

CLASS – 10 MATHEMATICS

CH – 11 AREAS RELATED TO CIRCLES

CBSE Board

Previous Year Questions – 1

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mg

1. What is the area of a semi-circle of diameter 'd'? (CBSE 2023)

$r = \frac{d}{2}$

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

$= \frac{\pi \times \left(\frac{d}{2}\right)^2}{2} = \frac{\pi}{2} \times \frac{d^2}{4} = \frac{\pi d^2}{8}$

A. $\frac{1}{16} \pi d^2$

B. $\frac{1}{4} \pi d^2$

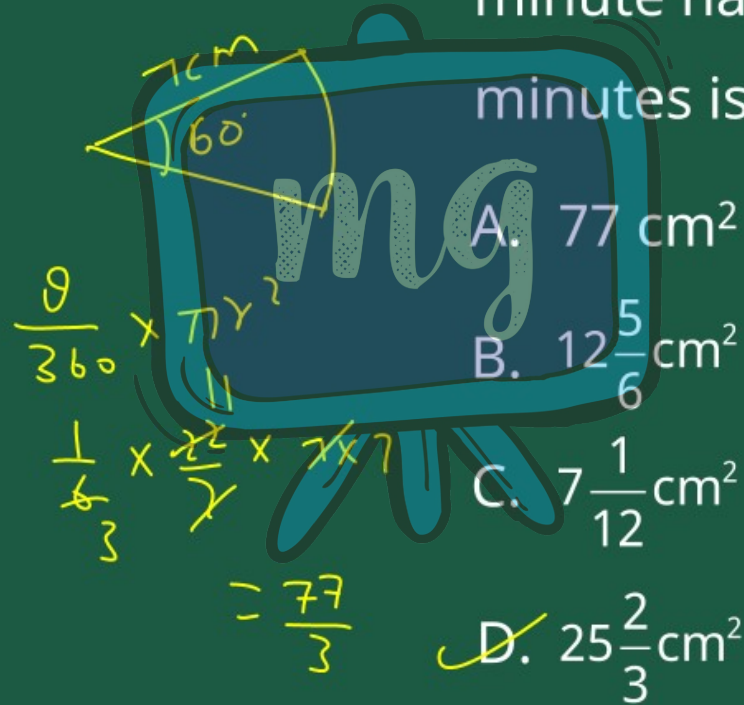
B. $\frac{1}{8} \pi d^2$

B. $\frac{1}{2} \pi d^2$

2. The area swept by 7 cm long minute hand of a clock in 10

minutes is

(CBSE Term I, 2022)

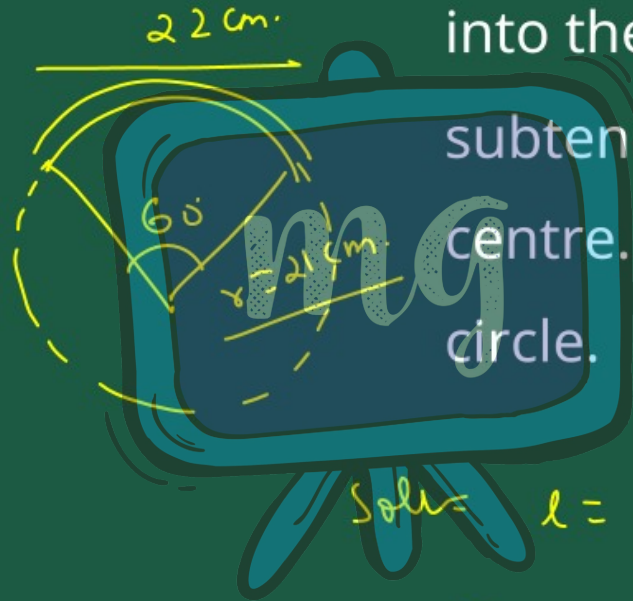


$\frac{9}{360} \times \pi r^2$
 $\frac{1}{4} \times \frac{22}{7} \times 7 \times 7$
 $= \frac{77}{3}$

A. 77 cm²
 B. $12\frac{5}{6}$ cm²
 C. $7\frac{1}{12}$ cm²
 D. $25\frac{2}{3}$ cm²

$1 \text{ min} = 6^\circ$
 $10 \text{ min} = 60^\circ$

3. 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. $\left[\text{Use } \pi = \frac{22}{7} \right]$ (CBSE 2020)

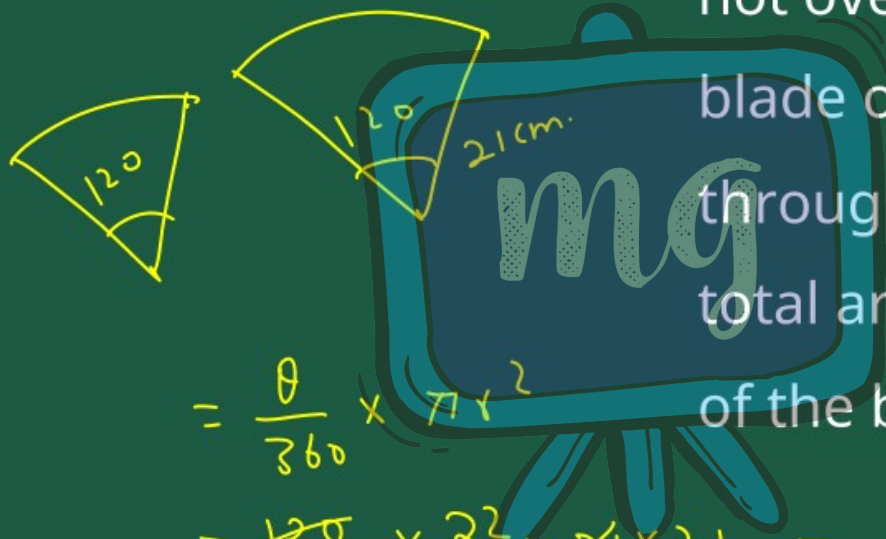


Soln- $l = \frac{\theta}{360} \times 2\pi r$

$$22 = \frac{1}{6} \times 2 \times \frac{22}{7} \times r$$

$$21 = r$$

4. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle 120° . Find the total area cleaned at each sweep of the blades. [Take $\pi = \frac{22}{7}$]



$$\begin{aligned}
 &= \frac{\theta}{360} \times \pi r^2 \\
 &= \frac{120}{360} \times \frac{22}{7} \times 21 \times 21 \\
 &= 22 \times 21 \\
 &= 11 \times 2 \times 21 \\
 &= 11 \times 42 = 462
 \end{aligned}$$

(CBSE 2019)

Total Area swept by the two blades

$$462 \times 2 =$$
$$= 924 \text{ cm}^2$$

5. Find the area of the segment shown in the given figure, if

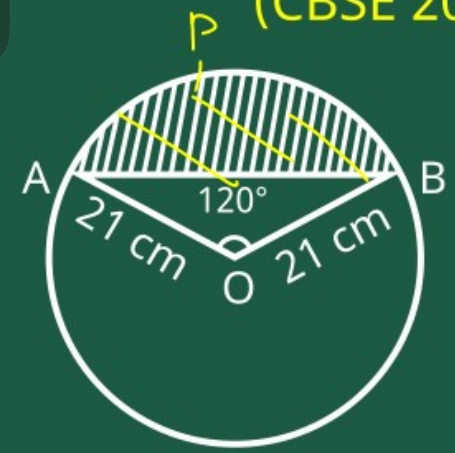
radius of the circle is 21 cm and

$\angle AOB = 120^\circ$. [Use $\pi = \frac{22}{7}$]

(CBSE 2019, NCERT)

Area of sector
 $OAPB =$

$$= \frac{\theta}{360} \times \pi r^2$$
$$= \frac{120}{360} \times \frac{22}{7} \times 21 \times 21$$
$$= 462 \text{ cm}^2$$



$$\frac{OM}{OB} = \cos 60^\circ$$

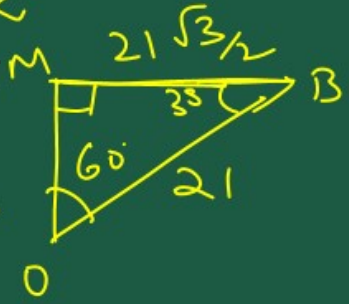
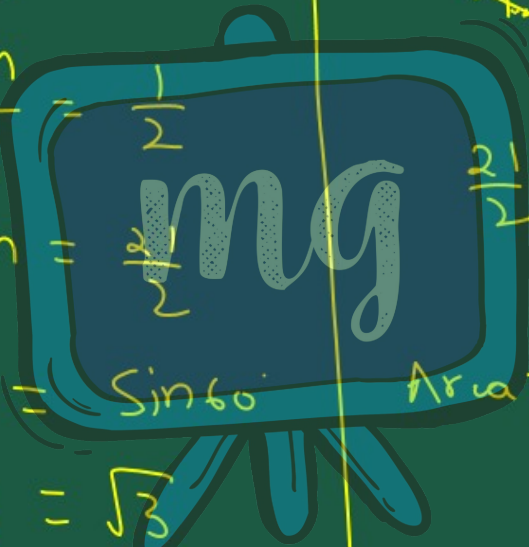
$$\frac{OM}{21} = \frac{1}{2}$$

$$OM = \frac{21}{2}$$

$$\frac{MB}{OB} = \sin 60^\circ$$

$$\frac{MB}{21} = \frac{\sqrt{3}}{2}$$

$$MB = \frac{21\sqrt{3}}{2}$$



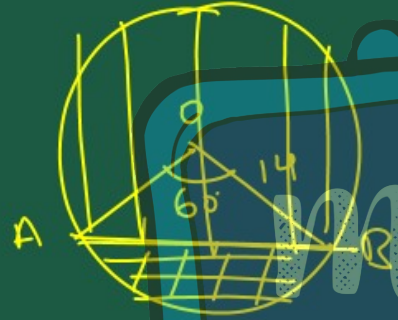
Area of $\Delta = \frac{1}{2} \times 21 \frac{\sqrt{3}}{2} \times \frac{21}{2}$
 $= \frac{(21)^2 \sqrt{3}}{8}$

Area of $\Delta OAB = \frac{(21)^2 \sqrt{3}}{8} \times 2 = \frac{(21)^2 \sqrt{3}}{4}$

Area of segment =

$$\begin{aligned} & \frac{462 - (21)^2 \frac{\sqrt{3}}{4}}{4} \\ &= \frac{21 \left[22 - \frac{21\sqrt{3}}{4} \right]}{4} \text{ cm}^2 \end{aligned}$$

6. A chord of a circle of radius 14 cm subtends an angle of 60° at the centre. Find the area of the corresponding minor segment of the circle. Also find the area of the major segment of the circle.



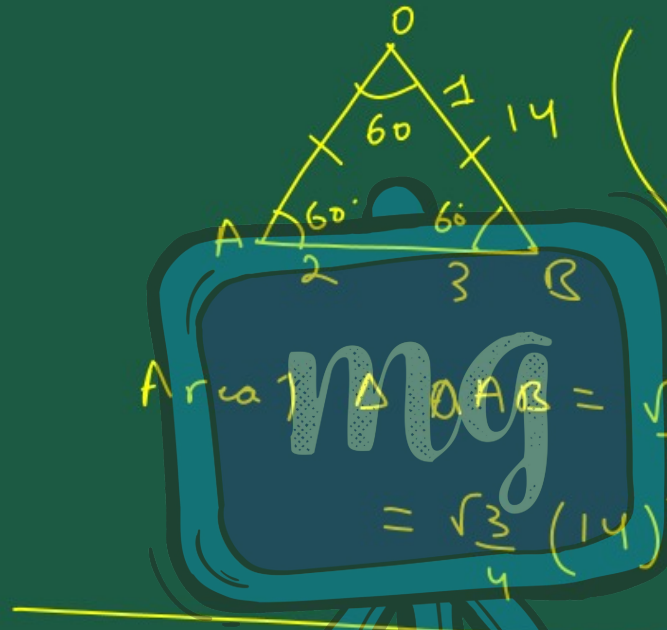
Area of sector =

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

$$\frac{1}{6} \times \frac{22}{7} \times (14)^2$$

$$= \frac{11}{21} (14)^2$$

(CBSE 2023)



$\angle 1 + \angle 2 + \angle 3 = 180^\circ$
 $60^\circ + \angle 2 + \angle 3 = 180^\circ$
 $\angle 2 + \angle 3 = 120^\circ$
 $2\angle 2 = 120^\circ$
 $\angle 2 = 60^\circ$
 $\angle 3 = 60^\circ$

Area of $\triangle OAB = \frac{\sqrt{3}}{4}(\text{side})^2$
 $= \frac{\sqrt{3}}{4}(14)^2$

Area of segment = $\frac{11}{21}(14)^2 - \frac{\sqrt{3}}{4}(14)^2$
 $= (14)^2 \left[\frac{11}{21} - \frac{\sqrt{3}}{4} \right]$

$$(14)^2 \left[\frac{11}{21} - \frac{\sqrt{3}}{4} \right]$$

$$14 \times 14 \left[\frac{44 - 21\sqrt{3}}{84} \right]$$

minor
segment:

$$= \frac{7}{3} \left[44 - 21\sqrt{3} \right]$$

major segment = Area of circle - Area of minor

$$= \pi r^2 - (14)^2 \left[\frac{11}{21} - \frac{\sqrt{3}}{4} \right] \text{segment}$$

$$= \frac{22}{7} \times (14)^2 -$$

$$= (14)^2 \left[\frac{2^2}{7} - \frac{11}{21} + \frac{\sqrt{3}}{4} \right]$$



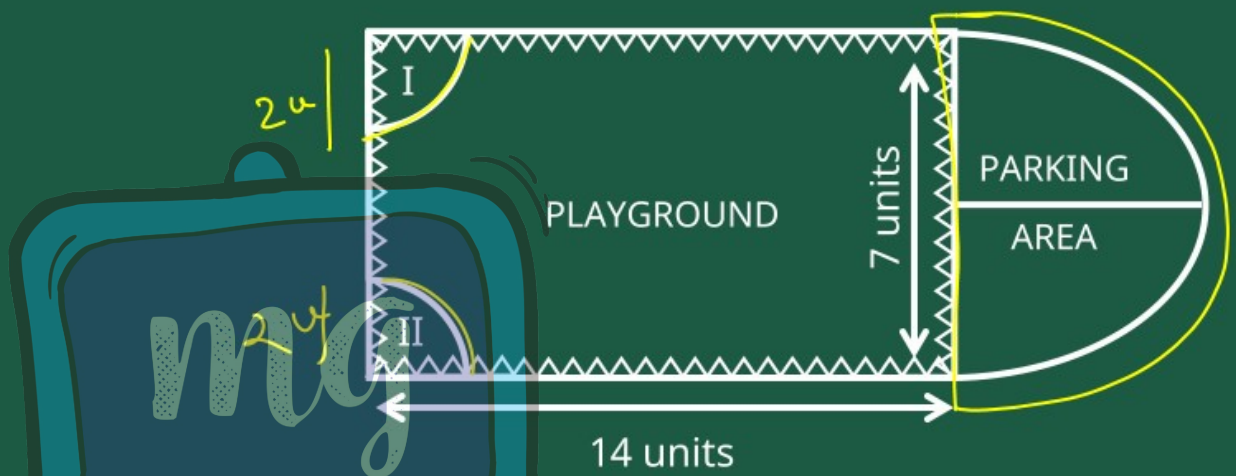
$$= (14)^2 \left[\frac{22 \times 12 - 11 \times 4 + 21\sqrt{3}}{84} \right]$$

$$= \frac{14 \times 14}{7} \left[\frac{220 + 21\sqrt{3}}{84} \right]$$

$$= \frac{7}{3} \left[220 + 21\sqrt{3} \right] \text{ (m}^2\text{)}$$

7. **Case Study** : Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.





$$\begin{aligned} \text{Perimeter of Semicircle} &= 2r + \pi r \\ &= 2 \times \frac{7}{2} + \frac{22}{7} \times \frac{7}{2} \\ &= 18 \text{ units} \end{aligned}$$

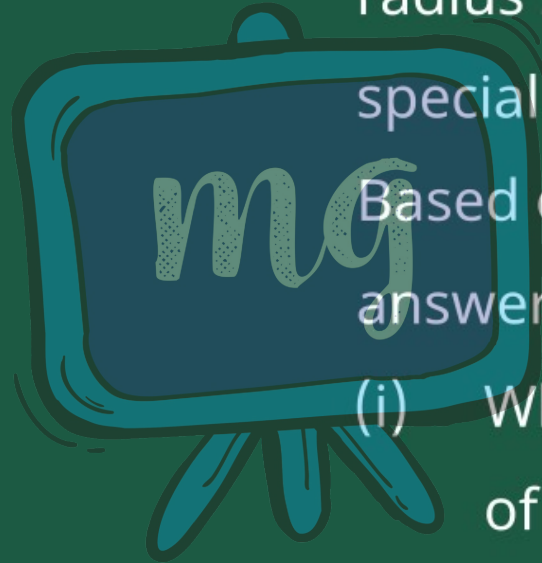
After survey, it was decided to build rectangular playground, with a semi-circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively.



There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions:

- (i) What is the total perimeter of the parking area?



(ii) (a) What is the total area of parking and the two quadrants?

OR

(b) What is the ratio of area of playground to the area of parking area?

(ii) (a)

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

$$= \frac{22}{7} \times \left(\frac{7}{2}\right)^2 + 2 \times \frac{90}{360} \times \frac{22}{7} \times 7^2$$

$$= \frac{11}{2} \times 7 \times 7 + \frac{44}{7}$$

$$= \frac{11 \times 7}{2} + \frac{44}{7}$$

$$\frac{77}{2} + \frac{44}{7}$$

A blue chalkboard with a 'mg' logo in the center. The board contains two math problems written in yellow chalk. The top problem is $\frac{77}{2} + \frac{44}{7}$. The bottom problem is $11 \times \frac{49+8}{28}$. The board has a blue border and three blue legs at the bottom.

$$\frac{57}{28} \times 11$$

$$\begin{array}{r} 627 \\ \hline 28 \end{array}$$

$$\begin{array}{r} 527 \\ 627 \end{array}$$

(b) Play $A_1 = L \times B = 14 \times 7$

Park $A_2 = \frac{178^2}{2} = \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times \frac{1}{2}$

$= 14 \times 14$

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

$= \frac{14 \times 14}{1} = \frac{56}{1}$

(iii) Find the cost of fencing the playground and parking area at the rate of ₹ 2 per unit.

(CBSE 2023)



Total length for Fencing.

$$\begin{aligned}
 &= 14 + 7 + 14 + 7 \\
 &= 28 + 7 + \frac{11}{2} \times \frac{4}{2} \\
 &= 35 + 11 \\
 &= 46 \text{ unit.}
 \end{aligned}$$

$$\text{Cost required} = \text{Length} \times \text{rate}$$



$$= 46 \times 2$$

$$= \underline{92 \text{ Rs.}}$$