Mathematics

Algebra

Questions:

1. Find the value of p, for which one root of the quadratic equation $px^2 + 14x + 8 = 0$ is 6 times the other.

2. If $ad \neq bc$, then prove that the equation

$$\left(a^2 + b^2\right) x^2 + 2\left(ac + bd\right) x + \left(c^2 + d^2\right) = 0 \tag{1}$$

has no real roots.

Geometry

1. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O, is $60°$, then find the length of OP.

2. A circle touches all the four sides of a quadrilateral $ABCD$. Prove that $AB + CD = BC + DA$.

3. A line intersects the y-axis and x-axis at the points P and Q respectively. If $(2, -5)$ is the midpoint of PQ, then find the coordinates of P and Q.

4. In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the points $P\left(2, -2\right)$ and $Q\left(3, 7\right)$? Also, find the value of y.

Circles

1. Three semicircles each of diameter 3 cm, a circle of diameter $4 \cdot 5$ cm and a semicircle of radius $4 \cdot 5$ cm are drawn in the given figure. Find the area of the shaded region.

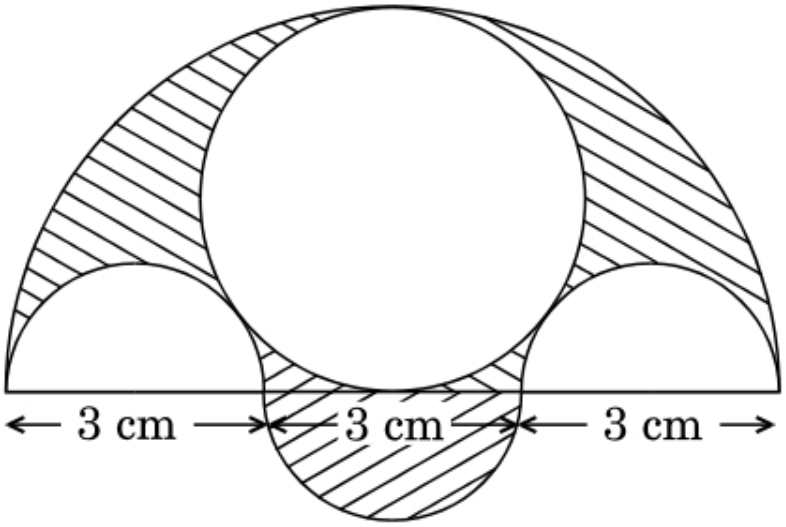

Figure 1

2. In the given figure, two concentric circles with centre O have radii 21 cm and 42 cm. If $\angle AOB = 60°$, find the area of the shaded region.
$\left[use \pi = \frac{22}{7}\right]$

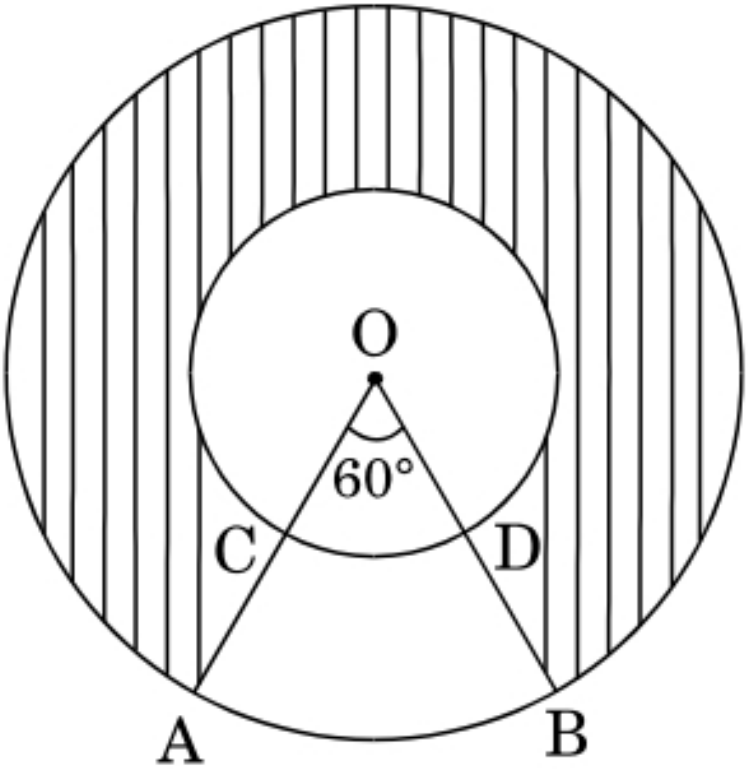

Figure 2

Menstrutations

1. Water in a canal, $5 \cdot 4$ m wide and $1 \cdot 8$ m deep, is flowing with a speed of 25 km/hour. How much area can it irrigate in 40 minutes , if 10 cm of standing water is required for irrigation ?

2. The slant height of a frustum of a cone is 4 cm and the perimeters of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

Probability

1. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.

2. The probability of selecting a rotten apple randomly from a heap of 900 apples is $0 \cdot 18$ .What is the number of rotten apples in the heap ?

Trigonometry

1. If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun?

2. On a straight line passing through the foot of a tower, two points C and D are at distances of 4 m and 16 m from the foot respectively. If the angles of elevation from C and D of the top of the tower are complementary, then find the height of the tower.

Progressions

1. What is the common difference of an A.P. in which $a_{21} - a_7 = 84$?

2. Which term of the progression $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots$ is the first negative term?

3. The first term of an A.P. is 5, the last term is 45 and the sum of all its terms is 400. Find the number of terms and the common difference of the A.P.