1. A ladder, leaning against a wall, makes an angle of 60° with the horizontal. If the foot of the ladder is $2.5m$ away from the wall, find the length of the ladder.

2. In Fig. 1, from an external point P, two tangents PT and PS are drawn to a circle with centre O and radius r. If $OP = 2r$, show that $\angle OTS = \angle OST = 30^{\circ}$.

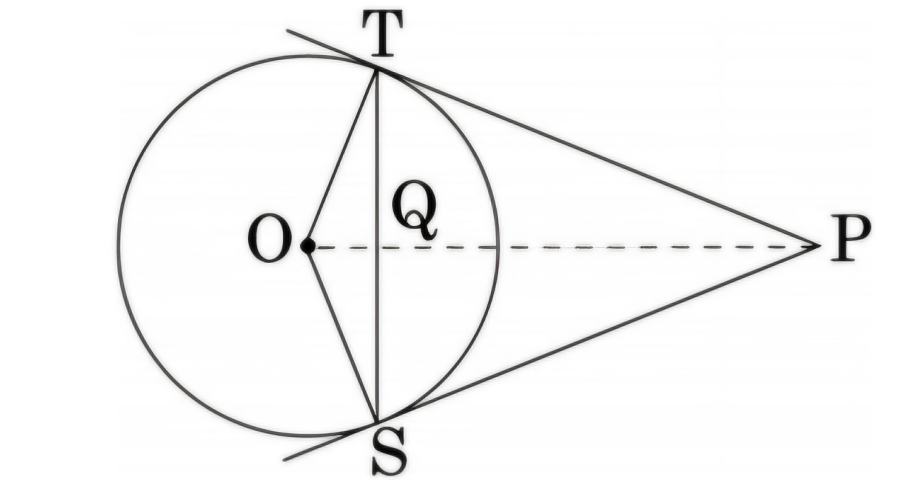

Figure 1: Two tangents of a circle

3. Prove that the points $(3, 0), (6, 4)$, and $(-1, 3)$ are the vertices of a right-angled isosceles triangle.

4. Solve for x:

$$\sqrt{2x + 9} + x = 13 \tag{1}$$

5. A conical vessel, with base radius $5cm$ and height $24cm$, is full of water. This water is emptied into a cylindrical vessel of base radius $10cm$. Find the height to which the water will rise in the cylindrical vessel. (Use $\pi =$

$\frac{22}{7}$)

6. In Fig. 2, find the area of the shaded region, enclosed between two concentric circles of radii $7cm$ and $14cm$ where $\angle AOC = 40^{\circ}$. (Use $\frac{22}{7}$)

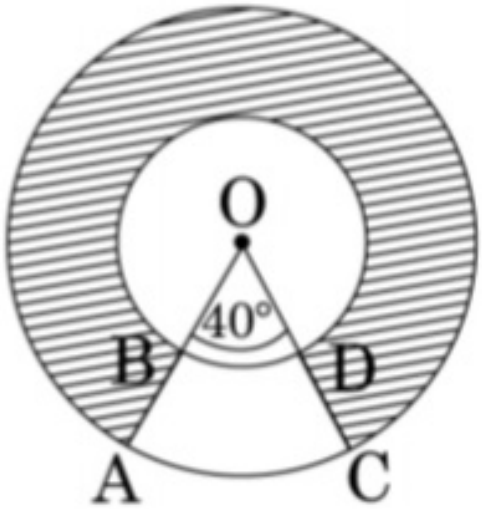

Figure 2: Two concentric circles

7. The digits of a positive number of three digits are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.

8. If the roots of the quadratic equation $(a-b)x^2 + (b-c)x + (c-a) = 0$ are equal, prove that $2a = b + c$.

9. From a pack of 52 playing cards, Jacks, Queens, and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that the drawn card is:

(a) a black King

(b) a card of red color

(c) a card of black color

10. In Fig. 3, is shown a sector OAP of a circle with center O, containing $\angle\theta$. AB is perpendicular to the radius OA and meets OP produced at B. Prove that the perimeter of the shaded region is $r\left(\tan\theta + \sec\theta + \frac{\pi\theta}{180}\right)$

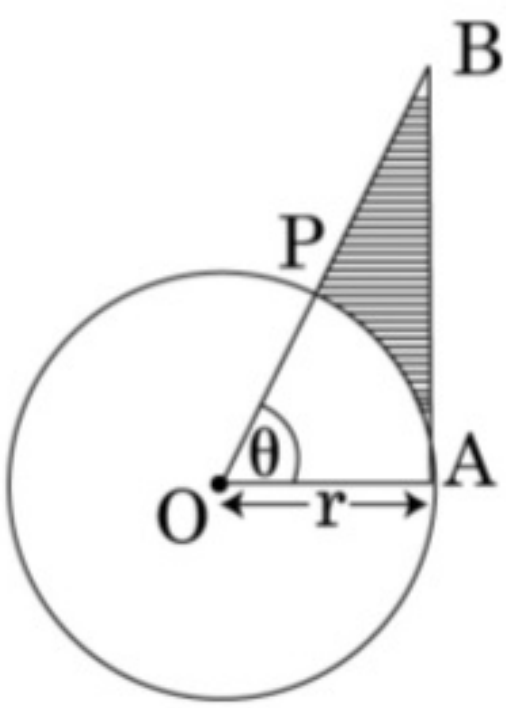

Figure 3: Sector OAP of a circle

11. The houses in a row are numbered consecutively from 1 to 49. Show that there exists a value of X such that the sum of the numbers of the houses proceeding the house numbered X is equal to sum of the numbers of houses following X.

12. Draw an isosceles $\triangle ABC$, in which $BC = 5.5cm$ and the altitude $AL = 3cm$. Then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of $\triangle ABC$.

13. Prove that the tangent drawn at any point of a circle is perpendicular to the radius through the point of contact.

14. As observed from the top of a light house, $100m$ high above sea level, the angles of depression of a ship sailing directly towards it, changes from 30° to 60°. Find the distance travelled by the ship during the period of observation. (Use $\sqrt{3} = 1.73$).

15. A rectangular park is to be designed whose breadth is $3m$ less than its length. Its area is to be 4 square meters more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and an altitude of $12m$. Find the length and breadth of the rectangular park.