

Trigonometry

1. A man observes a car from the top of a tower, which is moving towards the tower with a uniform speed. If the angle of depression of the car changes from 30° to 45° in 12 minutes, find the time taken by the car now to reach the tower.

TRIANGLES

1. Construct a triangle ABC with side $BC = 7$ cm, $\angle B = 45^\circ$, and $\angle A = 105^\circ$. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the $\triangle ABC$.

LINEAR

1. A train covers a distance of 300 km at a uniform speed. If the speed of the train is increased by 5 km/hour, it takes 2 hours less in the journey. Find the original speed of the train.

ARITHMETIC PROGRESSIONS

1. If the 10th term of an arithmetic progression (A.P.) is 52 and the 17th term is 20 more than the 13th term, find the A.P.
2. If the ratio of the sum of the first n terms of two A.P.s is $\frac{7n+1}{4n+27}$, then find the ratio of their 9th terms.

COORDINATE GEOMETRY

If the points $A(k+1, 2k)$, $B(3k, 2k+3)$, and $C(5k-1, 5k)$ are collinear, then find the value of K .

QUADRATIC EQUATION

If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ in x are equal, then show that either $a = 0$ or $a^3 + b^3 + c^3 = 3abc$.

RATIONAL FRACTIONS

1. Solve for x :

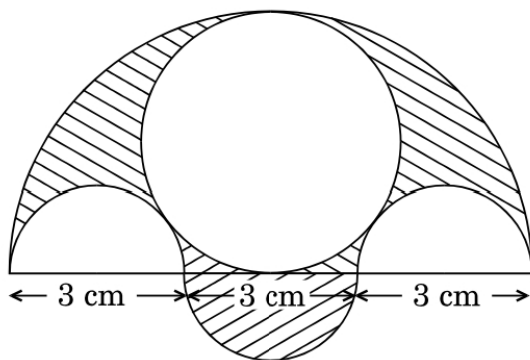
$$\frac{1}{2x-3} + \frac{1}{x-5} = 1\frac{1}{9}, \quad x \neq \frac{3}{2}, 5$$

PROBABILITY

1. A bag contains 15 white balls 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. Two different dice are thrown together. Find the probability that the numbers obtained have:
 - i. an even sum, and
 - ii. an even product.

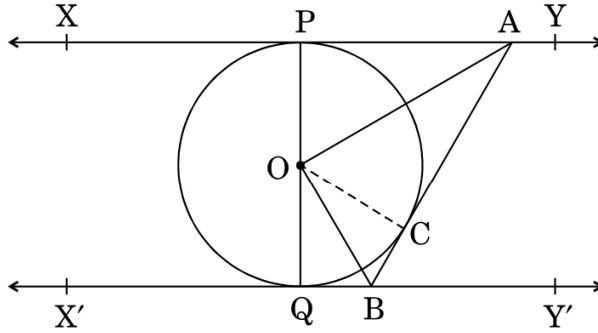
SURFACE AREAS AND VOLUMES

1. From a solid right circular cylinder of height 2.4 cm and radius 0.7 cm, a right circular cone of the same height and same radius is cut out. Find the total surface area of the remaining solid.
2. In a rain-water harvesting system, the rain-water from a roof of $22\text{ m} \times 20\text{ m}$ drains into a cylindrical tank having a diameter of base 2 m and height 43.5 m. If the tank is full, find the rainfall in cm. Write your views on water conservation.
3. Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm, and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region.



CIRCLES

1. In the given figure, XY and $X'Y'$ are two parallel tangents to a circle with center O and another tangent AB with point of contact C , intersecting XY at A and $X'Y'$ at B . Prove that $\angle AOB = 90^\circ$.



MENSURATION

1. In the given figure, $\triangle ABC$ is a right-angled triangle in which $\angle A = 90^\circ$. Semicircles are drawn on AB , AC , and BC as diameters. Find the area of the shaded region.

