MATHS BASE MAKER

Class 9 CBSE Mathematics | Ganita Manjari

Chapter 6: Perimeter and Area

STUDENT PRACTICE WORKSHEET (concept + questions)

PART 1: MASTER FORMULAS & CONCEPTS AT A GLANCE

Concept of Perimeter	Total boundary distance around a closed 2D plane shape. • Rectangle: P = 2(l + b) • Square: P = 4 × side (Ratio of P to side stays fixed at 4 : 1) • Equilateral Triangle: P = 3 × side (Ratio of P to side stays fixed at 3 : 1)
Circumference & Nature of π	• Circumference: C = 2πr = πd (where d = 2r). • Constant ratio: C / d = π ≈ 22/7 or 3.14159... • π is an IRRATIONAL number (non-terminating, non-repeating decimal expansion; 355/113 is a closer rational approximation than 22/7).
Arc Length of a Circle	Length of an arc subtending angle θ at centre: L = (θ / 360°) × 2πr
Area of Sector of a Circle	Area enclosed by two radii and arc of angle θ: Area = (θ / 360°) × πr^2
Area of General Triangles	• Standard / Right-Angled Triangle: Area = ½ × base × height • Heron's Formula (all scalene triangles): Area = $\sqrt{[s(s-a)(s-b)(s-c)]}$, where semi-perimeter s = (a + b + c) / 2
Area of Isosceles Triangle	For equal sides 'a' and base 'b': Area = (b / 4) × $\sqrt{(4a^2 - b^2)}$
Circumradius (R) Formula	Circle passing through all 3 vertices of triangle ABC: Area of ΔABC = abc / (4R) => R = abc / (4 × Area)

Inradius (r) Formula	Circle inscribed inside triangle touching all 3 sides: Area of ΔABC = r × s = r × (a + b + c) / 2 => r = Area / s
Brahmagupta's Formula	For the Area of a Cyclic Quadrilateral with sides a, b, c, d: Area = √[(s – a)(s – b)(s – c)(s – d)], where s = (a + b + c + d) / 2
Rectangle from Brahmagupta	For a rectangle with sides a, b, a, b (concyclic with s = a + b): Area = √[(s – a)(s – b)(s – a)(s – b)] = √(b · a · b · a) = a × b (Length × Breadth)

PART 2: PRACTICE QUESTIONS (WITH FINAL ANSWERS)

Watch the Complete Chapter 6 Video Solutions on YouTube

https://youtu.be/9oxX0OwhtaE

Question 1: Corner Cutout from a Square Sheet

A large square sheet of paper has an initial perimeter of 40 cm. A child cuts a small square of side 2 cm out from one of its corners for project work. Find:
(i) The perimeter of the remaining shape.
(ii) The area of the remaining shape.

Final Answer: (i) Perimeter = 40 cm (remains unchanged)
(ii) Area = 96 cm^2 [Original Area: $10^2 = 100$ cm^2; Cutout: $2^2 = 4$ cm^2; Remaining: $100 – 4 = 96$ cm^2]

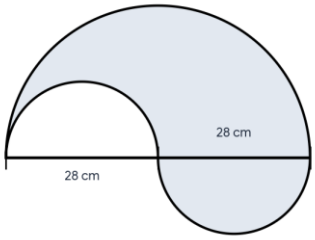
Question 2: Boundary of Park with Semicircular Flower Beds

A rectangular park of length 20 m and breadth 14 m has two semicircular flower beds constructed on both of its shorter sides (diameter = 14 m). Find the total perimeter of the outer park boundary. (Take π = 22/7)

Final Answer: Total Perimeter = 84 m
[Boundary = 2 × Length + Circumference of 1 full circle = 2(20) + 2π(7) = 40 + 44 = 84 m]

Question 3: Perimeter of Shaded Curved Boundary

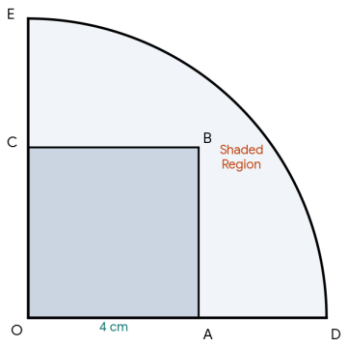
Find the total perimeter of the shaded region shown in the figure, consisting of a large outer semicircular arc of diameter 56 cm (28 cm + 28 cm) and two identical inner semicircular boundary arcs of diameter 28 cm each. (Take π = 22/7)



Final Answer: **Perimeter = 176 cm**
[Outer Arc: πR = (22/7) × 28 = 88 cm;
Two Inner Arcs: 2 × (πr) = 2 × ((22/7) × 14) = 88 cm;
Total Boundary = 88 + 88 = 176 cm]

Question 4: Area of Shaded Region (Quadrant minus Square)

In the given figure, OABC is a square of side 4 cm inscribed inside a circular sector OED of angle 90° with centre O. If EC = 3 cm, making the total radius OE = 7 cm, find the area of the shaded region. (Take π = 22/7)



Final Answer: **Area = 22.5 cm^2**
[Area of Quadrant OED = ¼ × (22/7) × 7^2 = 38.5 cm^2;
Area of Square OABC = 4 × 4 = 16 cm^2;
Shaded Area = 38.5 – 16 = 22.5 cm^2]

Question 5: Minor Arc Angle and Length from Major Arc Ratio

The measure of a minor arc of a circle is 4/11 of the measure of its corresponding major arc. If the radius of the circle is 7 cm, find:
(i) The central angle subtended by the minor arc.
(ii) The length of the minor arc. (Take π = 22/7)

Final Answer: **(i) Central Angle = 96° [θ + (11/4)θ = 360° => θ = 96°]**
(ii) Length of Minor Arc = 176/15 cm (or 11.73 cm)

Question 6: Area of Triangle with Sides in Ratio (Heron's Formula)

The sides of a triangular field are in the ratio 3 : 5 : 4 and its perimeter is 800 m. Find the area of the triangle.

Final Answer: **Area = 26,666.67 m^2 (or 80,000/3 m^2)**
[Sides: 200 m, 333.33 m, 266.67 m; Since 3:4:5 forms a right triangle, Area = ½ × base × height = ½ × 200 × (800/3) = 80,000/3 m^2]

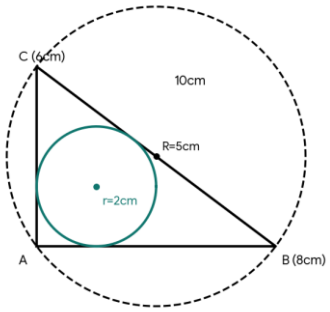
Question 7: Area of Isosceles Triangle

Find the area of an isosceles triangle if each of the two equal sides measures 5 cm and the base measures 6 cm.

Final Answer: **Area = 12 cm^2**
[Using A = (b/4)√(4a^2 – b^2): A = (6/4)√(4(25) – 36) = 1.5 × √64 = 1.5 × 8 = 12 cm^2]

Question 8: Area of Triangle via Circumradius & Inradius (Two Ways)

The sides of a triangle are 6 cm, 8 cm, and 10 cm. The circumradius R is 5 cm and the inradius r is 2 cm. Without using Heron's formula, calculate the area of the triangle in two different ways:
(i) Using the circumradius formula.
(ii) Using the inradius formula.



Final Answer: **Area = 24 cm^2 in both ways**
[(i) Area = abc / (4R) = (6 × 8 × 10) / (4 × 5) = 480 / 20 = 24 cm^2;
(ii) Area = r × s = 2 × ((6 + 8 + 10) / 2) = 2 × 12 = 24 cm^2]

Question 9: Deriving Area of Rectangle from Brahmagupta's Formula

A rectangle has length 'a' and breadth 'b'. Since every rectangle is a cyclic quadrilateral with opposite pairs of equal sides (a, b, a, b), use Brahmagupta's formula to derive its area formula.

Final Answer: **Area = a × b (Length × Breadth)**
[Semi-perimeter s = (a + b + a + b)/2 = a + b.
Brahmagupta's Area = √[(s – a)(s – b)(s – a)(s – b)] = √[b · a · b · a] = √(a^2b^2) = a · b]

Video solution on YouTube

https://youtu.be/9oxX0OwhtaE