Module 1

AREAS RELATED TO CIRCLE

- Introduction
- Formula : Area and circumference of circle and semicircle

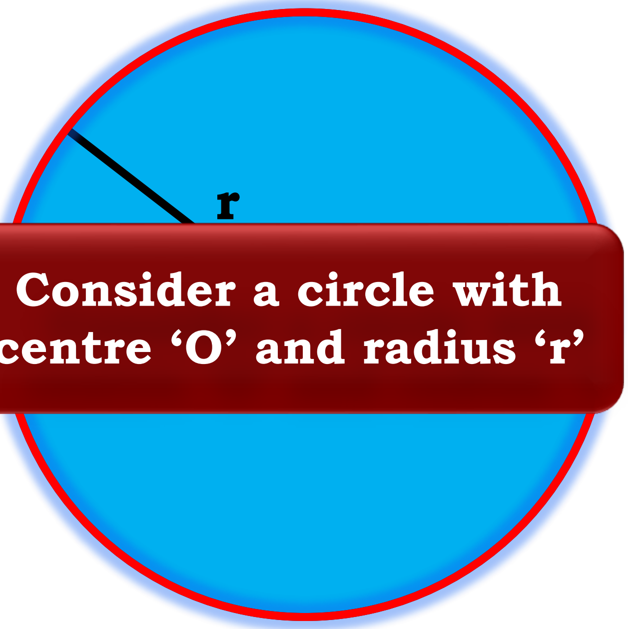
CIRCLE

Area of circle = πr^2

Circumference of the circle = $\boxed{2}\pi\boxed{r}$

or

= πd

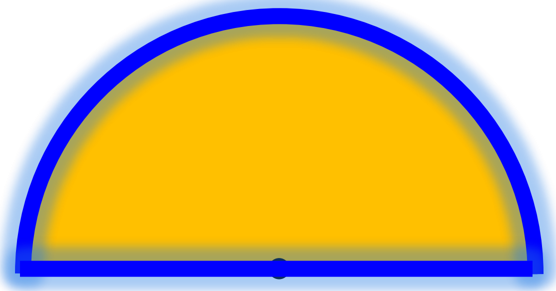


Consider a circle with centre ‘O’ and radius ‘r’

We know that,
Diameter = 2r

Half SEMI-CIRCLE

We know that,
Diameter = 2r



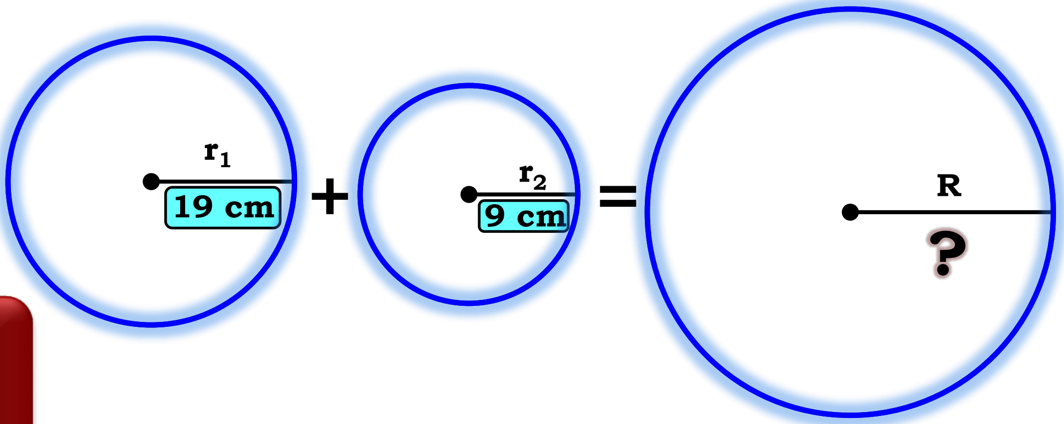
$$\text{Area of semicircle} = \frac{1}{2} \times \boxed{\text{Area of circle}}$$

$$\text{Area of semicircle} = \frac{1}{2} \pi r^2$$

$$\text{Perimeter of semicircle} = \pi r + \boxed{d}$$

$$= \pi r + 2r$$

Q. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumference of the two circles.



Sol. Let the radius of the bigger circle be R.

$\therefore \quad 2\pi R = 2\pi r_1 + 2\pi r_2$

What is the formula to find circumference of a circle?

$2\pi r$

$\therefore \quad R = 19 + 9$

$\therefore \quad R = 28$ cm

$\therefore$ **Radius of the bigger circle is 28 cm.**

Q. **The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having area equal to the sum of the areas of the two circles.**

Sol. Let the radius of the bigger circle be R

∴ $\pi R^2 = \pi r_1^2 + \pi r_2^2$

∴ $\cancel{\pi}R^2 = \cancel{\pi}(\boxed{r_1}^2 + \boxed{r_2}^2)$

∴ $+$

∴

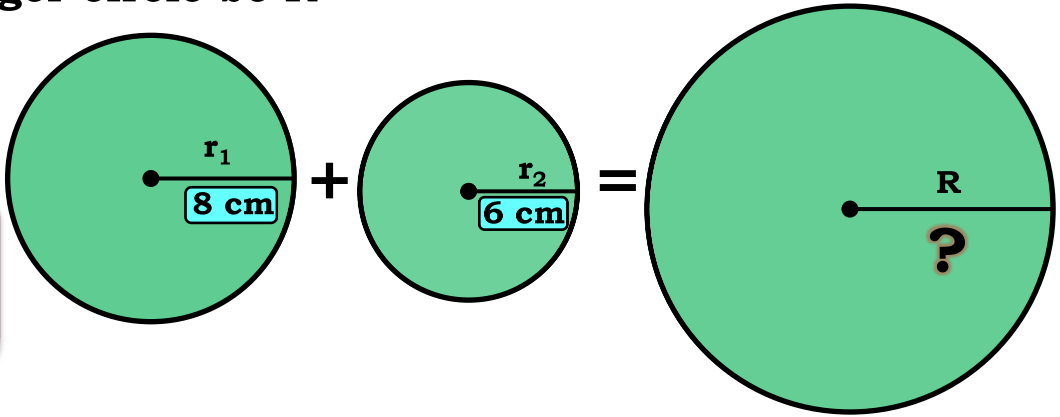
What is the formula to find area of a circle?

πr^2

∴ $R^2 = 100$

∴ $R = 10$ cm

∴ Radius of the bigger circle is 10 cm



Q. If the perimeter and the area of a circle are numerically equal, then find the radius of circle.

Sol. $\boxed{\text{Perimeter of a circle}} = \boxed{\text{Area of the circle}}$

$$\therefore \quad 2\cancel{\pi}r = \cancel{\pi}r^2$$

$$\therefore \quad 2r = r^2$$

$$\therefore \quad 2 = \frac{\overset{r}{\cancel{r^2}}}{\cancel{r}} \quad [\because\ r \neq 0]$$

$$\therefore \quad r = 2 \text{ units.}$$

Module 2

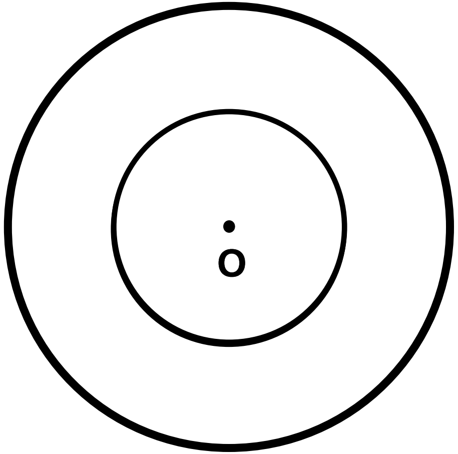
AREAS RELATED TO CIRCLE

- **Sum based on Area of circle**

UNDERSTAND!

Ar (shaded portion) = Ar (bigger circle) – Ar (smaller circle)

Let us understand how to find area of shaded region ?



Q. The following figure depicts an archery target marked with its five scoring … Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm an… bands is 10.5 cm wide. Find the area of … ng regions.

Let us find area of Gold circular region

Area of circle = πr^2

Sol.

Radius of gold circular region $(r_1) = \dfrac{21}{2} = 10.5$ cm

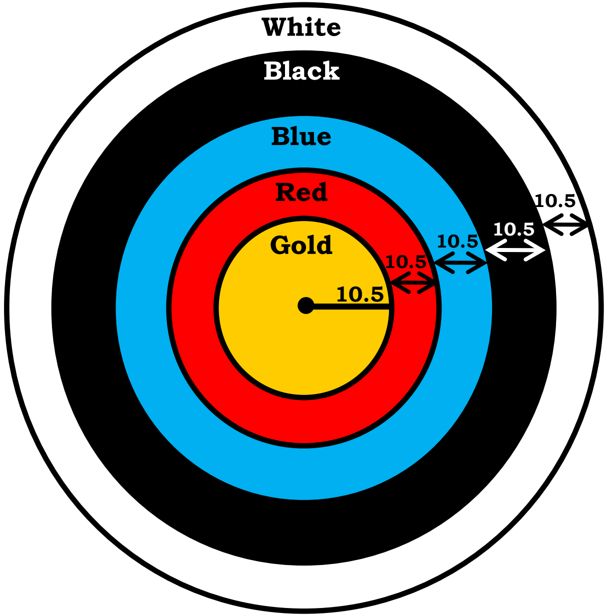
Area of gold circular region $= \pi \boxed{r_1}^2$

$= \dfrac{22}{\cancel{7}} \times \cancel{10.5}^{\,1.5} \times 10.5$

$= 22 \times 1.5 \times 10.5$

$= 346.5 \text{ cm}^2$

$\therefore$ Area of gold circular region is 346.5 cm^2



Q. The following figure depicts an archery target marked with its five scoring Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm an .5 cm wide. Find the area of e

Let us find radius of red circular region

Area of circle $= \pi r^2$

Red ring

Sol. A (Red ring) = A (Red circular region) – A (Gold circular region)

Radius of gold circular region $(r_1) = \dfrac{21}{2} = 10.5$ cm

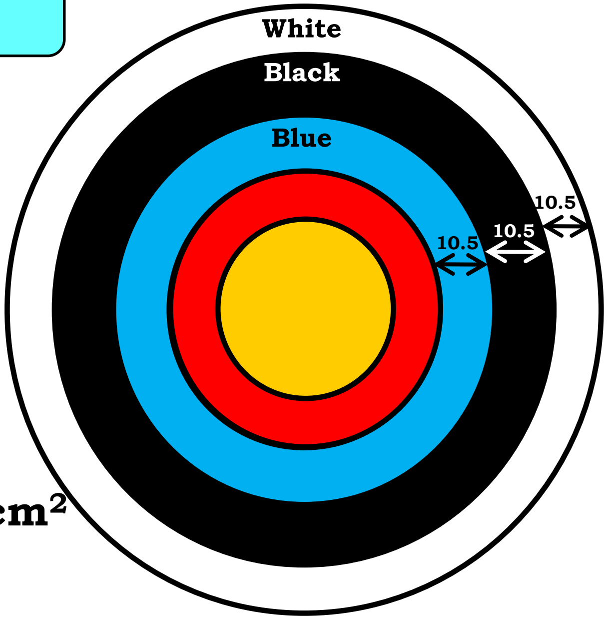
Radius of red circular region $(r_2) = r_1 + 10.5 = 21$ cm

$$\text{Area of red ring} = \pi r_2^2 - \pi r_1^2 = \pi(\boxed{r_2}^2 - \boxed{r_1}^2)$$

$$= \frac{22}{7} \times (21^2 - 10.5^2)$$

$$= \frac{22}{7} \times (21 + 10.5)(21 - 10.5)$$

$$= \frac{22}{\cancel{7}} \times 31.5 \times \overset{1.5}{\cancel{10.5}} = 1039.5 \text{ cm}^2$$



$\therefore$ Area of red ring is 1039.5 cm^2

Module 3

AREAS RELATED TO CIRCLE

- **Sum based on Area of circle (part-II)**

Q. The following figure depicts an archery target marked with its five scoring areas from the centre outwards as Gold, Red, Blue, Black and Whit

Let us find area of Blue ring

presenting Gold score is 21 cm and each of the other bands is 10.5 cm wide.

Find t

Let us find radius of blue circular region

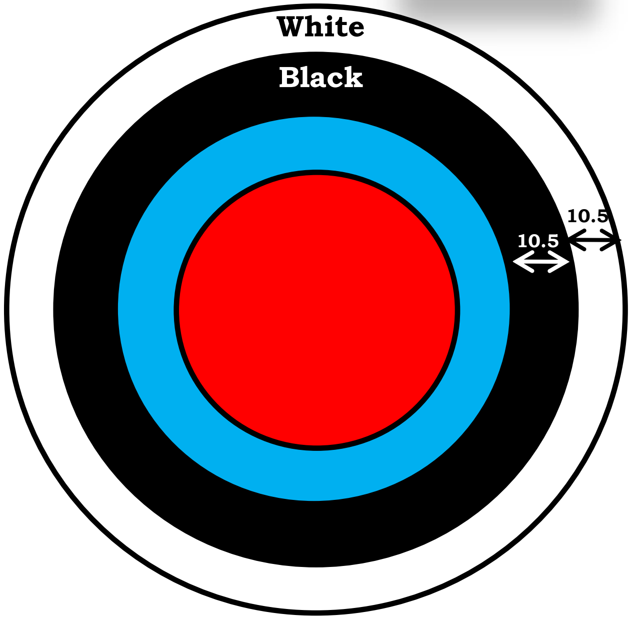
s.

Sol. A (Blue ring) = A (Blue circular region) – A (Red circular region)

$r_2 = 21$

Radius of blue circular region $(r_3) = r_2 + 10.5$

$\therefore \quad \boxed{r_3 = 31.5 \text{ cm}}$



$$A\text{ (Blue ring)} = \pi r_3^2 - \pi r_2^2 = \pi(\boxed{r_3}^2 - \boxed{r_2}^2)$$

$$= \frac{22}{7} \times (31.5^2 - 21^2)$$

$$= \frac{22}{7} \times (31.5 + 21)(31.5 - 21)$$

$$= \frac{22}{\cancel{7}} \times 52.5 \times \overset{1.5}{\cancel{10.5}} = 1732.5$$

$\therefore$ Area of blue ring is 1732.5 cm^2

Q. The following figure depicts an archery target marked with its five scoring areas from the centre outwards as Gold, Red, Blue, Black and White [...] presenting Gold score is 21 cm [...] .5 cm wide. Find t[...]

Let us find area of Black ring

Let us find radius of black circular region

A (Black ring) = A (Black circular region) – A (Blue circular region)

$r_3 = 31.5$

Sol. Radius of black circular region $(r_4) = r_3 + 10.5$

$= 31.5 + 10.5$

$\therefore \boxed{r_4 = 42 \text{ cm}}$

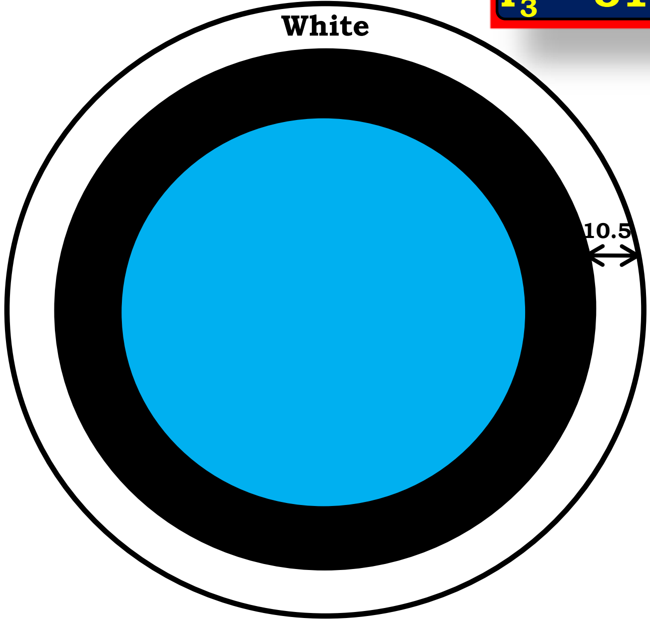
$\therefore$ A (Black ring) $= \pi r_4^2 - \pi r_3^2 = \pi(\boxed{r_4}^2 - \boxed{r_3}^2)$

$= \frac{22}{7} \times (42^2 - 31.5^2)$

$= \frac{22}{7} \times (42 + 31.5)(42 - 31.5)$

$= \frac{22}{\cancel{7}} \times 73.5 \times \overset{1.5}{\cancel{10.5}} = 2425.5 \text{ cm}^2$

$\therefore$ Area of black ring is 2425.5 cm²



Q. The following figure depicts an archery target marked with its five scoring areas from the centre outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 21 ... cm wide. Find the ...

Let us find area of White ring

Let us find radius of White circular region

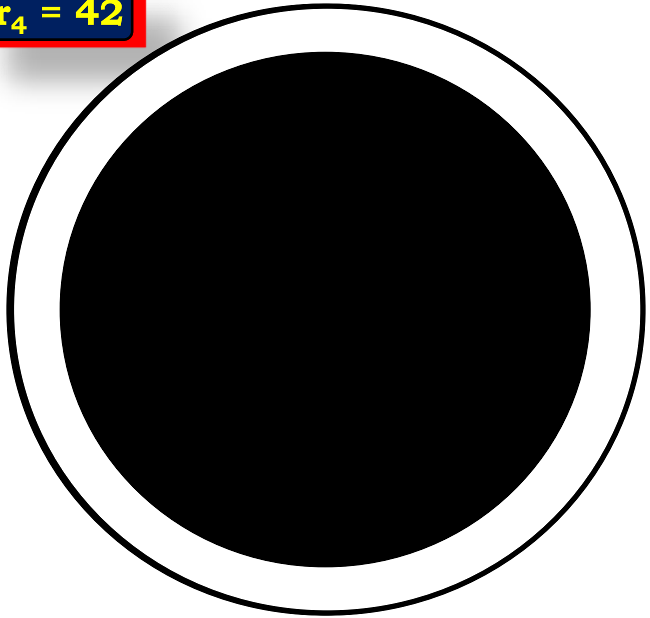
Sol. A (White ring) = A (White circular region) – A (Black circular region)

Radius of white circular region (r_5) $= r_4 + 10.5$

$r_4 = 42$

$= 42 + 10.5$

$\therefore$ $\boxed{r_5 = 52.5 \text{ cm}}$



$\therefore$ A (White ring) $= \pi r_5^2 - \pi r_4^2 = \pi (r_5^2 - r_4^2)$

$= \dfrac{22}{7} \times (52.5^2 - 42^2)$

$= \dfrac{22}{7} \times (52.5 + 42)(52.5 - 42)$

$= \dfrac{22}{\cancel{7}} \times 94.5 \times \cancel{10.5}^{1.5} = 3118.5 \text{ cm}^2$

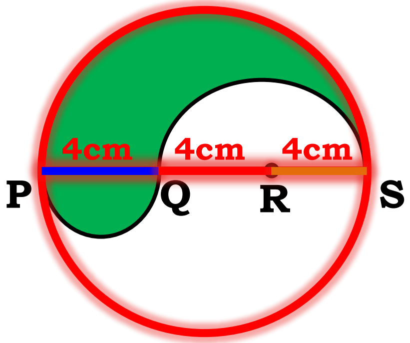
$\therefore$ Area of white ring is 3118.5 cm^2

Module 4

AREAS RELATED TO CIRCLE

- **Sum based on Area and Perimeter of semicircle**

Q. PQRS is a diameter of a circle of radius 6 cm. The lengths PQ, QR and RS are equal. Semi-circles are drawn on PQ and QS as diameters as shown in given figure, Find the perimeter and area of the shaded region.



Sol. Radius $(r_1) = 6$ cm

$\therefore$ $\boxed{\text{Diameter (PS)} = 12 \text{ cm}}$

$\therefore \quad PQ = QR = RS = \dfrac{\boxed{PS}}{3}$

$= \dfrac{12}{3}$

Diameter PS is divided into three equal parts

$\therefore \quad PQ = QR = RS = 4$ cm

$QS = QR + RS$

$= (4 + 4)$ cm

$QS = 8$ cm

What is the formula to find circumference of a semicircle ?

πr

Q. P… radius 6 cm. The lengths PQ, Q… es are drawn on PQ and QS as d… ure, Find the perimeter and area of the shaded region.

Sol.

Perimeter of shaded region = circumference of semi-circle with diameter PS

+ circumference of semi-circle with diameter PQ

+ circumference of semi-circle with diameter QS

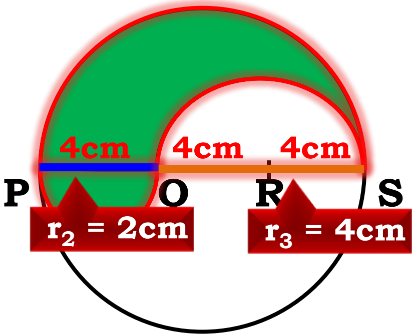
$$= (\pi r_1 + \pi r_2 + \pi r_3)$$

$$= \pi(\boxed{r_1} + \boxed{r_2} + \boxed{r_3})$$

$$= \pi (6 + 2 + 4)$$

$$= \frac{22}{7} \times 12$$

$$= \frac{264}{7} = 37.71 \text{ cm}$$



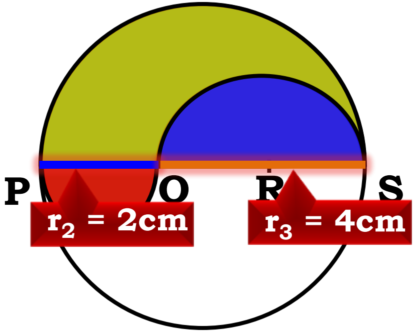
$\therefore$ Perimeter of shaded region is 37.71cm

Q. ... of radius 6 cm. The lengths PQ, ... les are drawn on PQ and QS as ... gure, Find the perimeter and area of the shaded region.

What is the formula to find area of a semicircle ?

$\frac{1}{2} \times \pi r^2$

Sol. Area of shaded region = ar(semi-circle with diameter PS) + ar(semi-circle with diameter PQ) – ar(semi-circle with diameter QS)



$$= \frac{1}{2} \times \pi r_1^2 + \frac{1}{2} \times \pi r_2^2 - \frac{1}{2} \times \pi r_3^2$$

$$= \frac{1}{2} \times \pi \left(\boxed{r_1^2} + \boxed{r_2^2} - \boxed{r_3^2}\right)$$

$$= \frac{1}{2} \times \boxed{\pi} (6^2 + 2^2 - 4^2)$$

$$= \frac{1}{2} \times \frac{22}{7} (36 + 4 - 16)$$

$$= \frac{1}{\cancel{2}} \times \frac{22}{7} \times \cancel{24}^{12}$$

$$= \frac{264}{7} = 37.71 \text{ cm}^2$$

$\therefore$ Area of shaded region is 37.71 cm²

Module 5

AREAS RELATED TO CIRCLE

- Sum based on Area of circle and semicircle

Q. Seg AB and seg CD are perpendicular diameters of a circle with radius 7 cm. Find the area of the shaded region.

Sol.

ar(shaded region) = ar (smaller circle) + ar (semi-circle CBD) – ar (ΔCBD)

Diameter of smaller circle = 7 cm

$\therefore$ its radius (r) = $\frac{7}{2}$ cm

ar (smaller circle) = πr^2

OA = OB = OC = OD = 7 cm

What is the formula to find area of circle?

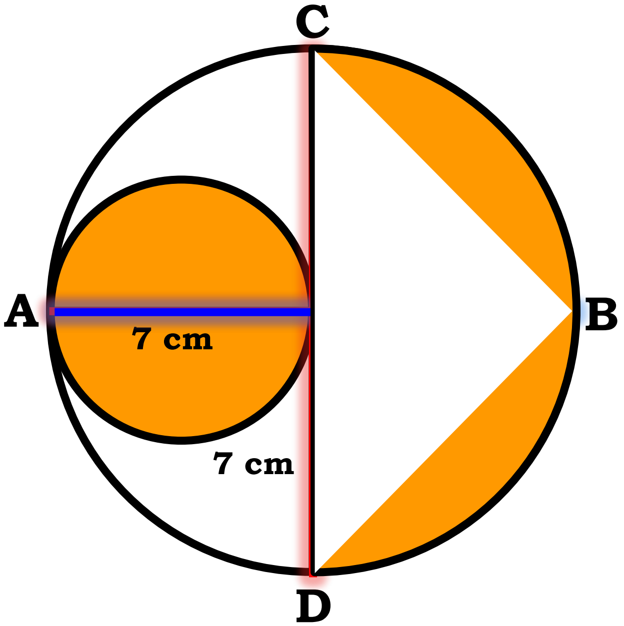
πr^2

$\cancel{\frac{7}{2}} \times \frac{7}{2}$

2

= 38.5 cm²

$\therefore$ ar (smaller circle) = 38.5 cm²



Q. Seg AB and seg CD are perpendicular diameters of a circle with radius 7 cm. Find the area of the shaded region.

Sol.

ar (shaded region) = ar (smaller circle) + ar (semi-circle CBD) – ar (ΔCBD)

ar (smaller circle) = 38.5 cm²

Radius of semicircle CBD (R) = 7 cm

Area of the semicircle CBD $= \frac{1}{2} \times \pi r^2$

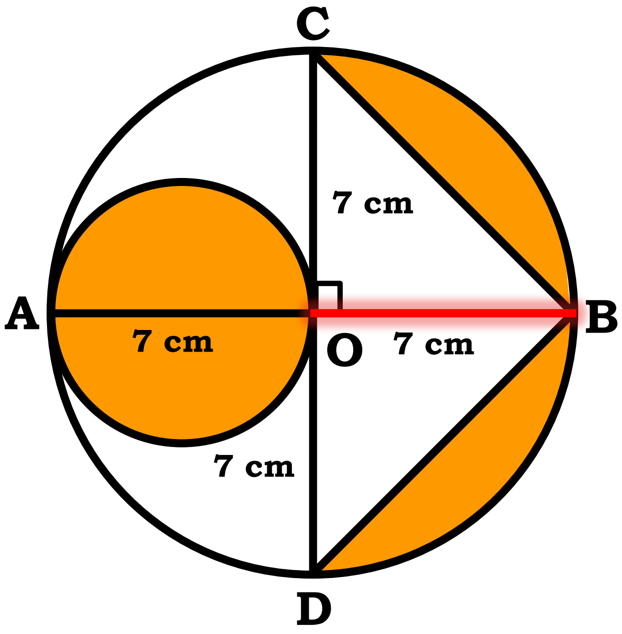
What is the formula to find area of semi-circle ?

$\frac{1}{2} \times \pi r^2$

$\times 7$

$= 11 \times 7$

$\therefore$ Area of the semicircle CBD = 77 cm²



Q. Seg AB and seg CD are perpendicular diameters of a circle with radius 7 cm. Find the area of the shaded region.

Sol.

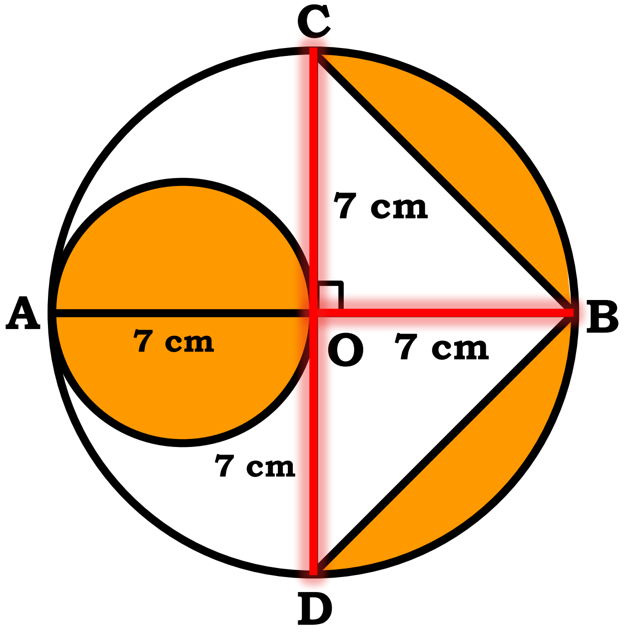
ar (shaded region) = ar (smaller circle) + ar (semi-circle CBD) – $\boxed{\text{ar } (\Delta CBD)}$

ar (semicircle CBD) = 77 cm²

ar (smaller cir

Which is the formula to find area of triangle?

$\frac{1}{2} \times$ base $\times$ height



$$\text{ar}(\Delta CBD) = \frac{1}{2} \times \boxed{\text{base}} \times \boxed{\text{height}}$$

$$= \frac{1}{2} \times CD \times OB$$

$$= \frac{1}{\cancel{2}} \times \overset{7}{\cancel{14}} \times 7$$

$$= 7 \times 7$$

$\therefore$ ar (ΔCBD) = 49 cm²

Q. Seg AB and seg CD are perpendicular diameters of a circle with radius 7 cm. Find the area of the shaded region.

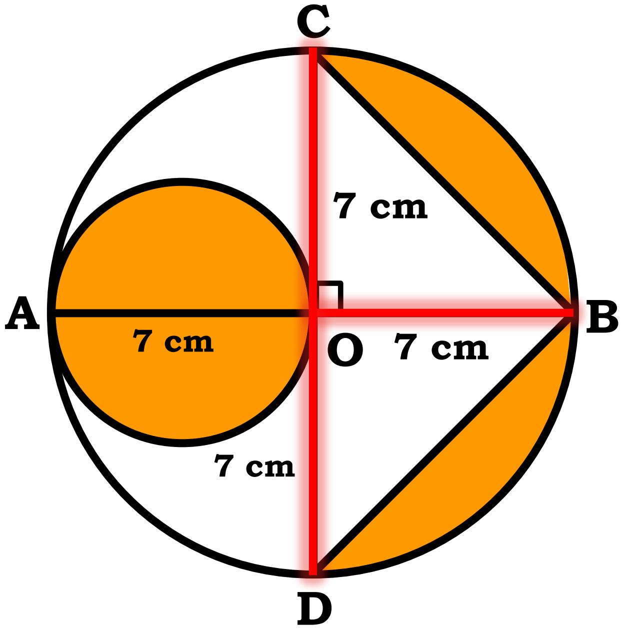
Sol.

ar (shaded region) = ar (smaller circle) + ar (semi-circle CBD) – ar (ΔCBD)

ar (smaller circle) = 38.5 cm^2

ar (semicircle CBD) = 77 cm^2

ar (ΔCBD) = 49 cm^2



$$\begin{aligned} \text{ar (shaded region)} &= \text{ar (smaller circle)} + \text{ar (semi-circle CBD)} - \text{ar }(\Delta CBD) \\ &= 38.5 + \underline{77 - 49} \\ &= 38.5 + 28 \\ &= 66.5 \text{ cm}^2 \end{aligned}$$

$\therefore$ Area of shaded region is 66.5 cm^2

Thank You

Module 6

AREAS RELATED TO CIRCLE

- **Sum based on finding Area of shaded region**

Q. In the adjoining figure,

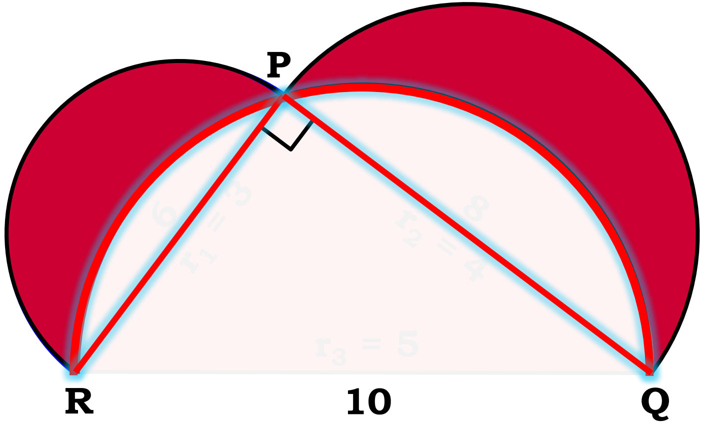
PR = 6 units, PQ = 8 units

Semicircles ... sides PR, RQ and PQ as diameters.

Find the area of the shaded portion.

What is formula for finding Area of triangle ?

$\frac{1}{2}$ × base × height



Sol.

Diameter $\boxed{PR = 6 \text{ units}}$

$\therefore$ Its radius (r_1) = 3 units

Diameter $\boxed{PQ = 8 \text{ units}}$

$\therefore$ Its radius (r_2) = 4 units

In ΔPRQ,

$\angle RPQ = 90^\circ$ [Angle inscribed in a semicircle]

$\therefore RQ^2 = \boxed{PR^2} + \boxed{PQ^2}$ [Pythagoras theorem]

$\therefore RQ^2 = (6)^2 + (8)^2$

$\therefore RQ^2 = 36 + 64$

$\therefore RQ^2 = 100$

$\therefore$ RQ = 10 units [Taking square roots]

Diameter RQ = 10 units

$\therefore$ Its radius (r_3) = 5 units

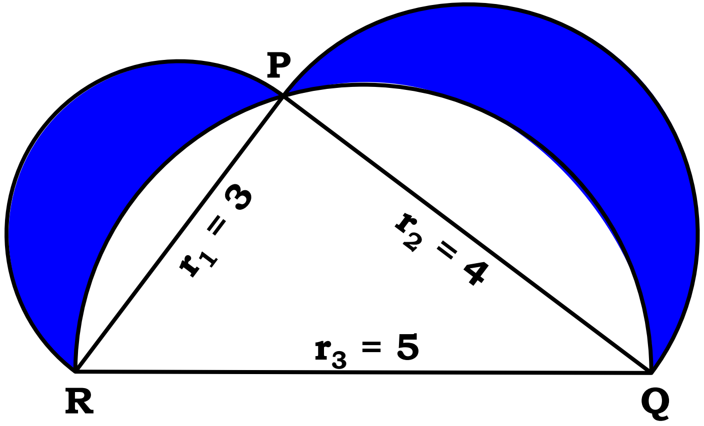
$$A(\Delta PRQ) = \frac{1}{2} \times \boxed{PR} \times \boxed{PQ}$$

$$\therefore A(\Delta PRQ) = \frac{1}{2} \times 6 \times 8$$

$$\therefore A(\Delta PRQ) = 24 \text{ sq. units}$$

ar(shaded region) = ar(semicircle with diameter PR)
+ ar(semicircle with diameter PQ)
+ $\boxed{ar(\Delta PRQ)}$
– ar(semicircle with diameter RQ)

Q. Find the area of the shaded portion.



Sol.

$r_1 = 3$, $r_2 = 4$,

ar(ΔPRQ) = 24

What is formula for finding area of semicircle ?

$\frac{1}{2} \times \pi r^2$

Area of the shaded region

= ar(semicircle with diameter PR)

\+ ar(semicircle with diameter PQ)

– ar(semicircle with diameter RQ) + ar(ΔPRQ)

$$= \frac{1}{2}\pi r_1^2 + \frac{1}{2}\pi r_2^2 - \frac{1}{2}\pi r_3^2 + 24$$

$$= \frac{1}{2}\pi (r_1^2 + r_2^2 - r_3^2) + 24$$

$$= \frac{1}{2}\pi (3^2 + 4^2 - 5^2) + 24$$

$$= \frac{1}{2}\pi (9 + 16 - 25) + 24$$

$$= 24 + \frac{1}{2}\pi (25 - 25)$$

$$= 24 + \frac{1}{2}\pi (0)$$

= 24 sq. units

∴ Area of the shaded region is 24 sq. units

ar(shaded region) = ar(semicircle with diameter PR)

\+ ar(semicircle with diameter PQ)

\+ ar(ΔPRQ)

– ar(semicircle with

Module 7

AREAS RELATED TO CIRCLE

- Sum based on finding Area of shaded region

Q. Find the area of the shaded region, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

ar (shaded region) = ar (semicircle RPQ) – ar (ΔPQR)

Sol. $\angle QPR = 90^\circ$ **[Angle in a semi-circle]**

ar (ΔPQR) $= \dfrac{1}{2} \times$ Product of perpendicular sides

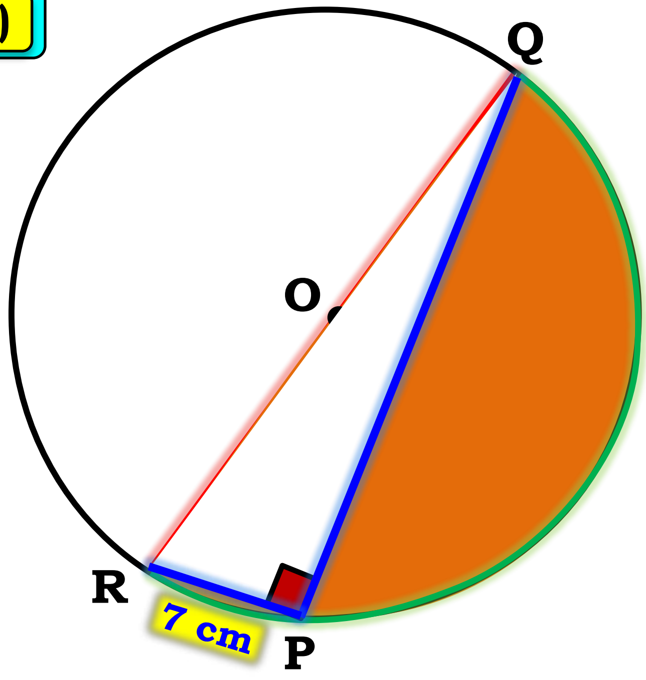
$= \dfrac{1}{2} \times RP \times PQ$

What is the formula to find area of right angle triangle?

$\dfrac{1}{2} \times$ Product of perpendicular sides

$= 12 \times 7$

$\therefore$ ar (ΔPQR) $= 84\ cm^2$



Q. Find the area of the shaded region, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

ar (shaded region) = ar (semicircle RPQ) – ar (ΔPQR)

To find: r

Sol: In ΔPQR, $\angle$QPR = 90°

$\therefore$ $QR^2 = \boxed{QP^2} + \boxed{PR^2}$ ... rem]

Consider ΔPQR

$\therefore$ $QR^2 = (24$ ...

Let us apply Pythagoras theorem

$\therefore$ $QR^2 = 576$ ...

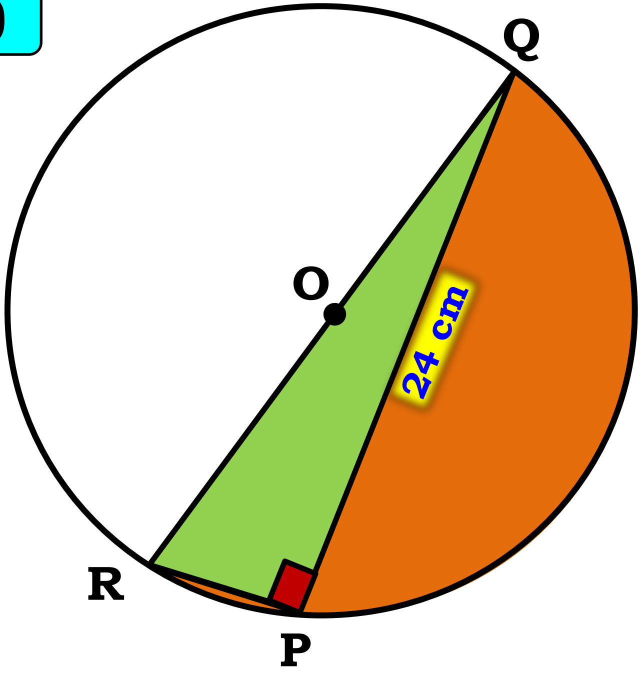
What is the formula to find area of semi-circle?

$\frac{1}{2} \times \pi r^2$

?

$\therefore$ $QR^2 = 625$

$\therefore$ QR = 25cm [Taking square roots]



ar (ΔPQR) = 84 cm^2

Q. Find the area of the shaded region, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

ar (shaded region) = ar (semicircle RPQ) – ar (ΔPQR)

To find: r

Sol: QR = 25 cm

$\therefore$ radius $= \dfrac{25}{2}$ cm

QR is the diagonal of circle

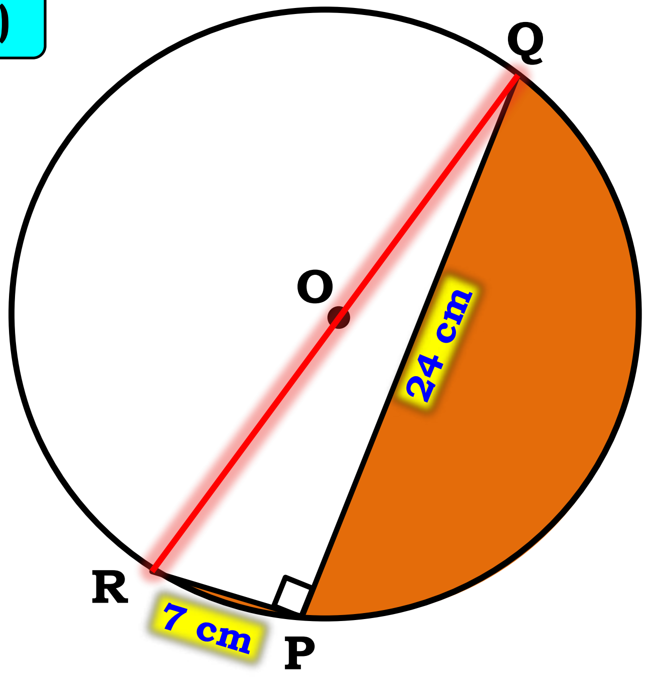
ar(s

$$= \frac{1}{\cancel{2}} \times \frac{\cancel{22}}{7} \times \frac{25}{2} \times \frac{25}{2}$$

$$= \frac{11 \times 25 \times 25}{4 \times 7}$$

$$= \frac{6875}{28}$$

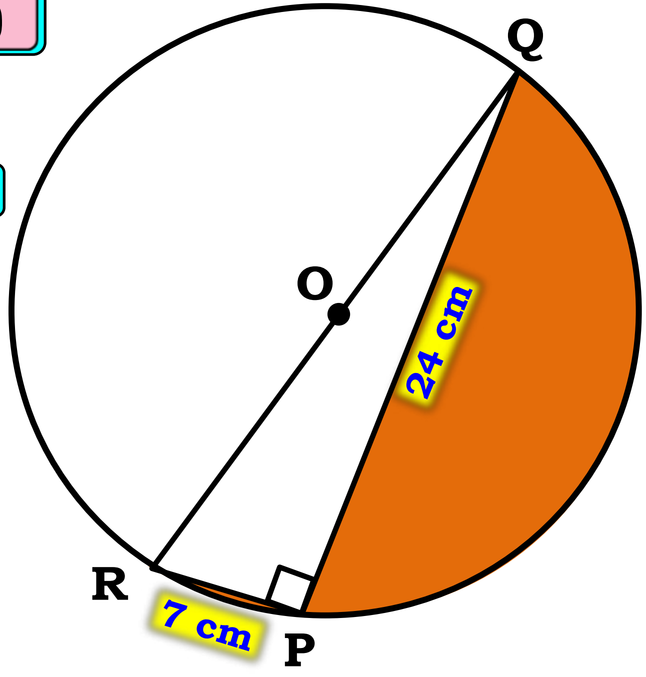
$$= 245.53 \text{ cm}^2$$



ar (ΔPQR) = 84 cm²

Q. Find the area of the shaded region, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

ar(shaded region) = ar(semicircle RPQ) – ar (ΔPQR)



Sol:

ar (shaded region) = $\boxed{\text{ar (semicircle RPQ)}}$ – $\boxed{\text{ar } (\Delta\text{PQR})}$

= 245.53 – 84

= 161.53 cm^2

$\therefore$ ar (shaded portion) is 161.53 cm^2

ar (ΔPQR) = 84 cm^2

ar (semicircle RQP) = 245.53 cm^2

Module 8

AREAS RELATED TO CIRCLE

- Sum based on finding Area of shaded region

Q. Find the area of the shaded region in adjacent figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

Sol. ar (shaded region) = ar (□ ABCD) – 2 ar (semi-circles)

Side of the square = 14 cm

ar (□ ABCD) = $(\text{side})^2$

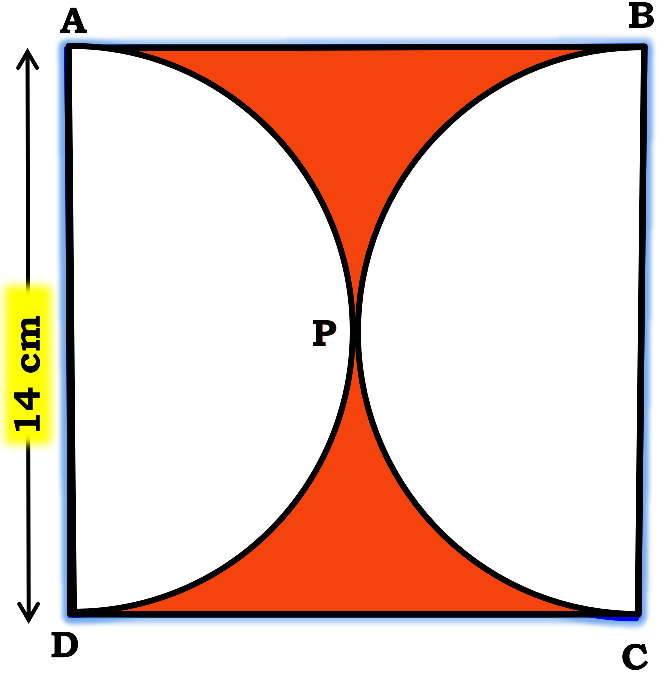
= $(14)^2$

= 196 cm^2

What is the formula to find area of a square?

$(\text{Side})^2$

∴ ar (□ ABCD) = 196 cm^2



Q. Find the area of the shaded region in adjacent figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

Sol. ar (shaded region) = ar (□ ABCD) – 2 ar (semi-circles)

Diameter = 14 cm

∴ Radius (r) = 7 cm

$$2 \text{ ar (semi-circles)} = \cancel{2} \times \frac{1}{\cancel{2}} \times \boxed{\pi r^2}$$

$$= \frac{22}{\cancel{7}} \times \cancel{7} \times 7$$

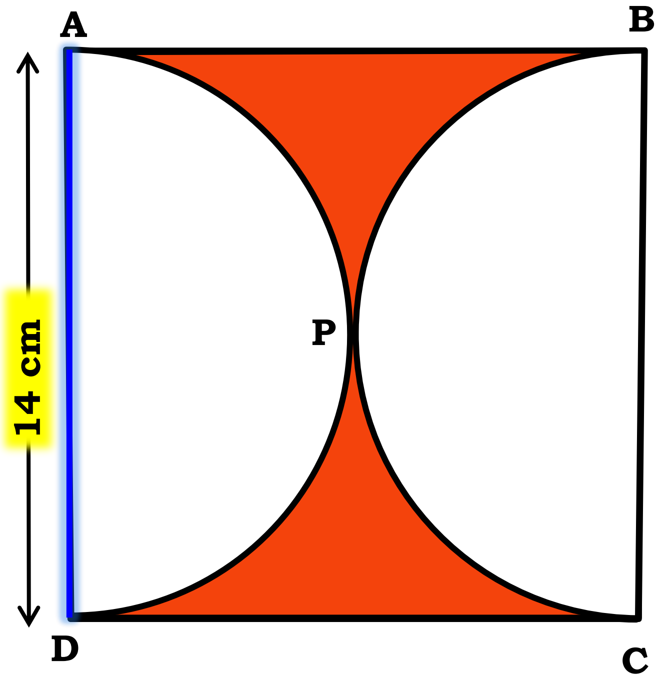
What is the formula to find area of semi circle?

$$\frac{1}{2} \times \pi r^2$$

$$= 22 \times 7$$

∴ 2 ar (semi-circles) = 154 cm²

ar (□ ABCD) = 196 cm²



Q. Find the area of the shaded region in adjacent figure, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

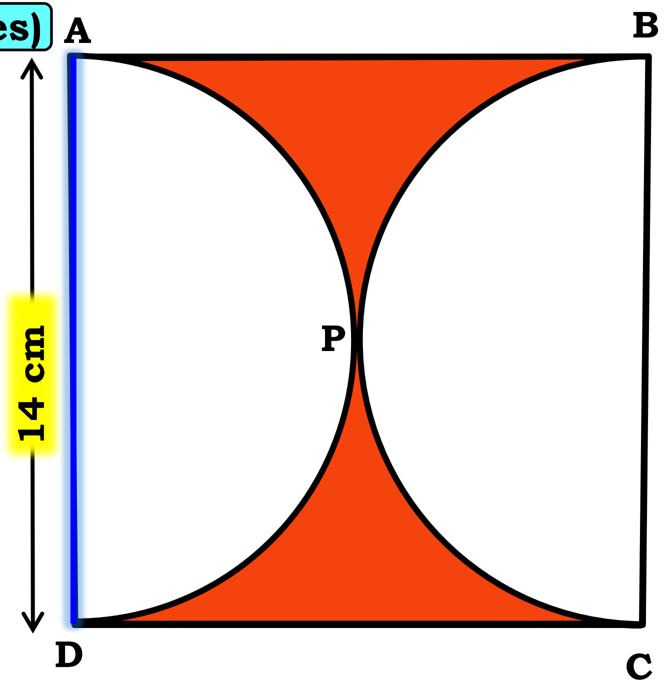
Sol. ar (shaded region) = ar (□ ABCD) – 2 ar (semi-circles)

ar(shaded region) = ar (□ ABCD) – 2 ar(semi-circles)

= 196 – 154

= 42 cm^2

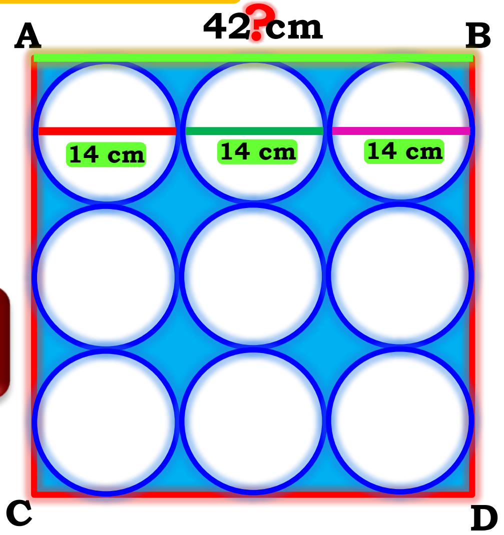
∴ Area of the shaded portion is 42 cm^2



2 Ar (semi-circles) = 154 cm^2

Ar (□ ABCD) = 196 cm^2

Q. On a square handkerchief, nine circular designs each of radius 7cm are made. Find the area of the remaining portion of the handkerchief.



Sol. ar(remaining portion) = ar(□ABCD) – ar(nine circles)

radius of one circle = 7 cm

Side of square = 14 + 14 + 14

∴ = 42 cm

Area of square = $(\text{side})^2$

= $(42)^2$

∴ Area of square

Side of square = Sum of diameter of 3 circles

∴ Diameter = 14 cm

What is formula to find area of circle? πr^2

$\times \cancel{7} \times 7$

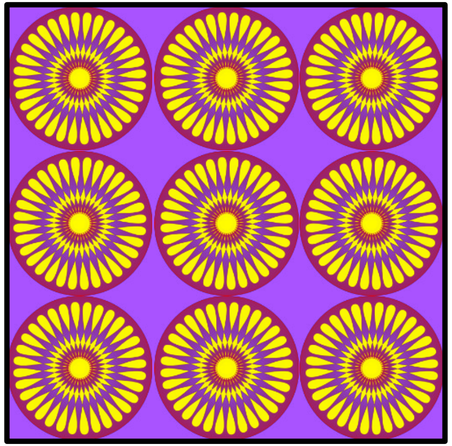
= 22 × 7

∴ Area of one circle = 154 cm²

∴ Area of 9 circles = 9 × 154

= 1386 cm²

Q. On a square handkerchief, nine circular designs each of radius 7cm are made. Find the area of the remaining portion of the handkerchief.



Sol. ar(remaining portion) = ar(□ABCD) – ar(9 circles)

∴ Area of the remaining portion = ar (□ABCD) – ar (9 Circles)

= 1764 – 1386

∴ Area of the remaining portion = 378 cm^2

∴ Area of the remaining portion is 378 cm^2

ar (□ABCD) = 1764 cm^2

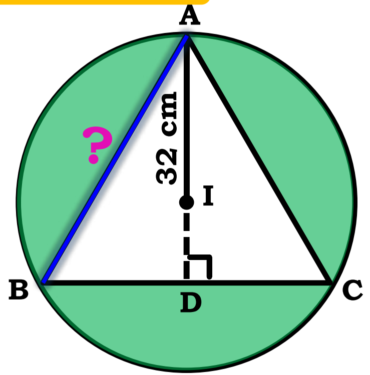
ar (9 circles) = 1386 cm^2

Module 9

AREAS RELATED TO CIRCLE

- **Sum based on Area of circle and equilateral triangle**

Q. In a circular table cover of radius 32cm, a design is formed leaving an equilateral triangle ABC in the middle. Find the area of the design (shaded region).



Sol.

ar(shaded region) = ar(circle) – ar(ΔABC)

?

Let I be the centre of circle.

To find: side

$\therefore$ Radius of circle (AI) = 32 cm

$\therefore$ A, I, D are collinear

Area of circle $= \pi r^2$

$= \dfrac{22}{7} \times 32 \times 32$

$\therefore$ Area of circle $= \dfrac{22528}{7}$ cm^2

ΔABC is equilateral triangle

$\therefore$ I is the centroid of ΔABC.

$\therefore$ AI $= \dfrac{2}{3} \times$ AD ... (I divides AD in the ratio 2 : 1)

Q. In a circular table cover of radius 32cm, a design is formed leaving an equilateral triangle ABC in the middle. Find the area ... ion).

Ra... e and Hy... us of

Consider ΔABD

Sol.

ar(shaded regi...

To find: side

Area of circle $= \dfrac{\ldots 528}{7}$ cm^2

$\therefore \quad \boxed{AI} = \dfrac{2}{3} \ldots$

$\therefore \quad 32 = \dfrac{2}{3} \times AD$

$\therefore \quad \dfrac{32 \times 3}{2} = AD$

$\therefore \quad \boxed{AD = 48 \text{ cm}}$

$\therefore \quad \angle B = 60^\circ$

$\therefore \quad \boxed{\sin 60} = \dfrac{\boxed{AD}}{AB}$

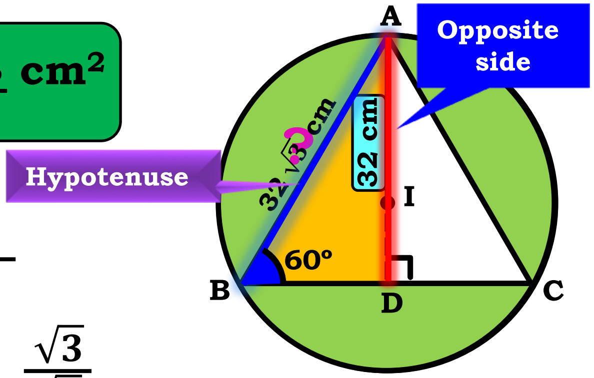
$\therefore \quad \dfrac{\sqrt{3}}{2} = \dfrac{48}{AB}$

$\therefore \quad AB = \dfrac{48 \times 2}{\sqrt{3}}$

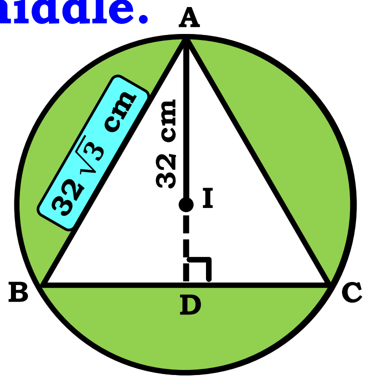
$\therefore \quad AB = \dfrac{96}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}}$

$\therefore \quad AB = \dfrac{96\sqrt{3}}{3}$

$\therefore \quad AB = 32\sqrt{3}$ cm



Q. In a circular table cover of radius 32cm, a design is formed leaving an equilateral triangle ABC in the middle. Find the area of the design (shaded region).



Sol. ar(shaded region) = ar(circle) – ar(ΔABC)

$$\therefore \text{ ar }(\Delta ABC) = \frac{\sqrt{3}}{4} \times (\text{side})^2$$

$$= \frac{\sqrt{3}}{4} \times (32\sqrt{3})^2$$

$$= \frac{\sqrt{3}}{\cancel{4}} \times \overset{8}{\cancel{32}} \times 32 \times 3$$

$$\therefore \text{ ar }(\Delta ABC) = 768\sqrt{3} \text{ cm}^2$$

$$\text{Area of circle} = \frac{22528}{7} \text{ cm}^2$$

$\therefore$ Area of the design = Area of circle – Ar (ΔABC)

$$\therefore \text{ Area of the design} = \left[\frac{22528}{7} - 768\sqrt{3}\right] \text{cm}^2$$

$$\therefore \text{ Area of the design is } \left[\frac{22528}{7} - 768\sqrt{3}\right] \text{cm}^2$$

Module 10

AREAS RELATED TO CIRCLE

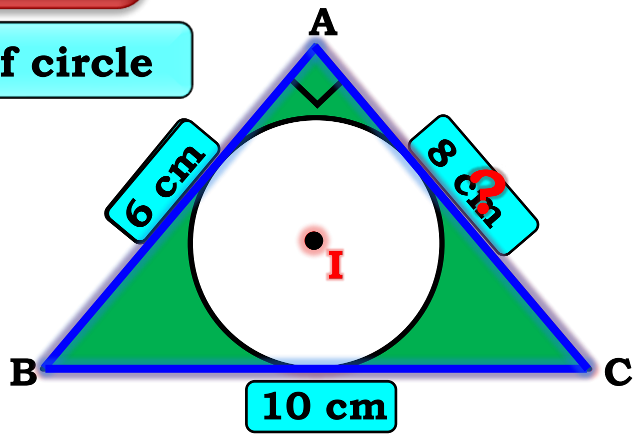
- Sum based on Area of circle and Right-angled triangle

Q. In the adjoinin … iangle at A.
find the area o … 10cm and I is
the center of i

Area of triangle $= \frac{1}{2} \times$ Product of perpendicular sides

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times \boxed{AB} \times \boxed{AC}$?

Sol. Area of shaded region = $\boxed{ar(\Delta ABC)}$ – Area of circle



Applying Pythagoras theorem in ΔABC, we have

To find: AC

$BC^2 = AB^2 + AC^2$

$\therefore AC^2 = \boxed{BC^2} - \boxed{AB^2}$

$\therefore AC^2 = 10^2 - 6^2$

$\therefore AC^2 = 100 - 36$

$\therefore AC^2 = 64$

$\therefore AC = 8$ cm

Area of $\Delta ABC = \frac{1}{2} \times \boxed{AB} \times \boxed{AC}$

$\therefore$ Area of $\Delta ABC = \frac{1}{\cancel{2}} \times \overset{3}{\cancel{6}} \times 8$

$\therefore$ Area of $\Delta ABC = 24 \text{cm}^2$

What is formula to find area of triangle?

Q. In the adjoining given figure, ABC is a right angled triangle at A.
find the a ... AB = 6cm, BC = 10cm and I is the center of incircle of ΔABC.

Area of triangle = $\frac{1}{2} \times b \times h$

Sol. Area of shaded region = ar(ΔABC) – Area of circle

Let radius of the incircle be 'r' cm .

Area of ΔABC = Area of ΔBIC + Area of ΔAIC + Area of ΔAIB

ar(ΔABC) = 24cm²

$\therefore \quad 24 = \frac{1}{2} \times (BC \times r) + \frac{1}{2}(AC \times r) + \frac{1}{2}(AB \times r)$

$\therefore \quad 24 = \frac{1}{2} \times r\ (BC + AC + AB)$

What is formula to find area of circle? πr^2

$\therefore \quad 24 = \frac{1}{2} \times r \times (10 + 8 + 6)$

$\therefore \quad 24 = \frac{1}{\cancel{2}} \times r \times \overset{12}{\cancel{24}}$

Let

ΔABC is divided into three triangle
ΔAIB, ΔBIC, ΔAIC

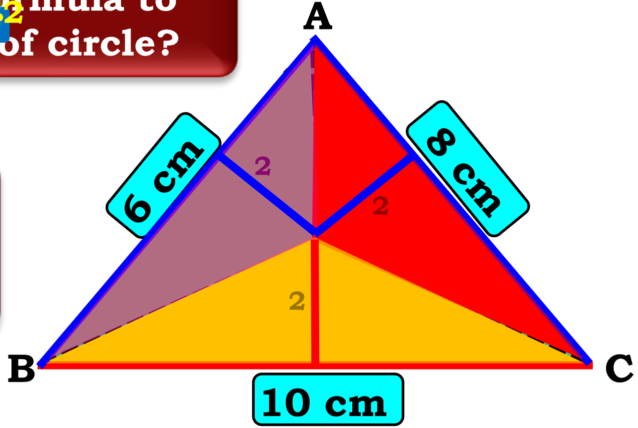
$\therefore \quad 24 = 12r$

$\therefore \quad \boxed{r = 2}$

Area of circle = πr^2

$= \frac{22}{7} \times 2 \times 2$

Area of circle = $\frac{88}{7}$ cm²



Q. In the adjoining given figure, ABC is a right angled triangle at A. find the area of the shaded region if AB = 6cm, BC = 10cm and I is the center of incircle of ΔABC.

Sol.

$$\boxed{\text{Area of shaded region} = ar(\Delta ABC) - \text{Area of circle}}$$

$$\text{Area of the shaded region} = \boxed{\text{Area of } \Delta ABC} - \boxed{\text{Area of circle}}$$

$$= 24 - \frac{88}{7}$$

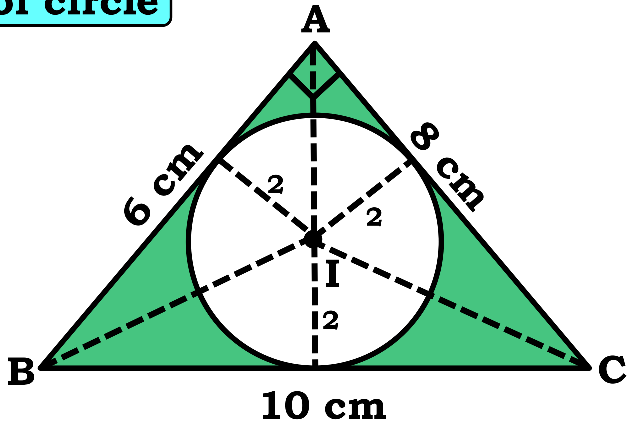
$$= \frac{168 - 88}{7}$$

$$= \frac{80}{7} \text{ cm}^2$$

$$\boxed{ar(\Delta ABC) = 24 \text{cm}^2}$$

$$\boxed{\text{Area of circle} = \frac{88}{7}}$$

$\therefore$ Area of the shaded region is $\frac{80}{7}$ cm^2

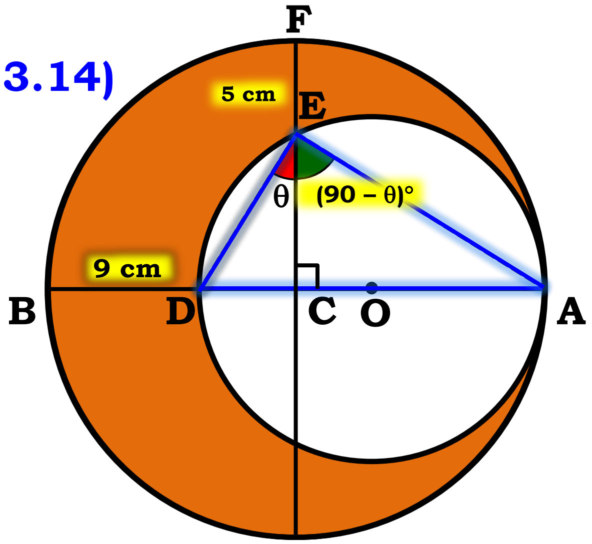


Module 11

AREAS RELATED TO CIRCLE

- Sum based on finding Area of shaded region

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle.
The width of the crescent at BD is 9 cm and at EF it is 5 cm.
Find : (i) the radii of two circles
(ii) the area of the shaded region. (Use π = 3.14)



Construction: Draw AE and DE.

Sol. In smaller circle

$\angle AED = 90°$ [Angle in a semi-circle]

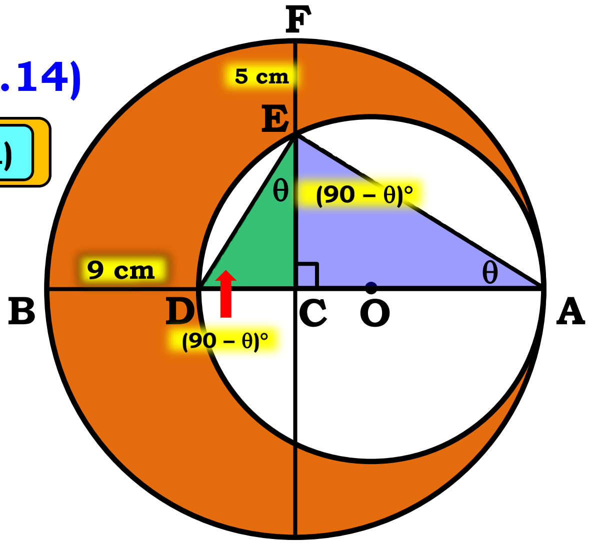
$\angle AED$ is made up of $\angle DEC$ and $\angle AEC$

$\angle AED = \angle DEC + \angle AEC$

$\therefore \quad 90° = \theta + \angle AEC$

$\therefore \quad \angle AEC = (90 - \theta)°$ ... (ii)

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle. The width of the crescent at BD is 9 cm and at EF it is 5 cm. Find : (i) the radii of two circles
(ii) the area of the shaded region. (Use $\pi = 3.14$)



Construction: Draw AE and DE.

$\angle AEC = (90 - \theta)^\circ$ ...(ii)

Consider Δ ECA

Sol. In ΔDCE,

$\angle DEC = \theta, \angle ECD = 90^\circ,$

$\therefore \quad \angle EDC = (90 - \theta)^\circ$ ... (iii) [Remaining angle]

In ΔECA,

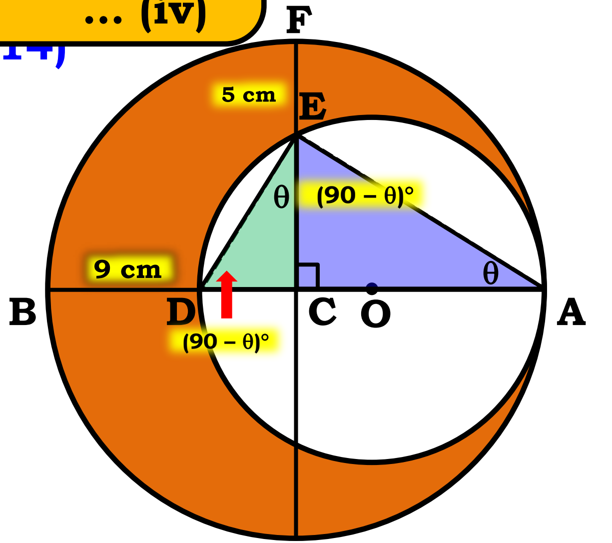
$\angle AEC = (90 - \theta)^\circ$ [From (ii)]

$\angle ECA = 90^\circ$

$\therefore \quad \angle EAC = \theta$ ... (iv) [Remaining angle]

Q. In given figure, a crescent is for[illegible]
touch at A. C is the centre of the [illegible]
The width of the crescent at BD i[illegible]
Find : (i) the radii of two circles
(ii) the area of the shaded region. (Use π = 3.14)

$\angle DEC = \theta$ ... (i)
$\angle AEC = (90 - \theta)°$ ... (ii)
$\angle EDC = (90 - \theta)°$ ... (iii)
$\angle EAC = \theta$ ... (iv)



Construction: Draw AE and DE.

Sol. In ΔDCE and ΔECA

Consider ΔDCE and ΔECA

$\angle DEC = \angle EAC$ [From (i) and (iv)]

$\angle EDC = \angle AEC$ [From (ii) and (iii)]

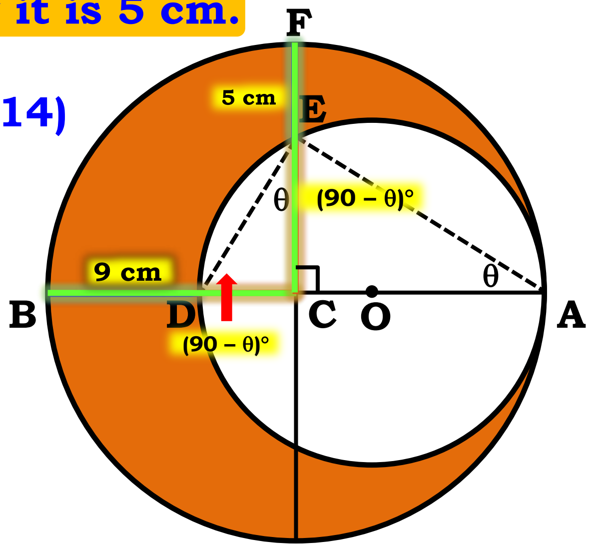
$\therefore \Delta DCE \sim \Delta ECA$ [AA criterion]

$\therefore \dfrac{DC}{EC} = \dfrac{EC}{CA}$ [c.s.s.t]

$\therefore EC^2 = DC \times CA$

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle. The width of the crescent at BD is 9 cm and at EF it is 5 cm. Find : (i) the radii of two circles

(ii) the area of the shaded region. (Use $\pi = 3.14$)



CA = 'R'

Construction: Draw AE and DE.

Now let us find EC and DC in terms of 'R'

Sol. $EC^2 = DC \times CA$

Let radius of larger circle be 'R'

$BD + DC = BC$

$\therefore \quad 9 + DC = R$

$\therefore \quad DC = (R - 9)$ cm

$CE + EF = CF$

$\therefore \quad CE + 5 = R$

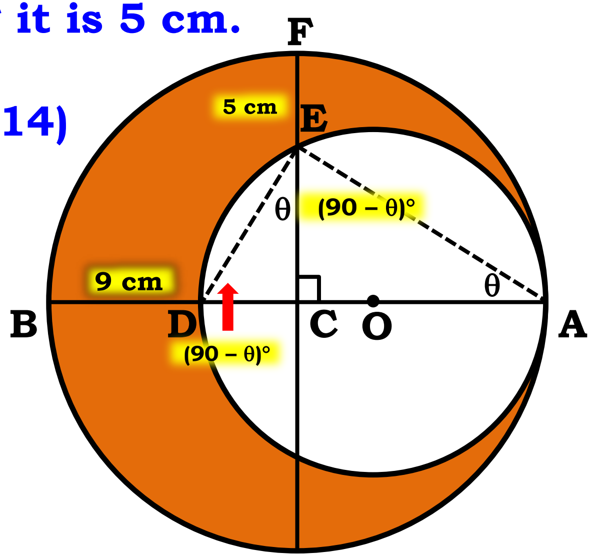
$\therefore \quad CE = (R - 5)$ cm

Module 12

AREAS RELATED TO CIRCLE

- **Sum based on finding Area of shaded region (Part-II)**

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle.
The width of the crescent at BD is 9 cm and at EF it is 5 cm.
Find : (i) the radii of two circles
(ii) the area of the shaded region. (Use $\pi = 3.14$)



Construction: Draw AE and DE.

CA = 'R'

DC = (R – 9) cm

CE = (R – 5) cm

$(a-b)^2 = a^2 - 2ab + b^2$

Sol. $\boxed{EC^2} = \boxed{DC} \times \boxed{CA}$

$\therefore \quad \boxed{(R - 5)^2} = (R - 9) \times R$

$\therefore \quad \cancel{R^2} - 10R + 25 = \cancel{R^2} - 9R$

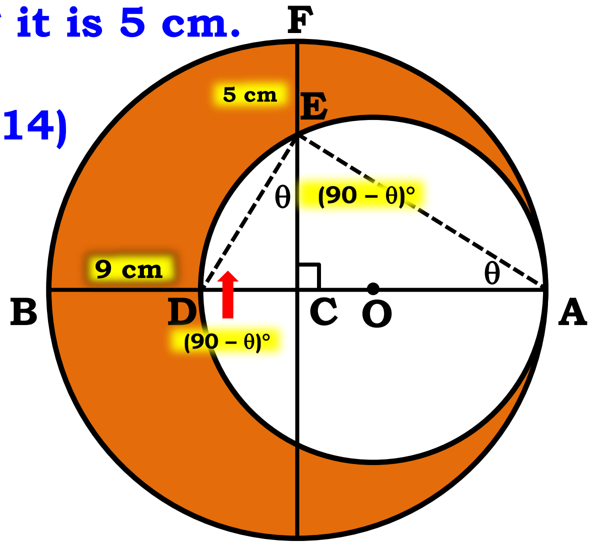
$\therefore \quad 25 = -9R + 10R$

$\therefore \quad R = 25$

Diameter of larger circle = 50 cm

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle. The width of the crescent at BD is 9 cm and at EF it is 5 cm. Find : (i) the radii of two circles

(ii) the area of the shaded region. (Use $\pi = 3.14$)



Construction: Draw AE and DE.

Sol. Diameter of smaller circle $= \boxed{AB} - \boxed{BD}$

$= 50 - 9$

$= \boxed{41 \text{ cm}}$

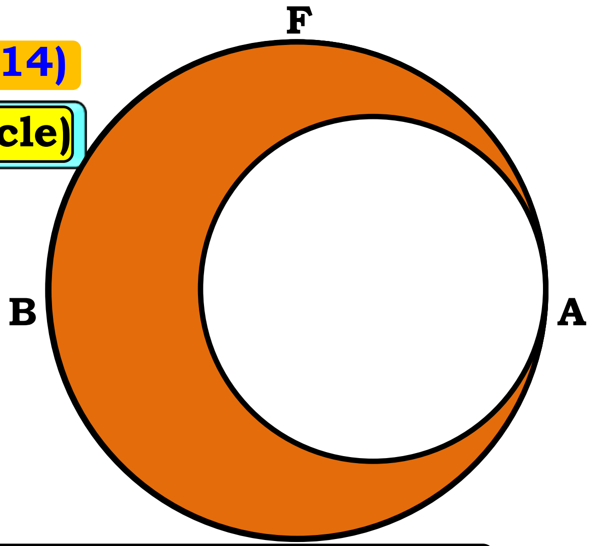
Let radius of smaller circle be 'r'

$\therefore$ radius of smaller circle (r) $= \dfrac{41}{2}$

$= 20.5$ cm

Diameter of larger circle = 50 cm

Q. In given figure, a crescent is formed by two circle which touch at A. C is the centre of the large circle.
The width of the crescent at BD is 9 cm and at EF it is 5 cm.
Find : (i) the radii of two circles
(ii) the area of the shaded region. (Use $\pi = 3.14$)



ar shaded region = ar (larger circle) – ar (smaller circle)

$a^2 - b^2 = (a + b)(a - b)$

Sol.

ar (shaded region) $= \pi R^2 - \pi r^2$

$= \pi\,(\boxed{R^2} - \boxed{r^2})$

$= \pi\,\boxed{(25^2 - 20.5^2)}$

What is the formula to find area of circle?

πr^2

$(25 - 20.5)$

$\times\ 4.5$

$= 642.915\ \text{cm}^2$

Radius of larger circle (R) = 25 cm

Radius of smaller circle (r) = 20.5 cm

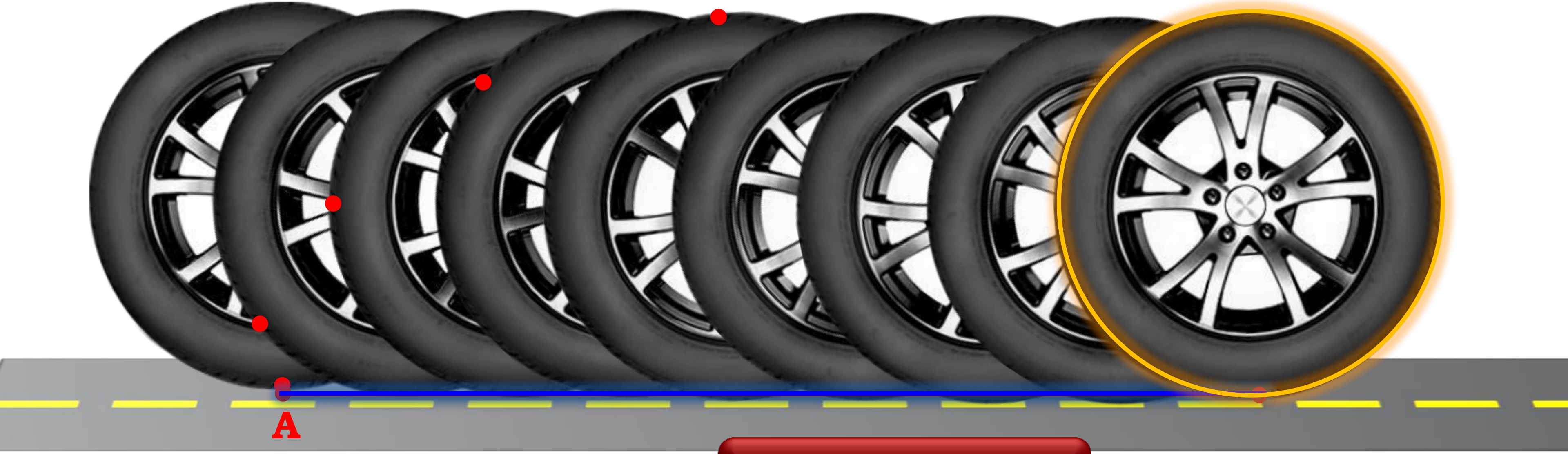
$\therefore$ ar (shaded region) is $642.915\ \text{cm}^2$

Module 13

AREAS RELATED TO CIRCLE

- Sum based on circumference of circle

UNDERSTAND!



Distance covered in 1 rotation = Circumference

Let us consider one rotation of the wheel

No. of rotations

Distance covered = N × Circumference

Total Distance covered = N × Distance covered in 1 revolution

$$\therefore \text{No. of rotations (N)} = \frac{\text{Total Distance covered}}{\text{Distance covered in 1 revolution}}$$

Q. **The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?**

$$\text{No. of revolutions} = \frac{\text{Total distance covered}}{\text{Distance covered in one revolution}}$$

Sol. Diameter of wheel of car = 80 cm

$\therefore$ Radius of wheel of car $= \frac{\cancel{80}^{40}}{\cancel{2}} = 40\text{cm}$

Distance travelled in one revolution = Circumference

$= 2\pi \boxed{r}$

No. of revolutions = 2

Distance co

Circumference = $2\pi r$

Circumference ?

40

$= 80\pi$ cm

Q. The wheels of a car are of diameter 80 cm each.
How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

$$\text{No. of revolutions} = \frac{\text{Total distance covered}}{\text{Distance covered in one revolution}}$$

Sol.

1 km = 100000 cm

Distance travelled in one revolution = 80π cm

Distance travelled in 1 hour = 66 km

$\therefore$ Distance travelled in 1 minute = $\frac{66}{60}$ km

$\therefore$ Distance travelled in 10 minutes = $\frac{\cancel{66}^{11}}{\cancel{60}_{\cancel{6}}} \times \cancel{10} = 11$ km

$\therefore$ Distance travelled in 10 minutes = 11×100000 cm

(1 km = 100000 cm)

Q. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

$$\text{No. of revolutions} = \frac{\text{Total distance covered}}{\text{Distance covered in one revolution}}$$

Sol. No. of revolutions $= \dfrac{\text{Total distance covered}}{\text{Distance covered in one revolution}}$

$$= \frac{11 \times 100000}{80\pi} = \frac{11 \times 100000}{80 \times \frac{22}{7}}$$

$$= \frac{\cancel{11} \times \overset{125}{\cancel{1000}} \times \overset{\cancel{50}}{\cancel{100}} \times 7}{\cancel{80} \times \underset{\cancel{2}}{\cancel{22}}}$$

Distance travelled in one revolution $= 80\pi$ cm

$= 125 \times 35$

Total distance covered $= 11 \times 100000$

$= 4375$

∴ Wheel makes 4375 revolutions in 10 minutes

Thank You

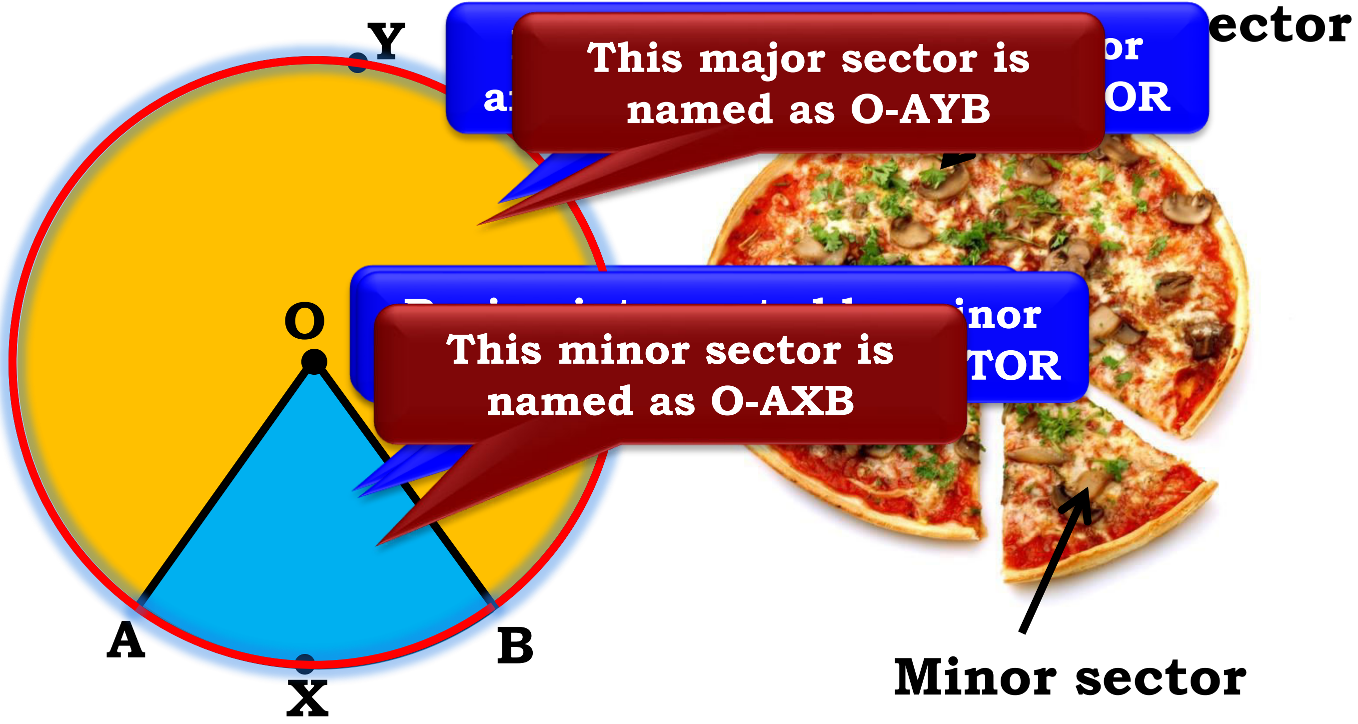
Module 14

AREAS RELATED TO CIRCLE

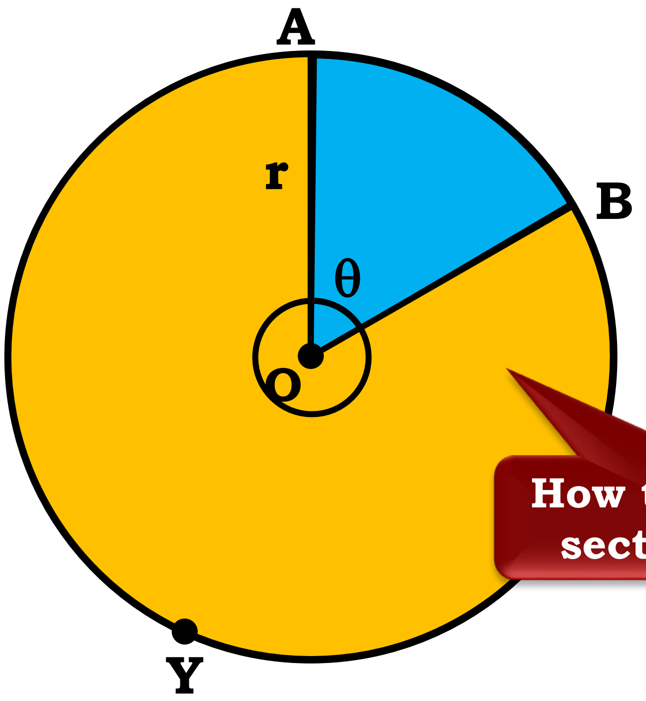
- Introduction : SECTOR
- Formula : Area of sector

SECTOR

Sector of a circle is the part of the circular region enclosed by two radii and their intercepted arc.



SECTOR



Rotation	Area
360°	πr^2
θ	A(sector) ?

$$Ar(sector) \times 360^\circ = \theta \times \pi r^2$$

$$Ar(sector) = \frac{\theta}{360} \times \pi r^2$$

How to find Area of sector O – AYB ?

Ar (O – AYB) = Ar (circle) – Ar (O – AB)

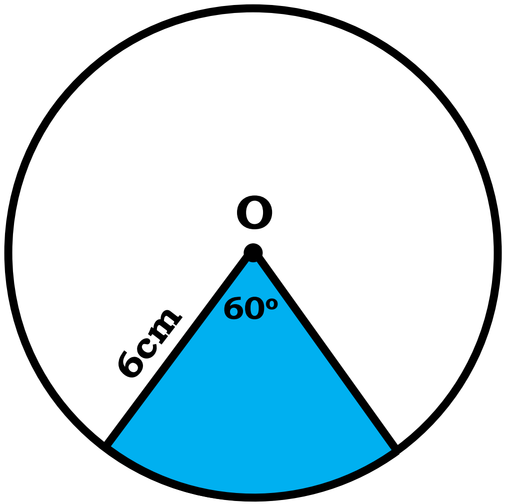
Q. Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60°.

Sol. $\boxed{r = 6\text{ cm}}$

$\boxed{\theta = 60^\circ}$

What is formula to find area of sector ?

$\frac{\theta}{360} \times \pi r^2$



$$\text{Area of sector} = \frac{\boxed{\theta}}{360} \times \boxed{\pi}\boxed{r}^2$$

$$= \frac{\cancel{60}}{\cancel{360}_{\cancel{6}}} \times \frac{22}{7} \times \cancel{6} \times 6$$

$$= \frac{132}{7}$$

$\therefore$ Area of sector $= 18.857\text{ cm}^2$

$\therefore$ **Area of sector is 18.86 cm^2**

Q. Tick the correct answer in the following :

Area of a sector of angle p (in degrees) of a circle with radius R is

(A) $\frac{p}{180} \times 2\pi R$ (B) $\frac{p}{180} \times \pi R^2$ (C) $\frac{p}{360} \times 2\pi R$ (D) $\frac{p}{720} \times 2\pi R^2$

Sol. $\boxed{\text{Radius} = R}$

$\boxed{\theta = p}$

Multiply and divide by 2

Area of sector $= \frac{\boxed{\theta}}{360} \times \pi \boxed{r}^2$

$$= \frac{p}{360} \times \pi R^2 \times \frac{2}{2}$$

$$= \frac{p}{720} \times 2\pi R^2$$

$\therefore$ Option (D) is correct.

Module 15

AREAS RELATED TO CIRCLE

- Sum based on Area of Sector

Q. If the area of the minor sector is 392.5 sq. cm and the corresponding central angle is 72°, find the radius. (π = 3.14)

Radius = ?

Sol.

Area of the sector $= \frac{\boxed{\theta}}{360} \times \boxed{\pi r}^2$

$$\therefore \quad 392.5 = \frac{72}{360} \times 3.14 \times r^2$$

$$\therefore \quad \frac{3925}{10} = \frac{72}{360} \times \frac{314}{100} \times r^2$$

$$\therefore \quad \frac{\cancel{3925}^{25}}{\cancel{10}} \times \frac{\cancel{360}^{\cancel{10}^{5}} \times \cancel{100}^{5}}{{}_{36}\cancel{72} \times \cancel{314}_{\cancel{157}}} = r^2$$

Since area of sector is given,

What is formula for finding area of sector ?

$$\frac{\theta}{360} \times \pi r^2$$

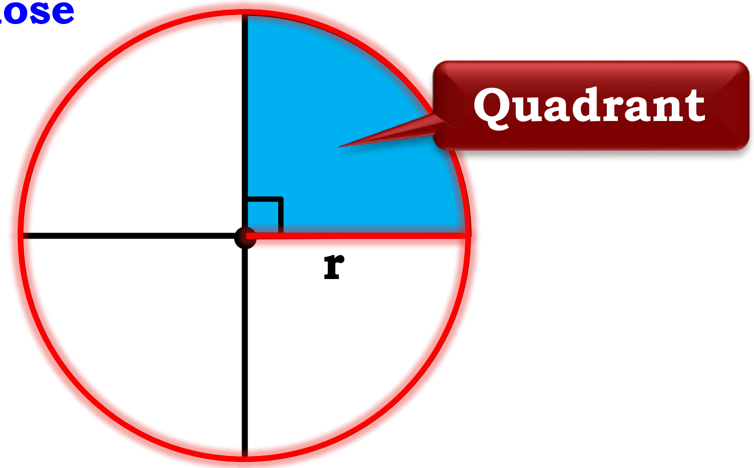
$$\therefore \quad r^2 = 25 \times 25$$

$$\therefore \quad r = 25 \text{ cm}$$

$\therefore$ **Radius of the circle is 25 cm.**

Q. Find the area of a quadrant of a circle whose circumference is 22 cm.

To find : r



Sol. Circumference = 22 cm

Circumference = $2\pi r$

$\therefore \quad 22 = 2 \times \frac{22}{7} \times r$

Let us draw two perpendicular diameters

$\therefore \quad \frac{\cancel{22} \times 7}{2 \times \cancel{22}}$

$\therefore \quad \boxed{r = \frac{7}{2} \text{ cm}}$

Area of quadrant of a circle $= \frac{1}{4} \times \pi \boxed{r}^2$

$= \frac{1}{4} \times \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{2}$

$= \frac{77}{8} = 9.625 \text{ cm}^2$

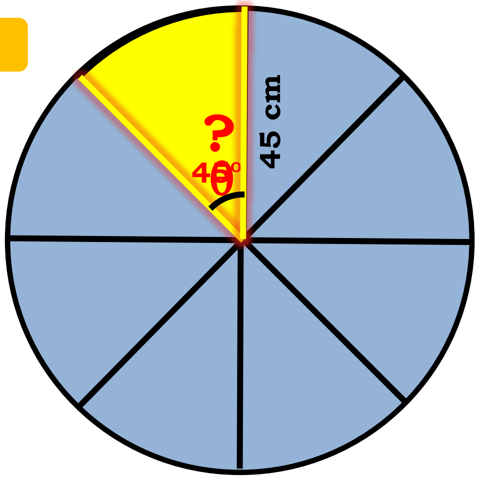
$\therefore$ **Area of quadrant of a circle is 9.63 cm^2**

Module 16

AREAS RELATED TO CIRCLE

- **Sums based on Area of sector**

Q. An umbrella has 8 ribs which are equally spaced. Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella.



Sol. Radius = 45 cm

...two ribs = $\frac{360}{8}$

$\theta = 45^\circ$

A... ...ve ribs) = $\frac{\boxed{\theta}}{360} \times \pi \boxed{r}^2$

$= \frac{\cancel{45}}{\cancel{360}_{\cancel{8}\ 4}} \times \frac{\cancel{22}^{11}}{7} \times 45 \times 45$

$= \frac{22275}{28}$

$= 795.53\ cm^2$

```
     795.53
   ________
28 | 22275
    -196
    ----
      267
    - 252
    -----
      155
    - 140
    -----
       150
    -  140
    ------
        100
    -    84
    -------
         16
```

d

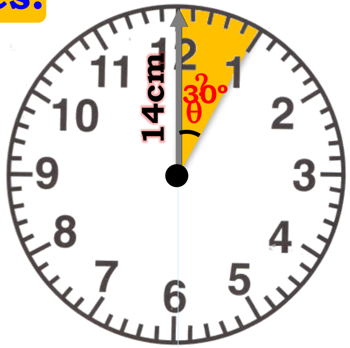
...two consecutive ribs of the umbrella is 795.53 cm^2

Q. The le ... 14 cm.
Find t ... 5 minutes.

Area swept by minute hand in 5 minutes $= \text{Area of sector}$

$$= \frac{\theta}{360} \times \pi r^2$$

Sol.



Angle swept by minute hand in 1 min $= \dfrac{360°}{60} = 6°$

Angle swept by minute hand in 5 min $= 5 \times 6° = 30°$

$$\boxed{\theta = 30°}$$

Area swept by minute hand in 5 minutes $= \text{Area of sector}$

$$= \frac{\boxed{\theta}}{360} \times \pi \boxed{r}^2$$

$$= \frac{\cancel{30}}{\cancel{360}_{\cancel{12}\ \cancel{6}\ 3}} \times \frac{22}{\cancel{7}} \times \overset{2}{\cancel{14}} \times \overset{7}{\cancel{14}}$$

$$= \frac{154}{3} = 51.33 \text{ cm}^2$$

$\therefore$ Area swept by the minute hand in 5 minutes is 51.33 cm^2

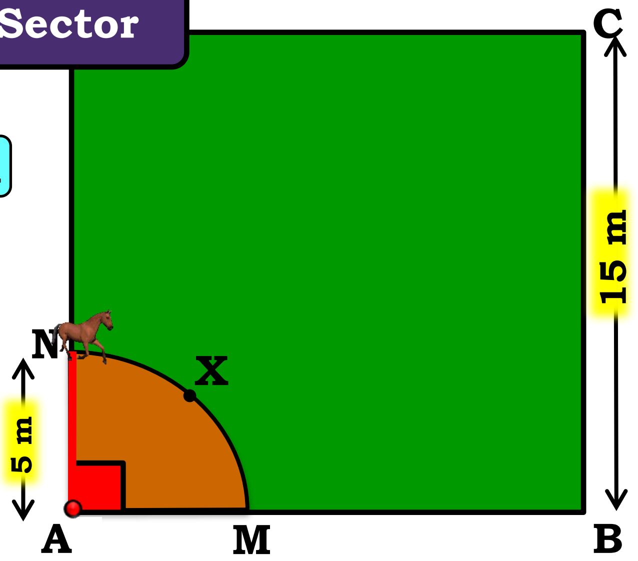
Module 17

AREAS RELATED TO CIRCLE

- Sum based on Area of sector

Q. A Horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope.
Find the area of that part of the field in which the horse can graze.
Also find the increase in the grazing area if the rope were 10m long instead of 5m. (Use $\pi = 3.14$)

Sector



Sol. Length of rope = 5 m

$\therefore$ Radius of sector (r) = length of rope = 5 m

$\theta = 90^\circ$

$$\text{ar}(A - MXN) = \frac{\theta}{360} \times \pi r^2$$

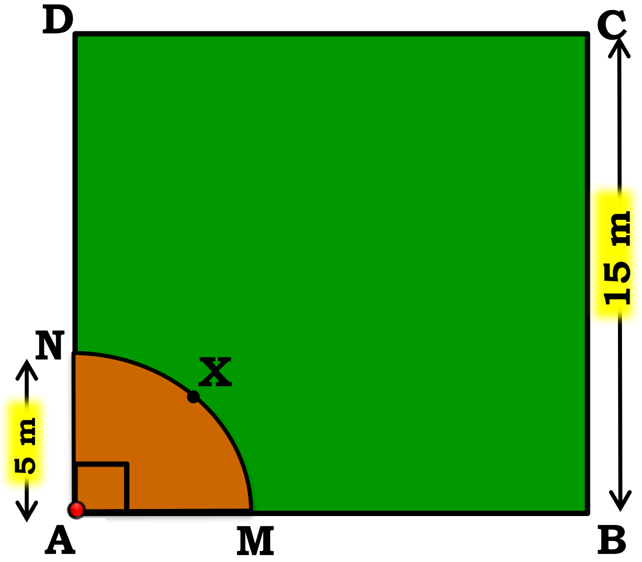
$$= \frac{\cancel{90}^{\,1}}{\cancel{360}_{\,4}} \times 3.14 \times 5 \times 5$$

What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

$$\therefore \text{ar}(A - MXN) = \frac{1}{4} \times \frac{314}{100} \times 5 \times 5$$

Q. A Horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope.
Find the area of that part of the field in which the horse can graze.
the increase in the grazing area if the rope were 10m long instead of 5m.
(Use π = 3.14)



Sol.

$$\text{ar}(A - MXN) = \frac{1}{\cancel{4}\ 2} \times \frac{\cancel{314}\ ^{157}}{100} \times 5 \times 5$$

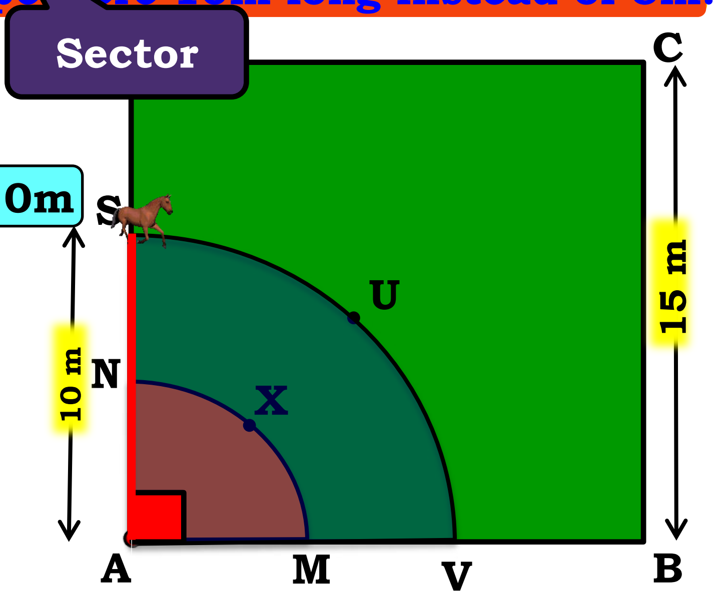
$$= \frac{\cancel{3925}\ ^{1962.5}}{\cancel{2} \times 100}$$

$$= \frac{1962.5}{100}$$

$\therefore$ ar (A – MXN) = 19.625 m^2

$\therefore$ Area of the part of the field in which horse can graze is 19.625 m^2

Q. A Horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope.
Find the area of that part of the field in which the horse can graze.
the increase in the grazing area if the rope were 10m long instead of 5m.
(Use π = 3.14)



Sol. Length of rope = 10 m

Radius of sector (r) = length of rope = 10m

$\theta = 90°$

$$\text{ar}(A - SUV) = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\cancel{90}^{\,1}}{\cancel{360}_{\,\cancel{4}\,2}} \times 3.14 \times \cancel{10}^{\,5} \times \cancel{10}^{\,5}$$

What is the formula to find area of sector?

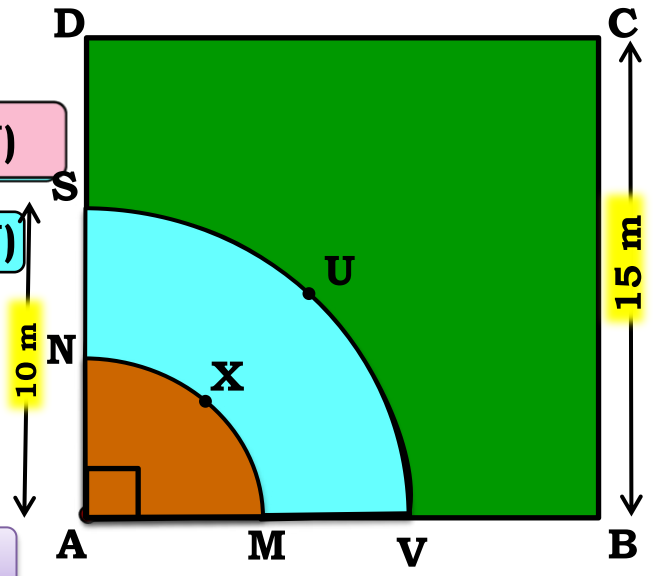
$\frac{\theta}{360} \times \pi r^2$

$= 3.14 \times 5 \times 5$

$\therefore$ ar (A – SUV) = 78.5 m^2

$\therefore$ Area of the part of the field in which horse can graze is 78.5 m^2

Q. A Horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope.
Find the area of that part of the field in which the horse can graze.
the increase in the grazing area if the rope were 10m long instead of 5m.
(Use π = 3.14)



$$\text{ar}(A - SUV) = 78.5 \text{ m}^2$$

$$\text{ar}(A - MXN) = 19.625 \text{ m}^2$$

Sol.

Increase in grazing area = ar(A–SUV) – ar(A–MXN)

Increase in grazing area = ar(A–SUV) – ar(A–MXN)

= 78.5 – 19.625

= 58.875 m^2

∴ Increase in the grazing area is 58.875 m^2

Module 18

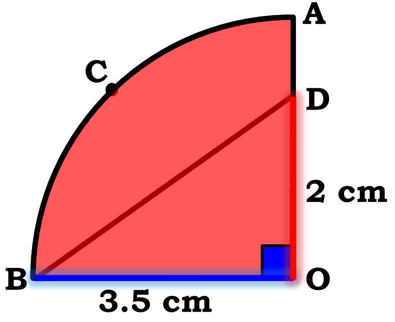
AREAS RELATED TO CIRCLE

- **Sum based on Area of sector and Right-angled triangle**

Q. In the adjoining figure, OACB is a quadrant of a circle (centre O) and radius 3.5 cm. If OD = 2 cm, find the area of the

(i) Quadrant OACB,

(ii) shaded region.



Sol.

$\boxed{\theta = 90^\circ}$

$\boxed{\text{Radius} = 3.5 \text{ cm}}$

What is formula to find area of quadrant ?

$\frac{\theta}{360} \times \pi r^2$

$$\therefore \quad \text{ar (O-BCA)} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\cancel{90}}{\underset{4}{\cancel{360}}} \times \frac{\overset{5.5}{\cancel{22}}}{\cancel{7}} \times \overset{0.5}{\cancel{3.5}} \times 3.5$$

$$= 5.5 \times 0.5 \times 3.5$$

$$= 9.625 \text{ cm}^2$$

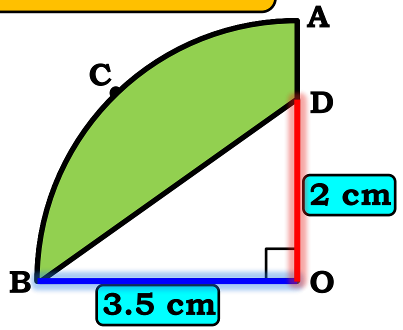
$\therefore$ **Area of the quadrant OACB is 9.625 cm²**

Q. In the adjoining figure, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the

(i) quadrant OACB,

(ii) shaded region.

$ar(O - BCA) = 9.625 \text{ cm}^2$



Sol. $ar(\text{shaded region}) = ar(O - BCA) - ar(\Delta BOD)$

$ar(\Delta BOD) = \frac{1}{2} \times \boxed{BO} \times \boxed{OD}$

$= \frac{1}{\cancel{2}} \times 3.5 \times \cancel{2}$

What is formula to find area of triangle?

$\frac{1}{2} \times$ base $\times$ height

$\therefore \quad ar(\Delta BOD) = 3.5 \text{ cm}^2$

Area of the shaded portion $= \boxed{ar(O\text{-}BCA)} - \boxed{ar(\Delta BOD)}$

$= 9.625 - 3.5$

$\therefore$ Area of the shaded portion $= 6.125 \text{ cm}^2$

$\therefore$ Area of the shaded portion is 6.125 cm^2

Module 19

AREAS RELATED TO CIRCLE

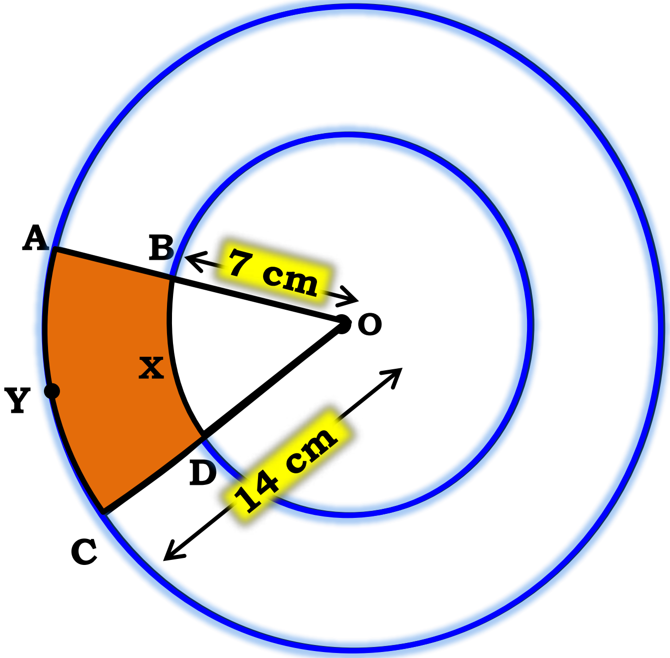
- **Sum based on Area of sector**

Q. Find the area of the shaded region, if the radii of the two concentric circles with center O are 7 cm and 14 cm respectively and ∠AOC = 40°.

Sol: Radius of smaller circle (r) = 7 cm

Radius of Bigger circle (R) = 14 cm

Central angle (θ) = 40°



ar (shaded portion) = ar(O – AYC) – ar(O – BXD)

$$= \frac{\theta}{360} \times \pi R^2 - \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\theta}{360} \pi (R^2 - r^2)$$

What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

ar (shaded portion)

Q. Find the area of the shaded region, if the radii of the two concentric circles with center O are 7 cm and 14 cm respectively and $\angle AOC = 40^\circ$.

Sol:

$$\text{ar (shaded portion)} = \frac{\overset{1}{\cancel{40}}}{\underset{9}{\cancel{360}}} \times \frac{22}{7} \times \boxed{(14^2 - 7^2)}$$

$$= \frac{1}{9} \times \frac{22}{7} \times (14 + 7)(14 - 7)$$

$$= \frac{1}{\ } \times \frac{22}{\ } \times \overset{7}{\cancel{21}} \times \cancel{7}$$

$(a + b)(a - b)$

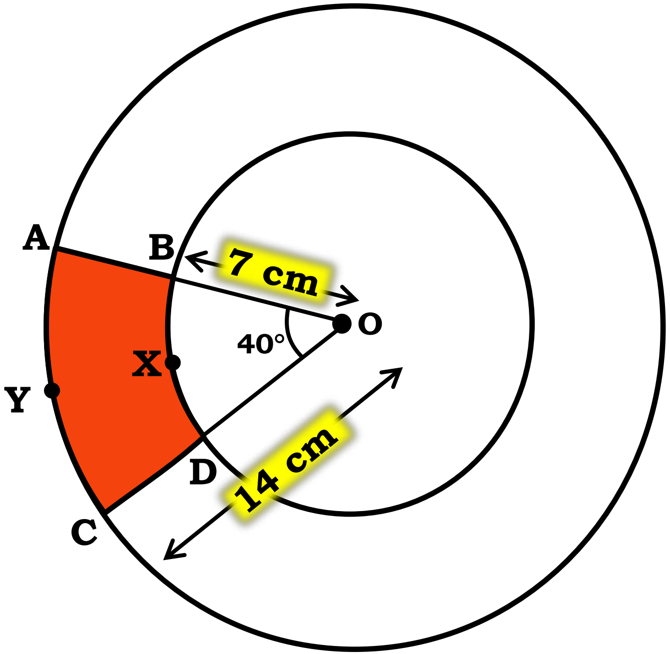
$a^2 - b^2 = ?$

$$= \frac{22 \times 7}{3}$$

$$= \frac{154}{3}$$

$$= 51.33 \text{cm}^2$$

$\therefore$ Area of the shaded portion is 51.33 cm^2



Q. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm with centre O. If $\angle AOB = 30°$, find the area of the shaded region.

Sol. Radius of smaller circle (r) = 7 cm

Radius of Bigger circle (R) = 21 cm

Central angle (θ) = 30°

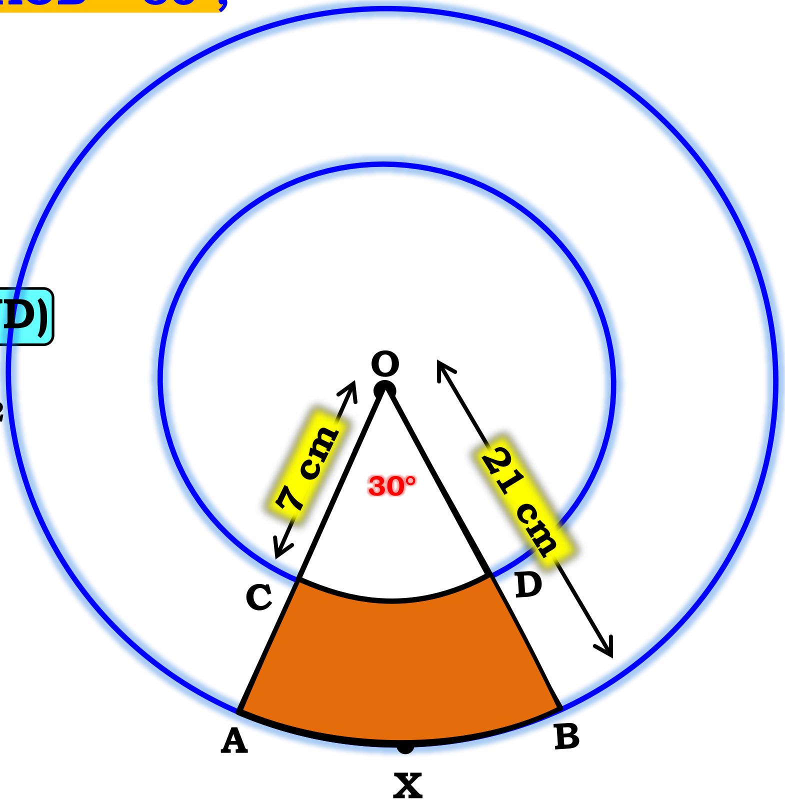
ar (shaded portion) = ar(O – AXB) – ar(O – CYD)

$$= \frac{\theta}{360} \times \pi R^2 - \frac{\theta}{360} \times \pi r^2$$

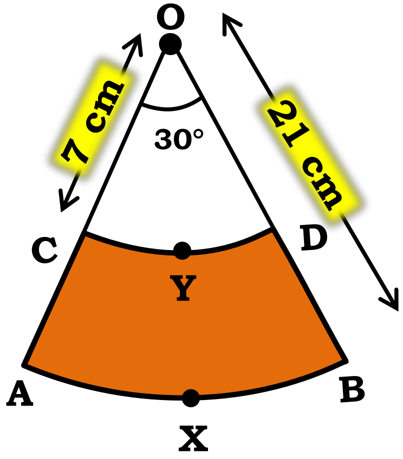
What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

ar (shaded portion) = $\dfrac{30}{360} \times \dfrac{22}{7} \times (21^2 - 7^2)$



Q. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm with centre O. If ∠AOB = 30°, find the area of the shaded region.



Sol.

$$\text{ar (shaded portion)} = \frac{\overset{1}{\cancel{30}}}{\underset{12}{\cancel{360}}} \times \frac{22}{7} \times \boxed{(21^2 - 7^2)}$$

$$= \frac{1}{12} \times \frac{22}{7} \times (21 + 7)(21 - 7)$$

$(a^2 - b^2) = (a + b)(a - b)$

$$= \frac{1}{\underset{\underset{3}{\cancel{6}}}{\cancel{12}}} \times \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times 28 \times \cancel{14}$$

$$= \frac{11 \times 28}{3}$$

$$= \frac{308}{3}$$

$$= 102.67 \text{cm}^2$$

$\therefore$ **Area of the shaded portion is 102.67 cm²**

Module 20

AREAS RELATED TO CIRCLE

- **Sum based on Area of sector**

Q. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in figure. Find : (i) the total length of the silver wire required.

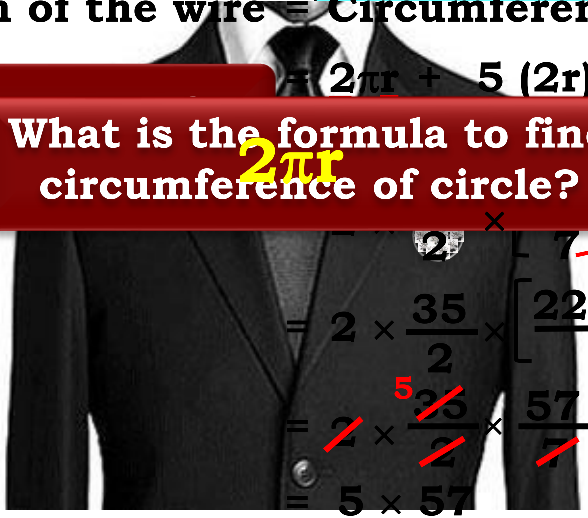
(ii) the area of each sector of the brooch.

Sol.

Radius (r) $= \dfrac{35}{2}$ mm

Total length of the wire = Circumference + 5 (Diameters)

$= 2\pi r + 5(2r)$



Dia

What is the formula to find circumference of circle?

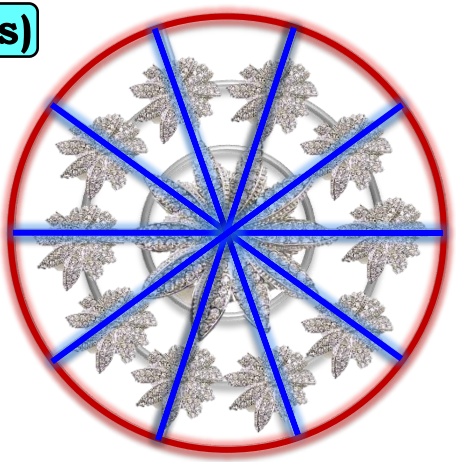
$2\pi r$

$\times \quad 5$

$= 2 \times \dfrac{35}{2} \times \left[\dfrac{22 + 35}{7}\right]$

$= \cancel{2} \times \dfrac{\overset{5}{\cancel{35}}}{\cancel{2}} \times \dfrac{57}{\cancel{7}}$

$= 5 \times 57$



$\therefore$ Total length of the wire is 285 mm

Q. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in figure. Find : (i) the total length of the silver wire required.

(ii) the area of each sector of the brooch.

Sol.

Central angle $= \dfrac{360}{10} = 36^\circ$

Radius (r) $= \dfrac{35}{2}$ mm

Area of each sector $= \dfrac{\boxed{\theta}}{360} \times \boxed{\pi r}^2$

What is the formula to find area of sector?

$\dfrac{\theta}{360} \times \pi r^2$

$= \dfrac{11 \times 35}{4}$

$= \dfrac{385}{4}$

$= 96.25 \text{ mm}^2$

$\therefore$ Area of each sector is 96.25 mm^2

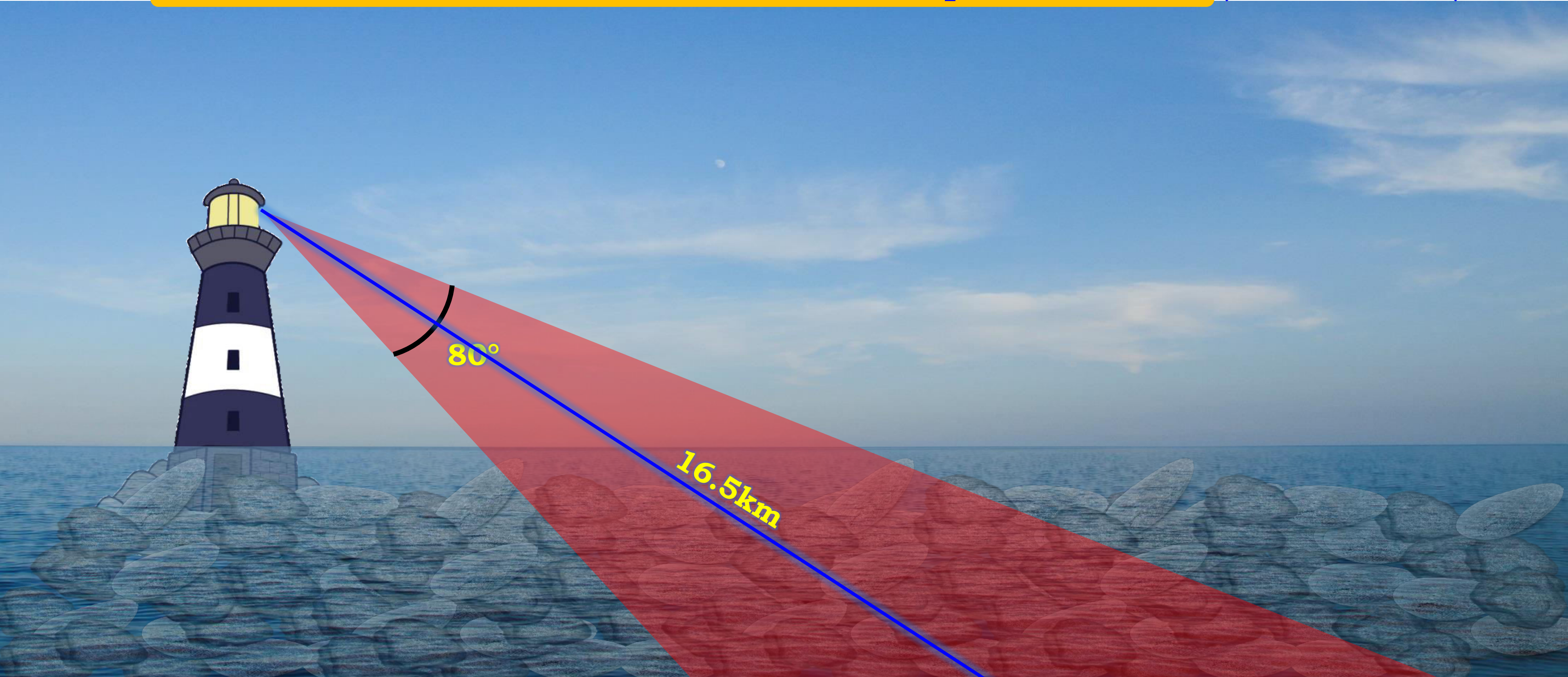
Thank You

Module 21

AREAS RELATED TO CIRCLE

- **Sums based on Area of sector**

Q. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use π = 3.14)



Q. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use $\pi = 3.14$)

Sol. Radius (r) = 16.5 km

Central angle (θ) = 80°

$$\text{ar(O-AXB)} = \frac{\boxed{\theta}}{360} \times \boxed{\pi r^2}$$

$$= \frac{\overset{2}{\cancel{80}}}{\underset{9}{\cancel{360}}} \times 3.14 \times 16.5 \times 16.5$$

$$= \frac{2}{\cancel{9}} \times \frac{314}{100} \times \frac{\overset{55}{\cancel{165}}}{10} \times \frac{\overset{55}{\cancel{165}}}{10}$$

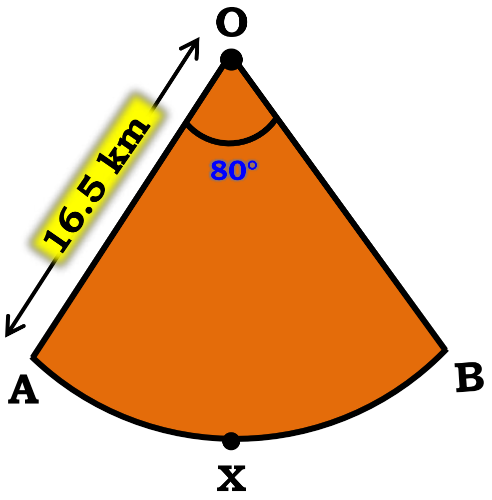
$$= \frac{2 \times 314 \times 55 \times 55}{10000} = \frac{1899700}{10000}$$

$$= 189.97 \text{ km}^2$$

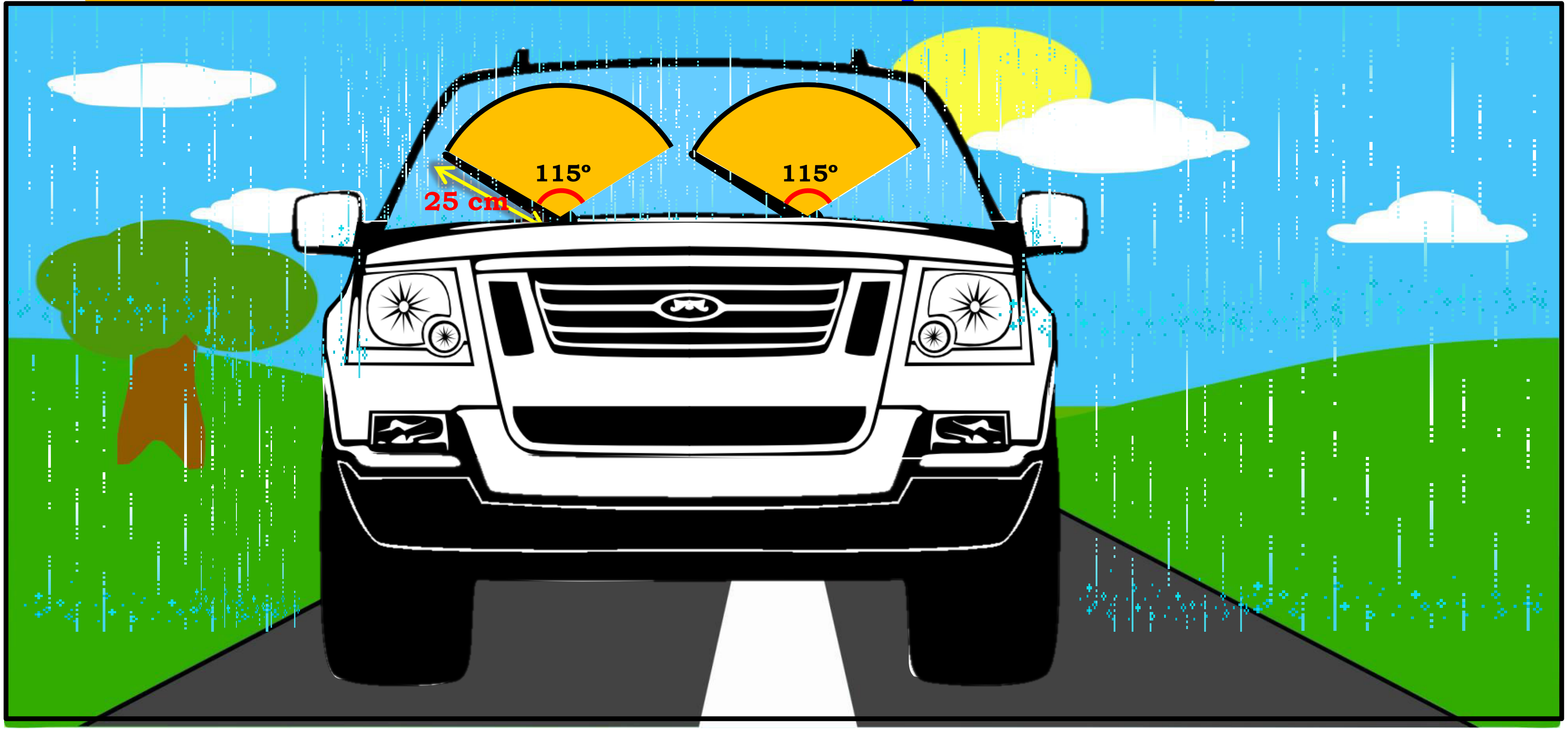
What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

$\therefore$ Area of sector is 189.97 km²



Q. A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of 115°. Find the total area cleaned at each sweep of the blades.



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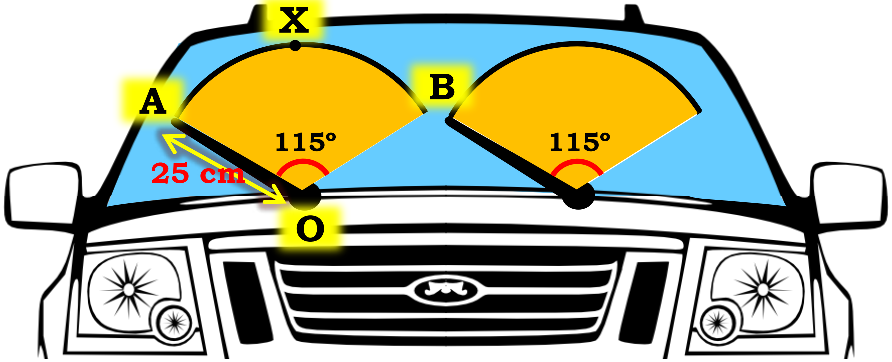


Sol. $\boxed{r = 25 \text{ cm}}$

$\boxed{\theta = 115^\circ}$

$$\therefore \quad ar(O\text{-}AXB) = \frac{\boxed{\theta}}{360} \times \pi \boxed{r}^2$$

$$= \frac{\cancel{115}^{23}}{\cancel{360}_{\cancel{72}_{36}}} \times \frac{\cancel{22}^{11}}{7} \times 25 \times 25$$

$$= \frac{23}{36} \times \frac{11}{7} \times 25 \times 25$$

$$\therefore \quad \text{Total area} = \cancel{2} \times \frac{23}{\cancel{36}_{18}} \times \frac{11}{7} \times 25 \times 25$$

$$= \frac{23 \times 11 \times 25 \times 25}{18 \times 7}$$

$$= \frac{158125}{126}$$

$$\therefore \quad \text{Total area} = 1254.96 \text{ cm}^2$$

$$\text{area of sector} = \frac{\theta}{360} \times \pi r^2$$

$\therefore$ The total area cleaned at each sweep of the blades is 1254.96 cm^2

Module 22

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. In given figure, a square OABC is inscribed in a quadrant ... A = 20 cm, find the area of the shaded region.

We know,

Diagonal $= \sqrt{2} \times$ Side

ar(O – PBQ) – ar(□OABC)

Sol. □OABC is a square

Draw OB

To find: r

$\therefore \angle O = 90°$

Radius of quadrant = Diagonal of a square

$\therefore$ Diagonal $= \sqrt{2} \times \boxed{\text{Side}}$

So, to find radius we need to find diagonal of square.

... formula to ... of quadrant?

$\times \pi r^2$

$\therefore$ Diago...

Radius of quadrant = Diagonal of a square

Let us draw radius for given quadrant OPBQ

We know,

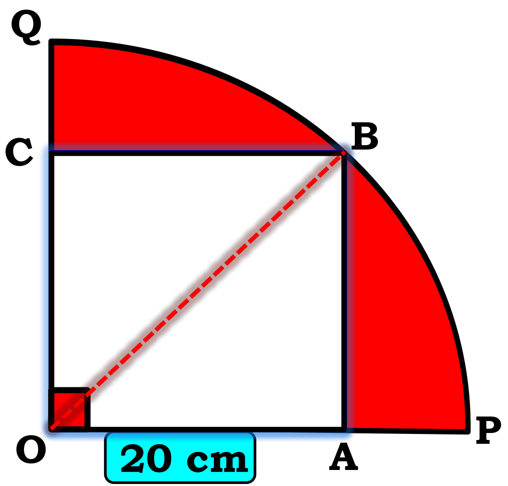
□OABC is a square

$$= \frac{\cancel{90}}{\cancel{360}_{4}} \times 3.14 \times \cancel{20}^{5}\boxed{\sqrt{2}} \times 20\boxed{\sqrt{2}}$$

$$= 3.14 \times 5 \times 20 \times 2$$

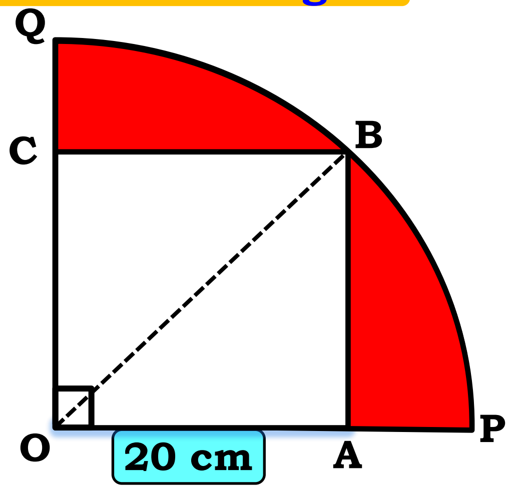
$$= 3.14 \times 200$$

$\therefore$ ar(O – PBQ) $= 628\text{ cm}^2$



Q. In given figure, a square OABC is inscribed in a quadrant OPBQ of a circle. If OA = 20 cm, find the area of the shaded region.

ar(shaded region) = ar(O – PBQ) – ar(□OABC)



Sol.

ar(□OABC) = $\boxed{(\text{Side})}^2$

What is formula to find area of square?

$(\text{Side})^2$

= $(20)^2$

∴ $\boxed{\text{ar}(\square OABC) = 400 \text{ cm}^2}$

ar(shaded region) = $\boxed{\text{ar}(O - PBQ)}$ – $\boxed{\text{ar}(\square OABC)}$

= 628 – 400

∴ ar(shaded region) = 228 cm²

∴ ar(shaded region) is 228 cm²

$\boxed{\text{ar}(O - PBQ) = 228 \text{ cm}^2}$

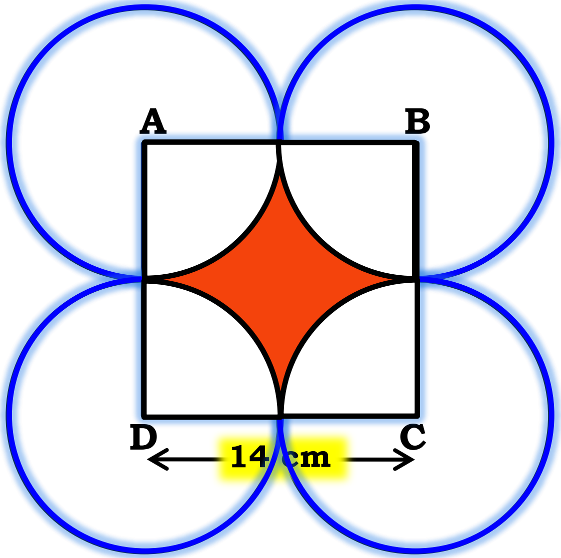
Module 23

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. **In the figure, ABCD is a square of side 14 cm. with centres A, B, C and D, four circles are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region.**

ar (shaded region) = ar (□ ABCD) – 4 ar(1 sector)



Sol.

Side of the square = 14 cm

Ar (□ ABCD) = $(\text{side})^2$

What is the formula to find area of a square?

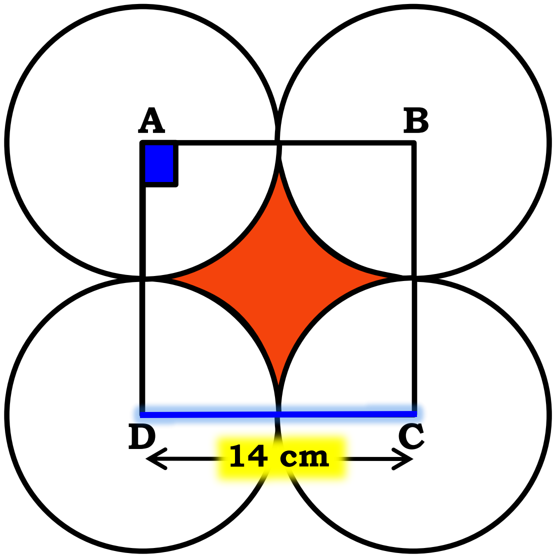
$(\text{Side})^2$

= 196 cm^2

∴ Ar (□ ABCD) = 196 cm^2

Q. In the figure, ABCD is a square of side 14 cm. with centres A, B, C and D, four circles are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region.

ar (shaded region) = ar (□ ABCD) – 4 ar (1 sectors)



Sol. Diameter = 14 cm

$\therefore$ Radius (r) = 7 cm

Central angle (θ) = 90°

$$\text{Ar (4 sectors)} = 4 \times \frac{\theta}{360} \times \pi r^2$$

$$= \cancel{4} \times \frac{\cancel{90}^{\,1}}{\cancel{360}} \times \frac{22}{\cancel{7}} \times \cancel{7} \times 7$$

What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

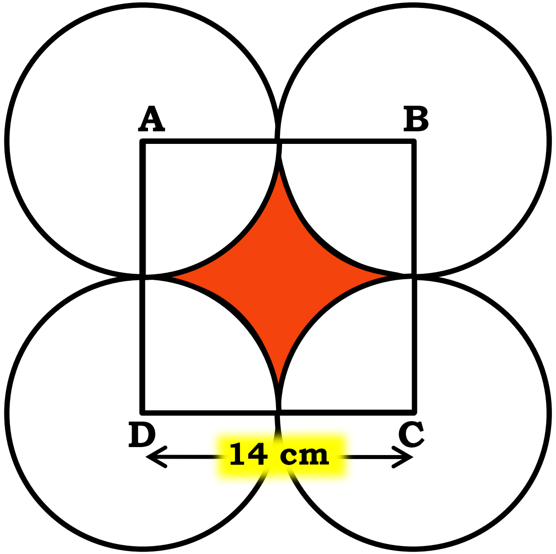
$$= 22 \times 7$$

$$= 154 \text{ cm}^2$$

$\therefore$ Ar (4 sectors) = 154 cm²

Q. In the figure, ABCD is a square of side 14 cm. with centres A, B, C and D, four circles are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region.

ar (shaded region) = ar (□ ABCD) – 4 ar (1 sectors)



Sol.

ar (shaded region) = ar (□ ABCD) – 4 ar (1 sectors)

= 196 – 154

= 42 cm²

∴ Ar (shaded region) is 42 cm²

Ar (□ ABCD) = 196 cm²

Ar (4 sectors) = 154 cm²

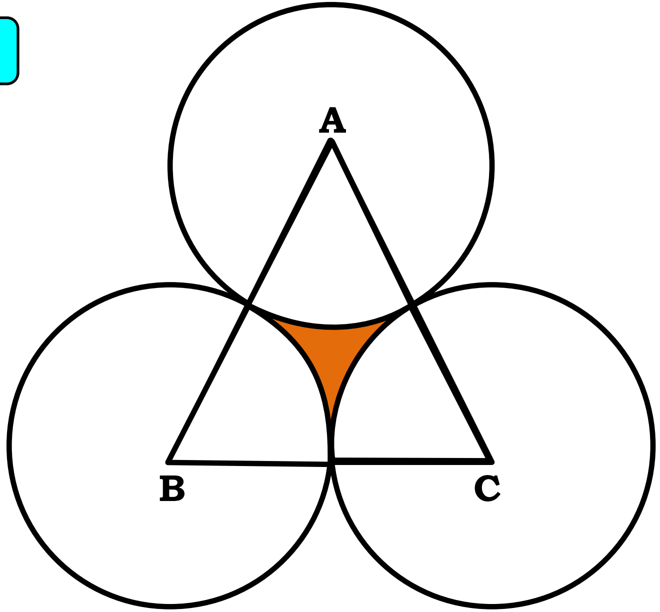
Module 24

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. The area of an equilateral triangle ABC is 17320.5 cm². With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle. Find the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73205$)

ar (shaded region) = ar (ΔABC) – 3 ar (3 sectors)



Sol.

$$\text{ar}(\Delta ABC) = 17320.5 \text{ cm}^2$$

$$\text{ar}(\Delta ABC) = \frac{\sqrt{3}}{4} \times (\text{side})^2$$

From area, let us find side of

What is the formula to find area of an equilateral triangle?

$$\frac{\sqrt{3}}{4} \times \text{side}^2$$

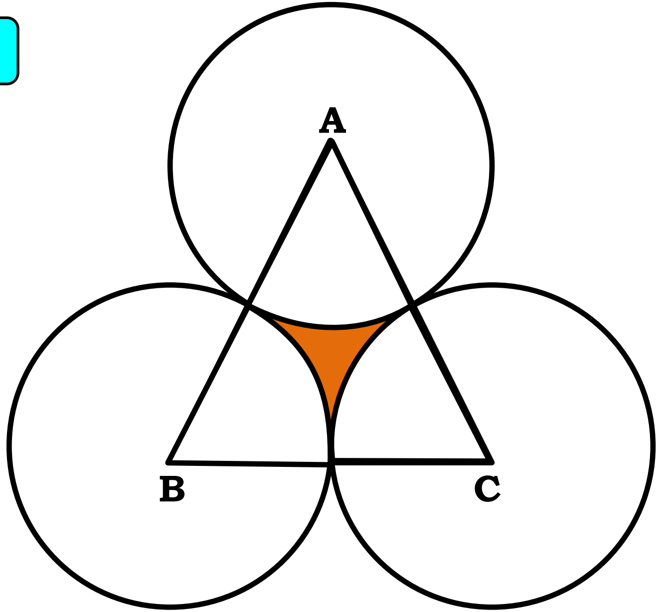
$$\therefore \quad \frac{\sqrt{3}}{4} \times (\text{side})^2 = 17320.5$$

$$\therefore \quad \frac{1.73205}{4} \times (\text{side})^2 = 17320.5$$

$$\therefore \quad \frac{173205}{4 \times 100000} \times (\text{side})^2 = \frac{173205}{4 \times 10}$$

Q. The area of an equilateral triangle ABC is 17320.5 cm^2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle. Find the area of the shaded region. (Use π = 3.14 and $\sqrt{3}$ = 1.73205)

ar (shaded region) = $\boxed{\text{ar } (\Delta ABC)}$ – 3 ar (1 sector)



Sol.

$$\therefore \quad \frac{173205}{4 \times 100000} \times (\text{side})^2 = \frac{173205}{4 \times 10}$$

$$\therefore \quad (\text{side})^2 = \frac{\cancel{173205} \times 4 \times 10000\cancel{0}}{1\cancel{0} \times \cancel{173205}}$$

$$= 4 \times 10000$$

$$\text{side} = 2 \times 100$$

$$\therefore \quad \text{side} = 200 \text{ cm}$$

Q. The area of an equilateral triangle ABC is 17320.5 cm^2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle. Find the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73205$)

ar (shaded region) = ar (ΔABC) − 3 ar (1 sector)

Sol. $$\text{Radius } (r) = \frac{1}{2} \times \text{Side}$$

$$= \frac{1}{2} \times 200$$

$\therefore$ Radius (r) = 100

What is the formula to find area of sector?

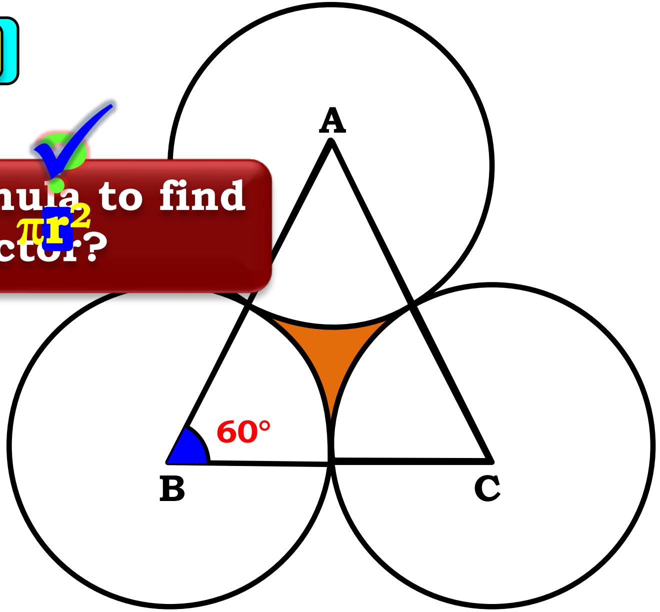
$$\frac{\theta}{360} \times \pi r^2$$

Central angle (θ) = 60°

We know that, angle of an equilateral triangle = 60°

$$\text{ar (3 sectors)} = 3 \times \frac{\theta}{360} \times \pi r^2$$

$$\text{ar (3 sectors)} = 3 \times \frac{60}{360} \times 3.14 \times 100 \times 100$$



Side = 200 cm

Q. The area of an equilateral triangle ABC is 17320.5 cm^2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle. Find the area of the shaded region. (Use π = 3.14 and $\sqrt{3}$ = 1.73205)

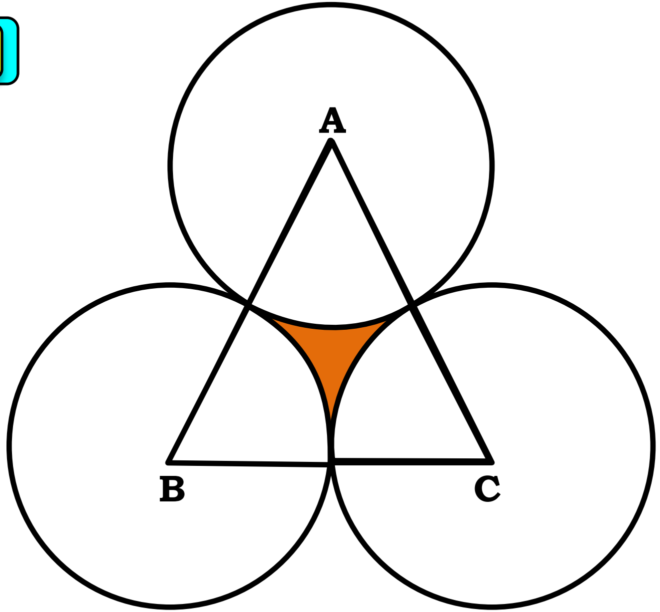
ar (shaded region) = ar (ΔABC) – $\boxed{\text{3 ar (1 sector)}}$

Sol.

$$\text{ar (3 sectors)} = \overset{1}{\cancel{3}} \times \frac{\overset{1}{\cancel{60}}}{\underset{\underset{2}{\cancel{6}}}{\cancel{360}}} \times 3.14 \times 100 \times 100$$

$$= \frac{1}{\cancel{2}} \times \frac{\overset{157}{\cancel{314}}}{\cancel{100}} \times \cancel{100} \times 100$$

$$= 15700 \text{ cm}^2$$



Q. The area of an equilateral triangle ABC is 17320.5 cm^2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle. Find the area of the shaded region. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73205$)

ar (shaded region) = ar (ΔABC) – 3 ar (1 sector)

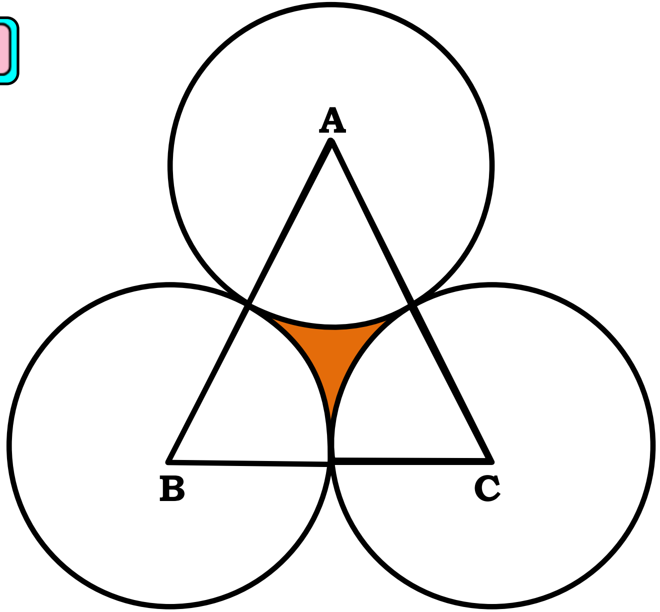
Sol.

ar (shaded region) = ar (ΔABC) – 3 ar (1 sector)

= 17320.5 – 15700

= 1620.5 cm^2

$\therefore$ Area of the shaded portion is 1620.5 cm^2



3 ar (1 sectors) = 15700 cm^2

Module 25

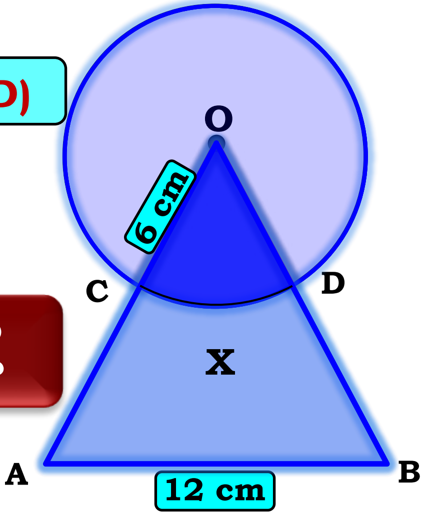
AREAS RELATED TO CIRCLE

- Sum based on finding area of shaded portion

Q. Find the area of the shaded region, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.

Sol.

$$\text{ar(shaded region)} = \boxed{\text{ar(circle)}} + \boxed{\text{ar}(\Delta AOB)} - \text{ar}(O - CXD)$$



Area of circle $= \boxed{\pi r}^2$

What is formula to find area of equilateral triangle ?

$\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$$= \frac{22}{7} \times 6 \times 6$$

$$= \frac{\cancel{792}^{113.14}}{\cancel{7}}$$

What is formula to find area of circle?

πr^2

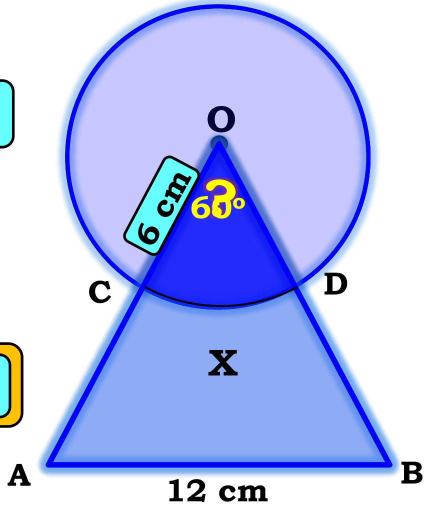
$\therefore$ Area of circle $= 113.14 \text{ cm}^2$

Area of ΔAOB $= \frac{\sqrt{3}}{4} \times \boxed{(\text{side})}^2$

$$= \frac{\sqrt{3}}{\cancel{4}} \times \cancel{12}^{3} \times 12$$

$\therefore$ Area of ΔAOB $= 36\sqrt{3} \text{ cm}^2$

Q. Find the area of the shaded region, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



Sol. ar(shaded region) = ar(circle) + ar(ΔAOB) – ar(O – CXD)

$$\text{ar}(O - CXD) = \frac{\boxed{\theta}}{360} \times \boxed{\pi r^2}$$

We know that, in equilateral triangle each angle is 60°

$$= \frac{\cancel{60}}{\cancel{360}_{6}} \times \frac{22}{7} \times 6 \times \cancel{6}$$

$$= \frac{132}{7}\ \text{cm}^2$$

ar(circle) = 113.14 cm²

ar(ΔAOB) = $36\sqrt{3}$

$\therefore$ ar(O - CXD) = 18.85 cm²

$\therefore$ Area of the shaded portion = Area of circle + ar(ΔAOB) – ar(O - CXD)

$= 113.14 + 36\sqrt{3} - 18.85$

$\therefore$ Area of the shaded portion = $[94.29 + 36\sqrt{3}]\ \text{cm}^2$

$\therefore$ Area of the shaded portion is $[94.29 + 36\sqrt{3}]\ \text{cm}^2$

Thank You

Module 26

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. **From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut in the middle. Find the area of the remaining portion of the square.**

ar (shaded region) = ar (□ ABCD) – 4 ar (quadrant) – ar (smaller circle)

Sol. Side of the square = 4 cm

Radius of quadrant (r) = 1 cm

Radius of circle (R) = $\frac{2}{2}$ = 1 cm

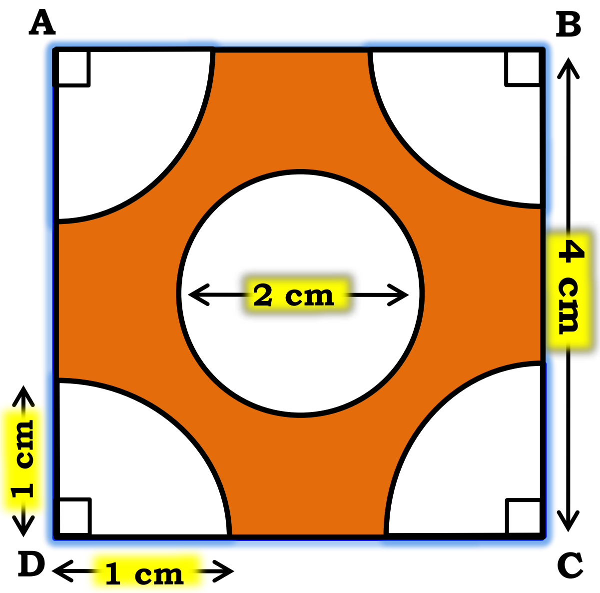
ar (□ ABCD) = $(\text{side})^2$

= $(4)^2$

What is the formula to find area of a square?

$(\text{Side})^2$

∴



Q. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut in the middle. Find the area of the remaining portion of the square.

ar (shaded region) = ar (□ ABCD) – 4 ar (quadrant) – ar (smaller circle)

Sol.

$$\text{ar (4 quadrants)} = \cancel{4} \times \frac{1}{\cancel{4}} \times \boxed{\pi}\boxed{r}^2$$

$$= \pi r^2$$

What is the formula to find area of quadrant?

$$\frac{1}{4}\pi r^2$$

$\times\ 1$

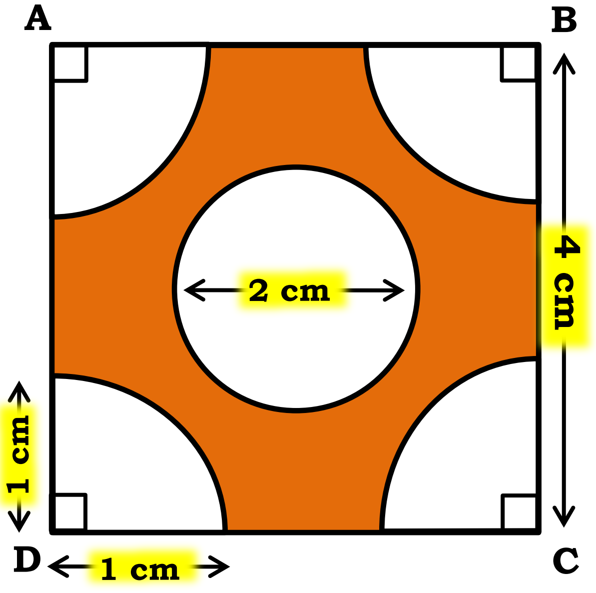
$$= \frac{22}{7}\ \text{cm}^2$$

$$\therefore\ \text{ar (4 quadrants)} = \frac{22}{7}\ \text{cm}^2$$

Radius of quadrant (r) = 1 cm

Radius of circle (R) = 1 cm

ar (□ ABCD) = 16 cm²



Q. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut in the middle. Find the area of the remaining portion of the square.

ar (shaded region) = ar (□ ABCD) – 4 ar (quadrant) – ar (smaller circle)

Sol. ar (smaller circle) $= \pi r^2$

$$= \frac{22}{7} \times 1 \times 1$$

What is the formula to find area of circle?

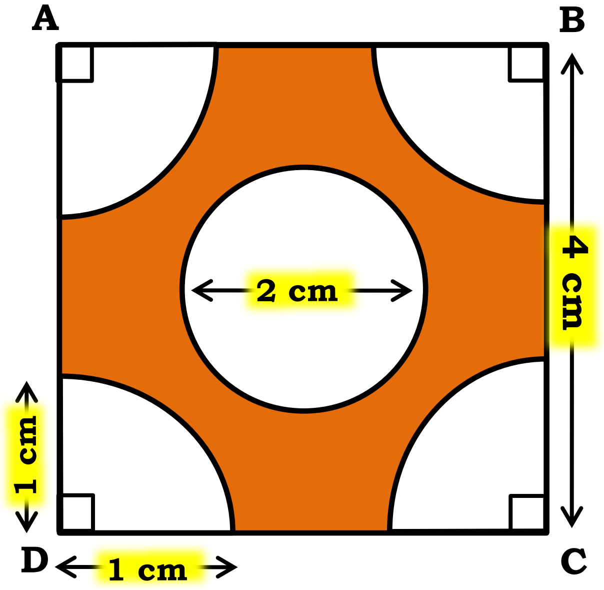
πr^2

$\therefore$ ar (smaller circle) $= \frac{22}{7}$ cm^2

Radius of circle (R) = 1 cm

ar (4 quadrants) $= \frac{22}{7}$ cm^2

ar (□ ABCD) = 16 cm^2



Q. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut in the middle. Find the area of the remaining portion of the square.

ar (shaded region) = ar (□ ABCD) − 4 ar (quadrant) − ar (smaller circle)

Sol. ar (shaded region) = ar (□ ABCD) − 4 ar (quadrant) − ar (smaller circle)

$$= 16 - \frac{22}{7} - \frac{22}{7}$$

$$= 16 - \left[\frac{22}{7} + \frac{22}{7}\right]$$

$$= 16 - \frac{44}{7}$$

$$\frac{112 - 44}{7}$$

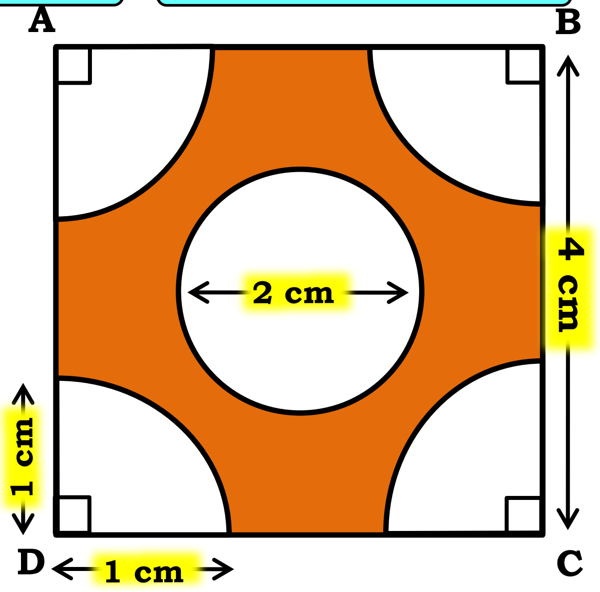
68

ar (□ ABCD) = 16 cm²

ar (4 quadrants) = $\frac{22}{7}$ cm²

ar (smaller circle) = $\frac{22}{7}$ cm²

∴ Area of the shaded portion is 9.71 cm²

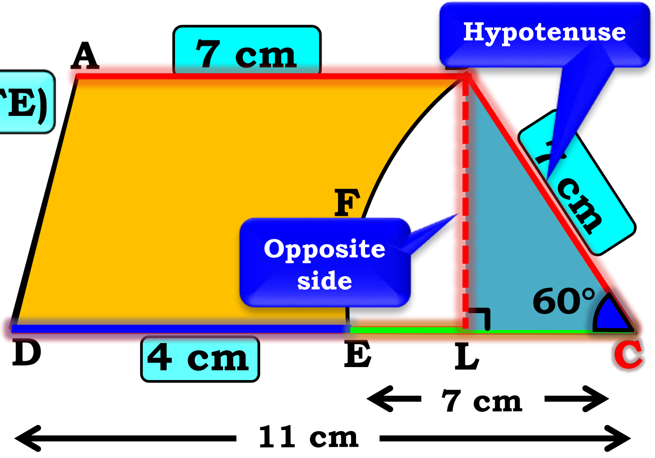


Module 27

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. In given figure, ABCD is a trapezium with AB ∥ DC and $\angle BCD = 60^\circ$. If BFEC is a sector of a circle with center C and AB = BC = 7 cm and DE = 4 cm, then find the area of the shaded region (use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.732$).



Area of shaded region = ar(▱ABCD) – ar(C – BFE)

Let us draw BL ⊥ DC

To find: DC and BL

Sol. BC = CE = 7cm

DC =

What can we say about BC and CE?

They are radii of given sector

∴ They are equal

∴ DC =

Opposite side → BL

Hypotenuse → BC

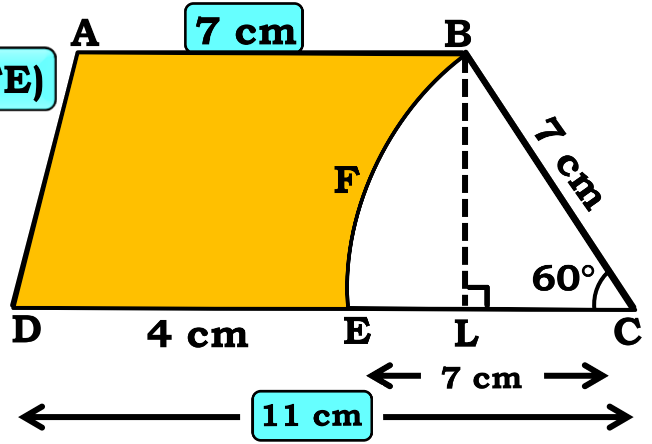
What is area of trapezium?

$\frac{1}{2}$ × [Sum of parallel sides] × height

$\frac{1}{2}$ × [AB + DC] × BL

$$BL = \frac{7\sqrt{3}}{2}$$

Q. In given figure, ABCD is a trapezium with AB ∥ DC and $\angle BCD = 60°$. If BFEC is a sector of a circle with center C and AB = BC = 7 cm and DE = 4 cm, then find the area of the shaded region (use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.732$).



$$\text{Area of shaded region} = \boxed{ar(\square ABCD)} - ar(C - BFE)$$

Sol.

$$\boxed{BL = \frac{7\sqrt{3}}{2}}$$

$$\therefore ar(\square ABCD) = \frac{1}{2} \times (AB + DC) \times BL$$

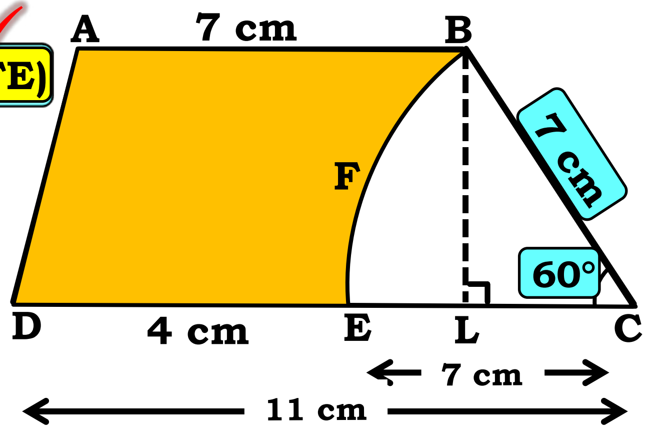
$$= \frac{1}{2}(7 + 11) \times \frac{7\sqrt{3}}{2}$$

$$= \frac{1}{\cancel{2}} \times \cancel{18}^{9} \times \frac{7\sqrt{3}}{2}$$

$$= \frac{9 \times 7\sqrt{3}}{2}$$

$$\therefore ar(\square ABCD) = \frac{63\sqrt{3}}{2}\ cm^2$$

Q. In given figure, ABCD is a trapezium with AB ∥ DC and $\angle BCD = 60°$. If BFEC is a sector of a circle with center C and AB = BC = 7 cm and DE = 4 cm, then find the area of the shaded region (use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.732$).



Area of shaded region = ar(□ABCD) − ar(C − BFE)

Sol.

$$ar(C - BFE) = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\cancel{60}}{\cancel{360}} \times \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \cancel{7} \times 7$$

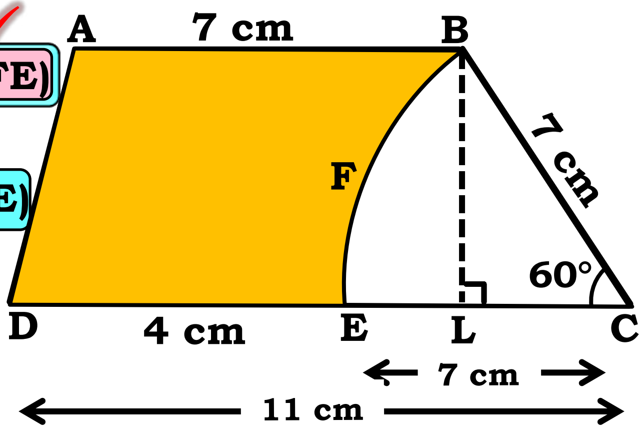
What is formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

3

$$\therefore \ ar(C\text{–}BFE) = \frac{77}{3} \text{ cm}^2$$

Q. In given figure, ABCD is a trapezium with AB ∥ DC and $\angle BCD = 60°$. If BFEC is a sector of a circle with center C and AB = BC = 7 cm and DE = 4 cm, then find the area of the shaded region (use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.732$).



Area of shaded region = ar(□ABCD) – ar(C – BFE)

Sol.

Area of shaded region = ar(□ABCD) – ar(C – BFE)

$$\therefore \quad = \left[\frac{63\sqrt{3}}{2} - \frac{77}{3}\right]$$

$$= \left[\frac{\overset{31.5}{\cancel{63}} \times 1.732}{\cancel{2}} - \frac{\overset{25.666}{\cancel{77}}}{\cancel{3}}\right]$$

$$= (31.5 \times 1.732) - 25.666$$

$$= 54.558 - 25.666$$

∴ Area of shaded region = 28.89 cm²

∴ Area of shaded region is 28.89 cm²

$$ar(C - BFE) = \frac{77}{3}\ cm^2$$

$$ar(\square ABCD) = \frac{63\sqrt{3}}{2}\ cm^2$$

Module 28

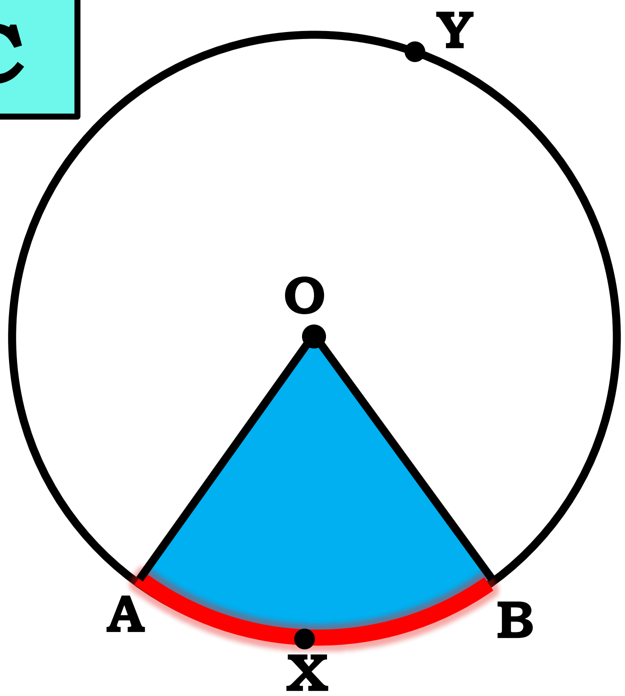
AREAS RELATED TO CIRCLE

- **Length of an Arc**

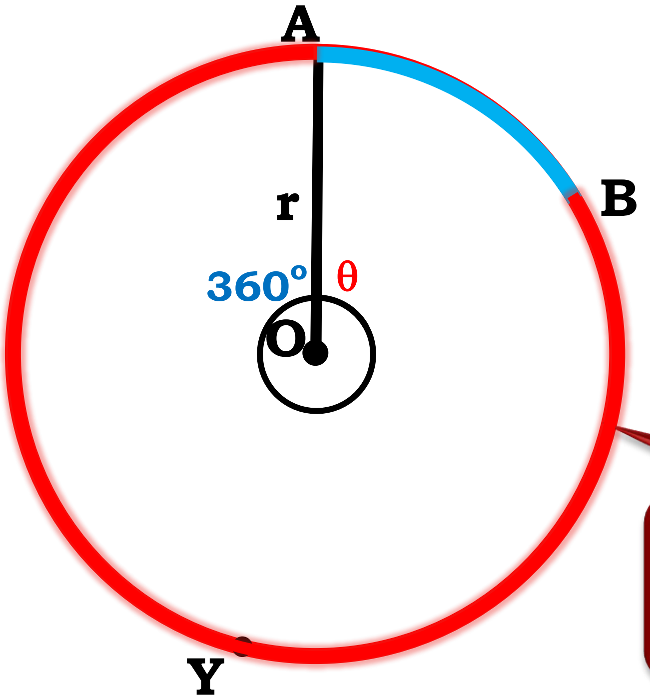
LENGTH OF ARC

Consider sector O-AXB

Let us understand the formula to find length of arc



LENGTH OF ARC



Rotation	Length
360°	$2\pi r$
θ	P

$$l \times 360^\circ = \theta \times 2\pi r$$

$$l = \frac{\theta}{360} \times 2\pi r$$

How to find length of arc AYB?

$$l\,(\text{arc AYB}) = \text{circumference} - l\,(\text{arc AB})$$

$\theta = ?$

Q. Find the angle subtended at the centre of the circle by an arc, radius of ci… m $\left[\pi = \frac{22}{7}\right]$

Let us keep ‘θ’ on RHS and move all the numbers on LHS

Sol. :

$$\boxed{\text{Length of arc } (l)} = \frac{\theta}{360} \times 2\boxed{\pi r}$$

$$\therefore \quad \boxed{6.05} = \frac{\theta}{360} \times 2 \times \frac{22}{7} \times \boxed{5.5}$$

$$\therefore \quad \frac{605}{100} = \frac{\theta}{360} \times 2 \times \frac{22}{7} \times \frac{55}{10}$$

$$\therefore \quad \frac{\overset{\cancel{55}}{\cancel{605}}}{\cancel{100}} \times \frac{\overset{\overset{9}{\cancel{18}}}{\cancel{360}} \times 7 \times \cancel{10}}{\cancel{2} \times \underset{\cancel{11}}{\cancel{22}} \times \cancel{55}} = \theta$$

$$\therefore \quad \theta = 9 \times 7$$

$$\therefore \quad \theta = 63^{\circ}$$

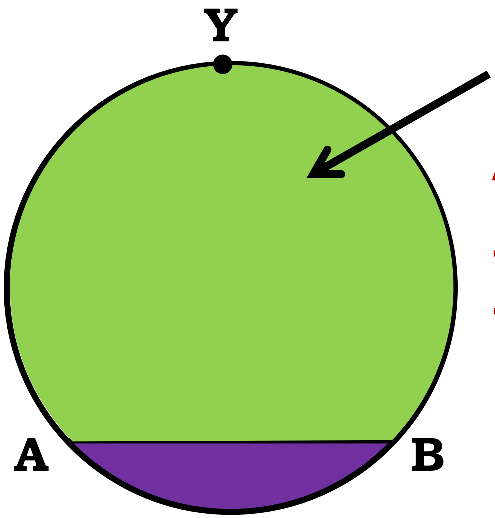
$\therefore$ **Angle subtended at the centre of the circle by an arc is 63°**

Module 29

AREAS RELATED TO CIRCLE

- Segment of a circle

Segment of a circle



The part of the circular region enclosed by a chord and its corresponding arc is called a Segment of a circle

Let us draw chord AB

Area of Segment = Area of sector – Area of triangle

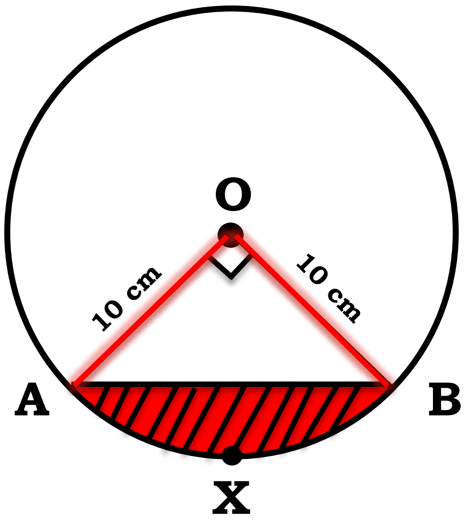
Area of Major Segment = Area of circle – Area of minor segment

Q. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding:

(i) Minor segment

(ii) Major segment. ? (Use $\pi = 3.14$)

Area of minor segment = ar(O – AXB) – ar(ΔOAB)



Sol. $r = 10$ cm

$\theta = 90^\circ$

What is formula to find area of sector?

$\frac{\theta}{360} \times \pi r^2$

Area of sector (O – AXB) $= \dfrac{\theta}{360} \times \pi r^2$

$= \dfrac{\cancel{90}}{\cancel{360}_{4}} \times 3.14 \times \overset{2.5}{\cancel{10}} \times 10$

$\therefore$ Area of sector (O – AXB) $= 78.5 \text{ cm}^2$

Q. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding:

(i) Minor segment

(ii) Major segment. (Use π = 3.14)

Area of minor segment = ar(O – AXB) – ar(ΔOAB) ?

Sol.

Area of ΔAOB $= \frac{1}{2} \times \boxed{AO} \times \boxed{OB}$

What is formula to find area of triangle?

$\frac{1}{2}$ × base × height

$= \frac{1}{\cancel{2}} \times \overset{5}{\cancel{10}} \times 10$

A (O – AXB) = 78.5 cm^2

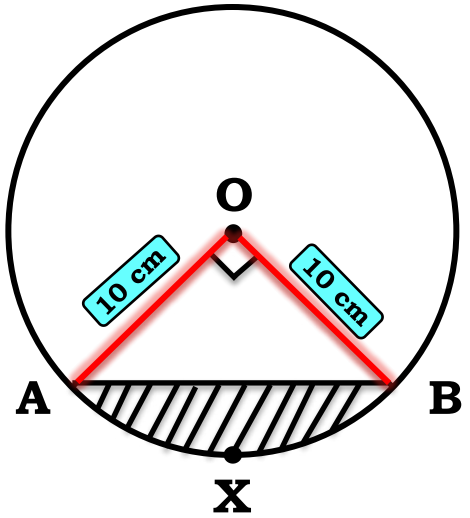
Area of ΔAOB = 50 cm^2

Area of minor segment = $\boxed{A(O - AXB)} - \boxed{A(\Delta AOB)}$

= 78.5 – 50

= 28.5 cm^2

$\therefore$ Area of minor segment is 28.5 cm^2

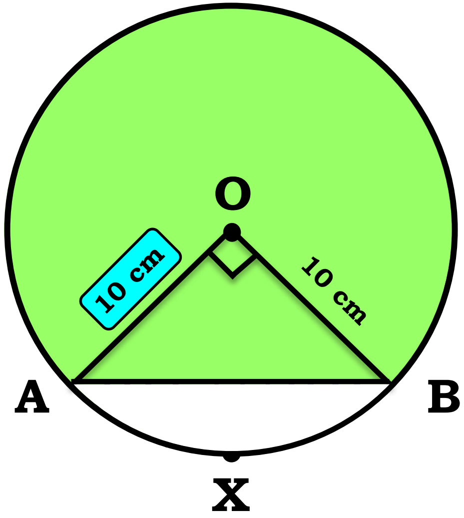


Q. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding:

(i) Minor segment

(ii) Major segment. ? (Use $\pi = 3.14$)

Area of major segment = Area of circle – Area of minor segment



Sol.

What is formula to find area of circle?

πr^2

Area of circle $= \pi r^2$

Area of circle $= 3.14 \times 10 \times 10$

$\therefore$ Area of circle $= 314 \text{ cm}^2$

Area of major segment = Area of circle – Area of minor segment

$= 314 - 28.5$

Area of minor segment $= 28.5 \text{cm}^2$

$\therefore$ Area of major segment is 285.5 cm^2

Module 30

AREAS RELATED TO CIRCLE

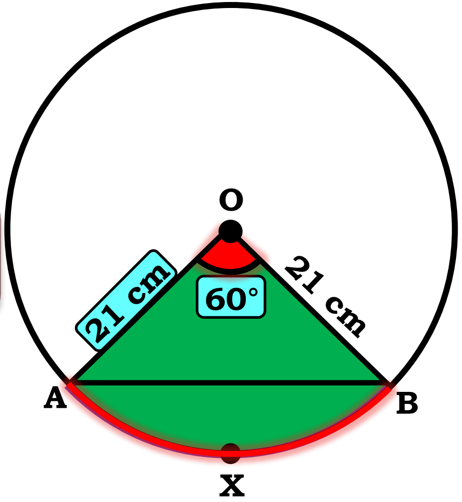
- **Sum based on length of an arc, Area of a sector and segment**

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

(i) The length of the arc

(ii) Area of the sector formed by the arc

(iii) Area of the segment formed by the the corresponding chord.



What is formula to find area of sector?

$\frac{\theta}{360} \times \pi r^2$

Sol. l (arc AXB) $= \dfrac{\boxed{\theta}}{360} \times 2\boxed{\pi r}$

$= \dfrac{\cancel{60}}{\cancel{360}} \times \cancel{2} \times \dfrac{22}{\cancel{7}} \times \cancel{21}$ ($\cancel{360} \to \cancel{6} \to \cancel{2}$, $\cancel{21} \to \cancel{3}$)

$\therefore$ $= 22$ cm

$\therefore$ **Length of arc is 22 cm.**

A (O – AXB) $= \dfrac{\boxed{\theta}}{360} \times \boxed{\pi r}^2$

$= \dfrac{\cancel{60}}{\cancel{360}} \times \dfrac{\cancel{22}}{\cancel{7}} \times \cancel{21} \times 21$ ($\cancel{360} \to \cancel{6} \to \cancel{3}$, $\cancel{22} \to 11$, $\cancel{21} \to \cancel{7}$)

$\therefore$ $= 231$ cm²

$\therefore$ **Area of sector (O – AXB) is 231 cm².**

Q. In a circle of radius 21 cm, an arc subtends

an ang... e. Find :

(i)

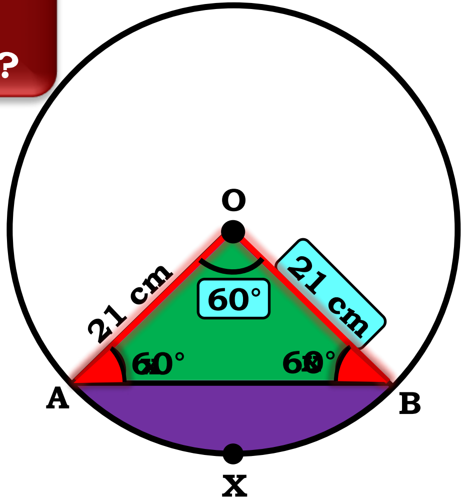
(ii) ... med by the arc

(iii) Area of the segment formed by the corresponding chord.

∴ ΔOAB is equilateral triangle

What is formula to find area of equilateral triangle ?

$\frac{\sqrt{3}}{4} \times (\text{Side})^2$



Area of minor segment = ar(O – AXB) – ar(ΔOAB)

Sol.

In ΔOAB,

OA = OB [radius of same circle]

$\boxed{\angle A} = \boxed{\angle B} = \boxed{x}$ [Angles opposite to equal sides are equal]

$\angle A + \angle B + \angle O = 180°$

∴ $x + x + 60 = 180$

∴ $2x = 180 - 60$

ar(O – AXB) = 231 cm²

∴ $x = \frac{\cancel{120}^{60}}{\cancel{2}}$

∴ $x = 60$

∴ ΔOAB is an equilateral triangle

$$\text{ar}(\Delta OAB) = \frac{\sqrt{3}}{4} \times (\text{Side})^2$$

$$= \frac{\sqrt{3}}{4} \times 21 \times 21$$

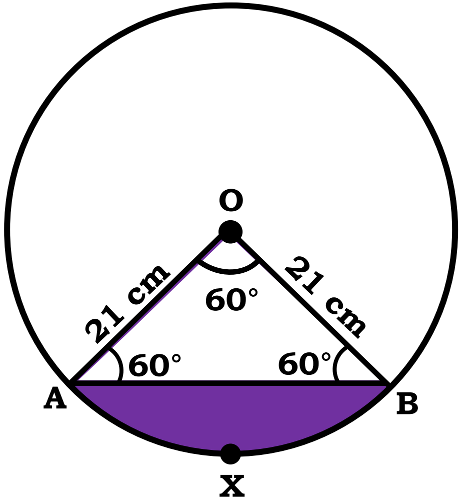
∴ $$\text{ar}(\Delta OAB) = \frac{441}{4}\sqrt{3}\ \text{cm}^2$$

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

(i) The length of the arc

(ii) Area of the sector formed by the arc

(iii) Area of the segment formed by the corresponding chord.



Area of minor segment = ar(O – AXB) – ar(ΔOAB)

Sol.

Area of minor segment = ar(O – AXB) – ar(ΔOAB)

$\therefore$ Area of Minor Segment $= 231 - \frac{441}{4}\sqrt{3}\,\text{cm}^2$

$\therefore$ Area of Minor Segment

ar(O – AXB) = 231 cm²

ar(ΔOAB) $= \frac{441}{4}\sqrt{3}\ \text{cm}^2$

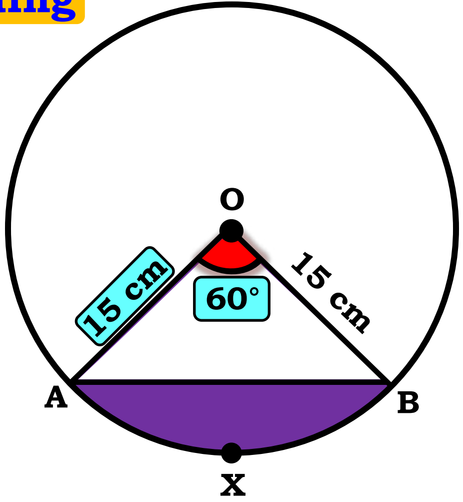
Thank You

Module 31

AREAS RELATED TO CIRCLE

- **Sum based on Area of minor and major segment**

Q. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)



Sol. **Area of minor segment = ar(O – AXB) – ar(ΔOAB)**

$$A\,(O - AXB) = \frac{\boxed{\theta}}{360} \times \boxed{\pi}\,\boxed{r}^2$$

$$= \frac{\cancel{60}}{\cancel{360}_{2}} \times \cancel{3.14}^{1.57} \times \cancel{15}^{5} \times 15$$

What is formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

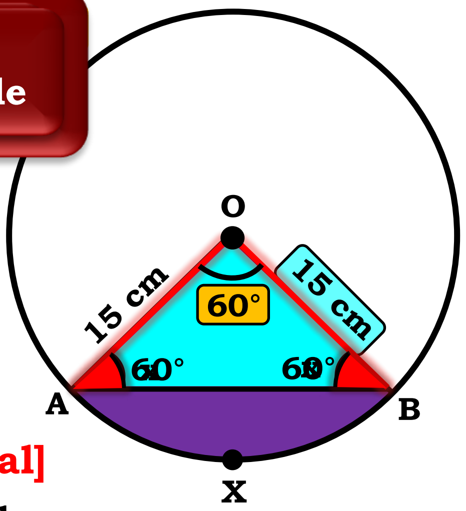
$$= 1.57 \times 5 \times 15$$

$$\therefore \quad A\,(O - AXB) = 117.75 \text{ cm}^2$$

Q. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the minor and major segments of the circle. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

∴ ΔOAB is equilateral triangle

Area of minor segment = ar(O – AXB) – ar(ΔOAB)



Sol.

In ΔOAB,

OA = OB [radii of same circle]

$\angle A = \angle B = x$ [Angles opposite to equal sides are equal]

What is formula to find area of equilateral triangle ?

$\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$\angle A + \angle B + \angle O = 180°$

$\therefore \quad x + x + 60 = 180$

$\therefore \quad 2x = 180 - 60$

$2x = 120$

$\therefore \quad x = \frac{\cancel{120}^{60}}{\cancel{2}}$

$\therefore \quad x = 60$

∴ ΔOAB is an equilateral triangle

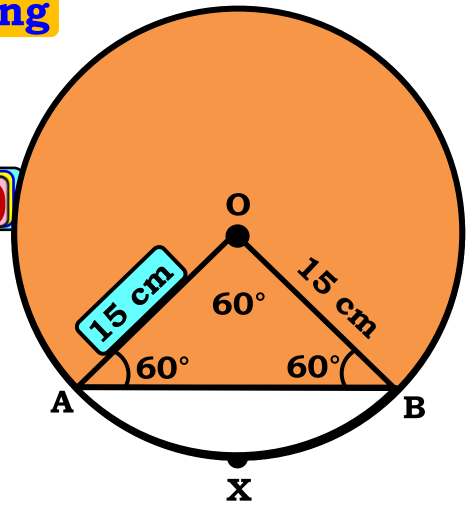
$$\text{ar}(\Delta OAB) = \frac{\sqrt{3}}{4} \times (\text{Side})^2$$

$$= \frac{1.73}{4} \times 15 \times 15$$

$$= \frac{1.73}{\cancel{4}} \times \cancel{225}^{56.25}$$

$\therefore$ ar (ΔOAB) = 97.3125 cm²

Q. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)



Sol. Area of major segment = ar(circle) – ar(minor segment)

Area of Minor Segment = ar(O – AXB) – ar (ΔOAB)

= 1

∴ Area of Minor Segment = 2

What is formula to find area of circle?

πr^2

∴ Area of Minor Segment is 20.4375 cm²

ar(O – AXB) = 117.75 cm²

ar(ΔOAB) = 97.3125 cm²

Area of circle = πr^2

= 3.14 × 15 × 15

∴ Area of circle = 706.5 cm²

Area of major Segment = Area of circle – Area of minor segment

= 706.5 – 20.4375

∴ Area of major Segment = 686.0625 cm²

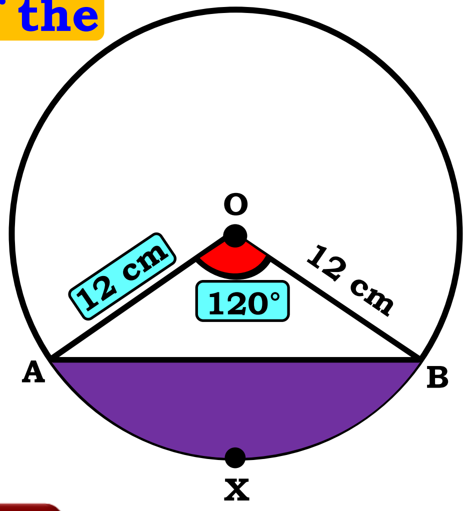
∴ Area of major Segment is 686.0625 cm²

Module 32

AREAS RELATED TO CIRCLE

- Sum based on Segment

Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.
(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)



Area of minor segment = ar(O – AXB) – ar(ΔOAB)

Sol. $\text{ar}(O - AXB) = \dfrac{\boxed{\theta}}{360} \times \boxed{\pi}\boxed{r}^2$

$= \dfrac{\cancel{120}}{\cancel{360}_{3}} \times 3.14 \times \cancel{12}^{4} \times 12$

$= 3.14 \times 4 \times 12$

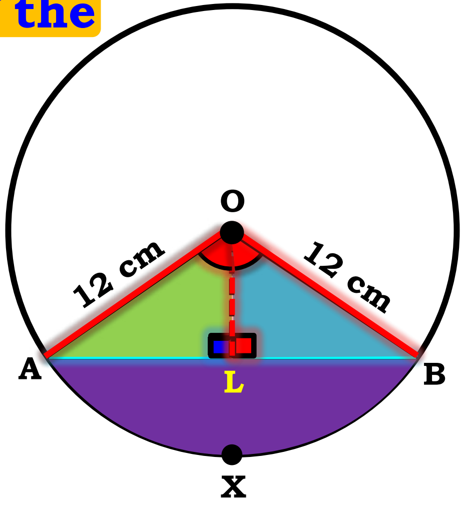
$\therefore \quad \text{ar}(O - AXB) = 150.72 \text{ cm}^2$

What is formula to find area of sector?

$\dfrac{\theta}{360} \times \pi r^2$

Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)



Area of minor segment = ar(O – AXB) – ar(ΔOAB)

To find: AB and OL

Sol. In ΔOLA and ΔOLB

What is formula to find area of triangle?

$\frac{1}{2} \times \text{base} \times \text{height}$

$\angle OLA = \angle OL$

$OA = OB$ [Radii of same circle]

$OL =$ ... e]

Consider ΔOLA and ΔOLB

$\Delta AOL \cong \Delta$

$\therefore \angle AOL = \angle BOL$ [c.p.c.t]

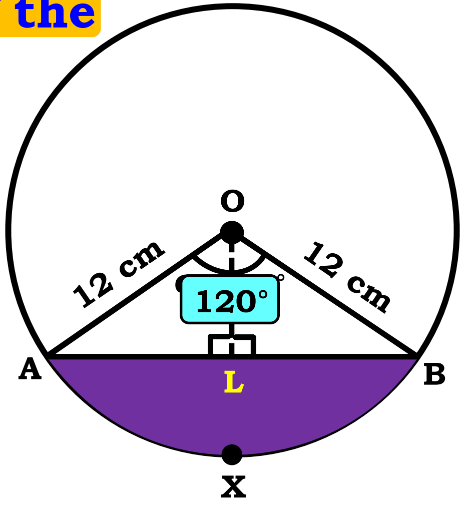
$ar\,(O - AXB) = 150.72\ cm^2$

Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

Area of minor segment = ar(O – AXB) – $\boxed{\text{ar}(\Delta OAB)}$?

To find: AB and OL



Sol.

$\therefore \quad \angle AOL = \angle BOL$ [c.p.c.t]

$$\angle AOL = \angle BOL = \frac{1}{2} \times \boxed{\angle AOB}$$

$$= \frac{1}{\cancel{2}} \times \cancel{120}^{60}$$

$$\angle AOL = \angle BOL = 60^\circ$$

ar (O – AXB) = 150.72 cm²

Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

Area of minor segment = ar(O – AXB) – ar(ΔOAB)

Sol.

ar (O – AXB) = 150.72 cm^2

To find: AB and OL

In Δ AOL,

For ∠AOL,
Opposite side → AL
Hypotenuse → AO

Ratio of opposite side and hypotenuse reminds us of 'sin'

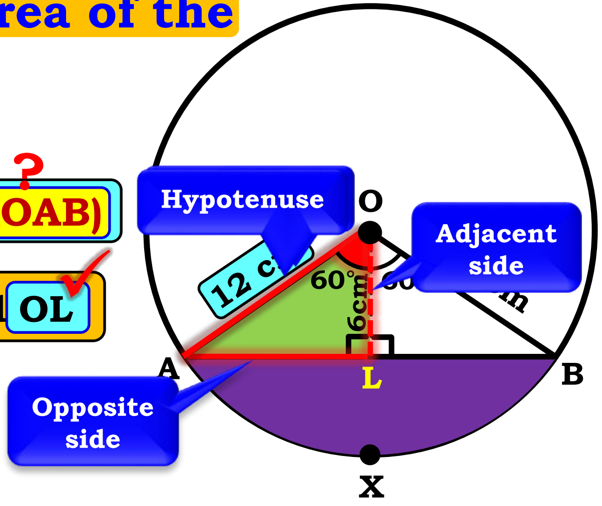
$\therefore$ OL = 6 cm

$\sin 60° = \dfrac{AL}{AO}$

Observe ∠AOL

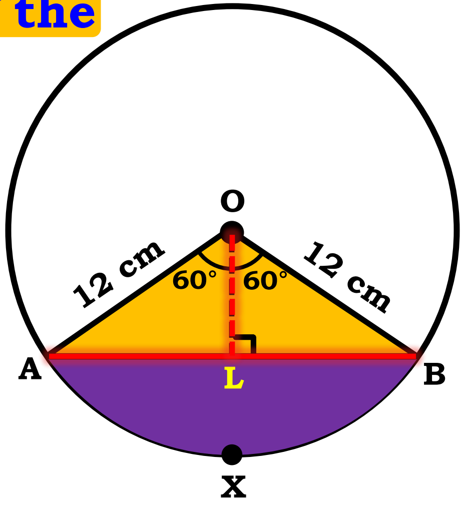
For ∠AOL,
Adjacent side → OL
Hypotenuse → AO

Ratio of adjacent side and hypotenuse reminds us of 'cos'



Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)



Area of minor segment = ar(O – AXB) – ar(ΔOAB)

Sol.

ar (O – AXB) = 150.72 cm²

OL = 6 cm

AB = $12\sqrt{3}$ cm

$$\text{ar}(\Delta OAB) = \frac{1}{2} \times \boxed{AB} \times \boxed{OL}$$

$$= \frac{1}{\cancel{2}} \times 12\sqrt{3} \times \cancel{6}^{3}$$

$$= 36\boxed{\sqrt{3}}$$

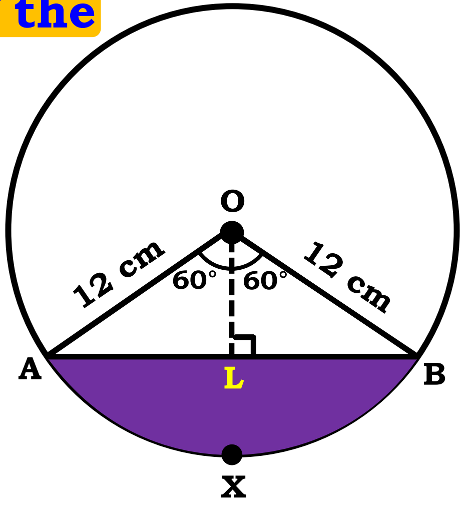
$$= 36 \times 1.73$$

$$\therefore \text{ar}(\Delta OAB) = 62.28 \text{ cm}^2$$

Q. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

(Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

Area of minor segment = ar(O – AXB) – ar(ΔOAB)



Sol.

Area of Minor Segment = ar(O – AXB) – ar(ΔOAB)

∴ = 150.72 – 62.28

∴ Area of Minor Segment = 88.44 cm^2

∴ Area of Minor Segment is 88.44 cm^2

ar(O – AXB) = 150.72 cm^2

ar(ΔOAB) = 62.28 cm^2

Module 33

AREAS RELATED TO CIRCLE

- **Sum based on Area of segment**

Q. A round table cover has six equal designs as shown

If the radius of the ... of making

the designs at the ... $\sqrt{3} = 1.7$)

What is the formula to find area of sector?

$$\frac{\theta}{360} \times \pi r^2$$

$$\text{ar (AXB)} = \boxed{\text{ar (O – AXB)}} - \text{ar } (\Delta \text{ OAB})$$

Sol. Radius of quadrant (r) = 28 cm

Let us first find area of 1 segment ...ents

6

Cost = $\boxed{\text{Rate}} \times \boxed{\text{Area}}$

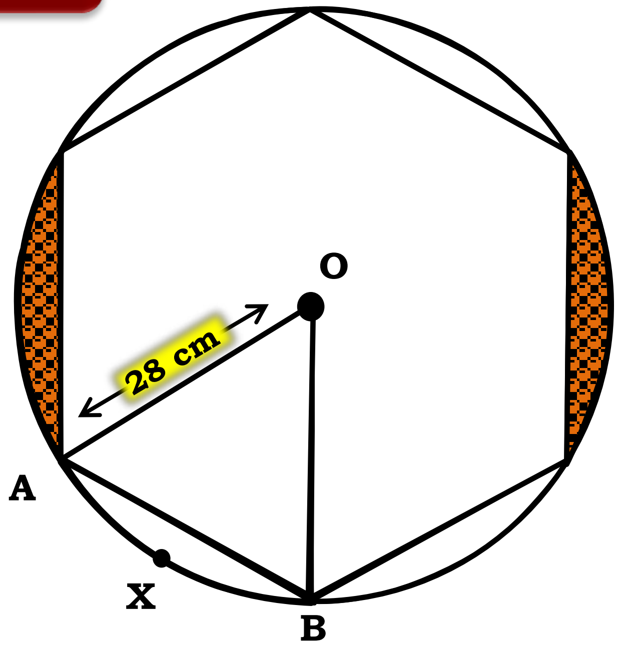
$$\text{ar(O-AXB)} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\cancel{60}^{1}}{\cancel{360}_{\cancel{6}\ 3}} \times \frac{22}{\cancel{7}_{1}} \times \cancel{28}^{\cancel{4}\ 2} \times 28$$

$$= \frac{22 \times 2 \times 28}{3} = \frac{1232}{3}$$

$$= 410.67 \text{ cm}^2$$

$\therefore$ ar (O-AXB) = 410.67 cm²



Q. A r … as shown in.
If t … e cost of making
the designs at the rate of Rs 0.35 per cm^2. (Use $\sqrt{3}$ = 1.7)

What is the formula to find area of an equilateral triangle?

$\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$\text{ar (AXB)} = \text{ar (O – AXB)} - \boxed{\text{ar }(\Delta \text{ OAB})}$

Sol. Radius of quadrant (r) = 28 cm

ΔOAB is an equilateral triangle

$$\text{ar }(\Delta OAB) = \frac{\sqrt{3}}{4} \times \boxed{(\text{side})^2}$$

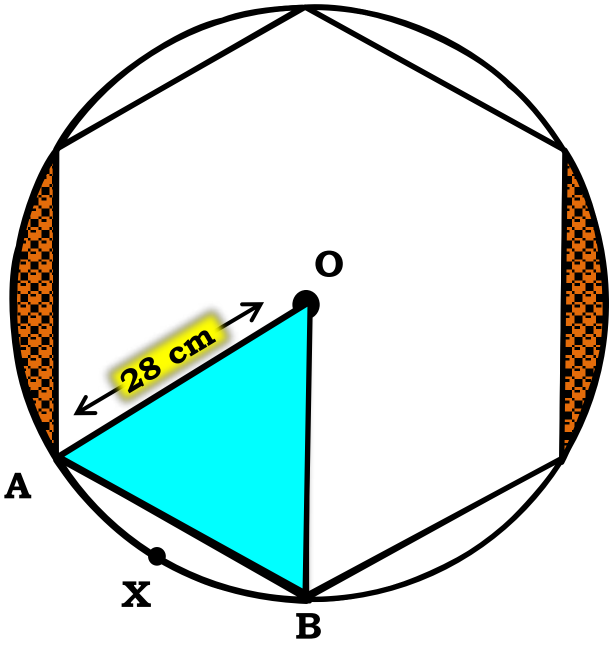
$$= \frac{\sqrt{3}}{4} \times (28)^2$$

$$= \frac{\sqrt{3}}{\cancel{4}_{\,1}} \times \cancel{28}^{\,7} \times 28$$

$$= \boxed{\sqrt{3}} \times 7 \times 28$$

$$= 1.7 \times 7 \times 28$$

$$\therefore \quad \text{ar }(\Delta OAB) = 333.2 \text{ cm}^2$$



Q. A round table cover has six equal designs as shown in. If the radius of the cover is 28 cm, find the cost of making the designs at the rate of Rs 0.35 per cm^2. (Use $\sqrt{3}$ = 1.7)

ar (AXB) = ar (O – AXB) – ar (Δ OAB)

Sol. ar (AXB) = ar (O – AXB) – ar (Δ OAB)

= 410.67 – 333.2

ar (AXB) = 77.47 cm^2

Area o

Cost = Rate $\times$ Area

$\therefore$ Area o .47

$\therefore$ Area of 6 segment = 464.82 cm^2

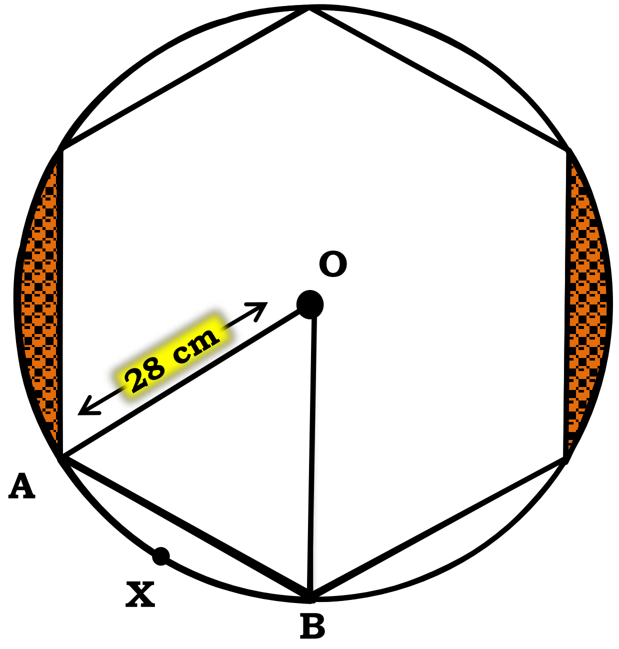
ar (ΔOAB) = 333.2 cm^2

= 0.35 $\times$ 464.82

ar (O-AXB) = 410.67 cm^2

= 162.68

$\therefore$ Total cost of making designs is162.68

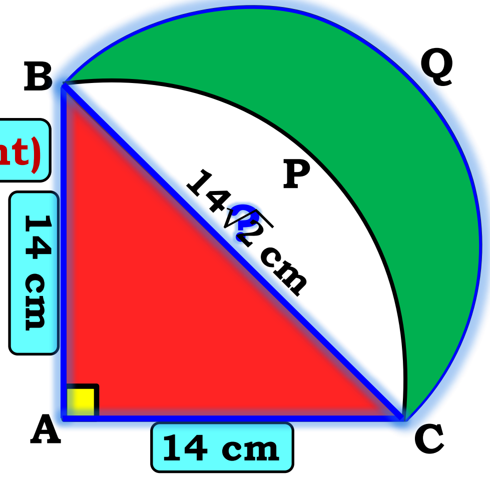


Module 34

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion**

Q. ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter. Find the area of the shaded region.



Area of shaded region = ar(semi-circle) – ar(minor segment)

Sol. In ΔABC,

$\angle A = 90^\circ$

What is formula to find area of semi-circle?

$\frac{1}{2}\pi R^2$

To find: R

$AB^2 + AC^2 = BC^2$ [By Pythagoras theorem]

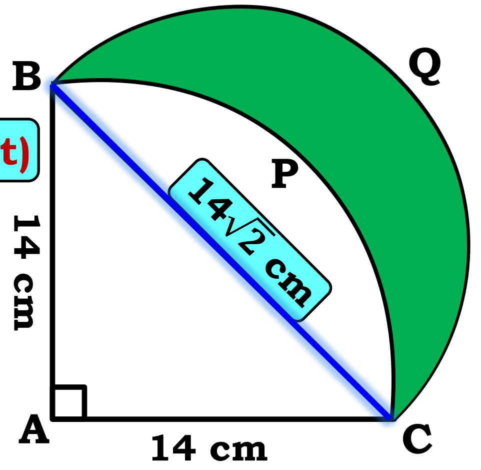
$\therefore \quad (14)^2 + (14)^2 = BC^2$

$\therefore \quad BC^2 = 196 + 196$

$\therefore \quad BC^2 = 2 \times 196$

$\therefore \quad BC = 14\sqrt{2}$ cm

Q. ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter.
Find the area of the shaded region.



Area of shaded region = ar(semi-circle) – ar(minor segment)

To find: R

Sol.

$\therefore$ Radius of semi-circle $= \dfrac{\boxed{BC}}{2}$

BC is diameter of semi-circle

$= \dfrac{\overset{7}{\cancel{14}}\sqrt{2}}{\cancel{2}}$

$\therefore$ Radius of semi-circle $= 7\sqrt{2}$ cm

Area of semi-circle $= \dfrac{1}{2} \times \pi R^2$

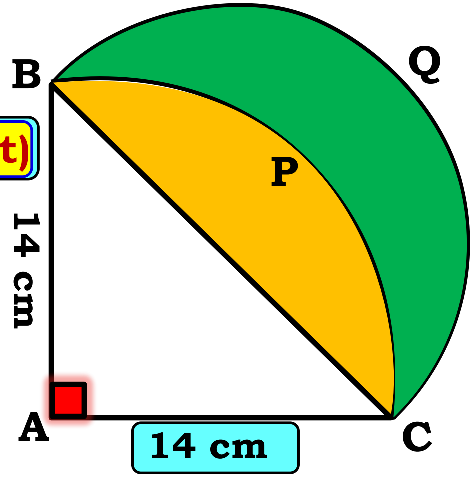
$= \dfrac{1}{\cancel{2}} \times \dfrac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \cancel{7}\sqrt{2} \times 7\sqrt{2}$

$= 11 \times \sqrt{2} \times 7\sqrt{2}$

$= 77 \times 2$

$\therefore$ Area of semi-circle $= 154 \text{ cm}^2$

Q. ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter.
Find the area of the shaded region.



Area of shaded region = ar(semi-circle) – ar(minor segment)

?

Sol.

What is formula to find area of sector?

$\frac{\theta}{360} \times \pi r^2$

ar(A – BPC) – ar(ΔABC)

$$\text{ar (A – BPC)} = \frac{\boxed{\theta}}{360} \times \boxed{\pi}\boxed{r}^2$$

$$= \frac{\cancel{90}}{\cancel{360}_{\cancel{4}\,2}} \times \frac{22}{\cancel{7}} \times \cancel{14}^{2} \times \cancel{14}^{7}$$

$$= 22 \times 7$$

$$\therefore \quad \text{ar (A – BPC)} = 154 \text{ cm}^2$$

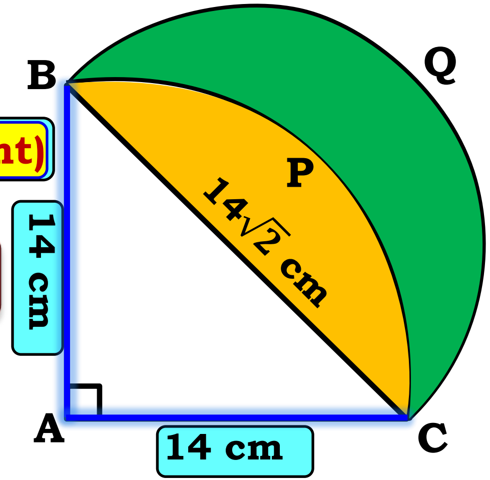
Area of semi-circle = 154 cm²

Module 35

AREAS RELATED TO CIRCLE

- **Sum based on finding area of shaded portion (Contd...)**

Q. ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter.
Find the area of the shaded region.



Area of shaded region = ar(semi-circle) – ar(minor segment)

?

Sol. What is formula to find area of triangle?

$\frac{1}{2}$ × base × height

ar(A – BPC) – ar(ΔABC)

$$\text{ar}(\Delta ABC) = \frac{1}{2} \times \boxed{AC} \times \boxed{AB}$$

$$= \frac{1}{\cancel{2}} \times \overset{7}{\cancel{14}} \times 14$$

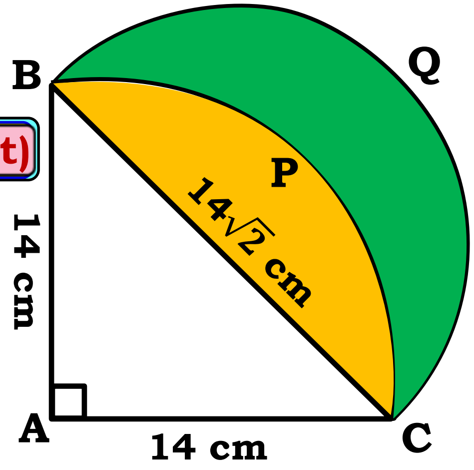
$$= 7 \times 14$$

$$\therefore \quad \text{ar}(\Delta ABC) = 98 \text{ cm}^2$$

ar (A – BPC) = 154 cm^2

Area of semi-circle = 154 cm^2

Q. ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter.
Find the area of the shaded region.



Area of shaded region = ar(semi-circle) – ar(minor segment)

Sol.

ar(A – BPC) – ar(ΔABC)

ar(minor segment BPC) = ar(A – BPC) – ar(ΔABC)

= 154 – 98

∴ ar(minor segment BPC) = 56 cm^2

Area of shaded region = ar(semi-circle) – ar(minor segment)

ar (ΔABC) = 98 cm^2

= 154 – 56

ar (A – BPC) = 154 cm^2

∴ Area of shaded region = 98 cm^2

Area of semi-circle = 154 cm^2

∴ Area of shaded region is 98 cm^2

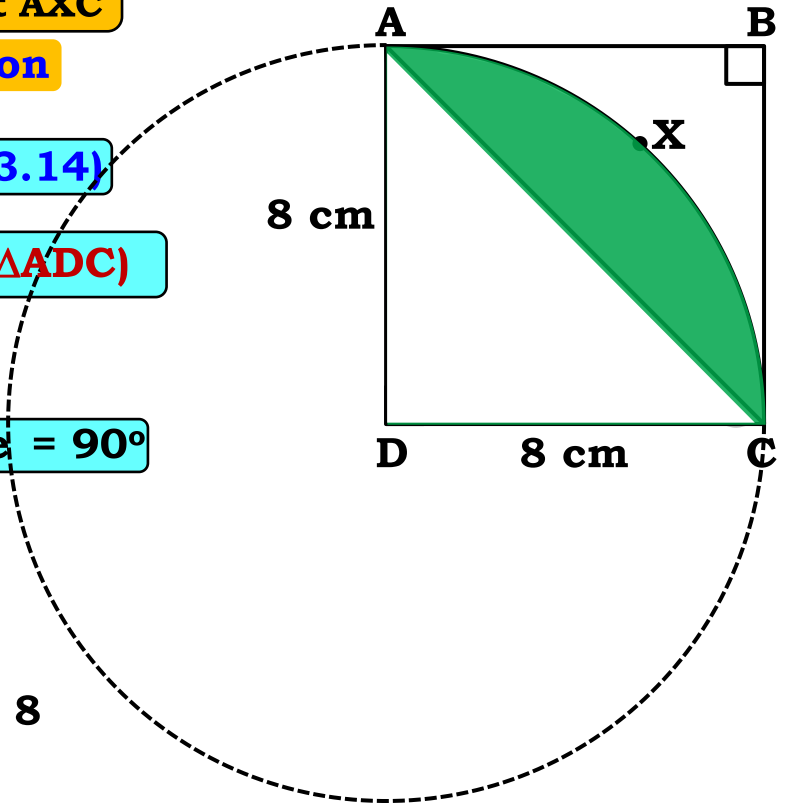
Module 36

AREAS RELATED TO CIRCLE

- **Sum based on Area of segment**

Area of the shaded region
= 2 × area of segment AXC

Q. Calculate the area of the shaded region in the adjoining figure where □ABCD is a square with side 8 cm each. ($\pi = 3.14$)



Sol.

ar(segment AXC) = ar(D-AXC) – ar(ΔADC)

R ... cm

M ... uare = 90°

Shaded region is made up of two identical segments

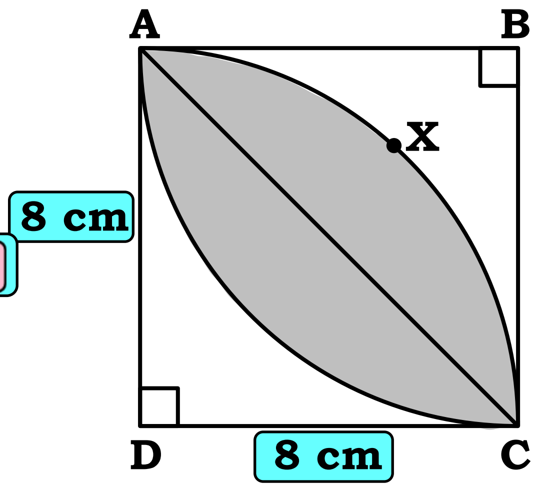
$$\text{ar(D-AXC)} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{\cancel{90}}{\cancel{360}_{4}} \times 3.14 \times \cancel{8}^{2} \times 8$$

$$\therefore \quad \text{ar(D-AXC)} = 50.24 \text{ cm}^2$$

Area of the shaded region
= 2 × area of segment AXC

Q. Calculate the area of the shaded region in the adjoining figure where □ABCD is a square with side 8 cm each. (π = 3.14)



Sol.

$$\text{ar(segment AXC)} = \text{ar(D-AXC)} - \text{ar}(\Delta ADC)$$

$$\text{ar}(\Delta ADC) = \frac{1}{2} \times \boxed{AD} \times \boxed{DC}$$

$$= \frac{1}{\cancel{2}} \times 8 \times \cancel{8}^{4}$$

$\therefore$

What is the formula to find area of right angled triangle?

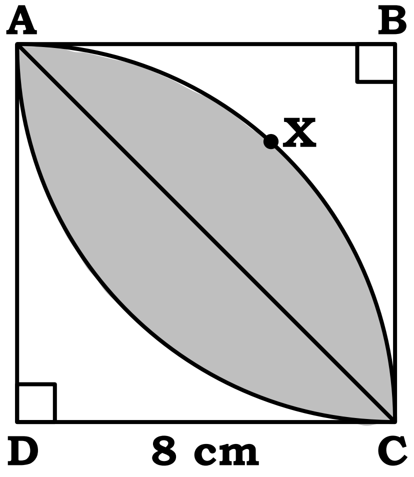
$\frac{1}{2}$ × Product of perpendicular sides

$\therefore$ ar(segment AXC) = 18.24 cm^2

$$\boxed{\text{ar(sector D-AXC)} = 50.24\ \text{cm}^2}$$

Area of the shaded region
$= 2 \times$ area of segment AXC

Q. Calculate the area of the shaded region in the adjoining figure where $\square$ABCD is a square with side 8 cm each. ($\pi = 3.14$)



Sol.

Area of the shaded region

$= 2 \times$ area of segment AXC

$= 2 \times 18.24$

$= 36.48 \text{ cm}^2$

$\therefore$ Area of the shaded region is 36.48 cm^2

ar(segment AXC) = 18.24 cm^2

Thank You