MATHEMATICS

CBSE

CLASS 8

As per the updated NCERT textbook Ganita Prakash (Part 1 & Part 2)

Question Bank with IIT Foundation

(14 Chapters · 2,100+ Questions · 700+ IIT Foundation Questions · Detailed Step-by-Step Solutions)

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Each chapter: Chapter at a Glance
· Level 1 questions (Easy, Medium, Tough) with solutions
· IIT Foundation Questions & its Answers

Part 2 · Chapter 7: Area

Chapter at a Glance

1. Basic Area Formulas

Shape	Area
Rectangle	$l \times b$
Square	a^2 (or $\frac{d^2}{2}$ from the diagonal)
Parallelogram	base × height $= bh$
Triangle	$\frac{1}{2}\times$ base × height
Trapezium	$\frac{1}{2}(a+b)h$ (a, b parallel sides)
Rhombus / kite	$\frac{1}{2}d_1d_2$ (product of diagonals ÷ 2)
Quadrilateral	$\frac{1}{2}d(h_1+h_2)$ (diagonal and offsets)

- A parallelogram can be cut and rearranged into a rectangle with the same base and height; two copies of a triangle make a parallelogram, giving the $\frac{1}{2}$.
- The height must be perpendicular to the base.

2. Units

1 m² $= 10000$ cm²; 1 hectare (ha) $= 10000$ m²; 1 km² $= 100$ ha.

3. Composite Shapes and Paths

- Split a figure into rectangles, triangles and trapeziums, or subtract a missing part.
- Path of width w outside an $l \times b$ rectangle: $(l+2w)(b+2w) - lb$; inside: $lb - (l-2w)(b-2w)$.
- Two crossing paths of width w through an $l \times b$ field: $wl + wb - w^2$ (the middle square is counted once).

4. Scaling

If every length is multiplied by k, the area is multiplied by k^2: doubling the sides of a square makes its area 4 times. On a map of scale $1:n$, areas are scaled by n^2.

Multiple Choice Questions

Level 1: Standard

Easy (15 questions)

Q1. The area of a rectangle 8 cm by 5 cm is
(a) 40 cm² **(b)** 26 cm² **(c)** 13 cm² **(d)** 80 cm²

Q2. A triangle has base 10 cm and height 6 cm. Its area is
(a) 60 cm² **(b)** 30 cm² **(c)** 16 cm² **(d)** 36 cm²

Q3. A parallelogram has base 9 cm and height 4 cm. Its area is
(a) 18 cm² **(b)** 26 cm² **(c)** 36 cm² **(d)** 13 cm²

Q4. A trapezium has parallel sides 6 cm and 10 cm and height 5 cm. Its area is
(a) 80 cm² **(b)** 21 cm² **(c)** 30 cm² **(d)** 40 cm²

Q5. A rhombus has diagonals 8 cm and 6 cm. Its area is
(a) 24 cm² **(b)** 48 cm² **(c)** 14 cm² **(d)** 28 cm²

Q6. The area of a square of side 7 m is
(a) 28 m² **(b)** 49 m² **(c)** 14 m² **(d)** 21 m²

Q7. 1 m² is equal to
(a) 100 cm² **(b)** 1000 cm² **(c)** 10000 cm² **(d)** 10 cm²

Q8. A triangle has area 24 cm² and base 8 cm. Its height is
(a) 3 cm **(b)** 12 cm **(c)** 4 cm **(d)** 6 cm

Q9. A parallelogram has area 72 cm² and height 8 cm. Its base is
(a) 9 cm **(b)** 18 cm **(c)** 64 cm **(d)** 576 cm

Q10. A kite has diagonals 12 cm and 9 cm. Its area is
(a) 108 cm² **(b)** 54 cm² **(c)** 21 cm² **(d)** 42 cm²

Q11. 1 hectare is equal to
(a) 100 m² **(b)** 1000 m² **(c)** 10000 m² **(d)** 100000 m²

Q12. A square has a diagonal of 10 cm. Its area is
(a) 100 cm² **(b)** 20 cm² **(c)** 40 cm² **(d)** 50 cm²

Q13. If both sides of a rectangle are doubled, its area becomes
(a) 4 times **(b)** 2 times **(c)** the same **(d)** 8 times

Q14. A right triangle has legs 6 cm and 8 cm. Its area is
(a) 48 cm² **(b)** 24 cm² **(c)** 14 cm² **(d)** 40 cm²

Q15. The area of a triangle is
(a) base × height **(b)** base + height
(c) half of base × height **(d)** twice base × height

Easy (15 questions) – Solutions

1. **Formula:** $l \times b$.
Answer: (a) 40 cm²
Step 1: $8 \times 5 = 40$.

2. **Formula:** $\frac{1}{2}bh$.
Answer: (b) 30 cm²
Step 1: $\frac{1}{2} \times 10 \times 6 = 30$.

3. **Formula:** bh.
Answer: (c) 36 cm²
Step 1: 36.

4. **Formula:** $\frac{1}{2}(a+b)h$.
Answer: (d) 40 cm²
Step 1: $\frac{1}{2} \times 16 \times 5 = 40$.

5. **Formula:** $\frac{1}{2}d_1d_2$.
Answer: (a) 24 cm²
Step 1: $\frac{1}{2} \times 48 = 24$.

6. **Formula:** a^2.
Answer: (b) 49 m²
Step 1: 49.

7. **Formula:** 1 m $= 100$ cm.
Answer: (c) 10000 cm²
Step 1: $100 \times 100 = 10000$.

8. **Formula:** $h = \frac{2A}{b}$.
Answer: (d) 6 cm
Step 1: $48 \div 8 = 6$.

9. **Formula:** $b = \frac{A}{h}$.
Answer: (a) 9 cm
Step 1: 9.

10. **Formula:** $\frac{1}{2}d_1d_2$.
Answer: (b) 54 cm²
Step 1: 54.

11. **Formula:** Unit fact.
Answer: (c) 10000 m²
Step 1: 10000 m².

12. **Formula:** $\frac{d^2}{2}$.
Answer: (d) 50 cm²
Step 1: $\frac{100}{2} = 50$.

13. **Formula:** Area scales by k^2.
Answer: (a) 4 times
Step 1: $2^2 = 4$.

14. **Formula:** The legs are base and height.
Answer: (b) 24 cm²
Step 1: $\frac{1}{2} \times 6 \times 8 = 24$.

15. **Formula:** Two triangles make a parallelogram.
Answer: (c) half of base × height
Step 1: $\frac{1}{2}bh$.

Medium (15 questions)

Q16. A trapezium has area 84 cm² and parallel sides 10 cm and 14 cm. Its height is
(a) 7 cm **(b)** 6 cm **(c)** 8 cm **(d)** 3.5 cm

Q17. A rhombus has side 13 cm and one diagonal 24 cm. Its area is
(a) 156 cm² **(b)** 120 cm² **(c)** 60 cm² **(d)** 312 cm²

Q18. A 2 m wide path runs outside a 20 m by 10 m garden. The path area is
(a) 120 m² **(b)** 100 m² **(c)** 136 m² **(d)** 336 m²

Q19. Two 2 m wide paths cross through the middle of a 30 m by 20 m field, parallel to its sides. Their area is
(a) 100 m² **(b)** 104 m² **(c)** 92 m² **(d)** 96 m²

Q20. A quadrilateral has a diagonal of 16 cm and offsets 5 cm and 7 cm. Its area is
(a) 96 cm² **(b)** 192 cm² **(c)** 80 cm² **(d)** 112 cm²

Q21. If a triangle's base is doubled and its height halved, its area
(a) doubles **(b)** stays the same
(c) halves **(d)** becomes 4 times

Q22. The area of an equilateral triangle of side 4 cm is
(a) 8 cm² **(b)** 16 cm² **(c)** $4\sqrt{3}$ cm² **(d)** $8\sqrt{3}$ cm²

Q23. A parallelogram has sides 12 cm and 8 cm; the height to the 12 cm side is 6 cm. The height to the 8 cm side is
(a) 4 cm **(b)** 16 cm **(c)** 6 cm **(d)** 9 cm

Q24. A trapezium with parallel sides 15 cm and 9 cm has area 96 cm². Its height is
(a) 8 cm **(b)** 4 cm **(c)** 6.4 cm **(d)** 12 cm

Q25. A rectangle has area 120 m² and length 15 m. Its perimeter is
(a) 30 m **(b)** 46 m **(c)** 54 m **(d)** 23 m

Q26. A 6 m by 4 m floor is covered with 50 cm square tiles. The number of tiles is
(a) 24 **(b)** 48 **(c)** 96 **(d)** 960

Q27. The triangle with vertices $(0,0)$, $(6,0)$ and $(0,4)$ has area
(a) 24 **(b)** 10 **(c)** 20 **(d)** 12

Q28. On a plan of scale $1:100$, a room has area 6 cm². Its real area is
(a) 6 m² **(b)** 600 cm² **(c)** 60 m² **(d)** 0.6 m²

Q29. A kite has area 60 cm² and one diagonal 12 cm. The other diagonal is
(a) 5 cm **(b)** 10 cm **(c)** 20 cm **(d)** 720 cm

Q30. An isosceles triangle has sides 10, 10 and 12 cm. Its area is
(a) 60 cm² **(b)** 96 cm² **(c)** 48 cm² **(d)** 120 cm²

Medium (15 questions) – Solutions

16. Formula: $h = \frac{2A}{a+b}$.
Answer: (a) 7 cm
Step 1: $168 \div 24 = 7$.

17. Formula: Find the other diagonal.
Answer: (b) 120 cm²
Step 1: Half-diagonals 12 and 5: other diagonal 10.
Step 2: $\frac{1}{2} \times 24 \times 10 = 120$.

18. Formula: Outer − inner.
Answer: (c) 136 m²
Step 1: $24 \times 14 - 200 = 136$.

19. Formula: $wl + wb - w^2$.
Answer: (d) 96 m²
Step 1: $60 + 40 - 4 = 96$.

20. Formula: $\frac{1}{2}d(h_1 + h_2)$.
Answer: (a) 96 cm²
Step 1: $8 \times 12 = 96$.

21. Formula: $\frac{1}{2}(2b)(\frac{h}{2})$.
Answer: (b) stays the same
Step 1: Same.

22. Formula: Height $= 2\sqrt{3}$.
Answer: (c) $4\sqrt{3}$ cm²
Step 1: $\frac{1}{2} \times 4 \times 2\sqrt{3} = 4\sqrt{3}$.

23. Formula: Area is the same either way.
Answer: (d) 9 cm
Step 1: Area $= 72$; $72 \div 8 = 9$.

24. Formula: $h = \frac{2A}{a+b}$.
Answer: (a) 8 cm
Step 1: $192 \div 24 = 8$.

25. Formula: Find the breadth.
Answer: (b) 46 m
Step 1: $b = 8$; $2(15 + 8) = 46$.

26. Formula: Count along each side.
Answer: (c) 96
Step 1: $12 \times 8 = 96$.

27. Formula: Right triangle.
Answer: (d) 12
Step 1: $\frac{1}{2} \times 6 \times 4 = 12$.

28. Formula: Areas scale by 100^2.
Answer: (a) 6 m²
Step 1: 6×10000 cm² $= 6$ m².

29. Formula: $d_2 = \frac{2A}{d_1}$.
Answer: (b) 10 cm
Step 1: $120 \div 12 = 10$.

30. Formula: Height to the base.
Answer: (c) 48 cm²
Step 1: $\sqrt{100 - 36} = 8$; $\frac{1}{2} \times 12 \times 8 = 48$.

Tough (10 questions)

Q31. A rhombus has perimeter 52 cm and one diagonal 10 cm. Its area is
(a) 120 cm² **(b)** 130 cm² **(c)** 65 cm² **(d)** 240 cm²

Q32. An isosceles trapezium has parallel sides 20 cm and 8 cm and slant sides 10 cm. Its area is
(a) 140 cm² **(b)** 112 cm² **(c)** 160 cm² **(d)** 96 cm²

Q33. If the area of a square is doubled, its side is multiplied by
(a) 2 **(b)** 4 **(c)** $\sqrt{2}$ **(d)** $\frac{1}{2}$

Q34. A rectangle has diagonal 25 cm and one side 7 cm. Its area is
(a) 175 cm² **(b)** 200 cm² **(c)** 84 cm² **(d)** 168 cm²

Q35. A triangle has sides 13, 14 and 15 cm. Its area is
(a) 84 cm² **(b)** 91 cm² **(c)** 105 cm² **(d)** 42 cm²

Q36. A regular hexagon of side 2 cm is made of 6 equilateral triangles. Its area is
(a) 12 cm² **(b)** $6\sqrt{3}$ cm² **(c)** $12\sqrt{3}$ cm² **(d)** $3\sqrt{3}$ cm²

Q37. A 2.5 m wide path runs along the inside of a 40 m by 30 m field. Its area is
(a) 350 m² **(b)** 300 m² **(c)** 325 m² **(d)** 275 m²

Q38. Joining the midpoints of the sides of a triangle of area 64 cm² gives a triangle of area
(a) 32 cm² **(b)** 8 cm² **(c)** 24 cm² **(d)** 16 cm²

Q39. A trapezium of area 180 cm² and height 12 cm has one parallel side 3 times the other. The shorter is
(a) 7.5 cm **(b)** 10 cm **(c)** 5 cm **(d)** 15 cm

Q40. Squares of sides 5 cm and 12 cm are replaced by one square of the same total area. Its side is
(a) 17 cm **(b)** 13 cm **(c)** 7 cm **(d)** 169 cm

Tough (10 questions) – Solutions

31. Formula: Side 13; half-diagonals 5 and 12.
Answer: (a) 120 cm²
Step 1: Other diagonal 24: $\frac{1}{2} \times 10 \times 24 = 120$.

32. Formula: Find the height.
Answer: (b) 112 cm²
Step 1: Overhang $= 6$: height $\sqrt{100 - 36} = 8$.
Step 2: $\frac{1}{2} \times 28 \times 8 = 112$.

33. Formula: Area $= a^2$.
Answer: (c) $\sqrt{2}$
Step 1: $(ka)^2 = 2a^2$ gives $k = \sqrt{2}$.

34. Formula: Other side by Pythagoras.
Answer: (d) 168 cm²
Step 1: 24 cm; $7 \times 24 = 168$.

35. Formula: Altitude to 14 is 12 (5 + 9 split).
Answer: (a) 84 cm²
Step 1: $\frac{1}{2} \times 14 \times 12 = 84$.

36. Formula: Each triangle has area $\sqrt{3}$.
Answer: (b) $6\sqrt{3}$ cm²
Step 1: $6 \times \sqrt{3}$.

37. Formula: Field − inner rectangle.
Answer: (c) 325 m²
Step 1: Inner $35 \times 25 = 875$; $1200 - 875 = 325$.

38. Formula: The sides are halved.
Answer: (d) 16 cm²
Step 1: Area $\times \frac{1}{4}$: 16.

39. Formula: $a + 3a = 30$.
Answer: (a) 7.5 cm
Step 1: $a = 7.5$.

40. Formula: $25 + 144 = 169$.
Answer: (b) 13 cm
Step 1: 13.

Very Short Answer Questions

Level 1: Standard

Easy (10 questions)

Q1. Find the area of a rectangle 12 m by 7 m.

Q2. Find the area of a triangle with base 14 cm and height 5 cm.

Q3. Find the area of a parallelogram with base 11 cm and height 6 cm.

Q4. Find the area of a rhombus with diagonals 10 cm and 7 cm.

Q5. Convert 3 m² to cm².

Q6. Find the area of a square of side 9 cm.

Q7. Find the area of a trapezium with parallel sides 8 and 12 m and height 4 m.

Q8. A triangle has area 30 cm² and height 6 cm. Find its base.

Q9. Convert 2.5 hectares to m².

Q10. A square has area 64 m². Find its side.

Easy (10 questions) – Solutions

Q1. Formula: Rectangle: A = l × b
Step 1: 12×7.
Answer: 84 m².

Q2. Formula: Triangle: A = ½ × b × h
Step 1: $\frac{1}{2} \times 14 \times 5$.
Answer: 35 cm².

Q3. Formula: Parallelogram: A = b × h
Step 1: 11×6.
Answer: 66 cm².

Q4. Formula: Rhombus / kite: A = ½ × d_1 × d_2
Step 1: $\frac{1}{2} \times 70$.
Answer: 35 cm².

Q5. Formula: 1 m² = 10000 cm²; 1 ha = 10000 m²
Step 1: 3×10000.
Answer: 30000 cm².

Q6. Formula: Square: A = a² = d²/2
Step 1: 81.
Answer: 81 cm².

Q7. Formula: Trapezium: A = ½(a + b)h
Step 1: $\frac{1}{2} \times 20 \times 4$.
Answer: 40 m².

Q8. Formula: Triangle: A = ½ × b × h
Step 1: $60 \div 6$.
Answer: 10 cm.

Q9. Formula: 1 m² = 10000 cm²; 1 ha = 10000 m²
Step 1: 2.5×10000.
Answer: 25000 m².

Q10. Formula: Square: A = a² = d²/2
Step 1: $\sqrt{64}$.
Answer: 8 m.

Medium (5 questions)

Q11. A trapezium has area 90 cm², height 6 cm, and one parallel side 12 cm. Find the other.

Q12. Find the area of a square whose diagonal is 12 cm.

Q13. A 1 m wide path goes around the outside of a 10 m by 6 m lawn. Find its area.

Q14. Find the area of a rhombus with side 10 cm and one diagonal 12 cm.

Q15. A rectangle's sides are each tripled. How many times is the area?

Medium (5 questions) – Solutions

Q11. **Formula:** Trapezium: A = ½(a + b)h

Step 1: $\frac{1}{2}(12 + b) \times 6 = 90$.

Answer: 18 cm.

Q12. **Formula:** Square: A = a² = d²/2

Step 1: $\frac{144}{2}$.

Answer: 72 cm².

Q13. **Formula:** Path outside: (l + 2w)(b + 2w) − lb

Step 1: $12 \times 8 - 60$.

Answer: 36 m².

Q14. **Formula:** Rhombus / kite: A = ½ × d_1 × d_2

Step 1: Other half-diagonal 8: diagonal 16.

Step 2: $\frac{1}{2} \times 12 \times 16$.

Answer: 96 cm².

Q15. **Formula:** Scale k ⟹ area × k²

Step 1: 3^2.

Answer: 9 times.

Tough (5 questions)

Q16. Find the area of an equilateral triangle of side 6 cm.

Q17. A rectangle has perimeter 34 cm and diagonal 13 cm. Find its area.

Q18. Two 3 m wide paths cross a 50 m by 40 m park through its middle. Find their area.

Q19. Find the area of a quadrilateral with diagonal 18 cm and offsets 4 cm and 6 cm.

Q20. A triangle with sides 5, 12, 13 cm: find its area and the altitude to the longest side.

Tough (5 questions) – Solutions

Q16. **Formula:** Equilateral triangle: A = (√3/4)a²

Step 1: Height $3\sqrt{3}$.

Answer: $9\sqrt{3}$ cm².

Q17. **Formula:** Rectangle: A = l × b; d² = l² + b²

Step 1: Sides 5 and 12.

Answer: 60 cm².

Q18. **Formula:** Crossing paths: wl + wb − w²

Step 1: $150 + 120 - 9$.

Answer: 261 m².

Q19. **Formula:** Quadrilateral: A = ½ × d × (h_1 + h_2)

Step 1: $\frac{1}{2} \times 18 \times 10$.

Answer: 90 cm².

Q20. **Formula:** Triangle: A = ½ × b × h; altitude = 2A ÷ base

Step 1: Area 30.

Step 2: $\frac{60}{13}$.

Answer: 30 cm²; $\frac{60}{13}$ cm.

Short Answer Questions

Level 1: Standard

Easy (10 questions)

Q1. Find the cost of carpeting a 6 m by 4.5 m room at ₹150 per m².

Q2. Find the area of a triangle with base 16 cm and height 9 cm, and the height if the base were 24 cm with the same area.

Q3. A parallelogram has base 14 cm and area 98 cm². Find its height.

Q4. Find the area of a trapezium with parallel sides 9 cm and 15 cm and height 6 cm.

Q5. A rhombus-shaped tile has diagonals 30 cm and 20 cm. Find its area and the number needed for 6 m².

Q6. A square garden has area 400 m². Find the fencing needed.

Q7. How many 20 cm square tiles cover a 4 m by 3 m floor?

Q8. A plot is 2 ha. How many m²? If 30% is built on, find the built area.

Q9. Find the area of an L-shape made of a 10 m by 4 m and a 6 m by 3 m rectangle (not overlapping).

Q10. A kite has diagonals 16 cm and 11 cm. Find its area.

Easy (10 questions) – Solutions

Q1. Formula: Rectangle: A = l × b; Cost = area × rate
Step 1: Area $= 27$ m².
Step 2: 27×150.
Answer: ₹4050.

Q2. Formula: Triangle: A = ½ × b × h
Step 1: Area $= 72$.
Step 2: $144 \div 24 = 6$.
Answer: 72 cm²; 6 cm.

Q3. Formula: Parallelogram: A = b × h
Step 1: $98 \div 14$.
Answer: 7 cm.

Q4. Formula: Trapezium: A = ½(a + b)h
Step 1: $\frac{1}{2} \times 24 \times 6$.
Answer: 72 cm².

Q5. Formula: Rhombus / kite: A = ½ × d_1 × d_2
Step 1: Area $= 300$ cm².
Step 2: $60000 \div 300 = 200$.
Answer: 300 cm²; 200 tiles.

Q6. Formula: Square: A = a² = d²/2; Perimeter = 4a
Step 1: Side 20 m; perimeter 80 m.
Answer: 80 m.

Q7. Formula: Tiles = floor area ÷ tile area
Step 1: 20×15.
Answer: 300.

Q8. Formula: 1 m² = 10000 cm²; 1 ha = 10000 m²
Step 1: 20000 m².
Step 2: 0.3×20000.
Answer: 20000 m²; 6000 m².

Q9. Formula: Rectangle: A = l × b
Step 1: $40 + 18$.
Answer: 58 m².

Q10. Formula: Rhombus / kite: A = ½ × d_1 × d_2
Step 1: $\frac{1}{2} \times 176$.
Answer: 88 cm².

Medium (5 questions)

Q11. A 3 m wide path runs outside a 30 m by 20 m garden. Find the cost of paving it at ₹50 per m².

Q12. A rhombus has diagonals in the ratio $3:4$ and side 15 cm. Find its area.

Q13. Find the area of a field shaped as a trapezium with parallel sides 50 m and 80 m and distance 40 m between them, in hectares.

Q14. A 12 cm by 8 cm photo has a 2 cm border outside. Find the border area.

Q15. The parallel sides of a trapezium are in the ratio $2:3$, height 10 cm, area 150 cm². Find them.

Medium (5 questions) – Solutions

Q11. **Formula:** Path outside: (l + 2w)(b + 2w) − lb
Step 1: $36 \times 26 - 600 = 336$ m².
Step 2: 336×50.
Answer: ₹16,800.

Q12. **Formula:** Rhombus / kite: A = ½ × d_1 × d_2
Step 1: Half-diagonals $3k$, $4k$: $5k = 15$, $k = 3$.
Step 2: Diagonals 18 and 24: $\frac{1}{2} \times 18 \times 24$.
Answer: 216 cm².

Q13. **Formula:** Trapezium: A = ½(a + b)h; 1 m² = 10000 cm²; 1 ha = 10000 m²
Step 1: $\frac{1}{2} \times 130 \times 40 = 2600$ m².
Answer: 0.26 ha.

Q14. **Formula:** Path outside: (l + 2w)(b + 2w) − lb
Step 1: $16 \times 12 - 96$.
Answer: 96 cm².

Q15. **Formula:** Trapezium: A = ½(a + b)h
Step 1: $\frac{1}{2}(5x)(10) = 150$, $x = 6$.
Answer: 12 cm and 18 cm.

Tough (5 questions)

Q16. An isosceles trapezium has parallel sides 22 cm and 10 cm and slant sides 10 cm. Find its area.

Q17. A rectangle's length is increased by 25% and breadth decreased by 20%. Find the % change in area.

Q18. Find the area of a regular hexagon of side 4 cm.

Q19. A path of width w outside a 20 m by 15 m lawn has area 156 m². Find w.

Q20. Find the area of triangle $(1,1)$, $(7,1)$, $(4,9)$.

Tough (5 questions) – Solutions

Q16. **Formula:** Trapezium: A = ½(a + b)h
Step 1: Overhang 6: height 8.
Step 2: $\frac{1}{2} \times 32 \times 8$.
Answer: 128 cm².

Q17. **Formula:** Area factor = (1 ± a%)(1 ± b%)
Step 1: $1.25 \times 0.8 = 1$.
Answer: No change.

Q18. **Formula:** Equilateral triangle: A = (√3/4)a²
Step 1: 6 equilateral triangles of area $4\sqrt{3}$.
Answer: $24\sqrt{3}$ cm².

Q19. **Formula:** Path outside: (l + 2w)(b + 2w) − lb
Step 1: $(20 + 2w)(15 + 2w) - 300 = 70w + 4w^2 = 156$.
Step 2: $w = 2$: $140 + 16 = 156$ ✓.
Answer: 2 m.

Q20. **Formula:** Triangle: A = ½ × b × h
Step 1: Base 6 (horizontal), height 8.
Answer: 24.

Long Answer Questions

Level 1: Standard

Easy (5 questions)

Q1. Find the areas:
(i) Rectangle 15 m × 9 m
(ii) Triangle base 20 cm, height 11 cm
(iii) Parallelogram base 13 cm, height 8 cm
(iv) Trapezium sides 7 and 11 cm, height 6 cm

Q2. Find the missing measure.
(i) Rectangle area 96 m², length 12 m: breadth?
(ii) Triangle area 45 cm², base 9 cm: height?
(iii) Parallelogram area 150 cm², base 25 cm: height?
(iv) Rhombus area 84 cm², one diagonal 14 cm: other?

Q3. Units.
(i) Convert 5 m² to cm².
(ii) Convert 45000 m² to ha.

(iii) Convert 3.2 ha to m².
(iv) A 250 m by 160 m farm: area in ha.

Q4. A room is 8 m by 5 m.
(i) Find its floor area.
(ii) Find the cost of tiling at ₹80 per m².
(iii) How many 50 cm square tiles are needed?
(iv) Find the perimeter for skirting.

Q5. Rhombus and kite.
(i) Rhombus diagonals 16 and 12 cm: area.
(ii) Its side.
(iii) Kite diagonals 20 and 15 cm: area.
(iv) Why does the same formula work for both?

Easy (5 questions) – Solutions

Q1. Formula: Rectangle: A = l × b; Triangle: A = ½ × b × h; Parallelogram: A = b × h; Trapezium: A = ½(a + b)h
(i) Step 1: 135 m².
(ii) Step 1: 110 cm².
(iii) Step 1: 104 cm².
(iv) Step 1: 54 cm².

Q2. Formula: Missing side = Area ÷ other side
(i) Step 1: 8 m.
(ii) Step 1: 10 cm.
(iii) Step 1: 6 cm.
(iv) Step 1: 12 cm.

Q3. Formula: 1 m² = 10000 cm²; 1 ha = 10000 m²
(i) Step 1: 50000 cm².
(ii) Step 1: 4.5 ha.
(iii) Step 1: 32000 m².
(iv) Step 1: 40000 m² $= 4$ ha.

Q4. Formula: Rectangle: A = l × b
(i) Step 1: 40 m².
(ii) Step 1: ₹3200.
(iii) Step 1: $16 \times 10 = 160$.
(iv) Step 1: 26 m.

Q5. Formula: Rhombus / kite: A = ½ × d_1 × d_2
(i) Step 1: 96 cm².
(ii) Step 1: 10 cm.
(iii) Step 1: 150 cm².
(iv) Step 1: In both, the diagonals are perpendicular, splitting the shape into triangles.

Medium (5 questions)

Q6. A 40 m by 25 m park.
(i) A 2 m path goes round the outside. Find its area.
(ii) Instead the path is inside. Find its area.
(iii) Two 2 m paths cross the middle. Find their area.
(iv) Cost of the crossing paths at ₹120 per m².

Q7. A trapezium-shaped field has parallel sides 60 m and 90 m and area 3000 m².
(i) Find the distance between the parallel sides.
(ii) Find the area in hectares.
(iii) Find the cost of levelling at ₹12 per m².
(iv) If both parallel sides were 10 m longer, find the new area.

Q8. Quadrilateral $ABCD$ has diagonal $AC = 24$ cm with offsets 7 cm (from B) and 9 cm (from D).
(i) Find the area of $\triangle ABC$.
(ii) Find the area of $\triangle ACD$.
(iii) Find the area of $ABCD$.
(iv) Write the formula used.

Q9. Scaling.
(i) A square of side 5 cm has its side doubled. Compare areas.
(ii) A rectangle's sides are halved. Compare areas.

(iii) A map is $1:5000$. A park is 4 cm² on it. Find its real area.

(iv) By what factor must sides change to make area 9 times?

Q10. A wall is 6 m long and 3 m high, with a door 2 m by 1 m and a window 1.5 m by 1 m.

(i) Find the wall area.

(ii) Find the openings' area.

(iii) Find the area to paint.

(iv) Cost at ₹25 per m².

Medium (5 questions) – Solutions

Q6. Formula: Path outside: (l + 2w)(b + 2w) − lb; Path inside: lb − (l − 2w)(b − 2w); Crossing paths: wl + wb − w²

(i) Step 1: $44 \times 29 - 1000 = 276$ m².

(ii) Step 1: $1000 - 36 \times 21 = 244$ m².

(iii) Step 1: $80 + 50 - 4 = 126$ m².

(iv) Step 1: ₹15,120.

Q7. Formula: Trapezium: A = ½(a + b)h

(i) Step 1: $\frac{6000}{150} = 40$ m.

(ii) Step 1: 0.3 ha.

(iii) Step 1: ₹36,000.

(iv) Step 1: $\frac{1}{2} \times 170 \times 40 = 3400$ m².

Q8. Formula: Quadrilateral: A = ½ × d × (h_1 + h_2)

(i) Step 1: 84 cm².

(ii) Step 1: 108 cm².

(iii) Step 1: 192 cm².

(iv) Step 1: $\frac{1}{2}d(h_1 + h_2)$.

Q9. Formula: Scale k ⟹area × k²

(i) Step 1: 4 times.

(ii) Step 1: $\frac{1}{4}$.

(iii) Step 1: 4×25000000 cm² $= 10000$ m² $=$ 1 ha.

(iv) Step 1: 3.

Q10. Formula: Paint area = wall − openings

(i) Step 1: 18 m².

(ii) Step 1: 3.5 m².

(iii) Step 1: 14.5 m².

(iv) Step 1: ₹362.50.

Tough (5 questions)

Q11. An isosceles trapezium has parallel sides 30 cm and 14 cm and slant sides 17 cm.

(i) Find the overhang on each side.

(ii) Find the height.

(iii) Find the area.

(iv) Find the perimeter.

Q12. Triangle with sides 13, 20 and 21 cm; the altitude to 21 splits it into x and $21 - x$.

(i) Write equations for the altitude.

(ii) Find x.

(iii) Find the altitude.

(iv) Find the area.

Q13. A rhombus has perimeter 100 cm and one diagonal 48 cm.

(i) Find the side.

(ii) Find the other diagonal.

(iii) Find the area.

(iv) Find the height (distance between opposite sides).

Q14. A regular hexagon of side 6 cm.

(i) How many equilateral triangles make it?

(ii) Find the area of one.

(iii) Find the hexagon's area.

(iv) Find the area of the largest triangle joining alternate vertices.

Q15. A rectangle 20 m by 12 m has a path of width w inside along its edges, with area 112 m².

(i) Write the inner dimensions.

(ii) Write the equation.
(iii) Find w.
(iv) Check.

Tough (5 questions) – Solutions

Q11. **Formula:** Trapezium: A = ½(a + b)h
(i) Step 1: 8 cm.
(ii) Step 1: $\sqrt{289 - 64} = 15$ cm.
(iii) Step 1: $\frac{1}{2} \times 44 \times 15 = 330$ cm².
(iv) Step 1: 78 cm.

Q12. **Formula:** Triangle: A = ½ × b × h
(i) Step 1: $169 - x^2 = 400 - (21 - x)^2$.
(ii) Step 1: $42x = 210$: $x = 5$.
(iii) Step 1: 12 cm.
(iv) Step 1: 126 cm².

Q13. **Formula:** Rhombus / kite: A = ½ × d_1 × d_2
(i) Step 1: 25 cm.
(ii) Step 1: Half-diagonals 24 and 7: 14 cm.
(iii) Step 1: 336 cm².
(iv) Step 1: $336 \div 25 = 13.44$ cm.

Q14. **Formula:** Equilateral triangle: A = (√3/4)a²
(i) Step 1: 6.
(ii) Step 1: $9\sqrt{3}$ cm².
(iii) Step 1: $54\sqrt{3}$ cm².
(iv) Step 1: Half the hexagon: $27\sqrt{3}$ cm².

Q15. **Formula:** Path inside: lb − (l − 2w)(b − 2w)
(i) Step 1: $20 - 2w$ and $12 - 2w$.
(ii) Step 1: $240 - (20 - 2w)(12 - 2w) = 112$.
(iii) Step 1: $64w - 4w^2 = 112$, $w^2 - 16w + 28 = 0$: $w = 2$.
(iv) Step 1: $240 - 16 \times 8 = 112$ ✓.

Case-Based Questions

Level 1: Standard

Easy (5 questions)

Q1. **Tiling a classroom**
A classroom floor is 9 m by 6 m.
(i) Find its area.
(ii) How many 30 cm square tiles are needed?
(iii) Find the cost of tiles at ₹40 each.
(iv) Find the perimeter.

Q2. **A farmer's field**
A farmer's field is a trapezium with parallel sides 120 m and 80 m and width 50 m.
(i) Find its area.
(ii) Find it in hectares.
(iii) Yield is 3000 kg per ha. Find the yield.
(iv) Find the cost of seeds at ₹4000 per ha.

Q3. **Kite paper**
A kite for a festival has diagonals 60 cm and 40 cm.
(i) Find the paper area.
(ii) How much paper for 5 kites?
(iii) Write it in m².
(iv) Cost at ₹2 per 100 cm².

Q4. **Painting a wall**
A wall 5 m by 3 m has a window 2 m by 1.5 m.
(i) Find the wall area.
(ii) Find the window area.
(iii) Find the area to paint.
(iv) Cost at ₹30 per m².

Q5. A lawn

A rectangular lawn is 25 m by 16 m.

(i) Find its area.

(ii) Grass seed costs ₹15 per m². Find the cost.

(iii) Fencing costs ₹40 per m. Find the cost.

(iv) Find the total cost.

Easy (5 questions) – Solutions

Q1. Formula: Rectangle: A = l × b; Tiles = area ÷ tile area

(i) Step 1: 54 m².

(ii) Step 1: $30 \times 20 = 600$.

(iii) Step 1: ₹24,000.

(iv) Step 1: 30 m.

Q2. Formula: Trapezium: A = ½(a + b)h; 1 m² = 10000 cm²; 1 ha = 10000 m²

(i) Step 1: 5000 m².

(ii) Step 1: 0.5 ha.

(iii) Step 1: 1500 kg.

(iv) Step 1: ₹2000.

Q3. Formula: Rhombus / kite: A = ½ × d_1 × d_2

(i) Step 1: 1200 cm².

(ii) Step 1: 6000 cm².

(iii) Step 1: 0.6 m².

(iv) Step 1: ₹120.

Q4. Formula: Paint area = wall − openings

(i) Step 1: 15 m².

(ii) Step 1: 3 m².

(iii) Step 1: 12 m².

(iv) Step 1: ₹360.

Q5. Formula: Rectangle: A = l × b; Perimeter = 2(l + b)

(i) Step 1: 400 m².

(ii) Step 1: ₹6000.

(iii) Step 1: $82 \times 40 =$ ₹3280.

(iv) Step 1: ₹9280.

Medium (2 questions)

Q6. A park path

A 50 m by 30 m park has a 2.5 m wide path running round it inside.

(i) Find the inner dimensions.

(ii) Find the path area.

(iii) Paving costs ₹90 per m². Find the cost.

(iv) Find the remaining grass area.

Q7. A garden bed

A rhombus-shaped garden bed has side 17 m and one diagonal 16 m.

(i) Find the other diagonal.

(ii) Find the area.

(iii) Soil costs ₹25 per m². Find the cost.

(iv) Find the perimeter.

Medium (2 questions) – Solutions

Q6. Formula: Path inside: lb − (l − 2w)(b − 2w)

(i) Step 1: 45 m by 25 m.

(ii) Step 1: $1500 - 1125 = 375$ m².

(iii) Step 1: ₹33,750.

(iv) Step 1: 1125 m².

Q7. Formula: Rhombus / kite: A = ½ × d_1 × d_2

(i) Step 1: Half-diagonals 8 and 15: 30 m.

(ii) Step 1: 240 m².

(iii) Step 1: ₹6000.

(iv) Step 1: 68 m.

Tough (3 questions)

Q8. Stadium road

A road 8 m wide runs around the outside of a 200 m by 150 m stadium.

(i) Find the outer dimensions.

(ii) Find the road area.

(iii) Find the cost at ₹350 per m².

(iv) Find the road area in hectares.

Q9. Measuring a plot

A plot $ABCD$ has diagonal $AC = 50$ m, with offsets 18 m and 22 m from B and D.

(i) Find the plot area.

(ii) Express it in hectares.

(iii) The plot sells at ₹5000 per m². Find the price.

(iv) If the offsets were equal, what would each be for the same area?

Q10. A hexagonal logo

A logo is a regular hexagon of side 10 cm printed on cloth.

(i) Into what triangles does it split?

(ii) Find the area of one triangle.

(iii) Find the hexagon's area ($\sqrt{3} \approx 1.73$).

(iv) Find the cloth for 50 logos.

Tough (3 questions) – Solutions

Q8. Formula: Path outside: (l + 2w)(b + 2w) − lb

(i) Step 1: 216 m by 166 m.

(ii) Step 1: $35856 - 30000 = 5856$ m².

(iii) Step 1: ₹20,49,600.

(iv) Step 1: 0.5856 ha.

Q9. Formula: Quadrilateral: A = ½ × d × (h_1 + h_2)

(i) Step 1: $\frac{1}{2} \times 50 \times 40 = 1000$ m².

(ii) Step 1: 0.1 ha.

(iii) Step 1: ₹50,00,000.

(iv) Step 1: 20 m.

Q10. Formula: Equilateral triangle: A = (√3/4)a²

(i) Step 1: 6 equilateral triangles.

(ii) Step 1: $25\sqrt{3} \approx 43.25$ cm².

(iii) Step 1: $150\sqrt{3} \approx 259.5$ cm².

(iv) Step 1: About 12,975 cm².

IIT Foundation Questions & its Answers

Multiple Choice Questions – IIT Foundation

Q41. A right triangle has legs in the ratio $3:4$ and hypotenuse 15 cm. Its area is
(a) 54 cm² **(b)** 108 cm² **(c)** 45 cm² **(d)** 60 cm²

Q42. A rhombus has side 10 cm and diagonals in the ratio $3:4$. Its area is
(a) 48 cm² **(b)** 96 cm² **(c)** 120 cm² **(d)** 192 cm²

Q43. A rectangle has perimeter 34 cm and diagonal 13 cm. Its area is
(a) 78 cm² **(b)** 65 cm² **(c)** 60 cm² **(d)** 120 cm²

Q44. A trapezium has parallel sides 12 and 18 m and height 10 m. Its area is
(a) 300 m² **(b)** 180 m² **(c)** 120 m² **(d)** 150 m²

Q45. A square plot has area 1 hectare. Its side is
(a) 100 m **(b)** 1000 m **(c)** 10 m **(d)** 316 m

Q46. Carpeting a 4 m by 3 m room at ₹60 per m² costs
(a) ₹420 **(b)** ₹720 **(c)** ₹840 **(d)** ₹600

Q47. A triangle with base 18 cm has the same area as a square of side 6 cm. Its height is
(a) 2 cm **(b)** 6 cm **(c)** 4 cm **(d)** 3 cm

Q48. A parallelogram has base 15 cm and height 8 cm. A rectangle with the same base and height has area
(a) 60 cm² **(b)** 46 cm² **(c)** 240 cm² **(d)** 120 cm²

Q49. If length increases by 20% and breadth decreases by 20%, the area
(a) decreases by 4% **(b)** is unchanged
(c) increases by 4% **(d)** decreases by 20%

Q50. A 1 m path surrounds a square of side 10 m (outside). Its area is
(a) 40 m² **(b)** 44 m² **(c)** 36 m² **(d)** 121 m²

Q51. An equilateral triangle has area $16\sqrt{3}$ cm². Its side is
(a) 4 cm **(b)** 16 cm **(c)** 8 cm **(d)** $4\sqrt{3}$ cm

Q52. A rhombus has area 96 cm² and one diagonal 16 cm. Its side is
(a) 12 cm **(b)** 8 cm **(c)** 6 cm **(d)** 10 cm

Q53. A diagonal splits a 12 cm by 5 cm rectangle into triangles of area
(a) 30 cm² **(b)** 60 cm² **(c)** 13 cm² **(d)** 15 cm²

Q54. A quadrilateral has diagonal 20 cm and offsets 6 cm and 9 cm. Its area is
(a) 300 cm² **(b)** 150 cm² **(c)** 180 cm² **(d)** 120 cm²

Q55. The number of 25 cm square tiles for a 5 m by 4 m floor is
(a) 80 **(b)** 200 **(c)** 320 **(d)** 400

Q56. Two triangles have the same height and bases in the ratio $3:5$. Their areas are in the ratio
(a) $9:25$ **(b)** $5:3$ **(c)** $1:1$ **(d)** $3:5$

Q57. A trapezium has height 8 cm and area 96 cm²; its parallel sides differ by 4 cm. The longer is
(a) 14 cm **(b)** 10 cm **(c)** 12 cm **(d)** 16 cm

Q58. On a map of scale $1:1000$, a 1 cm by 1 cm square represents
(a) 10 m² **(b)** 100 m² **(c)** 1000 m² **(d)** 1 m²

Q59. A square has diagonal $8\sqrt{2}$ cm. Its area is
(a) 128 cm² **(b)** 32 cm² **(c)** 64 cm² **(d)** 16 cm²

Q60. An isosceles right triangle has hypotenuse 10 cm. Its area is
(a) 50 cm² **(b)** 100 cm² **(c)** $50\sqrt{2}$ cm² **(d)** 25 cm²

Multiple Choice Questions – IIT Foundation – Solutions

41. Formula: Legs 9 and 12.
Answer: (a) 54 cm²
Step 1: $\frac{1}{2} \times 9 \times 12 = 54$.

42. Formula: Half-diagonals 6 and 8.
Answer: (b) 96 cm²
Step 1: Diagonals 12 and 16: 96.

43. Formula: $(l+b)^2 - (l^2+b^2) = 2lb$.
Answer: (c) 60 cm²
Step 1: $289 - 169 = 120$; area 60.

44. Formula: $\frac{1}{2} \times 30 \times 10$.
Answer: (d) 150 m²
Step 1: 150.

45. Formula: $\sqrt{10000}$.
Answer: (a) 100 m
Step 1: 100 m.

46. Formula: Area × rate.
Answer: (b) ₹720
Step 1: 12×60.

47. Formula: $\frac{1}{2} \times 18 \times h = 36$.
Answer: (c) 4 cm
Step 1: $h = 4$.

48. Formula: Same as the parallelogram.
Answer: (d) 120 cm²
Step 1: 120.

49. Formula: 1.2×0.8.
Answer: (a) decreases by 4%
Step 1: 0.96.

50. Formula: $12^2 - 10^2$.
Answer: (b) 44 m²
Step 1: 44.

51. Formula: Area $= \frac{\sqrt{3}}{4}a^2$.
Answer: (c) 8 cm
Step 1: $a^2 = 64$.

52. Formula: Other diagonal 12.
Answer: (d) 10 cm
Step 1: Half-diagonals 8, 6: side 10.

53. Formula: Half the rectangle.
Answer: (a) 30 cm²
Step 1: 30.

54. Formula: $\frac{1}{2} \times 20 \times 15$.
Answer: (b) 150 cm²
Step 1: 150.

55. Formula: 20×16.
Answer: (c) 320
Step 1: 320.

56. Formula: Area $\propto$ base.
Answer: (d) $3:5$
Step 1: $3:5$.

57. Formula: Sum of sides $= 24$.
Answer: (a) 14 cm
Step 1: $a + (a + 4) = 24$: 10 and 14.

58. Formula: 1 cm $= 10$ m.
Answer: (b) 100 m²
Step 1: $10 \times 10 = 100$.

59. Formula: Side 8.
Answer: (c) 64 cm²
Step 1: 64.

60. Formula: Legs $5\sqrt{2}$.
Answer: (d) 25 cm²
Step 1: $\frac{1}{2} \times 50 = 25$.

Very Short Answer Questions – IIT Foundation

Q21. Find the area of a rhombus with side 5 cm and one diagonal 8 cm.

Q22. A square and a rectangle 16 m by 9 m have equal areas. Find the square's side.

Q23. Find the area of a triangle with vertices $(0, 0)$, $(8, 0)$, $(3, 5)$.

Q24. A trapezium has area 120 cm² and parallel sides 9 and 15 cm. Find its height.

Q25. By what per cent does a square's area grow if its side grows by 10%?

Q26. Convert 0.75 km² to hectares.

Q27. A rectangle has area 180 cm² and sides in the ratio $5 : 4$. Find the sides.

Q28. Find the area of an equilateral triangle with height $3\sqrt{3}$ cm.

Q29. Two paths 1 m wide cross a 12 m by 8 m lawn. Find the remaining lawn area.

Q30. A kite has diagonals x and $2x$ and area 64 cm². Find x.

Very Short Answer Questions – IIT Foundation – Solutions

Q21. Formula: Rhombus / kite: A = ½ × d_1 × d_2
Step 1: Other diagonal 6.
Answer: 24 cm².

Q22. Formula: Square: A = a² = d²/2; Rectangle: A = l × b
Step 1: $\sqrt{144}$.
Answer: 12 m.

Q23. Formula: Triangle: A = ½ × b × h
Step 1: Base 8, height 5.
Answer: 20.

Q24. Formula: Trapezium: A = ½(a + b)h
Step 1: $240 \div 24$.
Answer: 10 cm.

Q25. Formula: Scale k ⟹ area × k²
Step 1: $1.1^2 = 1.21$.
Answer: 21%.

Q26. Formula: 1 km² = 100 ha
Step 1: 1 km² $= 100$ ha.
Answer: 75 ha.

Q27. Formula: Rectangle: A = l × b
Step 1: $20k^2 = 180$, $k = 3$.
Answer: 15 cm and 12 cm.

Q28. Formula: Equilateral triangle: A = (√3/4)a²
Step 1: Side 6.
Answer: $9\sqrt{3}$ cm².

Q29. Formula: Crossing paths: wl + wb − w²
Step 1: Paths $12 + 8 - 1 = 19$.
Answer: 77 m².

Q30. Formula: Rhombus / kite: A = ½ × d_1 × d_2
Step 1: $x^2 = 64$.
Answer: 8 cm.

Short Answer Questions – IIT Foundation

Q21. A rectangle has diagonal 17 cm and perimeter 46 cm. Find its area.

Q22. A rhombus has perimeter 40 cm and one diagonal 12 cm. Find its area and height.

Q23. A trapezium has parallel sides 25 and 13 cm and slant sides 10 cm each. Find its area.

Q24. A field's length is increased by 10% and breadth by 20%. Find the % increase in area.

Q25. A 3 m path outside a square lawn has area 276 m². Find the lawn's side.

Q26. Find the area of the quadrilateral $(0,0)$, $(6,0)$, $(6,4)$, $(2,4)$.

Q27. An equilateral triangle and a square have equal perimeters of 24 cm. Which has the greater area?

Q28. A triangle has sides 10, 17, 21 cm. Find its area (altitude to 21).

Q29. A square sheet of side 20 cm has a 5 cm square cut from each corner. Find the remaining area.

Q30. Find the ratio of the areas of a square and the square formed by joining its side midpoints.

Short Answer Questions – IIT Foundation – Solutions

Q21. **Formula:** $(l + b)^2 = l^2 + b^2 + 2lb$

Step 1: $l + b = 23$, $l^2 + b^2 = 289$.

Step 2: $2lb = 529 - 289 = 240$.

Answer: 120 cm².

Q22. **Formula:** Rhombus / kite: $A = \frac{1}{2} \times d_1 \times d_2$; height = A ÷ side

Step 1: Side 10; other diagonal 16.

Step 2: Area 96; height $96 \div 10$.

Answer: 96 cm²; 9.6 cm.

Q23. **Formula:** Trapezium: $A = \frac{1}{2}(a + b)h$

Step 1: Overhang 6, height 8.

Step 2: $\frac{1}{2} \times 38 \times 8$.

Answer: 152 cm².

Q24. **Formula:** Area factor = (1 + a%)(1 + b%)

Step 1: $1.1 \times 1.2 = 1.32$.

Answer: 32%.

Q25. **Formula:** Path outside: $(l + 2w)(b + 2w) - lb$

Step 1: $(a + 6)^2 - a^2 = 12a + 36 = 276$.

Answer: 20 m.

Q26. **Formula:** Trapezium: $A = \frac{1}{2}(a + b)h$

Step 1: Trapezium: parallel sides 6 and 4, height 4.

Answer: 20.

Q27. **Formula:** Equilateral triangle: $A = (\sqrt{3}/4)a^2$; Square: $A = a^2 = d^2/2$

Step 1: Square: 36. Triangle: side 8, area $16\sqrt{3} \approx 27.7$.

Answer: The square.

Q28. **Formula:** Triangle: $A = \frac{1}{2} \times b \times h$

Step 1: $100 - x^2 = 289 - (21 - x)^2$: $42x = 252$, $x = 6$.

Step 2: Altitude 8: $\frac{1}{2} \times 21 \times 8$.

Answer: 84 cm².

Q29. **Formula:** Remaining = whole − cut parts

Step 1: $400 - 4 \times 25$.

Answer: 300 cm².

Q30. **Formula:** Square: $A = a^2 = d^2/2$

Step 1: The inner square's side is $\frac{a}{\sqrt{2}}$; area $\frac{a^2}{2}$.

Answer: $2:1$.

Long Answer Questions – IIT Foundation

Q16. A rhombus has perimeter 68 cm and one diagonal 30 cm.

(i) Find the side.

(ii) Find the other diagonal.

(iii) Find the area.

(iv) Find the height.

Q17. A rectangular field 60 m by 40 m has two 3 m paths through its middle, parallel to the sides.

(i) Find the paths' area.

(ii) Find the remaining area.

(iii) Paving costs ₹150 per m². Find the cost.

(iv) If the paths ran round the inside edge instead, find their area.

Q18. A quadrilateral $ABCD$ has $AB = 9$, $BC = 12$, $\angle B = 90°$, $CD = 8$ and $AD = 17$.

(i) Find AC.

(ii) Show $\triangle ACD$ is right-angled.
(iii) Find the area of $ABCD$.
(iv) Find its perimeter.

Q19. Scaling areas.
(i) A square's side increases by 20%. Find the % change in area.
(ii) A rectangle 10 by 6 becomes 12 by 5. Find the % change in area.
(iii) A map of scale $1:20000$ shows a lake of 3 cm². Find its real area in ha.
(iv) By what factor must a triangle's sides be multiplied to double its area?

Q20. An isosceles trapezium has parallel sides 40 cm and 16 cm and area 336 cm².
(i) Find the height.
(ii) Find the overhang on each side.
(iii) Find the slant side.
(iv) Find the perimeter.

Long Answer Questions – IIT Foundation – Solutions

Q16. **Formula:** Rhombus / kite: A = ½ × d_1 × d_2
(i) Step 1: 17 cm.
(ii) Step 1: Half-diagonals 15 and 8: 16 cm.
(iii) Step 1: 240 cm².
(iv) Step 1: $240 \div 17 \approx 14.1$ cm.

Q17. **Formula:** Crossing paths: wl + wb − w²; Path inside: lb − (l − 2w)(b − 2w)
(i) Step 1: $180 + 120 - 9 = 291$ m².
(ii) Step 1: 2109 m².
(iii) Step 1: ₹43,650.
(iv) Step 1: $2400 - 54 \times 34 = 564$ m².

Q18. **Formula:** $c^2 = a^2 + b^2$; Quadrilateral: A = ½ × d × (h_1 + h_2)
(i) Step 1: 15.
(ii) Step 1: $15^2 + 8^2 = 289 = 17^2$ ✓.
(iii) Step 1: $54 + 60 = 114$.
(iv) Step 1: 46.

Q19. **Formula:** Scale k ⟹ area × k²
(i) Step 1: 44%.
(ii) Step 1: 0% (60 to 60).
(iii) Step 1: $3 \times 4 \times 10^8$ cm² $= 12$ ha.
(iv) Step 1: $\sqrt{2}$.

Q20. **Formula:** Trapezium: A = ½(a + b)h; $c^2 = a^2 + b^2$
(i) Step 1: $\frac{672}{56} = 12$ cm.
(ii) Step 1: 12 cm.
(iii) Step 1: $\sqrt{144 + 144} = 12\sqrt{2}$ cm.
(iv) Step 1: $56 + 24\sqrt{2} \approx 89.9$ cm.

Case-Based Questions – IIT Foundation

Q11. **A running track**
A school ground is 80 m by 60 m. A 4 m running track runs round the inside edge.
(i) Find the inner dimensions.
(ii) Find the track area.
(iii) Find the cost of surfacing at ₹500 per m².
(iv) Find the diagonal of the whole ground.

Q12. **Selling land**
A farmer has a field $ABCD$ with diagonal 120 m and offsets 40 m and 50 m.
(i) Find its area.
(ii) Express it in hectares.
(iii) He sells half at ₹30 lakh per ha. Find the amount.
(iv) Find the area of the larger of the two triangles.

Q13. **A tablecloth**
A tablecloth is a rhombus with diagonals 1.2 m and 0.9 m, with lace along its edges.
(i) Find its area.
(ii) Find its side.
(iii) Find the lace needed.

(iv) Lace costs ₹40 per m. Find the cost.

Q14. Painting a hall

A wall 12 m by 4 m has two windows 1.5 m by 1.2 m and a door 2 m by 1 m.

(i) Find the wall area.

(ii) Find the total openings.

(iii) Find the area to paint.

(iv) Paint covers 12 m² per litre. Find the paint needed.

Q15. A pond in a garden

A square garden of side 30 m has a square pond whose corners touch the midpoints of the garden's sides.

(i) Find the pond's area.

(ii) Find the remaining area.

(iii) Find the pond's side.

(iv) Find the ratio of pond area to garden area.

Case-Based Questions – IIT Foundation – Solutions

Q11. Formula: Path inside: $lb - (l - 2w)(b - 2w)$

(i) Step 1: 72 m by 52 m.

(ii) Step 1: $4800 - 3744 = 1056$ m².

(iii) Step 1: ₹5,28,000.

(iv) Step 1: 100 m.

Q12. Formula: Quadrilateral: $A = \frac{1}{2} \times d \times (h_1 + h_2)$

(i) Step 1: 5400 m².

(ii) Step 1: 0.54 ha.

(iii) Step 1: $0.27 \times 30 =$ ₹8.1 lakh.

(iv) Step 1: $\frac{1}{2} \times 120 \times 50 = 3000$ m².

Q13. Formula: Rhombus / kite: $A = \frac{1}{2} \times d_1 \times d_2$

(i) Step 1: 0.54 m².

(ii) Step 1: $\sqrt{0.36 + 0.2025} = 0.75$ m.

(iii) Step 1: 3 m.

(iv) Step 1: ₹120.

Q14. Formula: Paint area = wall − openings

(i) Step 1: 48 m².

(ii) Step 1: $3.6 + 2 = 5.6$ m².

(iii) Step 1: 42.4 m².

(iv) Step 1: About 3.53 L.

Q15. Formula: Square: $A = a^2 = d^2/2$

(i) Step 1: Half the garden: 450 m².

(ii) Step 1: 450 m².

(iii) Step 1: $15\sqrt{2} \approx 21.2$ m.

(iv) Step 1: $1:2$.