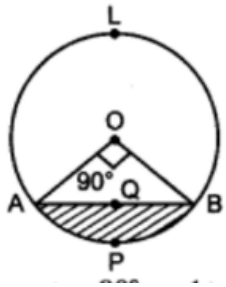
Chapter-Areas Related to Circles

Q1.

In figure, is a chord AB of a circle, with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment AQBP. Hence, find the area of major segment ALBQA

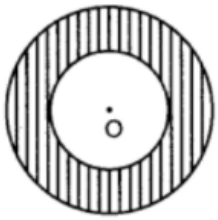


Q2.

Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°. Also find the area of the corresponding major segment

Q3.

In the given figure,the area of the shaded region between two concentric circles is 286 cm2.If the difference of the radii of the two circles is 7 cm, find the sum of their radii.



Q4.

In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find

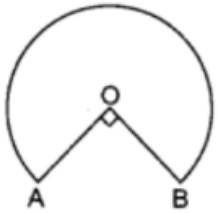
1. the length of the arc
2. area of the sector formed by the arc.

Q5.

A chord of length 10 cm divides a circle of radius $5\sqrt{2}$ cm in two segments. Find the area of the minor segment

Q6.

In the given figure, the shape of the top of a table is that a sector of a circle with centre O and $\angle AOB = 90°$. If AO = OB = 42 cm,then find the perimeter of the top of the table



Q7.

A chord of a circle of radius 21 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor segment of the circle

Q8.

. Find the area of the sector of a circle of radius 6 cm whose central angle is 30°. (Take $\pi = 3.14$)

Q9.

What is the perimeter of the sector with radius 10.5 cm and sector angle 60^o.

Q10.

A chord of a circle of radius 10 cm subtends a right angle at the centre. Find area of minor segment. ($\pi = 3.14$)

Solution 1.

Area of minor segment APBQ=θ/360° x πr²-r²sin45°cos45°

=3.14 x 100/4-100 x 1/√2 x 1/√2

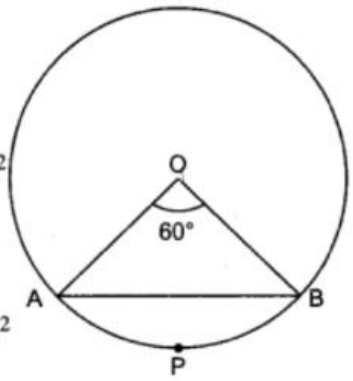
=(78.5-50)cm²=28.5 cm²

Area of major segment ALBQA =πr²-area of minor segment

=3.14 x (10)²-28.5

=(314-28.5)cm²=285.5 cm²

Solution 2.



In ΔAOB, $\angle AOB = 60°$

Also $AO = BO$

$\therefore$ ΔAOB is an equilateral triangle.

$$\text{Area of equilateral } \Delta AOB = \frac{\sqrt{3}}{4} \times 14 \times 14 = 49\sqrt{3} \text{ cm}^2$$

$$\text{Area of sector } AOBP = \frac{60}{360} \times \pi \times 14 \times 14$$

$$= \frac{1}{6} \times \frac{22}{7} \times 14 \times 14 = \frac{308}{3} \text{ cm}^2$$

$$\text{Area of minor segment} = \left(\frac{308}{3} - 49\sqrt{3}\right) = \frac{308}{3} - 49 \times 1.732 = 17.8 \text{ cm}^2$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2$$

Area of major segment = [616 – 17.8] = 598.2 cm²

Solution 3.

Let radius of outer circle is R_1 and radius of inner circle is R_2

According to question,

$$\pi R_1^2 - \pi R_2^2 = 286 \Rightarrow \pi(R_1^2 - R_2^2) = 286$$

$$\Rightarrow \frac{22}{7} \times (R_1 - R_2)(R_1 + R_2) = 286 \Rightarrow \frac{22}{7} \times 7 \times (R_1 + R_2) = 286$$

$$\Rightarrow R_1 + R_2 = 13 \text{ cm}$$

Solution 4.

Radius of circle, $r = 21$ cm

Central angle subtended by an arc $= 60°$

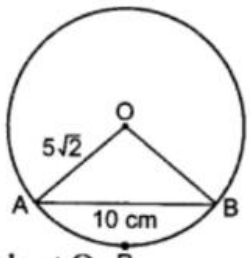
(*i*) Length of arc $= \frac{2\pi r\theta}{360°} = 2 \times \frac{22}{7} \times 21 \times \frac{60°}{360°} = 22$ cm

(*ii*) Area of sector formed by an arc $= \frac{\pi r^2\theta}{360°}$

$= \frac{22}{7} \times 21 \times 21 \times \frac{60°}{360°} = 231$ cm^2

Solution 5.

Consider, chord AB divides circle in two segments.



In ΔAOB,

$AB^2 = OA^2 + OB^2$

$(10)^2 = (5\sqrt{2})^2 + (5\sqrt{2})^2$

$= 25 \times 2 + 25 \times 2$

$100 = 50 + 50$

$100 = 100$

Hence, by converse of Pythagoras Theorem, ΔAOB is right-angled triangle at O.

$\therefore \angle AOB = 90°$

Area of minor segment = area of sector OAPB – area of ΔOAB

$= \frac{\pi r^2\theta}{360°} - \frac{1}{2} \cdot OA \cdot OB$

$= \frac{3.14 \times (5\sqrt{2})^2 \times 90°}{360°} - \frac{1}{2} \times 5\sqrt{2} \times 5\sqrt{2}$

$= \frac{314 \times 50 \times 1}{100 \times 4} - 25$

$= \frac{157}{4} - 25 = \frac{157 - 100}{4} = \frac{57}{4}$ cm^2 $= 14.25$ cm^2

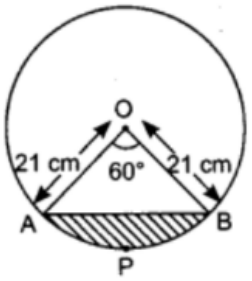
Solution 6.

Perimeter = length of major arc + $2r$

$= \frac{270°}{360°} \times 2 \times \pi r + 2r = \frac{3}{2} \times \frac{22}{7} \times 42 + 2 \times 42$

$= 198 + 84 = 282$ cm

Solution 7.



Area of shaded portion

$$= \text{Area of sector OAPB} - \text{area of } \Delta OAB$$

$$= \frac{\pi r^2 \theta}{360^\circ} - \frac{1}{2} r^2 \sin\theta$$

$$= \frac{22}{7} \times 21 \times 21 \times \frac{60}{360} - \frac{1}{2} \times 21 \times 21 \times \sin 60^\circ$$

$$= 22 \times 3 \times 21 \times \frac{1}{6} - \frac{1}{2} \times 21 \times 21 \times \frac{\sqrt{3}}{2}$$

$$= 11 \times 21 - \frac{441 \times 1.73}{4} = 231 - 190.73 = 40.27 \text{ cm}^2$$

Solution 8.

Radius, $r = 6$ cm

Central angle, $\theta = 30^\circ$

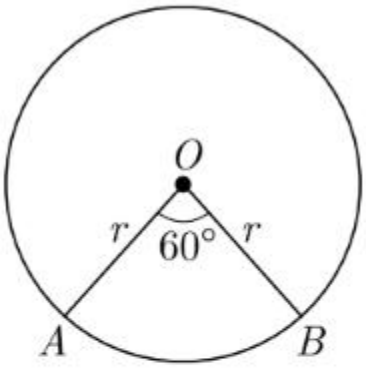
Area of the sector,

$$\frac{\pi r^2 \theta}{360^\circ} = \frac{3.14 \times 6 \times 6 \times 30^\circ}{360^\circ}$$

$$= 9.42 \text{ cm}^2$$

Solution 9.

As per question the digram is shown below.



Perimeter of the sector,

$$p = 2r + \frac{2\pi r\theta}{360^\circ}$$

$$= 10.5 \times 2 + 2 \times \frac{22}{7} \times \frac{10.5 \times 60}{360}$$

$$= 21 + 11 = 32 \text{ cm}$$

Solution 10.

Radius of circle $r = 10$ cm, central angle $= 90^\circ$

Area of minor segment,

$$= \frac{1}{2} \times 10^2 \times \left[\frac{3.14 \times 90}{180} - \sin 90^\circ\right.$$

$$= \frac{1}{2} \times 100 \times [1.57 - 1] = 28.5 \text{ cm}^2$$