \cos 110^\circ \cos 60^\circ), \text{ we get}$$

$$= \frac{16}{\sqrt{3}} \times \left(-\frac{\sqrt{3}}{8}\right) \times \frac{1}{2}$$

$$= -1$$

Option C is hence the correct answer.

- 35.** 18% of income tax = 2% of net income

$$\frac{\text{Income tax}}{\text{Net income}} = \frac{2}{18} = \frac{1}{9}$$

Let the income tax be x and Net income be $9x$

Therefore total income = $x + 9x = 10x$

$$\text{Rate of Income tax} = \frac{x}{10x} \times 100\% = 10\%$$

Hence, option A is correct.

36. Sol We have $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$$\text{Therefore } (x + y + z)^2 = (6\sqrt{3})^2$$

$$= x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 108$$

$$= 36 + 2(xy + yx + zx) = 108$$

$$= xy + yz + zx = 36 \dots \text{equation A}$$

Comparing equation A with $x^2 + y^2 + z^2 = 36$

$$\text{We get } x^2 = xy \text{ or } x = y$$

Similarly we get $x = y = z$

Therefore $x : y : z = 1 : 1 : 1$

Thus option C is correct answer.

37. We know that

Downstream speed = Speed of boat in still water + Speed of current

Upstream speed = Speed of boat in still water – Speed of current.

$$\text{Downstream speed} = 10 + 4 = 14 \text{ km/hr}$$

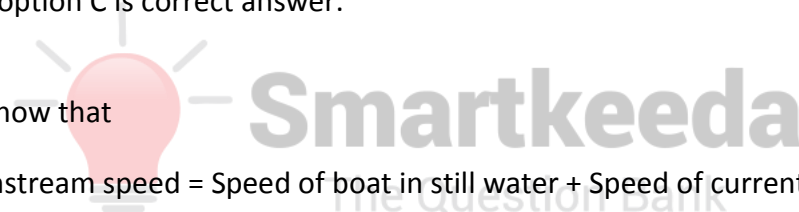
$$\text{Upstream speed} = 10 - 4 = 6 \text{ km/hr}$$

$$\text{Time taken to cover 12 km upstream} = 12/6 = 2 \text{ hr}$$

$$\text{Time taken to cover 14 km downstream} = 14/14 = 1$$

$$\text{Time for which he took rest} = 4 - 3 = 1 \text{ hr}$$

Hence, option B is correct.



38. We have,

$$41^2 = 1681$$

$$40^2 = 1600$$

$$9^2 = 81$$

$$\text{Since, } 41^2 = 40^2 + 9^2$$

Therefore, Given triangle is a right angle triangle whose hypotenuse is 41, and others two are perpendicular and base.

Sum of base and perpendicular = 49 cm

We know In right angle triangle,

$$\begin{aligned} \text{Inradius} &= \frac{P + B - H}{2} \\ &= \frac{49 - 41}{2} = \frac{8}{2} = 4 \text{ cm} \end{aligned}$$

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Also circumradius in right angle triangle =

$$\frac{H}{2} = \frac{41}{2} \text{ cm}$$

$$R + r = 4 + \frac{41}{2} = \frac{49}{2}$$

$$2(R + r) = 49 \text{ cm}$$

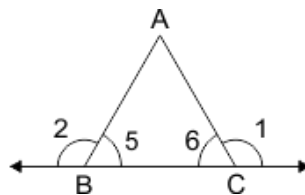
Hence option B is correct.

39. We know

$$\angle A + \angle 5 + \angle 6 = 180^\circ$$

$$\text{Also, } \angle 2 = \angle A + \angle 6$$

$$\text{and } \angle 1 = \angle A + \angle 5$$



[Exterior angle is equal to sum of two opposite angles of triangle]

$$\angle 1 + \angle 2 = 2\angle A + \angle 5 + \angle 6$$

$$= \angle A + 180^\circ$$

Hence, option A is correct.

40.
$$\cos^2 \theta \left(\sqrt{\frac{(1 + \sin \theta)(1 + \sin \theta)}{(1 - \sin \theta)(1 + \sin \theta)}} + \sqrt{\frac{(1 - \sin \theta)(1 - \sin \theta)}{(1 + \sin \theta)(1 - \sin \theta)}} \right)$$

$$\Rightarrow \cos^2 \theta \left(\sqrt{\frac{(1 + \sin \theta)^2}{(1 - \sin^2 \theta)}} + \sqrt{\frac{(1 - \sin \theta)^2}{(1 - \sin \theta)^2}} \right)$$
$$\Rightarrow \cos^2 \theta \left(\sqrt{\frac{(1 + \sin \theta)^2}{\cos^2 \theta}} + \sqrt{\frac{(1 - \sin \theta)^2}{\cos^2 \theta}} \right)$$
$$\Rightarrow \cos^2 \theta \left(\frac{1 + \sin \theta}{\cos \theta} + \frac{1 - \sin \theta}{\cos \theta} \right)$$
$$\Rightarrow \cos^2 \theta \left(\frac{1 + \sin \theta + 1 - \sin \theta}{\cos \theta} \right) = \frac{2 \cos^2 \theta}{\cos \theta} = 2 \cos \theta$$

Hence, option C is correct.

41. The Year wise production of all companies being together is given below:

$$2000 : 35 + 20 + 40 + 31 + 31 = 157 \text{ lakhs}$$

$$2001 : 10 + 20 + 23 + 30 + 41 = 124 \text{ lakhs}$$

$$2002 : 60 + 30 + 70 + 10 + 20 = 190 \text{ lakhs (maximum)}$$

$$2003 : 5 + 50 + 40 + 20 + 10 = 125 \text{ lakhs}$$

Hence, option C is the correct.

42. Production by B & C in year 2000 = 20 + 40 = 60 lakhs

Production by D and E in year 2003 = 20 + 10 = 30 lakhs.

Therefore percentage of Production by B & C together in year 2000 of the production by D and E in year 2003

$$= \frac{60}{30} \times 100\% = 200\%$$

Hence, option A is correct.

43. Production by A & D in 2001 = 10 + 30 = 40 lakhs

Production by B & E in 2003 = 50 + 10 = 60 lakhs

Therefore, the ratio of production by A & D in 2001 to the Production by B and E in 2003

$$= \frac{40}{60} = \frac{2}{3} = 2 : 3$$

Hence, option B is correct.

44. Total Number of Products produced by A in all years together

$$= 35 + 10 + 60 + 5$$

$$= 110 \text{ lakhs.}$$

Therefore, the total profit earned on selling all the products of A in all year together.

$$= 110 \times 4.5$$

$$= 495$$

Therefore A is the correct choice.





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