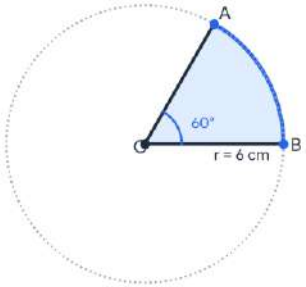
MATHS BASEMAKER

Class 10 CBSE — Chapter 11: Areas Related to Circles

SECTION A: MULTIPLE CHOICE QUESTIONS (4 Questions)

For video solution youtube link : https://youtu.be/crqfPhglidU

Q1. In the given figure, O is the centre of a circle of radius 6 cm. If the sector AOB subtends an angle of 60° at the centre, then the area of the sector is (take π = 22/7):



(a) 132/7 cm²
(b) 66/7 cm²
(c) 144/7 cm²
(d) 112/7 cm²

Q2. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is:

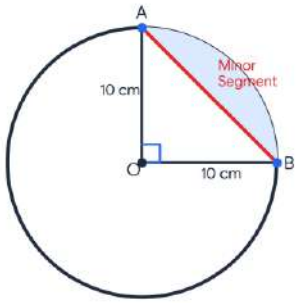
(a) π units
(b) 2 units
(c) 4 units
(d) 7 units

Q3. The length of the minute hand of a clock is 14 cm. The area swept by the minute hand in 5 minutes is (take π = 22/7):

(a) 44/3 cm²
(b) 77/3 cm²
(c) 154 cm²
(d) 154/3 cm²

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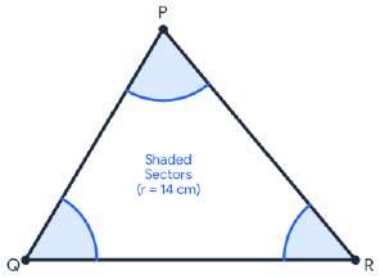
Q4. In the given figure, a chord AB of a circle of radius 10 cm subtends a right angle at the centre O. Find the area of the corresponding minor segment. (take π = 3.14):



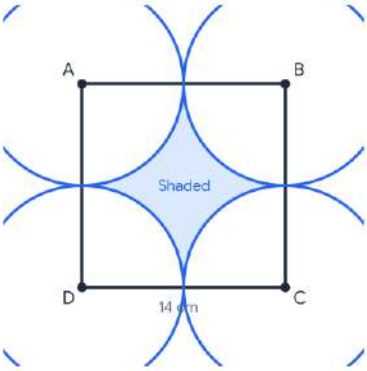
(a) 25.0cm²
(b) 31.4 cm²
(c) 28.5 cm²
(d) 50.0 cm²

SECTION B: DESCRIPTIVE QUESTIONS

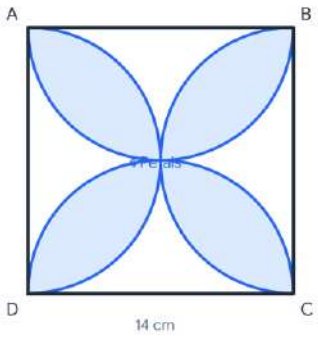
Q5. In the given figure, circular arcs of radii 14 cm each are drawn with centres at the vertices P, Q, and R of a scalene triangle PQR. Find the total area of the three shaded circular sectors formed. (take π = 22/7)



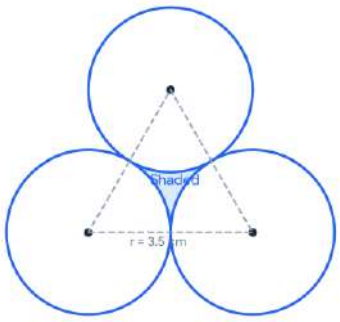
Q6. In the given figure, ABCD is a square of side 14 cm. With centres A, B, C, and D, four arcs of equal radii are drawn such that each circle touches externally two of the remaining three circles. Find the area of the shaded region enclosed between the four circles. (take π = 22/7)



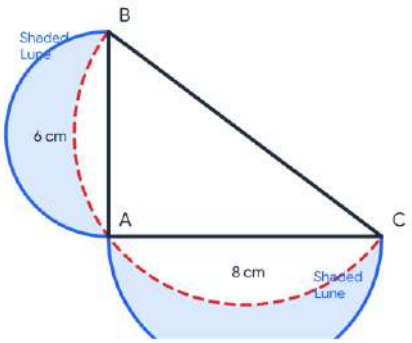
Q7. In the given figure, ABCD is a square of side 14 cm. Semicircles are drawn with each side of the square as diameter. Find the total area of the four shaded petals. (take π = 22/7)



Q8. In the given figure, three circles, each of radius 3.5 cm, are drawn in such a way that each circle touches the other two externally. Find the exact area of the shaded region enclosed between the three circles. (take π = 22/7 and √3 = 1.732)



Q9. In the given figure, triangle ABC is right-angled at A, with AB = 6 cm and AC = 8 cm. Semicircles are drawn on AB, AC, and the hypotenuse BC as diameters. Prove that the total area of the two shaded crescent regions (lunes) is equal to the area of triangle ABC, and hence calculate its value.

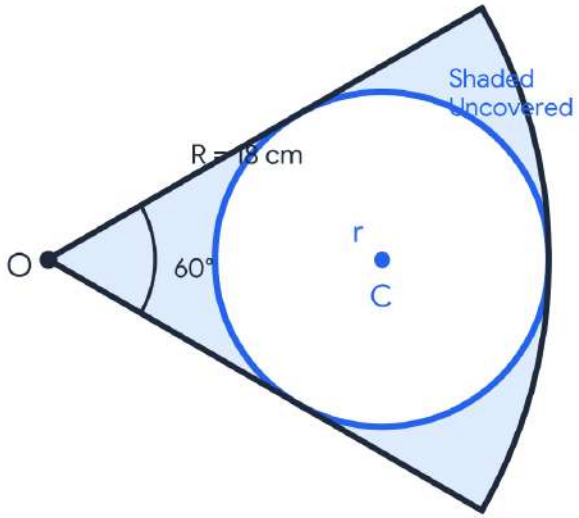


Q10. In the given figure, a circle with centre C and radius r is inscribed inside a circular sector of radius R = 18 cm having a central angle of 60°.

(i) Find the radius r of the inscribed circle.

(ii) Find the area of the sector that is NOT covered by the inscribed circle in terms of π.

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HINTS & STEPS

Q1. Solution & Steps [CBSE Sample Paper MCQ]

Hint: Area of sector = (ϑ / 360°) × πr².

Given: r = 6 cm, θ = 60°, π = 22/7.

Area of sector = (60° / 360°) × (22/7) × 6²

= (1/6) × (22/7) × 36 = 6 × (22/7) = 132/7 cm².

Answer: (a) 132/7 cm²

Q2. Solution & Steps [CBSE Board MCQ]

Hint: Equate circumference to area: 2πr = πr².

Given: Circumference = Area => 2πr = πr²

Dividing both sides by πr (since r > 0):

r = 2 units.

Answer: (b) 2 units

Q3. Solution & Steps [CBSE Board Standard MCQ]

Hint: Minute hand sweeps 360° in 60 minutes. Angle in 5 minutes = (360° / 60) × 5 = 30°.

Radius r = 14 cm, Angle θ = 30°.

Area swept = (θ / 360°) × πr²

= (30° / 360°) × (22/7) × 14 × 14

= (1/12) × (22/7) × 196 = (1/12) × 22 × 28 = (22 × 7) / 3 = 154/3 cm².

Answer: (d) 154/3 cm²

Q4. Solution & Steps [CBSE Sample Paper]

Hint: Area of minor segment = Area of sector AOB - Area of right triangle AOB.

Given: r = 10 cm, θ = 90°, π = 3.14.

Area of sector AOB = (90° / 360°) × 3.14 × 100 = 78.5 cm².

Area of right triangle AOB = (1/2) × 10 × 10 = 50 cm².

Area of minor segment = 78.5 - 50 = 28.5 cm².

Answer: (c) 28.5 cm²

Q5. Solution & Steps [CBSE Exemplar / Board Logical]

Hint: The sum of the three interior angles of any triangle is 180°. Combine the three sectors into a single half-circle sector.

1. Let the angles at vertices P, Q, and R be ∠P, ∠Q, and ∠R.

   By angle sum property of a triangle: ∠P + ∠Q + ∠R = 180°.

2. Total area of 3 sectors =

   [(∠P / 360°) × πr²] + [(∠Q / 360°) × πr²] + [(∠R / 360°) × πr²]

   = [(∠P + ∠Q + ∠R) / 360°] × πr²

   = (180° / 360°) × (22/7) × 14²

   = (1/2) × (22/7) × 196 = (1/2) × 22 × 28 = 11 × 28 = 308 cm².

Answer: 308 cm²

Q6. Solution & Steps [CBSE Board Classic — Kept from Original Set]

Hint: Side of square = 14 cm. Radius of each circle = 14/2 = 7 cm. Area = Area of square - 4 × (Area of quadrant).

1. Side of square a = 14 cm => Area of square ABCD = 14² = 196 cm².

2. Since adjacent circles touch externally: radius r = 14 / 2 = 7 cm.

3. Four corner angles of a square are each 90°.

   Area of 4 quadrants = 4 × [(90° / 360°) × π × r²]

   = 4 × (1/4) × (22/7) × 7² = (22/7) × 49 = 154 cm².

4. Area of shaded enclosed region = 196 - 154 = 42 cm².

Answer: 42 cm²

Q7. Solution & Steps [CBSE Board Classic HOTS — 4 Petals]

Area of two opp. unshaded = ar. Of sq. – ar. Of two opp semicircles = 42

Other two = 42

196-[42+42] = 112 cm².

Answer: 112 cm²

Q8. Solution & Steps [CBSE Board HOTS / Olympiad]

Hint: Connecting the centres of the three touching circles forms an equilateral triangle. Area of shaded region = Area of equilateral triangle - 3 × (Area of 60° sector).

1. Let centres be O_1, O_2, O_3. Distance between centres = r + r = 3.5 + 3.5 = 7 cm.
   Triangle $O_1O_2O_3$ is equilateral with side a = 7 cm.
2. Area of equilateral triangle = $(\sqrt{3} / 4) \times a^2$
   $= (1.732 / 4) \times 7^2 = (1.732 / 4) \times 49 = 21.217$ cm².
3. Each angle of equilateral triangle is 60°.
   Sum of areas of 3 sectors = $3 \times [(60° / 360°) \times \pi \times r^2]$
   $= 3 \times (1/6) \times (22/7) \times (3.5)^2 = (1/2) \times (22/7) \times 12.25 = 11 \times 1.75 = 19.25$ cm².
4. Area of shaded enclosed region = 21.217 - 19.25 = 1.967 cm² (approx 1.97 cm²).

Answer: 1.967 cm² (or 1.97 cm²)

Q9. Solution & Steps [CBSE Board Classic 4-Marker — Lunes]

Hint: By Pythagoras theorem, the sum of areas of semicircles on legs equals the area of semicircle on hypotenuse. The area of lunes simplifies exactly to the area of the right triangle.

1. In right triangle ABC: $BC = \sqrt{(AB^2 + AC^2)} = \sqrt{(6^2 + 8^2)} = \sqrt{100} = 10$ cm.
2. Area of semicircle on AB (radius 3 cm) = $(1/2) \times \pi \times 3^2 = 4.5\pi$ cm².
   Area of semicircle on AC (radius 4 cm) = $(1/2) \times \pi \times 4^2 = 8.0\pi$ cm².
   Sum of two leg semicircles = $4.5\pi + 8.0\pi = 12.5\pi$ cm².
3. Area of semicircle on hypotenuse BC (radius 5 cm) = $(1/2) \times \pi \times 5^2 = 12.5\pi$ cm².
   Notice: Area(semicircle AB) + Area(semicircle AC) = Area(semicircle BC).
4. Area of shaded lunes = [Area(semicircle AB) + Area(semicircle AC) + Area(triangle ABC)] - Area(semicircle BC)
   = Area(triangle ABC) = (1/2) × base × height = (1/2) × 8 × 6 = 24 cm².

Answer: 24 cm²

Q10. Solution & Steps [CBSE Board 5-Marker HOTS]

Hint: Use trigonometry on the bisector of the 60° central angle to relate sector radius R

to inscribed circle radius r: sin 30° = r / (R - r). Express final areas in terms of π.

1. Let sector centre be O, central angle = 60°, and radius R = 18 cm.
   Let centre of small circle be C with radius r.
   Line OC bisects the 60° angle, so ∠(radius to tangent) = 30°.
   Distance from O to C: OC = R - r = 18 - r.
2. In right triangle formed by OC and radius to touch point:
   sin 30° = r / OC => OC= 2r

OC +r = 18 , r = 3 cm

3. (i) Radius of inscribed circle r = 6 cm.
4. (ii) Area of sector in terms of π:
   Area(sector) = (60° / 360°) × π × 18^2 = (1/6) × 324π = 54π cm^2.
   Area of inscribed circle in terms of π:
   Area(circle) = π × r^2 = π × 6^2 = 36π cm^2.
5. Area of sector NOT covered by the inscribed circle:
   Uncovered Area = 54π - 36π = 18π cm^2.

Answer: (i) r = 6 cm, (ii) 18π cm^2