

All questions carry equal marks.

Total Marks 100

1. Average score of A, B, C, D and E is 36. A scores 45, C scores 41, D and E score equal runs. Score of B is 2 less than D . Find B 's score.

Solution: Suppose score of D and E is x . So, score of B is $x - 2$. So, average of $A, B, C, D, E = \frac{45 + (x - 2) + 41 + x + x}{5} = 36 \Rightarrow 180 = 84 + 3x \Rightarrow x = 32$. So B 's score is 30. **Ans. 30.**

2. If $a = -2, b = 3, c = 4$, then find the largest number among the following four. $2abc, -2a^2b^2c^2, -2abc, a^3b^3c^3$.

Solution: $2abc = -48, -2a^2b^2c^2 = 1152, -2abc = 48, a^3b^3c^3 = -13824$. Largest is 48. **Ans. 48.**

3. Four squares A, B, C and D are placed inside each other. A is the largest square. Area of square B is 10% less than square A . Area of square C is 10% less than square B and so on. Area of square A is 1000 sq. units. Find side of square D .

Solution: Area of $B = 0.9 * 1000 = 900$. Area of $C = 0.9 * 900 = 810$. Area of $D = 0.9 * 810 = 729 = 27^2$. **Ans. 27.**

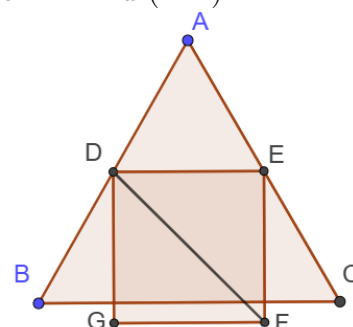


4. If $4^m = 256$, then $4^{m-2} = ?$

Solution: $4^{m-2} = \frac{4^m}{4^2} = \frac{256}{16} = 16$ **Ans. 16.**

5. $\triangle ABC$ is an equilateral triangle. $\square DEFG$ is a square. D and E are midpoints of segments AB and AC respectively. Perimeter of $\triangle ABC$ is 42 cm. Find $(DF)^2$.

Solution: Since perimeter is 42, each side of the equilateral triangle is 14. So, $DE = EF = \frac{14}{2} = 7$,
so $DF^2 = DE^2 + EF^2 = 7^2 + 7^2 = 98$ **Ans. 98.**

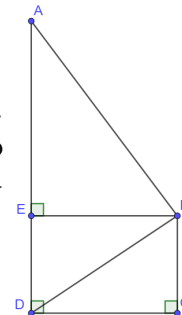


6. A librarian had to arrange some new books in the library. He arranged $\frac{4}{9}$ th of the total books and another 5 books in the morning and the rest in the evening. He realized that he had arranged equal number of books in the morning and evening. Find the total number of books.

Solution: The librarian arranged equal number of book in the morning and evening. Suppose there are x books. So, we get $\frac{4x}{9} + 5 = \frac{x}{2} \Rightarrow 8x + 90 = 9x \Rightarrow x = 90$. **Ans. 90.**

7. $m\angle C = m\angle D = 90^\circ$, $AB : CD = 5 : 3$, $AD : BC = 3 : 1$, $BD^2 = 8125$, Find CD .

Solution: Since $ED = BC$ and $AD : BC = 3 : 1$, we get $AE : ED = 2 : 1$. Let $AB = 5x$, so $EB = CD = 3x$ and by Pythagoras theorem, $AE = 4x$, so $BC = ED = 2x$, so $BD^2 = BC^2 + CD^2 \Rightarrow 8125 = (2x)^2 + (3x)^2 = 13x^2 \Rightarrow x = 25 \Rightarrow CD = 3x = 75$. **Ans. 75.**



8. A number $133a6$ is divisible by 84 . Find a

Solution: Suppose $84 * x = 133a6$. Clearly, unit place of x is either 4 or 9. Since $150 * 84 = 12600$ and $160 * 84 = 13440$, let's try $84 * 154 = 12936$ and $84 * 159 = 13356$, so $a = 5$ **Ans. 5.**

9. Samar can do a piece of work in 30 days. Amar does $\frac{1}{20}$ of the same work in 1 day. If Samar and Amar work together, how many days will they require to complete the same piece of work.

Solution: Samar does $\frac{1}{30}$ of the work in one day. So, Samar and Amar together do $\frac{1}{30} + \frac{1}{20} = \frac{1}{12}$ work in one day. So, they take 12 days to complete the work. **Ans. 12.**

10. $(50 + 48 + 46 + \dots + 4 + 2) - (1 + 3 + 5 + \dots + 47 + 49) = K$. Find K .

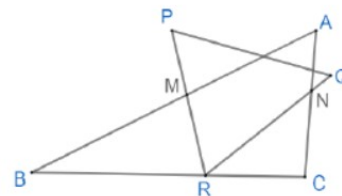
Solution: $(50 + 48 + 46 + \dots + 4 + 2) - (1 + 3 + 5 + \dots + 47 + 49) = (50 - 49) + (48 - 47) + (46 - 45) + \dots + (2 - 1) = (1) + (1) + \dots + (1) (25 \text{ times}) = 25$ **Ans. 25.**

11. If a number is multiplied by 3 and 12 is added to the product and the sum is divided by 5, the result is 4 less than the number. Find the number.

Solution: Let the number be x . So, we have $\frac{3x + 12}{5} = x - 4 \Rightarrow 3x + 12 = 5x - 20 \Rightarrow 2x = 32 \Rightarrow x = 16$ **Ans. 16.**

12. In the given figure, $m\angle B = 26^\circ$. $BM = BR$ and $RC = NC$, $\triangle PQR$ is an equilateral triangle. Find $m\angle A$

Solution: Since $\angle B = 26^\circ$, we have $\angle BRM = \angle BMR = \frac{180 - 26}{2} = 77^\circ$. Also, $\angle PRQ = 60^\circ$, so $\angle NRC = 180 - 77 - 60 = 43^\circ \Rightarrow \angle RNC = 43^\circ \Rightarrow$ in $\triangle RNC$, $\angle C = 180 - 43 - 43 = 94^\circ$, so $\angle A = 180 - \angle B - \angle C = 180 - 26 - 94 = 60^\circ$ **Ans. 60.**



13. $\frac{1}{5^{-y}} = 8$ and $5^{-x} = \frac{1}{3}$, Find the value of 5^{x+y} .

Solution: $\frac{1}{5^{-y}} = 8 \Rightarrow 5^y = 8$ and $5^{-x} = \frac{1}{3} \Rightarrow 5^x = 3 \Rightarrow 5^{x+y} = (5^x)(5^y) = (3)(8) = 24$. **Ans. 24.**

14. Find the angle between the minute and hour hand of a clock at 12:10 pm.

Solution: Hour hands moves 30° in 60 minutes, so it moves 0.5° every minute. So, It moves by 5° in 10 minutes.

Minute hand moves 6° every minute. So, it moves 60° in 10 minutes. So, angle between the hands = $60 - 5 = 55^\circ$. **Ans. 55.**

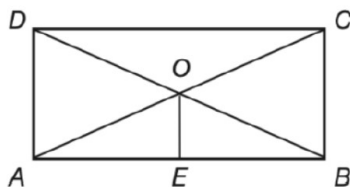
15. $\frac{2x-2}{1-x} - \frac{3(3x-13)}{6x-6} + \frac{2x+3}{x-1} = 1$. Find x

Solution: $\frac{2x-2}{1-x} - \frac{3(3x-13)}{6x-6} + \frac{2x+3}{x-1} = 1$
 $\Rightarrow \frac{-2(2x-2) - (3x-13) + 2(2x+3)}{2x-2} = 1$
 $\Rightarrow \frac{-3x+23}{2x-2} = 1 \Rightarrow -3x+23 = 2x-2 \Rightarrow x = 5$ **Ans. 5.**

16. Find the smallest natural number to be subtracted from 2025 so that we get a perfect square.

Solution: $2025 = 45^2$. The previous perfect square is $44^2 = 1936$. So, answer is $2025 - 1936 = 89$ **Ans. 89.**

17. In the given rectangle $ABCD$, the sum of the lengths of two diagonals equals 52 units, and E is a point in AB , such that OE is perpendicular to AB . Find CD if $OE = 5$ units.



Solution: $BC = 2(OE) = 10$ units. Since diagonals of a rectangle are congruent, each diagonal is 26 units. So, $CD^2 + CB^2 = BD^2 \Rightarrow CD^2 + 10^2 = 26^2 \Rightarrow CD^2 = 676 - 100 = 576 \Rightarrow CD = 24$ units. **Ans. 24.**

18. In the given figure (not to scale), AC is the diameter of the circle and $\angle ADB = 9^\circ$, then find $\angle BPC$.

Solution: $m\angle DAO = Y = Z + 9$

$$m\angle BDO = m\angle DBO = Z$$

$$m\angle DOC = 2Y$$

$$m\angle OPC = m\angle OCP = W$$

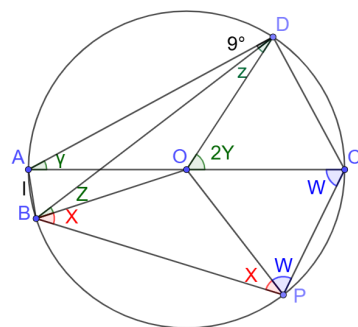
$$m\angle OBP = m\angle OPB = X$$

$$\angle BOD + \angle DOC + \angle COP + \angle POB = 360^\circ$$

$$\Rightarrow (180^\circ - 2Z) + 2Y + (180^\circ - 2W) + (180^\circ - 2X) = 360^\circ$$

$$\Rightarrow (180^\circ - 2Z) + 2(Z + 9) + (180^\circ - 2W) + (180^\circ - 2X) = 360^\circ$$

$$\Rightarrow X + W = 99^\circ$$
 Ans. 99.



19. In the following figure, $\overline{AB}$ and $\overline{CD}$ are diameters. O is the centre of the circle. If $m\angle CEB = x$ and $m\angle AFD = y$ and $x + y = 250$, find $m\angle AOC$.

Solution: $\triangle AOC \cong \triangle BOD$.

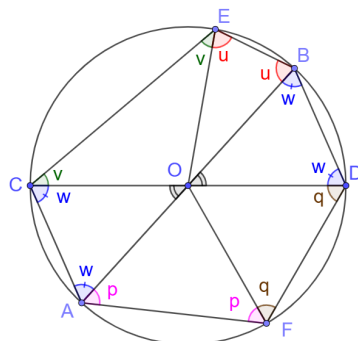
Sum of angles in a quadrilateral is 360° .

This gives $2v + 2u + 2w = 2q + 2p + 2w = 360$

$$\Rightarrow u + v = p + q \Rightarrow x = y = 125^\circ$$
 Substituting this in the first

equation, we get $2w = 360 - 250 = 110$

$$\Rightarrow m\angle AOC = 180 - 110 = 70^\circ$$
 Ans. 70.



20. A and B travelled the same distance at 9 km/hr. and 10 km/hr. respectively. If A required 36 minutes more than B then find the distance travelled by each of them in Kms.

Solution: $9 \text{ km / hr} = \frac{9000}{60} = 150 \text{ meters / minute}$

$10 \text{ km / hr} = \frac{10000}{60} = \frac{500}{3} \text{ meters / minute}$

Suppose both of them travel d meters.

Then time taken by A and B is $\frac{d}{150}$ and $\frac{d}{\frac{500}{3}}$ minutes respectively.

So, we have $\frac{d}{150} - \frac{d}{\frac{500}{3}} = 36 \Rightarrow \frac{d(10 - 9)}{1500} = 36 \Rightarrow d = 36 \times 1500 \text{ meters} = 54 \text{ km}.$

Ans. 54.

Answer Key

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
30	48	27	16	98	90	75	5	12	25	16	60	24	55	5	89	24	99	70	54