

OBJECTIVE Type Questions

[1 mark]

Multiple Choice Questions

* 1. The area of a circle, whose circumference is 22 cm, is:

- (A) 54 cm^2 (b) 46 cm^2
(c) 40.5 cm^2 (d) 38.5 cm^2

Ans. (d) 38.5 cm^2

Explanation: Let r be the radius of the circle. Then,

$$2\pi r = 22 \text{ cm}$$

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

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

$$\Rightarrow r = \frac{7}{2} \text{ cm or } 3.5 \text{ cm}$$

Now, area of circle

$$\pi r^2 = \frac{22}{7} \times 3.5 \times 3.5$$

$$= 38.5 \text{ cm}^2$$

* 2. The area of the circle that can be inscribed in a square of 6cm is:

- (A) $36\pi \text{ cm}^2$ (b) $18\pi \text{ cm}^2$
(c) $12\pi \text{ cm}^2$ (d) $9\pi \text{ cm}^2$

[CBSE SQP Std. 2022]

Ans. (d) $9\pi \text{ cm}^2$

Explanation: Diameter of circle = side of square
= 6 cm

$$\text{Radius} = \frac{6}{2}$$

$$\text{Radius} = 3 \text{ cm}$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 \\ &= \pi(3)^2 \\ &= 9\pi \end{aligned}$$

Therefore, the area of the circle is 9π square cm.

[CBSE Marking Scheme SQP Std. 2022]

* 3. The area of a quadrant of a circle where the circumference of circle is 176 m, is:

- (A) 2464 m^2 (b) 1232 m^2
(c) 616 m^2 (d) 308 m^2

[CBSE Term-1 2021]

Ans. (c) 616 m^2

Explanation: We have,

$$\Rightarrow \text{Circumference} = 176 \text{ m}$$

$$\Rightarrow 2\pi r = 176$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 176$$

$$r = 28 \text{ m}$$

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.



$$\begin{aligned} \text{So, area of quadrant} &= \frac{1}{4}\pi r^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times (28)^2 \\ &= 616 \text{ m}^2 \end{aligned}$$

- *4. If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of radius R , then:

- (A) $R_1 + R_2 = R$
(b) $R_1 + R_2 > R$
(c) $R_1 + R_2 < R$

- (d) nothing definite can be said about the relation among R_1, R_2 and R .

[NCERT Exemplar]

Ans. (A) $R_1 + R_2 = R$

Explanation: According to the given condition,
Circumference of circle with radius R
= Circumference of circle with radius R_1
+ Circumference of circle with radius R_2

$$\Rightarrow 2\pi R = 2\pi R_1 + 2\pi R_2$$

$$\Rightarrow R = R_1 + R_2$$

- *5. It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park would be:

- (A) 10 m (b) 15 m
(c) 20 m (d) 24 m

[CBSE 2012, NCERT Exemplar]

- *6. The number of revolutions made by a circular wheel of radius 0.25m in rolling a distance of 11km is:

- (A) 2800 (b) 4000
(c) 5500 (d) 7000

[CBSE SQP Std. 2022]

Ans. (d) 7000

[CBSE Marking Scheme SQP Std. 2022]

Explanation: Given, radius = 0.25m.

$$\begin{aligned} \text{Distance covered in 1 revolution} &= 2\pi r \\ &= 2 \times \frac{22}{7} \times 0.25 \\ &= \frac{11}{7} \end{aligned}$$

Given, total distance = 11km = 11000m.

$$\begin{aligned} \text{Then, the number of revolutions} &= 11000 \times \frac{7}{11} \\ &= \frac{77000}{11} \\ &= 7000 \end{aligned}$$

Therefore the number by revolutions = 7000

Caution

Remember that circumference of a wheel is the distance covered by the wheel in one round.

- *7. The radii of two concentric circles are 4 cm and 5 cm. The difference in the areas of these two circles is:

- (A) π (b) 7π
(c) 9π (d) 13π

Ans. (c) 9π

Explanation: Required difference = $\pi(5^2 - 4^2)$
= 9π

- *8. If the area of a circle is 154 cm^2 , then its circumference is:

- (A) 11 cm (b) 22 cm
(c) 44 cm (d) 55 cm

Ans. (c) 44 cm

Explanation:

Here, area of circle,

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

$$\Rightarrow \frac{22}{7} \times r^2 = 154$$

$$\Rightarrow r^2 = 154 \times \frac{7}{22} = 49$$

$$\Rightarrow r = 7 \text{ cm}$$

So, circumference = $2\pi r$

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

$$= 44 \text{ cm}$$

- *9. A wire is in the shape of a circle of radius 21 cm. It is bent to form a square. The side of the square is:

- (A) 22 cm (b) 33 cm
(c) 44 cm (d) 66 cm

(Use $\pi = \frac{22}{7}$)

Ans. (b) 33 cm

Explanation: Circumference of circle
= Perimeter of the square.

$$\text{So, } 2\pi r = 4a$$

$$\Rightarrow 4a = 2 \times \frac{22}{7} \times 21$$

$$\Rightarrow 4a = 132$$

$$\Rightarrow a = 33 \text{ cm}$$

- *10. If the perimeter of a circle is equal to that of a square, then the ratio of their areas is:

- (A) 22 : 7 (b) 14 : 11
(c) 7 : 22 (d) 11 : 14

[CBSE SQP Basic 2022]



Ans. (b) 14 : 11

[CBSE Marking Scheme SQP Basic 2022]

Explanation : Let radius of circle be r and side of a square be a .

According to the given condition,

Perimeter of a circle = Perimeter of a square

$$\therefore 2\pi r = 4a$$

$$\Rightarrow a = \frac{\pi r}{2} \quad \dots(i)$$

Now,

$$\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{(a)^2} = \frac{\pi r^2}{\left(\frac{\pi r}{2}\right)^2}$$

[from Eq. (i)]

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

$$= \frac{4}{22/7}$$

$$= \frac{28}{22} = \frac{14}{11}$$

*11. The circumference of a circle is 100 cm. The side of a square inscribed in the circle is:

- (A) $50\sqrt{2}$ cm (b) $\frac{100}{\pi}$ cm
(c) $\frac{50\sqrt{2}}{\pi}$ cm (d) $\frac{100\sqrt{2}}{\pi}$ cm

[CBSE Term-1 SQP 2021]

Ans. (c) $\frac{50\sqrt{2}}{\pi}$ cm

Explanation: $2\pi r = 100$.

So, diameter = $2r = \frac{100}{\pi}$ = diagonal of the square.

$$\text{Side } \sqrt{2} = \text{diagonal of square} = \frac{100}{\pi}$$

$$\therefore \text{Side} = \frac{100}{\sqrt{2}\pi} = \frac{50\sqrt{2}}{\pi} \text{ cm}$$

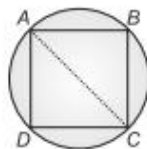
[CBSE Marking Scheme Term-1 SQP 2021]

Detailed Solution: Let r be the radius of circle.

Then, circumference of circle = $2\pi r$

$$\Rightarrow 100 = 2\pi r$$

$$\Rightarrow r = \frac{100}{2\pi} \quad \dots(ii)$$



Let ABCD be the square inscribed in the circle of radius r . Then,

$$\begin{aligned} \text{Diagonal of square} &= \text{Diameter of circle} \\ &= 2r = \frac{100}{\pi} \quad [\text{From (i)}] \end{aligned}$$

Now, in $\triangle ADC$,

$$\angle ADC = 90^\circ$$

$$\therefore AD^2 + DC^2 = AC^2$$

(By Pythagoras theorem)

$$\Rightarrow 2AD^2 = \left(\frac{100}{\pi}\right)^2$$

[$\because AD = DC = \text{side of square}$]

$$\Rightarrow \sqrt{2}AD = \frac{100}{\pi}$$

$$\Rightarrow AD = \frac{1}{\sqrt{2}} \times \frac{100}{\pi}$$

$$= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times \frac{7}{2}$$

$$= \frac{100\sqrt{2}}{2\pi}$$

$$= \frac{50\sqrt{2}}{\pi} \text{ cm}$$

*12. (c) The area of a circle that can be inscribed in a square of side 6 cm is:

- (A) $36\pi \text{ cm}^2$ (b) $18\pi \text{ cm}^2$
(c) $12\pi \text{ cm}^2$ (d) $9\pi \text{ cm}^2$

[CBSE 2012, NCERT Exemplar]

*13. (c) The outer and inner diameters of a circular ring are 34 cm and 32 cm respectively. The area of the ring is:

- (A) $66\pi \text{ cm}^2$ (b) $60\pi \text{ cm}^2$
(c) $33\pi \text{ cm}^2$ (d) $29\pi \text{ cm}^2$

*14. The diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24 cm and 7 cm, is:

- (A) 31 cm (b) 25 cm
(c) 62 cm (d) 50 cm

[CBSE 2011, NCERT Exemplar]

Ans. (d) 50 cm

Explanation: Let R be the radius of the new circle.

According to the given condition,

Area of new circle = Area of two circles

$$\Rightarrow \pi R^2 = \pi(24)^2 + \pi(7)^2$$

$$\Rightarrow \pi R^2 = 576\pi + 49\pi$$

$$\Rightarrow R^2 = 625$$



$$\Rightarrow R = 25 \text{ cm}$$

$$\therefore \text{Diameter of new circle}$$

$$= 2R = 2 \times 25$$

$$= 50 \text{ cm}$$

*15. If the radii of two circles are in the ratio of 4 : 3, then their areas are in the ratio of:

- (A) 4 : 3 (b) 8 : 3
(c) 16 : 9 (d) 9 : 16

[CBSE SQP Basic 2022]

Ans. (c) 16 : 9

[CBSE Marking Scheme SQP Basic 2022]

Explanation: Let the radii of the two circles be r and R , the circumferences of the circles be c and C and the areas of the two circles be a and A .

$$\text{Now, } \frac{c}{C} = \frac{4}{3}$$

$$\Rightarrow \frac{2\pi r}{2\pi R} = \frac{4}{3}$$

$$\Rightarrow \frac{r}{R} = \frac{4}{3}$$

Now, the ratio between their areas is given by

$$\frac{a}{A} = \frac{\pi r^2}{\pi R^2}$$

$$= \left(\frac{r}{R}\right)^2$$

$$= \left(\frac{4}{3}\right)^2$$

$$\frac{a}{A} = \frac{16}{9}$$

*16. (2) If a circular grass lawn of 35 m in radius has a path 7 m wide running around it on the outside, then the area of the path is:

- (A) 1450 m² (b) 1576 m²
(c) 1694 m² (d) 3368 m² [Diksha]

17. The minute hand of a clock is 84 cm long. The distance covered by the tip of minute hand from 10:10 am to 10:25 am is :

- (A) 44 cm (b) 88 cm
(c) 132 cm (d) 176 cm

[CBSE Term-1 Std. 2021]

Ans. (c) 132 cm

Explanation: Time covered by minute hand from 10:10 am to 10:25 am = 15 minutes

\therefore Angle covered by minute hand in 1 minute = 6°

$$\therefore \text{Angle covered by minute hand in 15 minutes}$$

$$= 6^\circ \times 15$$

$$= 90^\circ$$

So, distance covered by tip of minute hand

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

$$= \frac{90}{360} \times 2 \times \frac{22}{7} \times 84$$

$$= \frac{1}{4} \times 2 \times 22 \times 12$$

$$= 2 \times 22 \times 3$$

$$= 132 \text{ cm}$$

*18. What is the perimeter of a quadrant of a circle whose diameter is 10cm?

- (A) 7.85 cm (b) 17.85 cm
(c) 27.85 cm (d) 37.85 cm

[British Council 2022]

Ans. (b) 17.85 cm

Explanation: Given, diameter = 10 cm

$$\Rightarrow \text{radius} = \frac{10}{2} = 5 \text{ cm}$$

Perimeter of quadrant of a circle

$$= \frac{1}{4} \times 2\pi r + 2r$$

$$= \frac{\pi r}{2} + 2r$$

$$= \frac{\pi \times 5}{2} + 10$$

$$= \frac{5 \times 3.14 + 20}{2}$$

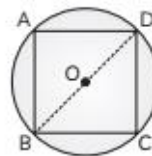
$$= 17.85 \text{ cm}$$

*19. If a square ABCD is inscribed in a circle of radius 'r' and AB = 4 cm, then the value of r is:

- (A) 2 cm (b) $2\sqrt{2}$ cm
(c) 4 cm (d) $4\sqrt{2}$ cm

Ans. (b) $2\sqrt{2}$ cm

Explanation :



Here,

$$r = \frac{1}{2} BD = \frac{1}{2} (\sqrt{AB^2 + AD^2})$$

[Applying Pythagoras theorem in ΔABD]



$$= \frac{1}{2}(\sqrt{2AB^2}) \quad [\because AB = AD]$$

$$= \frac{AB}{2}\sqrt{2}$$

$$= 2\sqrt{2} \text{ cm} \quad [\because AB = 4 \text{ cm}]$$

- *20. The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm is:

(A) 56 cm (b) 42 cm
(c) 28 cm (d) 16 cm

[NCERT Exemplar]

- *21. If the difference between the circumference and radius of a circle is 37 cm, then using $\pi = \frac{22}{7}$, the circumference (in cm) of the circle is:

(A) 154 (b) 44
(c) 14 (d) 7

[Delhi Gov. QB 2022, CBSE 2013]

Ans. (b) 44

Explanation: Let the radius of circle be 'r' cm.
Then, according to the question,

$$2\pi r - r = 37 \text{ cm}$$

$$\Rightarrow r\left(2 \times \frac{22}{7} - 1\right) = 37$$

$$\Rightarrow r(44 - 7) = 37 \times 7$$

$$\Rightarrow r = \frac{37 \times 7}{37} = 7 \text{ cm}$$

Now, circumference = $2\pi r$

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

$$= 44 \text{ cm}$$

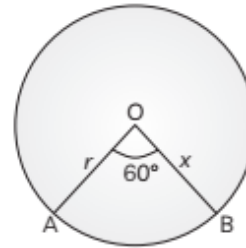
22. The perimeter of a sector of a circle having radius r and angle 60° is:

(A) $r\left(\frac{\pi}{6} + 1\right)$ (b) $2r\left(\frac{\pi}{6} - 1\right)$
(c) $r\left(\frac{\pi}{6} + 2\right)$ (d) $2r\left(\frac{\pi}{6} + 1\right)$

[Delhi Gov. SQP 2022]

Ans. (d) $2r\left(\frac{\pi}{6} + 1\right)$

Explanation: Let, AOB be a sector of radius r and central angle 60° ,



Perimeter of sector

$$AOB = OA + OB + \text{arc AB}$$

where, $OA = OB = r$

$$\text{Length of arc AB} = \frac{\theta}{360} \times 2\pi r$$

$$= \frac{60}{360} \times 2 \times \pi \times r$$

$$= \frac{\pi r}{3}$$

$$\Rightarrow \text{Perimeter of sector AOB} = r + r + \frac{\pi r}{3}$$

$$= r\left(1 + 1 + \frac{\pi}{3}\right)$$

$$= r\left(2 + \frac{\pi}{3}\right)$$

$$= 2r\left(\frac{\pi}{6} + 1\right)$$

- *23. The perimeter (in cm) of a square circumscribing a circle of radius 'a' cm, is:

(A) $8a$ (b) 4
(c) $2a$ (d) $16a$ [CBSE 2011]

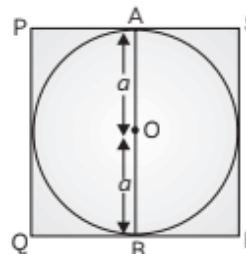
Ans. (A) $8a$

Explanation : Radius of circle = a cm

So, diameter of circle = $2a$

\therefore Side of square = $2a$

Perimeter of square = $4 \times \text{side}$
 $= 4 \times 2a = 8a$



- *24. In a right triangle ABC, right-angled at B, $BC = 12$ cm and $AB = 5$ cm. The radius (in cm) of the circle inscribed in the triangle is:

(A) 4 (b) 3
(c) 2 (d) 1 [CBSE 2014]

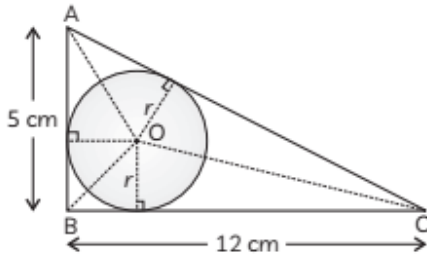


Ans. (c) 2

Explanation : Since, $\triangle ABC$ is right-angled at B,
So by Pythagoras theorem,

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ &= 5^2 + 12^2 = 169 \end{aligned}$$

$$\Rightarrow AC = 13 \text{ cm}$$



$$\begin{aligned} \text{Now, Area of } \triangle ABC &= \frac{1}{2} \times AB \times BC \\ &= \frac{1}{2} \times 5 \times 12 \\ &= 30 \text{ cm}^2 \end{aligned}$$

Also, Area of $\triangle ABC$ = Area of ($\triangle AOC$ + $\triangle BOC$ + $\triangle AOB$)

$$\begin{aligned} &= \frac{1}{2} \times 13 \times r + \frac{1}{2} \times 12 \times r + \frac{1}{2} \times 5 \times r \\ &\quad \text{[where, } r \text{ is the radius of the circle]} \end{aligned}$$

$$\Rightarrow 30 = \frac{13}{2}r + \frac{12}{2}r + \frac{5}{2}r$$

$$\Rightarrow \frac{30r}{2} = 30$$

$$\Rightarrow r = 2 \text{ cm}$$

25. In the given figure, three sectors of a circle of radius 7 cm, making angles of 60° , 80° , 40° at the centre are shown. The area (in cm^2) of the shaded region is:



- (A) 77 (b) 154
(c) 44 (d) 22 [Diksha]

Ans. (A) 77

Explanation : Radius of circle, $r = 7$ cm
Now, Area of shaded region = Area of three sectors

$$= \frac{\theta_1}{360} \pi r^2 + \frac{\theta_2}{360} \pi r^2 + \frac{\theta_3}{360} \pi r^2$$

$$= \frac{\pi r^2}{360} (\theta_1 + \theta_2 + \theta_3)$$

$$= \frac{1}{360} \times \frac{22}{7} \times 7 \times 7 (60 + 80 + 40)$$

$$= \frac{1}{180} \times 11 \times 7 \times 180$$

$$= 77 \text{ cm}^2$$

- *26. Raman draws a circle with diameter 6 units. He draws another circle by increasing the radius of the previously drawn circle by 4 units. What would be the quotient if he divides the circumference of the newly formed circle by its diameter?

- (A) π (b) 2π
(c) 8π (d) 12π

[CBSE Question Bank 2022]

27. An arc of a circle is of length 5π cm and the sector it bounds has an area of $20\pi \text{ cm}^2$. Then the radius of the circle is:

- (A) 4 cm (b) 8 cm
(c) 12 cm (d) 16 cm

[NCERT Exemplar]

Ans. (b) 8 cm

Explanation : Let r cm be the radius of the circle and θ be the angle formed by arc of the sector.

$$\text{Then, length of arc} = \frac{\theta}{360} \times 2\pi r = 5\pi \quad \dots(i)$$

$$\text{And, area of sector} = \frac{\theta}{360} \times \pi r^2 = 20\pi \quad \dots(ii)$$

Dividing (ii) by (i), we get

$$\frac{\frac{\theta}{360} \times \pi r^2}{\frac{\theta}{360} \times 2\pi r} = \frac{20\pi}{5\pi}$$

$$\Rightarrow \frac{r}{2} = 4$$

$$\Rightarrow r = 8 \text{ cm}$$

- *28. Summer seasons are the best to enjoy cool shakes and ice creams! Saumya wanted to try watermelon sharbat which she had just learnt making from her online cooking classes. She cut a slice of watermelon whose cross section was semi-circular in shape.



If the perimeter of a semi-circular watermelon is 36 cm, then its diameter is:

- (A) 12 cm (b) 13 cm
(c) 14 cm (d) 15 cm

Ans. (c) 14 cm

Explanation :



Perimeter of semi-circular watermelon

$$= AB + \widehat{AB}$$

$$= 2r + \pi r \quad [\text{where, } r \text{ is radius of the watermelon}]$$

$$\Rightarrow 36 = r(2 + \pi)$$

$$\Rightarrow r = \frac{36}{2 + \pi} = \frac{36}{2 + \frac{22}{7}}$$

$$= \frac{36 \times 7}{14 + 22} = \frac{36 \times 7}{36}$$

$$= 7$$

Now, diameter = 2 × radius

$$= 2 \times 7$$

$$= 14 \text{ cm}$$

- *29. Swati and her friends went to a popular pizza joint at Kolkata city centre to enjoy their favourite pizza. When they noticed that a new pizza was just launched with four different but equal toppings they could not resist themselves and ordered one pizza. Each topping occupied a quadrant of a circle, as Swati remarked while relishing the pizza.

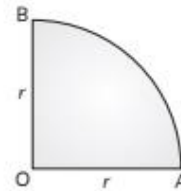


The perimeter of a quadrant of a pizza of radius 'r' is:

- (A) $4 \frac{\pi r}{2}$ (b) $2\pi r$
(c) $\frac{r}{2} [\pi + 4]$ (d) $2\pi r + \frac{r}{2}$

Ans. (c) $\frac{r}{2} [\pi + 4]$

Explanation :



Perimeter of quadrant BOA

$$= r + r + \frac{1}{4} \times 2\pi r$$

$$= 2r + \frac{\pi r}{2}$$

$$= \frac{r}{2} [4 + \pi]$$

- *30. ② Raghu has a habit of collecting coins not only from India but from all across the globe. He called his friends over to his place to show his prized possession and gave two of them, to his friend Pulkit.



If the sum of the areas of two circular coins with radii R_1 and R_2 is equal to the area of a circle of radius R , then:

- (A) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$
(c) $R_1 + R_2 < R$ (d) $R_1^2 + R_2^2 < R^2$

[Mod. CBSE 2011, Mod. NCERT Exemplar]

Fill in the Blanks

- *31. The ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal, is



Ans. $\frac{\pi}{\sqrt{3}}$

Explanation: Given: $2r = a$

$$\Rightarrow \frac{r}{a} = \frac{1}{2}$$

$$\begin{aligned} \text{Now, } \frac{\text{Area of circle}}{\text{Area of equilateral triangle}} &= \frac{\pi r^2}{\frac{\sqrt{3}}{4} a^2} \\ &= \frac{4\pi}{\sqrt{3}} \times \left(\frac{r}{a}\right)^2 \\ &= \frac{4\pi}{\sqrt{3}} \times \left(\frac{1}{2}\right)^2 \\ &= \frac{\pi}{\sqrt{3}} \end{aligned}$$

- *32. The radius of a wheel is 0.25 m. The number of revolutions it will make to travel a distance of 11 km, is

Ans. 7000

Explanation: Circumference of wheel
 $= 2\pi r$
 $= 2 \times \frac{22}{7} \times 0.25 \text{ m}$

Number of revolutions made by wheel
 $= \frac{\text{Distance covered by wheel}}{\text{Circumference of wheel}}$
 $= \frac{11 \times 1000}{2 \times \frac{22}{7} \times 0.25}$
 $= 7000$

- *33. The area of the circle inscribed in a square of side a cm is

Ans. $\frac{\pi a^2}{4} \text{ cm}^2$

Explanation: Diameter of the circle
 $=$ Side of square $= a$ cm

$$\Rightarrow \text{Radius of circle} = \frac{a}{2}$$

$$\text{So, Area of circle} = \pi \left(\frac{a}{2}\right)^2 = \frac{\pi a^2}{4} \text{ cm}^2$$

- *34. (A) If circumference and the area of a circle are numerically equal, then the diameter of the circle is

- *35. If the circumference of a circle is 66 cm, then its area is

Ans. 346.5 cm^2

Explanation: Let r be the radius of the circle.

Now, Circumference $= 66$ cm [Given]

Then, $2\pi r = 66$

$$\Rightarrow r = \frac{66}{2\pi} = \frac{66 \times 7}{2 \times 22} = \frac{21}{2}$$

$$\begin{aligned} \text{Area} = \pi r^2 &= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \\ &= 11 \times 3 \times \frac{21}{2} = 346.5 \text{ cm}^2 \end{aligned}$$

- *36. (A) If the area of circle is 616 cm^2 , then its circumference is

- *37. If the area of a semi-circular region is 308 sq. cm , then its perimeter is

Ans. 72 cm

Explanation : Let r be the radius of the semi-circular region.

Then, Area of semi-circular region

$$\begin{aligned} &= \frac{1}{2} \pi r^2 \\ &= 308 \text{ cm}^2 \end{aligned}$$

$$\Rightarrow \frac{1}{2} \times \frac{22}{7} \times r^2 = 308$$

$$\Rightarrow r^2 = \frac{308 \times 2 \times 7}{22}$$

$$= 14 \times 14$$

$$\Rightarrow r = 14 \text{ cm}$$

So, Perimeter $= \pi r + 2r$

$$\begin{aligned} &= \frac{22}{7} \times 14 + 2 \times 14 \\ &= 44 + 28 \\ &= 72 \text{ cm} \end{aligned}$$

38. (A) Number of rounds that a wheel of diameter

$\frac{7}{11}$ metre will make in moving a distance of

2 km, is

Assertion Reason

Direction for questions 39 to 42: In question number 39 to 42, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option as:



- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
- (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true but reason (R) is false.
- (d) Assertion (A) is false but reason (R) is true.

39. Assertion (A): In a circle of radius 4 cm, the angle of a sector is 45° , then the area of the sector is $\frac{44}{7} \text{ cm}^2$.

Reason (R): Area of sector = $\frac{\theta}{360^\circ} \times \pi r^2 \text{ cm}^2$.

Ans. (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Explanation: We know that,

$$\begin{aligned} \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{45}{360} \times \frac{22}{7} \times 4 \times 4 \\ &= \frac{44}{7} \text{ cm}^2 \end{aligned}$$

Hence, both assertion and reason is true and reason is the correct explanation of assertion.

40. Assertion (A): If the radius of an arc is 8 cm and the central angle is 40° , then the length of an arc is 5.59 cm.

Reason (R): Length of arc = $\pi r^2 \times \frac{\theta}{360^\circ}$.

Ans. (c) Assertion (A) is true but reason (R) is false.

Explanation: Radius, $r = 8 \text{ cm}$
Central angle, $\theta = 40^\circ$

$$\begin{aligned} \text{Length of arc} &= 2\pi r \times \frac{\theta}{360^\circ} \\ &= 2 \times \frac{22}{7} \times 8 \times \frac{40}{360} \\ &= 5.59 \text{ cm} \end{aligned}$$

Hence, assertion is true reason is false.

*41. Assertion (A): If the circumference of a circle is 221 cm then its radius is 35 cm.

Reason (R): The circumference of a circle can be calculated by multiplying π with the diameter of the circle.

Ans. (d) Assertion (A) is false but reason (R) is true.

Explanation: Radius, $r = 35 \text{ cm}$
Circumference, $C = 2\pi r$
 $= 2\pi r$

$$\begin{aligned} &= 2 \times \frac{22}{7} \times 35 \\ &= 220 \text{ cm} \end{aligned}$$

Hence, assertion is false but reason is true.

*42. Assertion (A): The difference between the circumference and the diameter of a circle is 5 cm, then the radius of the circle is 1.166 cm.

Reason (R): Area of circle = πr^2 .

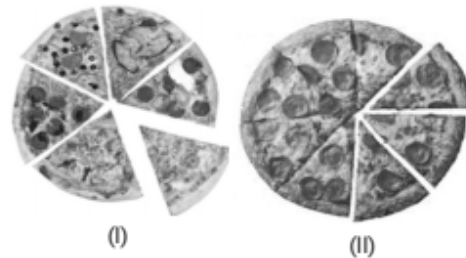
CASE BASED Questions (CBQs)

[4 & 5 marks]

Read the following passages and answer the questions that follow:

*43. We all love to eat pizzas, and nowadays a variety of pizzas are available in India which have been modified according to Indian taste and menu. From the Greeks to the Egyptians, from the Persians to the Indians, there have been incarnations of pizza served throughout history. Flatbreads, naan, etc. are all early preparations that could be considered cousins to the modern pizza, but there isn't a consensus as to which is first and whether these could even be considered precursors to pizza at all.

Consider two pizzas, both of equal diameter, namely, 12 inches. The first pizza marked (I) have been cut into six equal slices, whereas the second pizza, marked (II) has been cut into eight equal slices.



* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.



- (A) Find the perimeter of pizza I.
 (B) (C) Find the perimeter of pizza II.
 (C) (C) Find the ratio of areas of each slice of pizza (I) and (II).

Ans. (A) Perimeter of a sector = $l + 2r$, where l is the length of the arc, given by

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

Since, pizza I is cut into six equal slices.

So, angle subtended by each slice at the centre

$$\theta_1 = \frac{360^\circ}{6} = 60^\circ$$

$$\begin{aligned} \therefore \text{Perimeter of a slice of pizza I} &= \text{Perimeter of a sector} \\ &= l_1 + 2r \\ &= \frac{\theta_1}{360} 2\pi r + 2r \\ &= \frac{60}{360} \times 2 \times \pi \times 6 + 2 \times 6 \\ &= (2\pi + 12) \text{ inches} \end{aligned}$$

- * 44. A girl purchased a pair of earrings as shown below. The ring consisted of four circles marked C_1 , C_2 , C_3 and C_4 from innermost circle to outermost circle. The diameter of the innermost circle C_1 is 14 cm and radius of each of the next circle is double the radius of the preceding inner circle.



- (A) (C) The radius of the outermost circle C_4 is:
 (A) 112 cm (b) 56 cm
 (c) 28 cm (d) 14 cm

- (B) The area of the circle C_2 is:
 (A) 154 cm^2 (b) 308 cm^2
 (c) 616 cm^2 (d) 1232 cm^2
 (C) The length of a colourful thread used to decorate the boundary of the outermost circle C_4 is:
 (A) 352 cm (b) 704 cm
 (c) 176 cm (d) 88 cm
 (D) (C) Find area of the region between the innermost circle C_1 and the circle C_2 having dots.
 (A) $588 \pi \text{ cm}^2$ (b) $294 \pi \text{ cm}^2$
 (c) $147 \pi \text{ cm}^2$ (d) $73.5 \pi \text{ cm}^2$
 (E) Find the ratio of areas of innermost circle C_1 and outermost circle C_4 .
 (A) 1 : 4 (b) 1 : 8
 (c) 1 : 16 (d) 1 : 64

Ans. (B) (c) 616 cm^2

Explanation: Radius of the circle $C_2 = 14 \text{ cm}$.

$$\begin{aligned} \therefore \text{Its area } A_2 &= \pi r_2^2 \\ &= \frac{22}{7} \times 14 \times 14 \\ &= 616 \text{ cm}^2. \end{aligned}$$

(C) (A) 352 cm

Explanation: Length of the colourful thread used to decorate the boundary of the outermost circle $C_4 =$ Circumference of circle C_4

$$\begin{aligned} &= 2\pi r_4 \\ &= 2 \times \frac{22}{7} \times 56 \\ &= 352 \text{ cm}. \end{aligned}$$

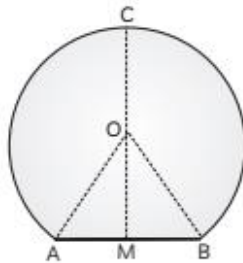
(E) (d) 1 : 64

Explanation: The ratio of areas of innermost circle C_1 and outermost circle C_4

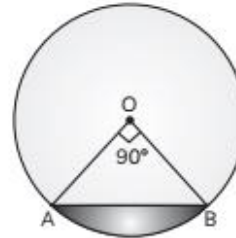
$$\begin{aligned} &= \pi r_1^2 : \pi r_4^2 \\ &= r_1^2 : r_4^2 \\ &= (7)^2 : (56)^2 \\ &= 49 : 3136 \\ &= 1 : 64 \end{aligned}$$

45. The South Central Zone of Indian Railways has commissioned the longest electrified railway tunnel in the country. According to local media reports, the construction of the 6.6 km-long tunnel took 43 months to complete. The electrified railway tunnel is situated between Cherlopalli and Rapuru stations as a part of the Obulavaripalli-Venkatachalam railway line. The tunnel is expected to facilitate freight movement in the region, reducing the distance between Krishnapatnam Port and hinterland areas by nearly 60 km.

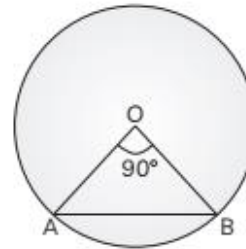
The adjoining figure shows a cross-section of the railway tunnel, which is a part of a circle. The radius OA of the circular part is 4 m and $\angle AOB = 90^\circ$.



- (A) Considering the tunnel to be part of a circle as shown below, find the area of minor segment.



- (B) Find the area of major segment.



- (C) Find the perimeter of cross-section.

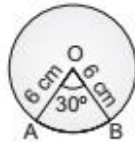
Ans. (B) Area of major segment = Area of circle
 - Area of minor segment
 $= \pi r^2 - 4(\pi - 2)$
 $= \pi(4)^2 - 4\pi + 8$
 $= 16\pi - 4\pi + 8$
 $= 12\pi + 8$
 $= 4(3\pi + 2) \text{ cm}^2$

VERY SHORT ANSWER Type Questions (VSA)

[1 mark]

46. Find the area of the sector of a circle of radius 6 cm whose central angle is 30° .
 (Take $\pi = 3.14$) [CBSE 2020]

Ans.



Required area of the sector

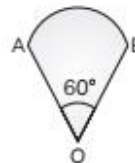
$$= \frac{\theta}{360^\circ} \times \pi r^2$$

$$= \frac{30^\circ}{360^\circ} \times 3.14 \times (6)^2$$

$$= 3.14 \times 3 = 9.42 \text{ sq. cm}$$

47. In the figure, is a sector of circle of radius 10.5 cm. Find the perimeter of the sector.

(Take $\pi = \frac{22}{7}$)



[CBSE 2020]

Ans. Perimeter of sector AOB
 $= OA + \widehat{AB} + OB$
 $= r + \frac{\theta}{360^\circ} \times 2\pi r + r$

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

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

*48. Show that if the circumferences of two circles are equal, then their areas are also equal.

Ans. Let radii of two circles be 'r' and 'R'.

We are given that

$$\Rightarrow 2\pi r = 2\pi R$$

$$\Rightarrow r = R$$

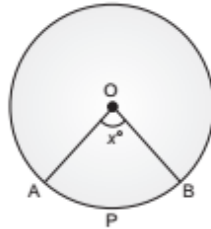
$$r^2 = R^2$$

or, $\pi r^2 = \pi R^2$

\Rightarrow The areas are equal.

Hence, proved.

49. In given figure, O is the centre of a circle. If the area of the sector OAPB is $\frac{5}{36}$ times the area of the circle, then find the value of x.



[Diksha]

Ans. Given : Area of sector OAPB is $\frac{5}{36}$ times the area of circle.

Let r be the radius of the circle.

$$\text{Then, } \frac{x}{360^\circ} \pi r^2 = \frac{5}{36} \pi r^2$$

$$\Rightarrow \frac{x}{360^\circ} = \frac{5}{36}$$

$$= \frac{360^\circ \times 5}{36}$$

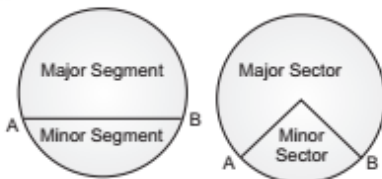
$$\Rightarrow x = 50$$

So, the value of x is 50° .

50. Is it true to say that area of a segment of a circle is less than the area of its corresponding sector? Why?

[NCERT Exemplar]

Ans. No.



It is true only in case of minor segment.

In case of major segment, area of segment is always greater than the area of its corresponding sector.

51. (a) In covering a distance s metres, a circular wheel of radius r metres makes $\frac{s}{2\pi r}$ revolutions. Is this statement true? Why?

[NCERT Exemplar]

52. Is it true to say that the area of a square inscribed in a circle of diameter p cm is $p^2 \text{ cm}^2$? Why? [NCERT Exemplar]

Ans. No.

When a square is inscribed in a circle, the diameter of the circle is equal to the diagonal of the square but not the side of the square.

Let side of square be a cm.

$$\therefore \text{Length of its diagonal} = \sqrt{a^2 + a^2} = \sqrt{2}a$$

So, Diameter of circle, $p = \sqrt{2}a$

$$\Rightarrow p^2 = 2a^2$$

$$\therefore \text{Area of square} = a^2 = \frac{p^2}{2}$$

53. Find the area of a sector of a circle of diameter 56 cm and central angle 90° .

Ans. Given: Diameter of the circle (d) = 56 cm

Then, radius of circle (r) = $\frac{56}{2} = 28 \text{ cm}$

Central angle, $\theta = 90^\circ$

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

$$= \frac{90^\circ}{360^\circ} \times \frac{22}{7} \times 28 \times 28$$

$$= 616 \text{ cm}^2$$

Hence, the area of the sector is 616 cm^2 .

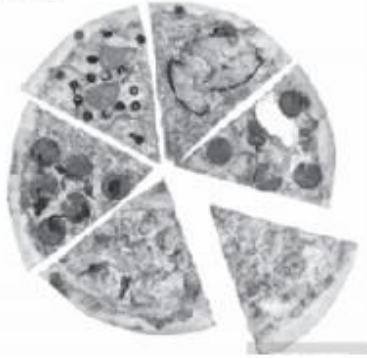
54. (a) Find the area of sector of a circle of radius 28 cm and central angle 45° .

[NCERT Exemplar]

55. (a) In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find the area of sector formed by the arc. [CBSE 2017]



56. Jayesh and his friends were celebrating birthday of their friend and ordered pizzas for themselves. Each of them took a slice of the pizza.



In a circle of diameter 42 cm, if an arc subtends an angle of 60° at the centre where $\pi = \frac{22}{7}$, then what will be the length of arc? [CBSE SQP 2020]

Ans. Length of arc = $\frac{\theta}{360^\circ} (2\pi r)$

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

$$= 22 \text{ cm}$$

[CBSE Marking Scheme SQP 2020]

Given, diameter of circle = 42 cm

Then, radius of circle (r) = $\frac{42}{2} = 21$ cm

Angle subtended at centre, $\theta = 60^\circ$

Then, length of arc = $\frac{\theta}{360^\circ} \times 2\pi r$

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

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

$$= 22$$

Hence, the length of arc is 22 cm.

57. When Rohan came out of his school and went to the cycle stand, he was shocked to see that the wheel of his cycle was damaged beyond repair. So, he went to the cycle shop with his father in the evening to buy a new cycle wheel.



The diameter of a cycle wheel is 21 cm. How many revolutions will it make in moving 66 m?

Ans. Let R be the radius of the wheel.

Then, Circumference of the wheel = $2\pi R$

$$= 2 \times \frac{22}{7} \times 10.5 = 66 \text{ cm}$$

Thus, to cover a distance of 66 m i.e., 6600 cm, Number of revolutions made

$$= \frac{\text{Total distance covered by wheel}}{\text{Circumference of the wheel}}$$

$$= \frac{6600}{66} = 100$$

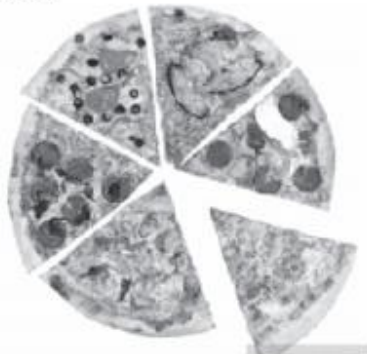
- *58. Susan went with her mother to buy a clock for her room. They found an antique looking clock with a round dial inside a square base and liked it so much that they immediately purchased it, though it was quite costly.



Will it be true to say that the perimeter of a square circumscribing a circle of radius a cm is $8a$ cm? Give reasons for your answer.

[NCERT Exemplar]

56. Jayesh and his friends were celebrating birthday of their friend and ordered pizzas for themselves. Each of them took a slice of the pizza.



In a circle of diameter 42 cm, if an arc subtends an angle of 60° at the centre where $\pi = \frac{22}{7}$, then what will be the length of arc? [CBSE SQP 2020]

Ans. Length of arc = $\frac{\theta}{360^\circ} (2\pi r)$
 $= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 21$
 $= 22 \text{ cm}$

[CBSE Marking Scheme SQP 2020]

Given, diameter of circle = 42 cm

Then, radius of circle (r) = $\frac{42}{2} = 21 \text{ cm}$

Angle subtended at centre, $\theta = 60^\circ$

Then, length of arc = $\frac{\theta}{360^\circ} \times 2\pi r$
 $= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 21$
 $= \frac{1}{6} \times 2 \times 22 \times 3$
 $= 22$

Hence, the length of arc is 22 cm.

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The diameter of a cycle wheel is 21 cm. How many revolutions will it make in moving 66 m?

Ans. Let R be the radius of the wheel.

Then, Circumference of the wheel = $2\pi R$

$$= 2 \times \frac{22}{7} \times 10.5 = 66 \text{ cm}$$

Thus, to cover a distance of 66 m i.e., 6600 cm, Number of revolutions made

$$= \frac{\text{Total distance covered by wheel}}{\text{Circumference of the wheel}}$$

$$= \frac{6600}{66} = 100$$

- *58. Susan went with her mother to buy a clock for her room. They found an antique looking clock with a round dial inside a square base and liked it so much that they immediately purchased it, though it was quite costly.



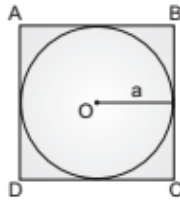
Will it be true to say that the perimeter of a square circumscribing a circle of radius a cm is $8a$ cm? Give reasons for your answer.

[NCERT Exemplar]



Ans. Yes.

Let ABCD be a square with circle of radius a cm inscribed in it.



Radius of circle, $r = a$ cm

∴ Diameter of circle,

$$d = 2 \times r = 2a \text{ cm}$$

⇒ Side of square ABCD = Diameter of circle
= $2a$ cm

∴ Perimeter of square ABCD
= $4 \times (\text{side})$
= $4 \times 2a$
= $8a$ cm

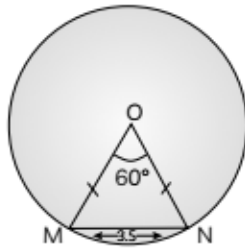
SHORT ANSWER Type-I Questions (SA-I)

[2 marks]

59. A 3.5 cm chord subtends an angle of 60° at the centre of a circle. What is the arc length of the minor sector? Draw a rough figure and show your steps. (Note: Take π as $\frac{22}{7}$)

[CBSE Question Bank 2023]

Ans.



From the figure,

$$OM = ON \quad [\text{radii}]$$

$$\Rightarrow \angle OMN = \angle ONM = 60^\circ$$

$$\Rightarrow \angle MON = 60^\circ \quad [\text{given}]$$

⇒ $\triangle OMN$ is an equilateral triangle.

$$\text{Arc length of minor sector} = \frac{\theta}{360^\circ} \times 2\pi r$$

$$= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times \frac{7}{2}$$

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

$$= \frac{11}{3} \text{ cm}$$

60. The perimeter of a sector of a circle of radius 5.2 cm is 16.4 cm. Find the area of the sector.

[CBSE 2020]

Ans. Let θ be the central angle of the sector and r be the radius of the circle.

Then, length of arc of sector (l) = $\frac{\theta}{360^\circ} \times 2\pi r$



So, perimeter of the sector = $l + r + r$

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

$$\Rightarrow 16.4 = \frac{\theta}{360^\circ} \times 2\pi \times (5.2) + 2 \times 5.2$$

[∵ $r = 5.2$ cm]

$$\Rightarrow \pi\theta = \frac{1080}{5.2} \quad \dots(i)$$

Now, area of the sector = $\frac{\theta}{360^\circ} \times \pi(5.2)^2$

$$= \frac{1}{360^\circ} \times \frac{1080}{5.2} \times (5.2)^2$$

[Using (i)]

$$= 15.6 \text{ cm}^2$$

Hence, area of the sector is 15.6 cm^2 .

61. A The length of the minute hand of a clock is 6cm. Find the area swept by it when it moves from 7:05 p.m. to 7:40 p.m.

[CBSE SQP Std. 2022]

Ans. We know that, in 60 minutes, the tip of minute hand moves 360°

$$\text{In 1 minute, it will move} = \frac{360^\circ}{60} = 6^\circ$$

∴ From 7 : 05 pm to 7 : 40 pm i.e. 35 min, it will move through = $35 \times 6^\circ = 210^\circ$



\therefore Area of swept by the minute hand in 35 min
= Area of sector with sectorial angle θ of 210°
and radius of 6 cm

$$\begin{aligned} &= \frac{210}{360} \times \pi \times 6^2 \\ &= \frac{7}{12} \times \frac{22}{7} \times 6 \times 6 \\ &= 66 \text{ cm}^2 \end{aligned}$$

[CBSE Marking Scheme SQP Std. 2022]

Caution

Remember that total angle at the centre of a circle is 360° and equal sectors means each sector subtends equal angle.

62. A piece of wire 22 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle. [Use $\pi = \frac{22}{7}$] [CBSE 2020]

- *63. The diameters of two circles with centres A and B are 16 cm and 30 cm respectively. If area of another circle with centre C is equal to the sum of areas of these two circles, then find the circumference of the circle with centre C. [Diksha]

Ans. We know,

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

Let the radius of circle with centre C be R cm.

According to the question, we have,

$$\pi(8)^2 + \pi(15)^2 = \pi R^2$$

$$\Rightarrow 64\pi + 225\pi = \pi R^2$$

$$\Rightarrow 289\pi = \pi R^2$$

$$\Rightarrow R^2 = 289$$

$$\Rightarrow R = 17 \text{ cm}$$

Circumference of circle with centre C

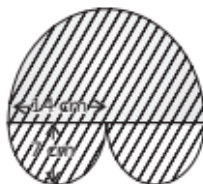
$$= 2\pi r$$

$$= 2 \times \frac{22}{7} \times 17$$

$$= 106.86 \text{ cm}$$

So, the circumference of the circle with centre C is 106.86 cm.

- *64. In the figure, find the area of the shaded region.



* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

Ans. Area of the shaded region

= Area of semi-circle of radius 14 cm

+ 2 \times Area of semi-circle of radius 7 cm

$$= \frac{\pi}{2} (14)^2 + 2 \times \frac{\pi}{2} (7)^2$$

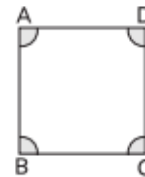
$$= \frac{1}{2} \times \frac{22}{7} \times 14 \times 14 + \frac{22}{7} \times 7 \times 7$$

$$= 308 + 154$$

$$= 462 \text{ cm}^2$$

Hence, the area of shaded region is 462 cm^2 .

65. In the given figure, arcs have been drawn of radius 7 cm each with vertices A, B, C and D of quadrilateral ABCD as centres. Find the area of the shaded region.



[CBSE SQP Std. 2022]

Ans. Let, the measure of $\angle A$, $\angle B$, $\angle C$ and $\angle D$ be θ_1 , θ_2 , θ_3 and θ_4 respectively

Required area = Area of sector with centre A + Area of sector with centre B + Area of sector with centre C + Area of sector with centre D

$$\begin{aligned} &= \frac{\theta_1}{360} \times \pi \times 7^2 + \frac{\theta_2}{360} \times \pi \times 7^2 + \frac{\theta_3}{360} \times \pi \times 7^2 \\ &\quad + \frac{\theta_4}{360} \times \pi \times 7^2 \end{aligned}$$

$$= \frac{(\theta_1 + \theta_2 + \theta_3 + \theta_4)}{360} \times \pi \times 7^2$$

$$= \frac{(360)}{360} \times \frac{22}{7} \times 7 \times 7$$

(By angle sum property of a triangle)

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

[CBSE Marking Scheme SQP Std. 2022]

66. If the length of an arc of a circle of radius r is equal to that of an arc of a circle of radius $2r$, then the angle of the corresponding sector of the first circle is double the angle of the corresponding sector of the other circle. Is this statement false? Why?

[NCERT Exemplar]



67. The areas of two sectors of two different circles are equal. Is it necessary that their corresponding arc lengths are equal? Why?

[NCERT Exemplar]

Ans. No.

The given statement will be true for sectors of the same circle. But in circles of different radii, it depends on their arc lengths as well as on their radii.

$$\text{Area of 1}^{\text{st}} \text{ sector} = \frac{1}{2} l_1 r_1$$

Where, r_1 is the radius of first circle and l_1 is the central arc length of the sector.

$$\text{Area of 2}^{\text{nd}} \text{ sector} = \frac{1}{2} l_2 r_2$$

Where, r_2 is the radius of second circle and l_2 is the central arc length of the sector.

$$\text{It is given that, } \frac{1}{2} l_1 r_1 = \frac{1}{2} l_2 r_2$$

$$\Rightarrow l_1 r_1 = l_2 r_2$$

Thus, for their corresponding arc lengths to be equal, the radii of the two circles must be equal.

68. Ⓐ The minute hand of a clock is 2 cm long. Find the area of the face of the clock described by the minute hand between 7 am and 7:15 am.

- * 69. Find the perimeter of a quadrant of a circle of radius 14 cm. [CBSE SQP Basic 2022]

Ans. Perimeter of quadrant = $2r + \frac{1}{4} \times 2\pi r$

$$\Rightarrow \text{Perimeter} = 2 \times 14 + \frac{1}{2} \times \frac{22}{7} \times 14$$

$$\Rightarrow \text{Perimeter} = 28 + 22 = 50 \text{ cm}$$

[CBSE Marking Scheme SQP Basic 2022]

- * 70. In the figure, two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60^\circ$, find the area of the shaded region.



[CBSE 2019]

- Ans. Given: two concentric circles smaller radius (r) = 21 cm and larger radius (R) = 42 cm.

$$\text{Also, } \angle AOB = 60^\circ$$

\therefore Area of shaded region

$$= \frac{360 - \angle AOB}{360^\circ} [\pi R^2 - \pi r^2]$$

$$= \frac{360 - 60}{360} \times \pi [(42)^2 - (21)^2]$$

$$= \frac{300}{360} \times \frac{22}{7} (42 - 21)(42 + 21)$$

$$= \frac{5}{6} \times \frac{22}{7} \times 21 \times 63$$

$$= 3465 \text{ cm}^2$$

Hence, the area of shaded region is 3465 cm^2 .

71. Find the diameter of a circle whose area is equal to the sum of the areas of the two circles of radii 24 cm and 7 cm.

[CBSE SQP Basic 2022]

- Ans. Area of the circle = Area of first circle + Area of second circle

$$\Rightarrow \pi R^2 = \pi (r_1)^2 + \pi (r_2)^2$$

$$\Rightarrow \pi R^2 = \pi (24)^2 + \pi (7)^2$$

$$\Rightarrow \pi R^2 = 576\pi + 49\pi$$

$$\Rightarrow \pi R^2 = 625\pi$$

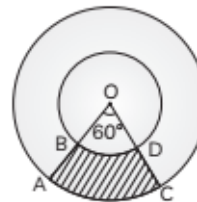
$$\Rightarrow R^2 = 625$$

$$\Rightarrow R = 25$$

Thus, diameter of the circle = $2R = 50 \text{ cm}$.

[CBSE Marking Scheme SQP Basic 2022]

72. Ⓐ In the figure, the radii of two concentric circles with centre O are 7 cm and 14 cm and $\angle AOC = 60^\circ$. Find the area of the shaded region.



[CBSE 2019]



SHORT ANSWER Type-II Questions (SA-II)

[3 marks]

- * 73. The area of a circular playground is 22176 cm^2 . Find the cost of fencing this ground at the rate of ₹ 50 per metre. [CBSE 2020]

Ans. Let r cm be the radius of the circular playground

$$\begin{aligned} \therefore \pi r^2 &= 22176 \\ \Rightarrow r^2 &= 22176 \times \frac{7}{22} \\ &= 7056 \\ \Rightarrow r &= 84 \text{ cm.} \end{aligned}$$

Now, Circumference of playground

$$\begin{aligned} &= 2\pi r \\ &= 2 \times \frac{22}{7} \times 84 \\ &= 528 \text{ cm} = \frac{528}{100} \text{ m} \end{aligned}$$

$$\therefore \text{Rate of fencing} = ₹ 50 \text{ per m}$$

$$\begin{aligned} \therefore \text{Total cost of fencing} &= ₹ \left(50 \times \frac{528}{100} \right) \\ &= ₹ 264 \end{aligned}$$

- * 74. (a) The wheel of a motor cycle is of radius 35 cm. How many revolutions per minute must the wheel make so as to keep a speed of 66 km/h? [NCERT Exemplar]

75. A cow is tied with a rope of length 14 m at the corner of a rectangular field of dimensions 20 m × 16 m. Find the area of the field in which the cow can graze. [CBSE 2010, NCERT Exemplar]

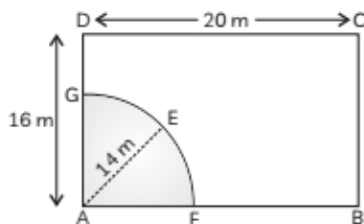
Ans. Since, cow is tied at the vertex of the field, so it will graze the field in the shape of sector of a circle of radius equal to the length of rope.

Let ABCD be a rectangular field of dimensions 20 m × 16 m.

Let the cow be tied at point A.

Given : Length of rope AE = 14 m.

$$\begin{aligned} \therefore \text{Area of field in which cow can graze} &= \text{Area of sector AFEG} \\ &= \frac{\theta}{360} \times \pi r^2 \end{aligned}$$



We know that the angle between two sides of rectangle is 90° .

$$\therefore \theta = 90^\circ$$

$$\begin{aligned} \therefore \text{Area of sector AFEG} &= \frac{90}{360} \times \frac{22}{7} \times (14)^2 \\ &= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 = 154 \text{ m}^2 \end{aligned}$$

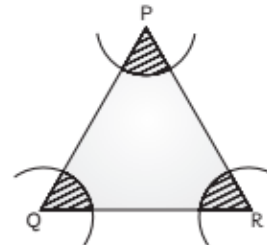
Hence, the required area grazed by cow is 154 m^2 .



Concept Applied

↳ Angle between two adjacent sides of rectangle is 90° .

76. (a) In the given figure, arcs have been drawn with radii 14 cm each and with centres P, Q and R. Find the area of the shaded region.



[NCERT Exemplar]

- * 77. (a) The difference between the radii of the smaller circle and the larger circle is 7 cm and the difference between the areas of the circles is 1078 sq. cm. Find the radius of the smaller circle. [CBSE 2017]

- * 78. A wire when bent in the form of an equilateral triangle encloses an area of $121\sqrt{3} \text{ cm}^2$. If the wire is bent in the form of a circle, find the area enclosed by the circle. (Use $\pi = \frac{22}{7}$)

Ans. Let each side of the equilateral triangle, so formed be a .

Given, area of equilateral triangle = $121\sqrt{3} \text{ cm}^2$

$$\Rightarrow \frac{\sqrt{3}}{4} \times a^2 = 121\sqrt{3}$$

$$\Rightarrow a^2 = 121 \times 4$$

$$\begin{aligned} \Rightarrow a &= \sqrt{11 \times 11 \times 2 \times 2} \\ &= 22 \text{ cm} \end{aligned}$$



$$\begin{aligned} \therefore \text{Perimeter of the equilateral triangle} &= 3 \times \text{side} \\ &= 3 \times 22 = 66 \text{ cm} \end{aligned}$$

Let, 'r' be the radius of the circle.

$$\begin{aligned} \text{Then, Perimeter of the equilateral triangle} &= \text{Circumference of the circle} \\ \Rightarrow 66 &= 2\pi r \end{aligned}$$

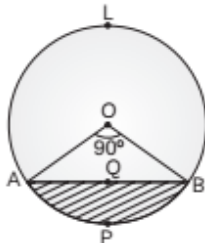
$$\Rightarrow 2 \times \frac{22}{7} \times r = 66$$

$$\Rightarrow r = \frac{7 \times 66}{2 \times 22} = \frac{21}{2} \text{ cm}$$

$$\begin{aligned} \text{Now, area of the enclosed circle} &= \pi r^2 \\ &= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \\ &= \frac{11 \times 3 \times 21}{2} \\ &= 346.5 \text{ cm}^2 \end{aligned}$$

Hence, the area of enclosed circle is 346.5 cm².

79. In the figure, AB is a chord of a circle with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment AQB. Also, find the area of the major segment ALBQA. (Use $\pi = 3.14$)



[CBSE 2016]

Ans. Given: A circle of radius (r) = 10 cm in which $\angle AOB = 90^\circ$.

$$\begin{aligned} \text{Area of the minor segment AQB} &= \text{Area of sector OAPB} - \text{Area of } \triangle AOB \\ &= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} \times OA \times OB \\ &= \frac{90}{360} \times 3.14 \times 10 \times 10 - \frac{1}{2} \times 10 \times 10 \\ &= 3.14 \times 5 \times 5 - 5 \times 10 \\ &= 78.5 - 50 = 28.5 \end{aligned}$$

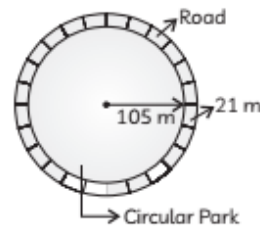
\therefore Area of the minor segment AQB = 28.5 cm²

$$\begin{aligned} \text{Area of the major segment ALBQA} &= \text{Area of circle} - \text{Area of minor segment AQB} \\ &= 3.14 \times (10)^2 - 28.5 \\ &= 314 - 28.5 \\ &= 285.5 \end{aligned}$$

\therefore Area of major segment ALBQA = 285.5 cm².
Hence, the area of the minor segment AQB = 28.5 cm² and the area of the major segment ALBQA is 285.5 cm².

- * 80. A circular park is surrounded by a road 21 m wide. If the radius of the park is 105 m, find the area of the road. [CBSE 2020]

Ans.



Given: Width of road = 21 m

Radius of park, $r_1 = 105$ m

\Rightarrow Radius of the whole circular portion (park + road)

$$r_2 = 105 + 21 = 126 \text{ m}$$

So, Area of road = Area of park and road

- Area of park

$$\begin{aligned} &= \pi r_2^2 - \pi r_1^2 \\ &= \pi(r_2^2 - r_1^2) \\ &= \frac{22}{7} [(126)^2 - (105)^2] \\ &= \frac{22}{7} \times (126 + 105)(126 - 105) \\ &\quad [\because a^2 - b^2 = (a + b)(a - b)] \\ &= \frac{22}{7} \times 231 \times 21 = 15246 \end{aligned}$$

Hence, the area of the road is 15246 m².

81. Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°. Also, find the area of the corresponding major segment. (Use $\pi = \frac{22}{7}$)

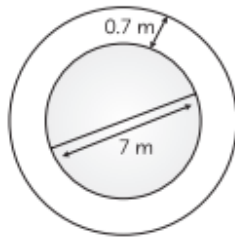
[CBSE SQP 2015]

- * 82. A park is of the shape of a circle of diameter 7 m. It is surrounded by a path of width 0.7 m. Find the expenditure of cementing the path, if its cost is ₹ 110 per sq. m. [CBSE 2017]

Ans. Given: Diameter of the park = 7 m

$$\text{Then, its radius } (r) = \frac{7}{2} = 3.5 \text{ m}$$

And, width of the path = 0.7 m



∴ Radius of the park with the path

$$R = 3.5 + 0.7 = 4.2 \text{ m}$$

Then, area of the path = $\pi(R^2 - r^2)$

$$= \frac{22}{7} [(4.2)^2 - (3.5)^2]$$

$$= \frac{22}{7} (4.2 - 3.5) (4.2 + 3.5)$$

$$[\because a^2 - b^2 = (a - b)(a + b)]$$

$$= \frac{22}{7} \times 0.7 \times 7.7$$

$$= 16.94$$

Now, cost of cementing the path = Area of the path × Cost of cementing per metre square

$$= 16.94 \times 110$$

$$= ₹1863.40$$

Hence, the cost of cementing the path is ₹ 1863.40.

* 83. The figure below shows various semi-circles.

In each figure, all the semi-circles are of the same size and AB = 14 cm.



(A) Find the perimeter of each figure.

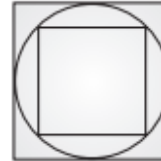
(B) Find the area of each figure.

(C) What do you observe? Can you generalise your observations?

Ans. (C) The perimeter remains the same, but area goes on decreasing.

$$\text{Area with semi-circles } n = \frac{77}{n} \text{ sq. cm}$$

* 84. In the figure, a square is inscribed in a circle of diameter d and another square is circumscribing the circle. Is the area of the outer square four times the area of the inner square? Give reasons for your answer.

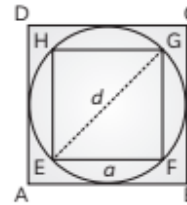


[NCERT Exemplar]

Ans. No.

Let, ABCD be a square circumscribing a circle of diameter, d .

Let, EFGH be a square of side a units inscribed in the circle.



⇒ Diagonal of inner square

$$= \text{Diameter of circle} = d$$

In right-angled $\triangle EFG$,

$$EG^2 = EF^2 + FG^2$$

[Using Pythagoras theorem]

$$\Rightarrow d^2 = a^2 + a^2$$

$$\Rightarrow d^2 = 2a^2$$

$$\Rightarrow a^2 = \frac{d^2}{2}$$

$$\text{Area of inner square EFGH} = a^2 = \frac{d^2}{2}$$

Side of outer square ABCD = d

So, area of outer square = $d^2 = 2a^2$

⇒ Area of outer square

$$= 2 \text{ times area of smaller square}$$

So, the given statements is false.

* 85. A circular pond is of diameter 17.5 m. It is surrounded by a 2 m wide path. Find the cost of constructing the path at the rate of ₹ 25 per m^2 . [Use $\pi = 3.14$] [NCERT Exemplar]

LONG ANSWER Type Questions (LA)

[4 & 5 marks]

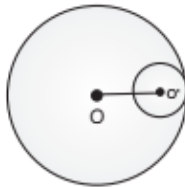
- * 86. Two circles touch internally. The sum of their areas is $116\pi \text{ cm}^2$ and the distance between their centres is 6 cm. Find the radii of the circles. [CBSE 2017]

Ans. Let 'r' and 'R' be the radii of the smaller and bigger circles, respectively.

Then, $OO' = R - r = 6 \text{ cm}$ [Given] ... (i)

Also, sum of their areas = $116\pi \text{ cm}^2$

i.e., $\pi R^2 + \pi r^2 = 116\pi$



$$\Rightarrow R^2 + r^2 = 116 \quad \dots \text{(ii)}$$

We know, $(R - r)^2 = R^2 + r^2 - 2Rr$

$$\Rightarrow (6)^2 = 116 - 2Rr$$

$$\Rightarrow 2Rr = 116 - 36 = 80$$

$$\Rightarrow Rr = 40 \quad \dots \text{(iii)}$$

Also, $(R + r)^2 = R^2 + r^2 + 2Rr$
 $= 116 + 2 \times 40$

[Using (ii) and (iii)]

$$\Rightarrow (R + r)^2 = 196$$

$$\Rightarrow R + r = 14 \quad \dots \text{(iv)}$$

Now, adding equations (i) and (iv), we get

$$2R = 20$$

$$\Rightarrow R = 10 \text{ cm}$$

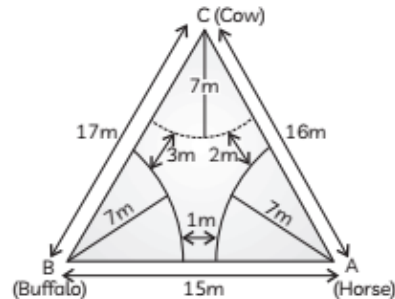
Putting the value of R in equation (i), we get

$$r = 4 \text{ cm}$$

Hence, the radii of the bigger and smaller circles are 10 cm and 4 cm, respectively.

87. Sides of a triangular field are 15 m, 16 m and 17 m. In the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of length 7 m each to graze in the field. Find the area of the field which cannot be grazed by the three animals. [NCERT Exemplar]

Ans. Let ABC be the triangular field in which horse, buffalo and cow are tied at the corners A, B and C, respectively, with a rope of length 7 m each.



Now, Area of field which cannot be grazed by animals = Area of $\triangle ABC$ - Area of three sectors
 Here,

Radius of each sector = 7 m (length of rope)

\therefore Area of each sector grazed by horse

$$= \frac{\theta}{360} \times \pi r^2 = \frac{\theta}{360} \times \pi \times (7)^2 = \frac{49\pi\angle A}{360}$$

Similarly,

$$\text{Area of sector grazed by buffalo} = \frac{49\pi\angle B}{360}$$

$$\text{Area of sector grazed by cow} = \frac{49\pi\angle C}{360}$$

Sum of areas of three sectors

$$= \frac{49\pi}{360}\angle A + \frac{49\pi}{360}\angle B + \frac{49\pi}{360}\angle C$$

$$= (\angle A + \angle B + \angle C) \times \frac{49\pi}{360}$$

$$= 180 \times \frac{49\pi}{360}$$

[$\because \angle A + \angle B + \angle C = 180$; angle sum property of triangle].

$$= 180 \times \frac{49}{360} \times \frac{22}{7}$$

$$= 7 \times 11 = 77 \text{ m}^2$$

Given sides of triangle are $a = 15 \text{ m}$, $b = 16 \text{ m}$ and $c = 17 \text{ m}$.

$$\text{Semi-perimeter of triangle, } s = \frac{a+b+c}{2}$$

$$\Rightarrow s = \frac{15+16+17}{2} = \frac{48}{2} \text{ m} = 24 \text{ m}$$

\therefore Area of triangular field ABC

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

[Heron's formula]



$$= \sqrt{24(24-15)(24-16)(24-17)}$$

$$= \sqrt{24 \times 9 \times 8 \times 7} = 24\sqrt{21} \text{ m}^2$$

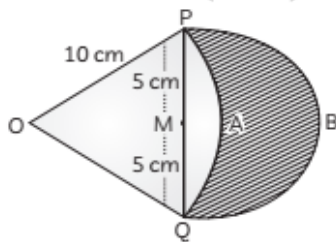
∴ Area of field which cannot be grazed by the three animals

= Area of $\triangle ABC$ - Area of three sectors

$$= (24\sqrt{21} - 77) \text{ m}^2$$

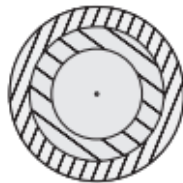
Hence, the area which cannot be grazed by the three animals is $(24\sqrt{21} - 77) \text{ m}^2$.

88. In the figure, two arcs PAQ and PBQ are shown. Arc PAQ is a part of a circle with centre O and radius OP while arc PBQ is a semi-circle drawn on PQ diameter with centre M. If $OP = PQ = 10 \text{ cm}$, show that the area of the shaded region is $25\left(\sqrt{3} - \frac{\pi}{6}\right) \text{ cm}^2$.



[CBSE 2016]

- *89. An archery target has three regions formed by three concentric circles as shown in the given figure. If the diameters of the concentric circles are in the ratio 1 : 2 : 3, then find the ratio of the areas of three regions.



[NCERT Exemplar]

Ans. Since, the diameters of three concentric circles are in the ratio 1 : 2 : 3.

∴ Let $d_1 = x$, $d_2 = 2x$ and $d_3 = 3x$

$$\text{So, } r_1 = \frac{x}{2}, r_2 = \frac{2x}{2} = x \text{ and } r_3 = \frac{3x}{2}.$$

$$\text{Area of inner circle, } A_1 = \pi\left(\frac{x}{2}\right)^2 = \frac{\pi x^2}{4}$$

$$\text{Area of middle circle, } A' = \pi x^2$$

$$\text{and, Area of outer circle, } A'' = \pi\left(\frac{3x}{2}\right)^2 = \frac{9}{4}\pi x^2$$

Now, Area of middle region, $A_2 = A' - A_1$

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

$$= \pi x^2 - \frac{\pi x^2}{4}$$

$$= \frac{3\pi x^2}{4}$$

Area of outer region, $A_3 = A'' - A'$

$$= \frac{9\pi x^2}{4} - \pi x^2 = \frac{5\pi x^2}{4}$$

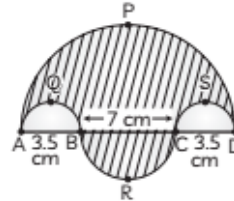
∴ Required ratio = $A_1 : A_2 : A_3$

$$= \frac{\pi x^2}{4} : \frac{3\pi x^2}{4} : \frac{5\pi x^2}{4}$$

$$= 1 : 3 : 5$$

90. Find the difference of the areas of the two segments of a circle formed by a chord of length 5 cm subtending an angle of 90° at the centre. [NCERT Exemplar]

- *91. Find the area of the shaded region in the figure, where APD, AQB, BRC and CSD are semi-circles of the diameters 14 cm, 3.5 cm, 7 cm and 3.5 cm, respectively. (Use $\pi = \frac{22}{7}$)



[CBSE 2016]

Ans. Given: a semi-circle APD of radius (R) = $\frac{14}{2} = 7 \text{ cm}$

Radii of semicircles AQB and CSD,

$$(r) = \frac{3.5}{2} \text{ cm}$$

Radius of the semi-circle BRC (r') = $\frac{7}{2} \text{ cm}$

Area of the shaded region = Area of the semi-circle APD + Area of the semi-circle BRC - Area of the semi-circle AQB - Area of the semi-circle CSD

$$= \frac{\pi R^2}{2} + \frac{\pi (r')^2}{2} - \frac{\pi r^2}{2} - \frac{\pi r^2}{2}$$

$$= \frac{\pi}{2} [R^2 + r'^2 - 2r^2]$$

$$= \frac{1}{2} \times \frac{22}{7} \times \left[7^2 + \left(\frac{7}{2}\right)^2 - 2\left(\frac{3.5}{2}\right)^2 \right]$$

$$= \frac{1}{2} \times \frac{22}{7} \times \left[49 + \frac{49}{4} - \frac{12.25}{2} \right]$$



$$\begin{aligned}
 &= \frac{1}{2} \times \frac{22}{7} \times \left[\frac{196 + 49 - 24.5}{4} \right] \\
 &= \frac{1}{2} \times \frac{22}{7} \times \frac{220.5}{4} \\
 &= 11 \times \frac{31.5}{4} \\
 &= 86.625
 \end{aligned}$$

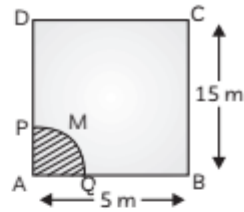
Hence, the area of shaded region is 86.625 cm^2 .

92. (C) The central angles of two sectors of circles of radii 7 cm and 21 cm are 120° and 40° respectively. Find the areas of the two sectors as well as the lengths of the corresponding arcs. What do you observe?
93. (C) Find the difference of the areas of a sector of angle 120° and its corresponding major sector of a circle of radius 21 cm.

*94. A horse is tied to a peg at one corner of a square shaped grass field side 15 m by means of a 5 m long rope. Find:

- (A) the area of the part of the field in which the horse can graze.
- (B) the increase in the grazing area if the rope were 10 m long instead of 5 m. (Use $\pi = 3.14$)

Ans. Consider a square shaped grass field ABCD in which horse is tied at the corner A.



- (A) Area of the field in which horse can graze
= Area of the quadrant APMQ of radius 5 m

$$\begin{aligned}
 &= \frac{1}{4} \pi r^2 \\
 &= \frac{1}{4} \times 3.14 \times (5)^2 \\
 &= 19.625 \text{ m}^2
 \end{aligned}$$

- (B) Increase in the grazing area

= Area of quadrant of radius 10 m - Area of quadrant of radius 5 m

$$\begin{aligned}
 &= \frac{1}{4} \pi R^2 - \frac{1}{4} \pi r^2 \\
 &= \frac{1}{4} \pi (R^2 - r^2) \\
 &= \frac{1}{4} \times 3.14 [(10)^2 - (5)^2] \\
 &= \frac{1}{4} \times 3.14 \times 75 \\
 &= 58.875 \text{ m}^2
 \end{aligned}$$

