LF LearnFrenzy

QUANTITATIVE APTITUDE · FREE STUDY MATERIAL

Area and Perimeter

Formulas & Shortcut Tricks

Every important formula, shortcut and exam trick for Area and Perimeter in one place – with solved examples, common mistakes and a one-page revision sheet.

WHAT'S INSIDE

1. Topic introduction
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USEFUL FOR

- SSC CGL / CHSL / MTS
- Railways (RRB NTPC, Group D)
- Bank PO & Clerk (IBPS, SBI, RBI)
- Campus placements (TCS, Infosys, Wipro, Accenture)
- UPSC CSAT & state PSC exams

Practise Area and Perimeter free on LearnFrenzy – questions with instant explanations →

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1 Topic introduction

What it is, why it matters and how it is asked

Perimeter is the length of the boundary of a flat shape; area is the amount of surface it covers. Perimeter is measured in units such as metres, area in square units such as m^2. Fencing a field is a perimeter question; tiling or carpeting it is an area question.

Exams combine the standard shapes – rectangles, squares, triangles, quadrilaterals and circles – with practical settings: paths around gardens, crossroads in parks, costs of fencing and tiling, percentage change in area, and figures drawn inside other figures.

Why it matters in exams

- SSC exams ask several mensuration questions in every paper.
- Railway and bank papers use paths, costs and percentage-change problems.
- Placement tests like circles, sectors and inscribed figures.

Where it is used

- Buying paint, tiles, carpet or fencing for a room or plot.
- Land measurement and plot planning.
- Designing tracks, gardens and circular objects.

Common question patterns

Rectangles and squares
Area, perimeter and diagonal from given conditions.

Triangles
Heron's formula, equilateral and right triangles.

Quadrilaterals
Rhombus, parallelogram and trapezium.

Circles
Area, circumference, sectors, arcs and rings.

Paths and roads
Paths outside or inside a plot; crossroads.

Costs
Fencing, tiling, carpeting and painting.

Percentage change
Sides change by given percentages.

Inscribed figures
Circle in a square, square in a circle; tethered animals.

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2 Important formulas

Cards marked MOST USED are the ones to revise first

Rectangles and squares

Rectangle

MOST USED

Area = l × b; perimeter = 2(l + b); diagonal = $\sqrt{(l^2 + b^2)}$

Perimeter is once around the boundary.

l – length **b** – breadth

EXAMPLE 24 m × 10 m → area 240 m², perimeter 68 m, diagonal $\sqrt{676}$ = **26 m**.

Square

MOST USED

Area = $a^2 = d^2/2$; perimeter = 4a; diagonal = $a\sqrt{2}$

If only the diagonal is known, area = half the square of the diagonal.

EXAMPLE Diagonal $12\sqrt{2}$ m → area = $(12\sqrt{2})^2/2$ = **144 m²**.

Triangles

Base and height

MOST USED

Area = ½ × base × height; right triangle: ½ × (product of the two legs)

The height must be perpendicular to the base.

EXAMPLE Legs 7 cm and 24 cm → area = ½ × 7 × 24 = **84 cm²**.

Heron's formula

MOST USED

Area = $\sqrt{[s(s - a)(s - b)(s - c)]}$, s = (a + b + c)/2

Use it when all three sides are known.

EXAMPLE Sides 13, 14, 15 → s = 21 → $\sqrt{(21 \times 8 \times 7 \times 6)}$ = **84**.

Equilateral triangle

Area = $(\sqrt{3}/4)\ a^2$; height = $(\sqrt{3}/2)\ a$

Learn $\sqrt{3} \approx 1.732$.

EXAMPLE Side 12 cm → area = $(\sqrt{3}/4) \times 144$ = **$36\sqrt{3}$ cm²**.

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Other quadrilaterals and polygons

Parallelogram and trapezium

Parallelogram: base × height. Trapezium: ½ × (sum of parallel sides) × height

Height is the perpendicular distance between the parallel sides.

EXAMPLE Trapezium with parallel sides 10 and 16, height 6 → ½ × 26 × 6 = **78**.

Rhombus

MOST USED

Area = ½ × d_1 × d_2; side = $\sqrt{[(d_1/2)^2 + (d_2/2)^2]}$

The diagonals bisect each other at right angles.

EXAMPLE Diagonals 16 and 12 → area 96, side $\sqrt{(64 + 36)}$ = **10**.

Regular hexagon

Area = $(3\sqrt{3}/2)\ a^2$ (six equilateral triangles)

Split it into six equilateral triangles of side a.

EXAMPLE Side 4 → area = 6 × $(\sqrt{3}/4)$ × 16 = **$24\sqrt{3}$**.

Circles

Area and circumference

MOST USED

Area = πr^2; circumference = $2\pi r$; semicircle perimeter = $\pi r + 2r$

Use π = 22/7 when r is a multiple of 7.

EXAMPLE r = 14 cm → area = 22/7 × 196 = **616 cm²**, circumference 88 cm.

Sector and arc

Sector area = $(\theta/360) \times \pi r^2$; arc length = $(\theta/360) \times 2\pi r$

A sector is a slice of the circle in the ratio θ : 360.

EXAMPLE r = 21, θ = 60° → sector area = 1/6 × 1,386 = **231**; arc = 22.

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Ring (annulus)

> **Area = π(R² − r²) = π(R + r)(R − r)**

The big circle minus the small one.

EXAMPLE R = 21, r = 14 → 22/7 × 35 × 7 = **770**.

Paths, changes and inscribed figures

Paths around and inside a plot

MOST USED

> **Outside: 2w(l + b + 2w). Inside: 2w(l + b − 2w). Crossroads through the middle: w(l + b) − w²**

For crossroads the square where the roads cross is counted once.

w – width of the path

EXAMPLE Garden 40 × 30 with a 2 m path outside → 2 × 2 × (70 + 4) = **296 m²**.

Percentage change in area

MOST USED

> **Sides change by a% and b% → area changes by a + b + ab/100 %; every side +x% → area (2x + x²/100)%**

Area is a product of two lengths – use the successive-change rule.

EXAMPLE Length and breadth both +10% → area + **21%**.

Inscribed and circumscribed figures

> **Circle in a square of side a: r = a/2. Square in a circle of radius r: side = r√2. Square around a circle: side = 2r**

A diagonal of the inner square is a diameter of the circle.

EXAMPLE Square inscribed in a circle of radius 7√2 → side = 7√2 × √2 = **14**.

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3 Shortcut tricks & smart techniques

Each trick says when to use it – that matters as much as the trick

Pythagorean triples

MOST USED

USE WHEN Diagonals, right triangles and rhombus sides.

Triple	Multiples to watch
3, 4, 5	6-8-10, 9-12-15, 12-16-20
5, 12, 13	10-24-26, 15-36-39
8, 15, 17	16-30-34
7, 24, 25	14-48-50
20, 21, 29	—

EXAMPLE Rectangle 24 × 10 → diagonal from 5-12-13 doubled = **26**.

Use 22/7 smartly

USE WHEN Radius or diameter is a multiple of 7.

1. Cancel the 7 first.
2. Circumference from 2 × 22 × (r/7); area from 22 × r × (r/7).

EXAMPLE Circumference 132 → r = 132 × 7/44 = **21**.

Path formulas in one step

MOST USED

USE WHEN Path around, inside or across a rectangular plot.

1. Outside: 2w(l + b + 2w); inside: 2w(l + b − 2w).
2. Crossroads: w(l + b) − w^2.

EXAMPLE Park 80 × 60 with two 4 m roads crossing in the middle → 4 × 140 − 16 = **544 m^2**.

Tethered animals

USE WHEN A goat or cow tied to a corner or the middle of a side.

1. The grazing area is a sector of radius = rope length.
2. Corner of a square/rectangle → quarter circle; middle of a side → semicircle.

EXAMPLE Goat tied at a corner of a field with a 14 m rope → ¼ × 22/7 × 196 = **154 m^2**.

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4 Solved examples

The full method on the left, the exam shortcut on the right

1 RECTANGLE

The length of a rectangle is three times its breadth and its perimeter is 96 m. Find its area.

STEP BY STEP

1. 2(3b + b) = 96 → 8b = 96 → b = 12.
2. l = 36.
3. Area = 36 × 12 = 432 m².

SHORTCUT

8 parts = 96 → 1 part = 12 → area = 3 × 12 × 12.

Why it works: Perimeter gives the sum of length and breadth.

Answer: 432 m²

2 SQUARE

The diagonal of a square is $12\sqrt{2}$ cm. Find its area and perimeter.

STEP BY STEP

1. Side = $12\sqrt{2} \div \sqrt{2} = 12$.
2. Area = 144 cm²; perimeter = 48 cm.

SHORTCUT

Area = $d^2/2 = 288/2 = 144$.

Why it works: The diagonal of a square is side × $\sqrt{2}$.

Answer: 144 cm² and 48 cm

3 HERON

Find the area of a triangle with sides 9 cm, 10 cm and 17 cm.

STEP BY STEP

1. s = (9 + 10 + 17) ÷ 2 = 18.
2. Area = $\sqrt{(18 \times 9 \times 8 \times 1)} = \sqrt{1{,}296}$.
3. = 36 cm².

SHORTCUT

s − a, s − b, s − c = 9, 8, 1.

Why it works: With three sides known, Heron's formula is direct.

Answer: 36 cm²

4 EQUILATERAL

Find the area of an equilateral triangle of side 12 cm.

STEP BY STEP

1. Area = $(\sqrt{3}/4) \times 12^2 = (\sqrt{3}/4) \times 144$.
2. = $36\sqrt{3}$ cm² (≈ 62.35 cm²).

SHORTCUT

$a^2/4 = 36 \rightarrow 36\sqrt{3}$.

Why it works: The formula comes from height = $(\sqrt{3}/2)a$.

Answer: $36\sqrt{3}$ cm²

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5 CIRCLE

The circumference of a circle is 132 cm. Find its area.

STEP BY STEP

1. $2 \times 22/7 \times r = 132 \rightarrow r = 21$ cm.
2. Area $= 22/7 \times 441 = 1{,}386$ cm².

SHORTCUT

$r = 132 \times 7/44 = 21 \rightarrow \pi r^2 = 1{,}386$.

Why it works: Find the radius first; area needs r^2.

Answer: 1,386 cm²

6 RING

A circular path lies between two circles of radii 21 m and 14 m. Find its area.

STEP BY STEP

1. Area $= \pi(21^2 - 14^2) = 22/7 \times (441 - 196)$.
2. $= 22/7 \times 245 = 770$ m².

SHORTCUT

$\pi(R + r)(R - r) = 22/7 \times 35 \times 7 = 770$.

Why it works: Factor $R^2 - r^2$ to cancel the 7 quickly.

Answer: 770 m²

7 SECTOR

Find the area and arc length of a sector of radius 21 cm and angle 60°.

STEP BY STEP

1. Area $= 60/360 \times 22/7 \times 441 = 231$ cm².
2. Arc $= 60/360 \times 2 \times 22/7 \times 21 = 22$ cm.

SHORTCUT

60° is 1/6 of the circle → 1,386/6 and 132/6.

Why it works: A sector is the fraction θ/360 of the whole circle.

Answer: 231 cm² and 22 cm

8 PATH INSIDE

A lawn 60 m by 40 m has a 3 m wide path running along its edges inside it. Find the area of the path.

STEP BY STEP

1. Inner rectangle $= 54 \times 34 = 1{,}836$ m².
2. Lawn $= 2{,}400$ m².
3. Path $= 2{,}400 - 1{,}836 = 564$ m².

SHORTCUT

$2w(l + b - 2w) = 6 \times 94 = 564$.

Why it works: An inside path reduces both length and breadth by 2w.

Answer: 564 m²

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9 CROSSROADS

Two roads, each 4 m wide, cross through the middle of a park 80 m by 60 m, parallel to its sides. Find their total area.

STEP BY STEP

1. Road along the length: 80 × 4 = 320; along the breadth: 60 × 4 = 240.
2. The crossing square (4 × 4 = 16) is counted twice.
3. Area = 320 + 240 − 16 = 544 m².

SHORTCUT

$w(l + b) - w^2 = 4 \times 140 - 16$.

Why it works: Subtract the overlap once.

Answer: 544 m²

10 PERCENTAGE CHANGE

The length of a rectangle is increased by 20% and the breadth decreased by 20%. What is the change in its area?

STEP BY STEP

1. New area = 1.2 × 0.8 = 0.96 of the old.
2. Change = −4%.

SHORTCUT

20 − 20 − 400/100 = −4%.

Why it works: Equal percentage rise and fall always reduce the product.

Answer: 4% decrease

11 TETHERED GOAT

A goat is tied to a corner of a square field of side 28 m with a rope 14 m long. Over what area can it graze?

STEP BY STEP

1. The goat sweeps a quarter circle of radius 14 m (the field's corner is 90°).
2. Area = ¼ × 22/7 × 196 = 154 m².

SHORTCUT

Quarter of $\pi r^2 = 616/4$.

Why it works: The rope is shorter than the side, so the full quarter circle fits inside the field.

Answer: 154 m²

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5 Important exam tips

Patterns, traps and habits that save marks

Frequently asked question patterns

- Rectangles and squares from perimeter or diagonal.
- Heron's formula and equilateral triangles.
- Rhombus from its diagonals; trapezium areas.
- Circles, sectors, arcs and rings with $\pi = 22/7$.
- Paths outside, inside and crossing a plot.
- Percentage change in area.
- Inscribed figures and tethered animals.

Common mistakes to avoid

- Mixing perimeter (length) with area (square units).
- Using diameter instead of radius in πr^2.
- Counting the crossing square twice in crossroads questions.
- Using the slant side as the height of a parallelogram or trapezium.
- Adding percentage changes of sides directly for area.
- Forgetting the two straight edges in a semicircle's perimeter.

Points to remember

- Square: area = $d^2/2$.
- Heron: $\sqrt{[s(s-a)(s-b)(s-c)]}$.
- Equilateral: $(\sqrt{3}/4)a^2$.
- Rhombus: $\frac{1}{2} d_1 d_2$.
- Sector: $(\theta/360)\pi r^2$.

Speed and accuracy

- Learn the Pythagorean triples.
- Cancel 7s before multiplying with 22/7.
- Use the path formulas instead of subtracting rectangles.
- Draw a quick sketch for inscribed and path questions.

Preparation strategy

- Learn the formula sheet first; mensuration is mostly direct recall.
- Practise on LearnFrenzy in order: Easy → Medium → Hard → Exam Pattern Mix → Data Sufficiency.
- Aim for 40–60 seconds per question.
- Keep an error log of radius/diameter and unit slips.
- Read the Quick Revision Sheet (next page) the night before the exam.

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6 Quick revision sheet

Everything on one page for the night before the exam

Formulas

Rectangle	lb; $2(l + b)$	Diagonal	$\sqrt{(l^2 + b^2)}$
Square	$a^2 = d^2/2$; $4a$	Triangle	$\frac{1}{2}$ bh
Heron	$\sqrt{[s(s-a)(s-b)(s-c)]}$	Equilateral	$(\sqrt{3}/4)\ a^2$
Parallelogram	$b \times h$	Trapezium	$\frac{1}{2}\ (a + b)\ h$
Rhombus	$\frac{1}{2}\ d_1\ d_2$	Hexagon	$(3\sqrt{3}/2)\ a^2$
Circle	πr^2; $2\pi r$	Sector / arc	$(\theta/360)\ \pi r^2$ / $(\theta/360)\ 2\pi r$
Ring	$\pi(R^2 - r^2)$	Path outside / inside	$2w(l + b \pm 2w)$
Crossroads	$w(l + b) - w^2$	Area change	$a + b + ab/100$ %

Shortcut tricks

- Triples: 3-4-5, 5-12-13, 8-15-17.
- r multiple of 7 → use 22/7.
- Crossroads: subtract w^2 once.
- Similar figures: area ∝ side².
- Corner goat → quarter circle.
- Square in circle: side = $r\sqrt{2}$.

Must-know numbers

Circles (π = 22/7)	r 7: C 44, A 154 · r 14: C 88, A 616 · r 21: C 132, A 1,386 · r 35: C 220, A 3,850
Roots	√2 = 1.414 · √3 = 1.732 · √5 = 2.236

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7 A message from LearnFrenzy

For everyone preparing for placements, competitive and government exams

Keep going – you are closer than you think

Success in examinations is not just about how many hours you study. It is about how effectively you understand concepts, practise questions, and improve yourself every day.

Every formula you learn, every problem you solve, and every mistake you correct brings you one step closer to your goal.

Whether you are preparing for campus placements, competitive examinations, or government jobs, remember that consistency, confidence, and smart preparation make a real difference.

Don’t just memorize formulas. Understand the concepts, practise smart techniques, and develop the confidence to solve problems independently.

Your hard work today can create the opportunities you dream of tomorrow.

— Team LearnFrenzy

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