1. 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

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

3. 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 $\pi =$

$\frac{22}{7}$)

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

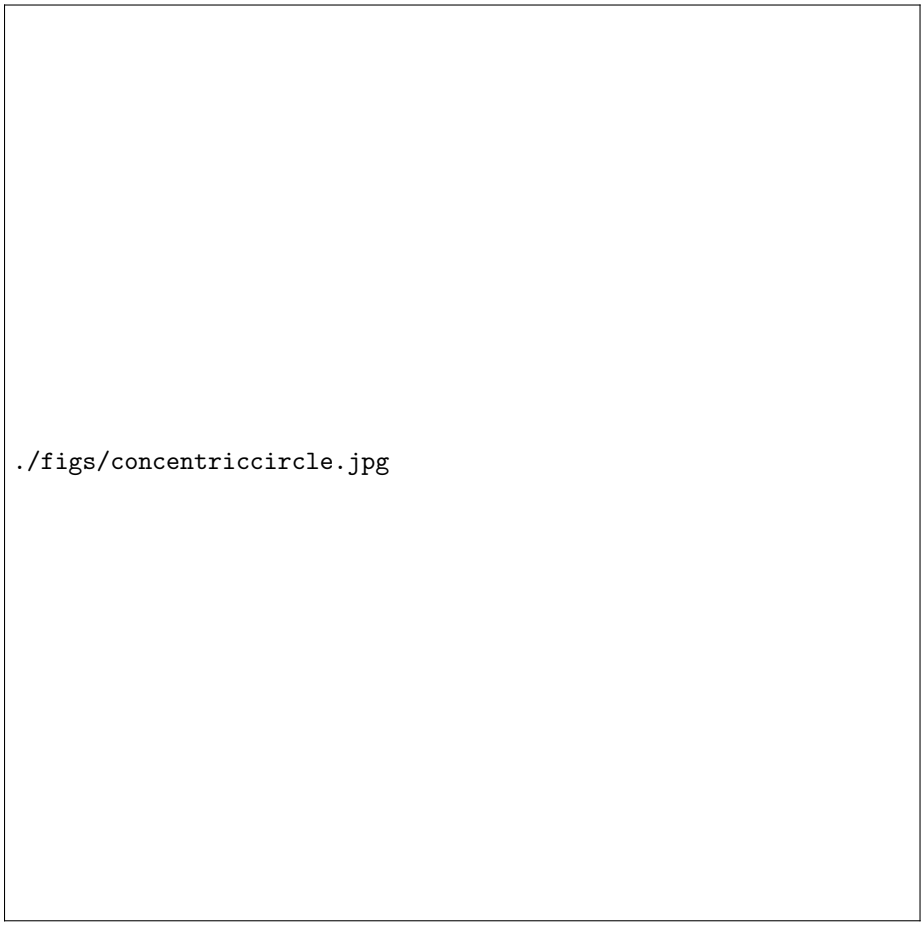

Figure 2: Two concentric circles

5. In Fig. **??**, 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 $r\left(\tan\theta + \sec\theta + \frac{\pi\theta}{180}\right)$

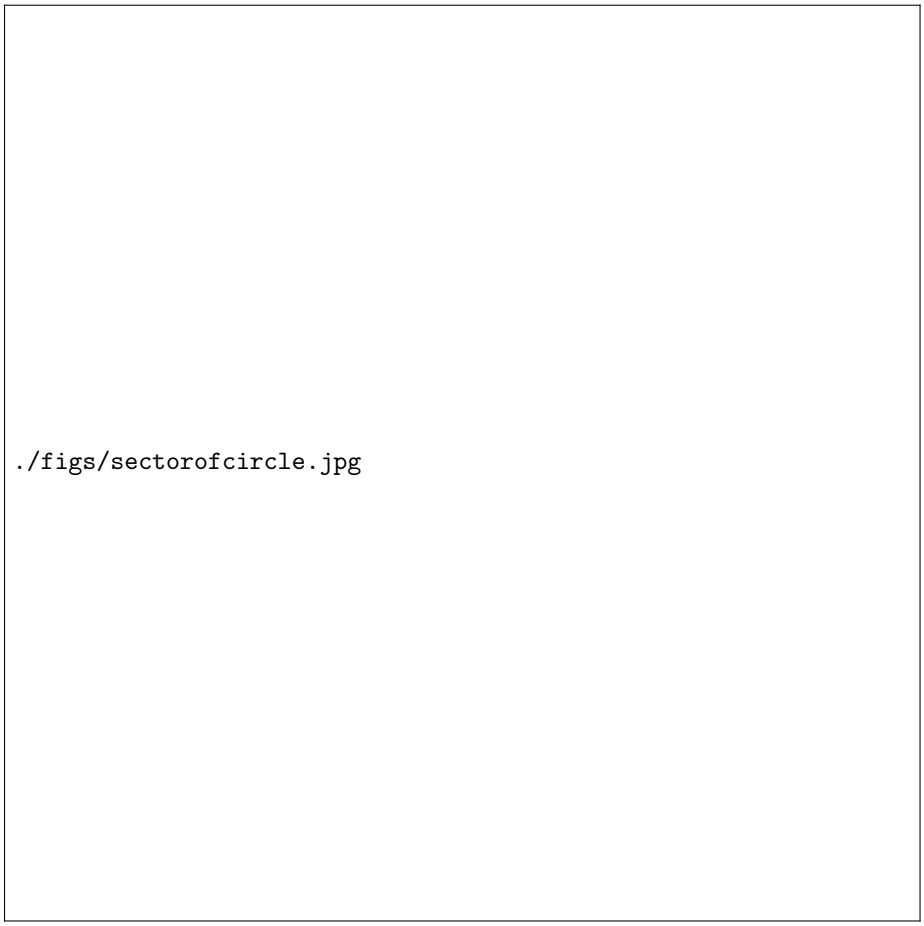

Figure 3: Sector OAP of a circle

6. 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 h ouses proceeding the house numbered X is equal to sum of the numbers of houses following X.

7. Drawan 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 $\triangle ABC$.

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

9. 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 pa rk 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 $12m$. Fi nd the length and breadth of the rectangular park.