

All questions carry equal marks.

Total Marks 100

1. Simplify : $\frac{31.5 \times 31.5 + 63 \times 18.5 + 18.5 \times 18.5}{23.5 \times 23.5 - 23.5 \times 27 + 13.5 \times 13.5}$

Solution: $\frac{(31.5)^2 + 2 \times 31.5 \times 18.5 + (18.5)^2}{(23.5)^2 - 23.5 \times 2 \times 13.5 + (13.5)^2} = \frac{(31.5 + 18.5)^2}{(23.5 - 13.5)^2} = \frac{(50)^2}{(10)^2} = 25$

2. If 15% of 60 added to 15% of 20 is less than 35% of an unknown number by 2, find the unknown number.

Solution: $\frac{15}{100} \times 60 + \frac{15}{100} \times 20 + 2 = \frac{35}{100} \times x \Rightarrow x = 40$

3. Find the sum of consecutive odd numbers between $\sqrt{47}$ and $\sqrt{291}$.

Solution: Odd no. after $\sqrt{47}$ is $\sqrt{49} = 7$ and odd no. before $\sqrt{291}$ is $\sqrt{289} = 17$.
Sum of odd numbers from 7 to 17 = 72

4. Find the value of x , if $2^{x+5} = 128^{\frac{x}{2}}$

Solution: $2^{x+5} = (2^7)^{\frac{x}{2}} \Rightarrow$ Bases are equal, hence equating powers we get,
 $x + 5 = \frac{7x}{2} \Rightarrow x = 2$

5. Find the largest number that divides 125 and 137 such that we get 4 and 5 as remainders respectively.

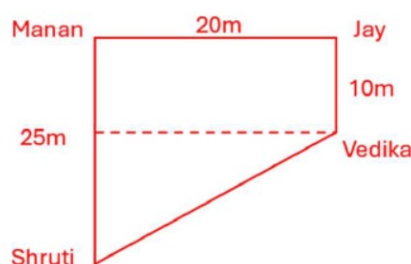
Solution: $125 - 4 = 121$; $137 - 5 = 132$; 121 and 132 - divisible by 11.

6. A watchmaker repaired a watch and told it's owner that the watch was now showing the correct time as " $3x$ minutes to 8 ". The customer took a look at the watch and said the time was " $2x$ minutes past 7 ". If both were correct, what is the value of x ?

Solution: $3x$ minutes to 8 = $2x$ minutes past 7 . Common multiple of 2&3 which satisfies both conditions is 12 .

7. During a game, Manan stands 20 m to the west of Jay, Shruti stands 25 m to the south of Manan and Vedika stands 10 m to the south of Jay. What is the distance between Vedika and Shruti?

Solution: Distance between Shruti and Vedika $\sqrt{20^2 + 15^2} = 25$



8. In trapezium $ABCD$, $AB \parallel DC$, diagonals AC and BD intersect at P . If diagonal BD is three times of diagonal AC and $AP = 2x - 3$, $BP = 3x - 7$, $CP = 4x - 5$, $DP = 9x + 1$, find the value of x .

Solution:

$$AC = AP + CP = 2x - 3 + 4x - 5 = 6x - 8$$

$$BD = BP + DP = 3x - 7 + 9x + 1 = 12x - 6$$

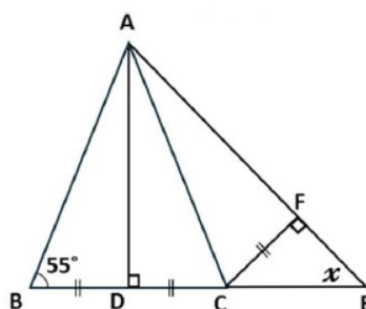
$$3AC = BD \Rightarrow 3(6x - 8) = 12x - 6 \Rightarrow x = 3$$

9. Simplify $2 + \frac{1}{\sqrt{2}} + \frac{1}{2} \left(\frac{2}{4 + 2\sqrt{2}} - \frac{2}{4 - 2\sqrt{2}} \right)$

Solution:

$$\begin{aligned} 2 + \frac{1}{\sqrt{2}} + \frac{1}{2} \left(\frac{2}{2(2 + \sqrt{2})} - \frac{2}{2(2 - \sqrt{2})} \right) &= 2 + \frac{1}{\sqrt{2}} + \frac{1}{2} \left(\frac{(2 - \sqrt{2})}{4 - 2} - \frac{(2 + \sqrt{2})}{4 - 2} \right) \\ &= 2 + \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{-2\sqrt{2}}{2} = 2 + \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} = 2 \end{aligned}$$

10. Find the value of x in the following figure -



Solution:

$$\triangle ABD \cong \triangle ACD, \angle ABD = \angle ACD = 55^\circ, \angle BAD = \angle CAD = 35^\circ;$$

$$\triangle ADC \cong \triangle AFC, \angle ACD = \angle ACF = 55^\circ; \angle ACE = \angle ABC + \angle BAC = 55^\circ + 70^\circ = 125^\circ;$$

$$\angle FCE = \angle ACE - \angle ACF = 70^\circ; x = 90^\circ - 70^\circ = 20^\circ$$

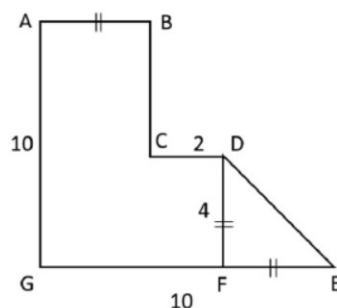
11. The ages of Rohit and Niraj are in the ratio of 4:3 and the product of their ages is 108 years. After how many years will the ratio of their ages be 6 : 5 ?

Solution: $4x \times 3x = 108 \Rightarrow x^2 = 9 \Rightarrow x = 3$. Present ages are 12 and 9, Ages after y years will be $12 + y$ and $9 + y$; Ratio $\Rightarrow \frac{12 + y}{9 + y} = \frac{6}{5} \Rightarrow y = 6$

12. Find the value of $:- \sqrt{\frac{\sqrt{324}}{\sqrt{16}}} - \frac{\sqrt{1296}}{\sqrt{256}} \times \frac{2}{3} =$

$$\text{Solution: } \sqrt{\frac{18}{4} - \frac{36}{16}} \times \frac{2}{3} = \sqrt{\frac{72 - 36}{16}} \times \frac{2}{3} = \frac{6}{4} \times \frac{2}{3} = 1$$

13. Find the area of the polygon $ABCDEG$.



Solution:

$$[ABCDEG] = [ABHG] + [CHFD] + [DFE] = (10 \times 4) + (2 \times 4) + (4 \times 4/2) = 56$$

14. A father can complete a job twice as fast as his two sons working together. If one son completes the job in 3 hours and the other completes it in 6 hours, how many hours will the father take to complete the job?

Solution: Work completed by sons together in 2 hours; same work completed by father in 1 hour.

15. The monthly pocket money given to Rajesh is Rs. 2400 . He spends $\frac{1}{4}$ th of it on stationary items and $\frac{2}{3}$ rd on fuel. Out of the remaining amount, he spends $\frac{1}{4}$ th on food and $\frac{3}{5}$ th on other expenses. Find the sum of money left with him.

Solution: $2400 - \left(\frac{1}{4} + \frac{2}{3}\right) 2400 = 200$; $200 - \left(\frac{1}{4} + \frac{3}{5}\right) 200 = 30$

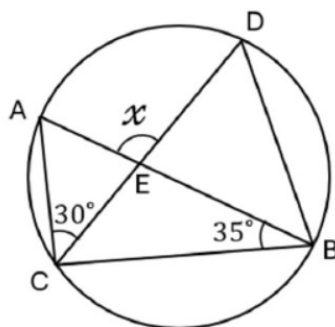
16. The area of a right angled triangle is 24 sq. units and length of one of the sides making right angle is 6 units, find the perimeter of the triangle.

Solution: Area = $\frac{6 \times h}{2} = 24$; $h = 8$; By Pythagoras, Hypotenuse = 10; Perimeter = 24

17. The number of rows of plants are three times the plants planted in each row. If out of 600 plants in total, the plants in each row are 14, find the excess number of plants.

Solution: $3 \times 14 \times 14 = 588 \Rightarrow$ Excess no. of plants = $600 - 588 = 12$

18. Find the value of x in the given figure, if AB is diameter and chord CD intersects AB at point E .



Solution: $\angle ACB = 90^\circ$, $\angle CAB = 90^\circ - 35^\circ = 55^\circ$; $\angle AED = x = 55^\circ - 35^\circ = 85^\circ$

19. If Rs. 240 is to be divided among 'A', 'B' and 'C' in the ratio 3 : 4 : 8. What is difference between the shares of 'A' and 'C'?

Solution: A's share = $\frac{3}{15} \times 240 = 48$; C's share = $\frac{8}{15} \times 240 = 128$; Difference = 80

20. The exterior angle of a polygon measures $\frac{1}{3}$ rd of the interior angle. How many sides does the polygon have?

Solution: Ext. angle + Int. angle = $180^\circ \Rightarrow \frac{x}{3} + x = 180^\circ \Rightarrow \text{ext. angle} = 45^\circ$;
Sum of ext. angles = 360° ; no. of sides = $360/45 = 8$