CBSE Test Paper 01

Chapter 12 Area Related to Circle

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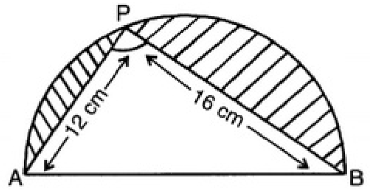
1. The part of the circular region enclosed by a chord and the corresponding arc of a circle is called **(1)**
   a. a segment
   b. a diameter
   c. a radius
   d. a sector
2. If a line meets the circle in two distinct points, it is called **(1)**
   a. a chord
   b. a radius
   c. secant
   d. a tangent
3. Area of a sector of angle p (in degrees) of a circle with radius R is **(1)**
   a. $\frac{p}{360} \times 2\pi R$
   b. $\frac{\mathrm{p}}{180} \times \pi \mathrm{R}^2$
   c. $\frac{p}{180} \times 2\pi \mathrm{R}$
   d. $\frac{p}{720} \times 2\pi R^2$
4. If ‘r’ is the radius of a circle, then it's circumference is given by **(1)**
   a. $2\pi r$
   b. None of these
   c. πr
   d. $2\pi d$
5. The perimeter of a protractor is **(1)**
   a. πr
   b. $\pi r + 2r$
   c. $\pi + r$
   d. $\pi + 2r$

6. If circumference of a circle is 44 cm, then what will be the area of the circle? **(1)**

7. Find the area of circle that can be inscribed in a square of side 10 cm. **(1)**

8. In the given figure, AB is the diameter where AP = 12 cm and PB = 16 cm. Taking the value of π as 3, find the perimeter of the shaded region. **(1)**



9. If the perimeter of a semi-circular protactor is 36 cm, then find its diameter. **(1)**

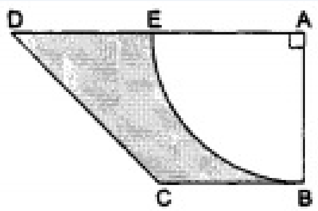
10. What is the perimeter of a square which circumscribes a circle of radius a cm? **(1)**

11. On a square cardboard sheet of area 784 cm^2, four circular plates of maximum size are placed such that each circular plate touches the other two plates and each side of the square sheet is tangent to circular plates. Find the area of the square sheet not covered by the circular plates. **(2)**

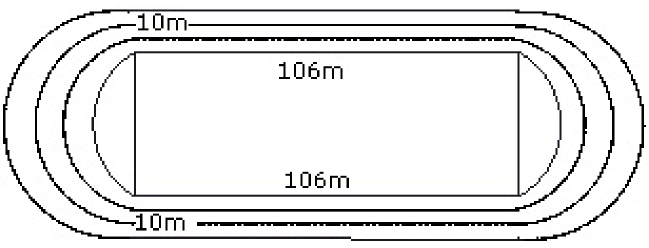
12. The circumference of a circle is 22 cm. Find the area of its quadrant. **(2)**

13. A sector of a circle of radius 4 cm contains an angle of 30°. Find the area of the sector. **(2)**

14. In the given figure, ABCD is a trapezium of area 24.5 cm^2. If AD II BC, $\angle DAB$ = 90°, AD = 10 cm, BC = 4 cm and ABE is quadrant of a circle then find the area of the shaded region. **(3)**



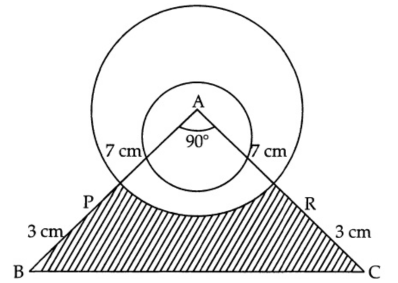
15. The given figure depicts a racing track whose left and right ends are semi-circular. The difference between the two inner parallel line segments is 60m and they are each 106m long. If the track is 10m wide, find:



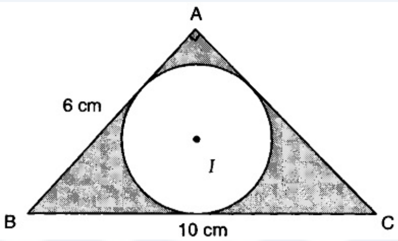
i. The distance around the track along its inner edge,
ii. The area of the track. **(3)**

16. A circular pond is 17.5 m in diameter. It is surrounded by a 2 m wide path. Find the cost of constructing the path at the rate of Rs 25 per m^2. **(3)**

17. A momento is made as shown in the figure. Its base PBCR is silver plated from the front side. Find the area which is silver plated. $(\pi = \frac{22}{7})$ **(3)**

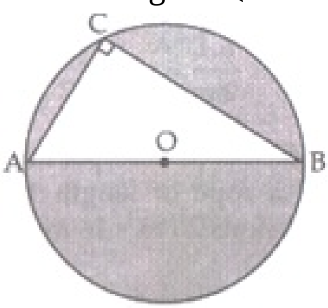


18. In Figure ABC is a right-angled triangle at A. Find the area of the shaded region, if AB = 6 cm, BC = 10 cm and I is the centre of incircle of $\triangle ABC$. **(4)**



19. A chord of a circle of radius 10cm subtends a right angle at the center. Find the area of the corresponding: (Use π = 3.14)
   i. minor sector
   ii. major sector
   iii. minor segment
   iv. major segment **(4)**

20. In the given figure, AB is diameter of circle, AC = 6 and BC = 8 cm. Find the area of the shaded region. (π = 3.14). **(4)**



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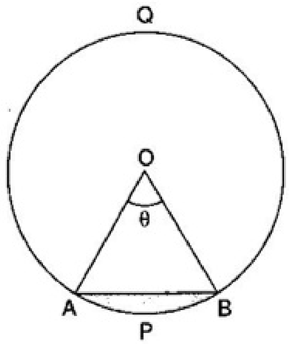
Solution

1. a. a segment

Explanation: 

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

2. c. secant

Explanation: A secant line, also simply called a secant, is a line meet two points in a circle.

3. d. $\frac{p}{720} \times 2\pi R^2$

Explanation: Area of the sector of angle p of a circle with radius R

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

$= \frac{p}{2(360)} \times 2\pi R^2 = \frac{p}{720} \times 2\pi R^2$

4. a. $2\pi r$

Explanation: If the radius of a circle is given, the circumference or perimeter can be calculated using the formula below:-

Circumference = $2\pi r$

5. b. $\pi r + 2r$

Explanation: Let radius of the protractor be r $\therefore$ Perimeter of protractor = Perimeter of semicircle + Diameter of semicircle

$\Rightarrow$ Perimeter of protractor = $\pi r + 2r$

6. Circumference of a circle = 44 cm

$$2\pi r = 44$$

$$2 \times \frac{22}{7} \times r = 44$$

$$\frac{44}{7} \times r = 44$$

Radius of the circle = $\frac{44}{\frac{44}{7}} = 7\text{cm}$

Area of the circle =$\pi r^2 = \frac{22}{7} \times 7 \times 7$

= 154 cm^2.

So, Area of the circle is 154 cm^2.

7. Side of square = 10 cm

Side of square = diameter of square = 10 cm

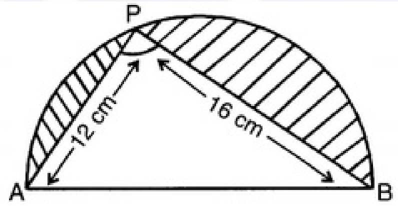
Radius of the circle = $\frac{10}{2} = 5\text{cm}$

Area of the circle = $\pi \times r^2$

$= \pi \times (5)^2$

$= \pi \times 5 \times 5$

$= 25\pi\ \text{cm}^2$

8. 

In △APB

$AB^2 = AP^2 + PB^2$

$AB = \sqrt{(16)^2 + (12)^2}$ (From Pythagoras theorem)

$= \sqrt{256 + 144}$

$= \sqrt{400}$

$= 20\text{cm}$

∴ Radius of circle = $\frac{20}{2}$ =10 cm.

Perimeter of shaded region

$= \pi r + AP + PB$

$= 3 \times 10 + 12 + 16$

$= 30 + 12 + 16$

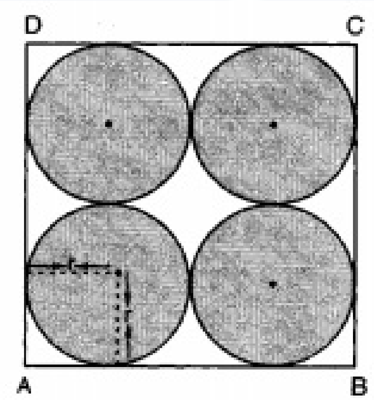
$= 58$ cm.

9. Perimeter of a semi-circular protactor = Perimeter of a semi-circle = $\frac{1}{2}$(circumference of circle) + diameter = $\frac{1}{2}$(circumference of circle) + 2 $\times$ radius = $(2r + \pi r)cm$

$\Rightarrow 2r + \pi r = 36$ [Given, perimeter of semi-cicular protactor = 36]
$\Rightarrow r = \frac{36}{2+\pi}$
$\Rightarrow r = 7cm$
Hence, diameter of semi-circular protactor = 2r = 2(7) = 14cm

10. When a square circumscribes a circle, the radius of the circle is half the length of the square.
Therefore, if the radius of the circumscribed circle is a, the diameter will be 2a. It is this diameter that is equal to the length of the square.
Therefore, the length of the square is 2a cm.
Then area of a square =4 $\times$ length
= 4 $\times$ 2a cm
= 8a cm

11. Let the radius of each circular plate be r cm. Then,



Length of each side of the square sheet = 4r cm.
$\therefore$ Area of the square cardboard sheet = (4r $\times$ 4r) cm^2 = 16 r^2 cm^2
But, the area of the cardboard sheet is given to be 784 cm^2
$\because$ $16r^2$ = 784 $\Rightarrow$ r^2 = 49
$\Rightarrow$r = 7
Area of one circular plate = $\pi r^2 = \frac{22}{7} \times 7^2 cm^2$ = 154 cm
$\therefore$ Area of four circular plates = 4 $\times$ 154 cm^2 = 616 cm^2
$\therefore$ Uncovered area of the square sheet = (784 - 616) cm^2 = 168 cm^2

12. Suppose r be the radius of a circle

Circumference of a circle $= 22cm$

$\Rightarrow 2\pi r = 22$

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

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

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

$= \left(\frac{1}{4} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right)\text{cm}^2$

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

13. Radius of cirlce = 4cm

$\theta = 30^\circ$

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

$= \frac{30^\circ}{360^\circ} \times \pi \times 4 \times 4$

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

14. Area of the trapezium ABCD

$= \frac{1}{2}$ (sum of parallel sides) $\times$ distance between them

$= \frac{1}{2}(AD + BC) \times AB$

$\Rightarrow 24.5 = \frac{1}{2} \times (10 + 4) \times AB$

$\Rightarrow 24.5$

= 7 AB

$\Rightarrow AB = \frac{24.5}{7}$

$\Rightarrow AB = 3.5\text{cm}$

$\Rightarrow$ Radius of a quadrant ABE = 3.5 cm

$\therefore$ Area of a quadrant ABE $= \frac{1}{4}\pi r^2$

$= \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$

= 9.625 cm^2

Now, Area of the shaded region

= Area of the trapezium ABCD - Area of a quadrant ABE

= 24.5 - 9.625

= 14.875 cm^2

15. i. The distance around the track along the inner edge = 106 + 106 + ($\pi \times 30 + \pi \times$

30)

= 212 + $\frac{22}{7}$ $\times$ 60 = 212 + $\frac{1320}{7}$ = $\frac{2807}{7}m$

ii. The area of the track = 106 $\times$ 80 - 106 $\times$ 60 + 2 $\times$ $\frac{1}{2}$ $\times$ π [40^2 - 30^2]

= 106 $\times$ 20 + π(70) $\times$ (10)

= 2120 + 700 $\times$ $\frac{22}{7}$ = 2120 + 2200 = 4320 m^2

16. $\therefore$ Radius of a pond $= \frac{17.5}{2} = 8.75$

$\therefore$ Area of a pond $= \pi(8.75)^2\ sq.m$

Radius of a circle including path = 8.75 + 2 = 10.75 m

$\therefore$According to question,

Area of the path = Area of a circle including path - Area of a pond

$= \pi(10.75)^2 - \pi(8.75)^2$

$= \pi\left[(10.75)^2 - (8.75)^2\right]$

$= \frac{22}{7}[(10.75 + 8.75)(10.75 - 8.75)]$

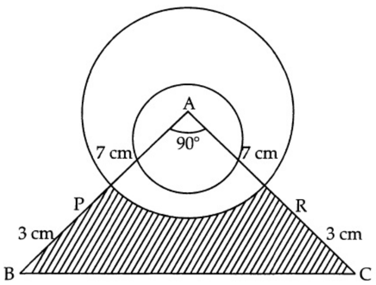
$= \frac{22}{7}[19.5 \times 2]$

$= \frac{22}{7} \times 39$

$= \frac{858}{7} sq.m$

= 122.5 sq.m

Cost of constructing the path = 25×122.5= Rs.3062.50

17. 

Base = 7 + 3 = 10cm and height = 7 + 3 =10 cm

From the given figure

Area of right-angled$\triangle ABC = \frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 10 \times 10$

$= 50\ \text{cm}^2$

Area of quadrant APR of the circle of radius 7 cm

$= \frac{1}{4} \times \pi \times (7)^2$

Area of quadrant$= \frac{1}{4} \times \frac{22}{7} \times 49 = 38.5\text{cm}^2$

Area of base PBCR = Area of $\triangle$ABC - Area of quadrant APR

= $50 - 38.5$ = 11.5 cm^2.

So, Area of shaded portion is 11.5 cm^2.

18. Applying Pythagoras theorem in $\triangle ABC$, we obtain

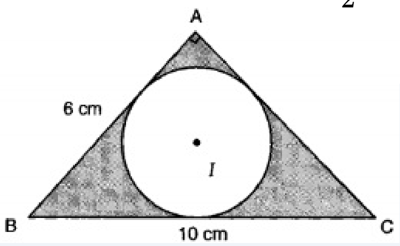
$BC^2 = AB^2 + AC^2$

$\Rightarrow AC^2 = BC^2 - AB^2$

$\Rightarrow AC^2 = 100 - 36 = 64$

$\Rightarrow$ AC = 8 cm

$\therefore$ Area of $\triangle ABC = \frac{1}{2} \times AB \times AC = \frac{1}{2} \times 6 \times 8 cm^2$ = 24 cm^2



Let r cm be the radius of the incircle, (circle inscribed in $\triangle ABC$). We observe that:

Area of $\triangle ABC$ = Area of $\triangle IBC$ + Area of $\triangle ICA$ + Area of $\triangle IAB$

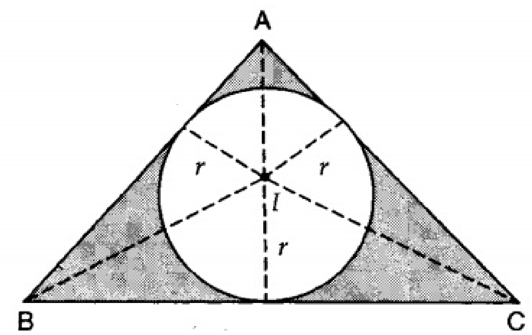
$$\Rightarrow \quad 24 = \frac{1}{2}(BC \times r) + \frac{1}{2}(CA \times r) + \frac{1}{2}(AB \times r)$$

$$\Rightarrow \quad 24 = \frac{1}{2} r(BC + CA + AB)$$

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

$\Rightarrow$ 24 = 12r

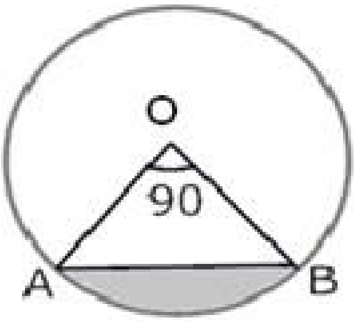
$\Rightarrow$ r = 2



Let A be the area of the shaded region. Then,

A = Area of $\triangle ABC$ - Area of the incircle

$$\Rightarrow \quad A = 24 - \pi r^2 = \left(24 - \frac{22}{7} \times 4\right) cm^2 = \frac{80}{7} cm^2$$

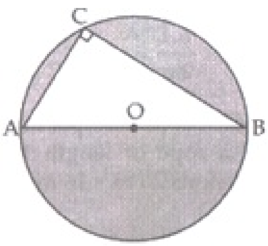
19. 

i. Area of minor sector = $\frac{\theta}{360}\pi r^2$
$= \frac{90}{360}(3.14)(10)^2$
$= \frac{1}{4} \times 3.14 \times 100$
$= \frac{314}{4}$
= 78.50 = 78.5 cm^2

ii. Area of major sector = Area of circle - Area of minor sector
= $\pi(10)^2$ - $\frac{90}{360}$ $\pi(10)^2$ = 3.14 (100) - $\frac{1}{4}$ (3.14) (100)
= 314 - 78.50 = 235.5 cm^2

iii. We know that area of minor segment
= Area of minor sector OAB - Area of ΔOAB
$\because$ area of $\triangle OAB = \frac{1}{2}(OA)(OB)\sin\angle AOB$
$= \frac{1}{2}(OA)(OB)\,(\because \angle AOB = 90^\circ)$
Area of sector = $\frac{\theta}{360}\pi r^2$
= $\frac{1}{4}$ (3.14) (100) - 50 = 25(3.14) - 50 = 78.50 - 50 = 28.5 cm^2

iv. Area of major segment = Area of the circle - Area of minor segment
= $\pi(10)^2$ - 28.5
= 100(3.14) - 28.5
= 314 - 28. 5 = 285.5 cm^2

20. 

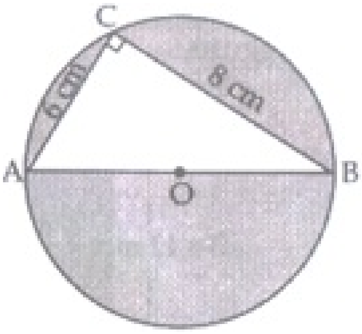
Identify the figure as a circle, and a right-angled triangle (and semicircle, segment also) since AOB is diameter and angle in semicircle is 90^o.

Therefore, $\angle C = 90^o$

In right-angled $\triangle ABC$,

b = base = BC = 8 cm

a = altitude = AC = 6 cm



Therefore,by Pythagoras theorem in right $\triangle ABC$,

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

$= 8^2 + 6^2 = 64 + 36$

$\Rightarrow AB^2 = 100$ cm

$\Rightarrow AB = 10$ cm

Therefore, $r = \frac{10}{2} = 5$ cm

Therefore, Area of shaded region = Area of circle – Area of right $\triangle ABC$

$= \pi r^2 - \frac{1}{2}$ Base $\times$ Alt.

$= 3.14 \times 5 \times 5 - \frac{1}{2} \times 8 \times 6$

$= 3.14 \times 25 - 8 \times 3 = (78.50 - 24)\ cm^2 = 54.50\ cm^2$

Therefore, Area of shaded region = $54.50\ cm^2$