Trigonometry

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

Probability

2. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?

Progressions

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

4. Which term of the A.P. $8, 14, 20, 26, \ldots$ will be 72 more than its 41st term?

Geometry

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

6. Prove that the tangents drawn at the endpoints of a chord of a circle make equal angles with the chord.

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

8. The dimensions of a solid iron cuboid are $4.4 \times 2.6 \times 10$. It is melted and recast into a hollow cylindrical pipe of 30 cm inner radius and thickness 5 cm. Find the length of the pipe.

9. In the given figure, two concentric circles with center O have radii 21 cm and 42 cm. If $\angle AOB = 60°$, find the area of the shaded region.

[Use $\pi = \frac{22}{7}$]

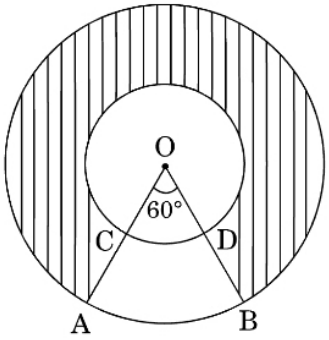

Figure 1: final1

10. Water in a canal, 5.4 wide and 1.8 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?

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

12. On a straight line passing through the foot of a tower, two points C and D are at distances of 4 and 16 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.

Coordinate Geometry

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

14. If the distances of $P(x, y)$ from $A(5, 1)$ and $B(-1, 5)$ are equal, then prove that $3x = 2y$.

Polynomial

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