

CAT 2026 · QUANT · GEOMETRY

ThinkCAT Practice Book



CAT Geometry Formula Sheet

9 topics · 89 formulas · 27 common mistakes · 13 real CAT PYQs one tap away

45

Geometry questions in CAT 2021-25

14%

of all 330 QA questions

8-10

questions every year from 2021 to 2025

14

were TITA: no negative marks

HOW OFTEN CAT ASKED EACH TOPIC · 2021-25

Tap a topic to open its page

#	Topic	2021	2022	2023	2024	2025	Total	TITA	Page
1	• Triangles	2	3	2	1	3	11	3	p.3
2	• Quadrilaterals	4	2	1	·	2	9	3	p.5
3	• Circles	·	2	2	2	2	8	1	p.7
4	• Triangle Centres	1	1	1	3	·	6	5	p.4
4	• Polygons	2	1	1	1	1	6	2	p.6
6	• Coordinate Geometry	·	1	1	1	1	4	0	p.8
7	• Mensuration 3D	·	·	·	1	·	1	0	p.10
-	• Lines & Angles	·	·	·	·	·	0	0	p.2
-	• Mensuration 2D	·	·	·	·	·	0	0	p.9
All Geometry		9	10	8	9	9	45	14	

Counts: every official CAT QA question from 2021-2025 (15 slots, 330 questions), tagged to one main topic by ThinkCAT. Deep links open the exact question on thinkcat.in.

[Take a free full CAT mock ↗](#)

Two free full-length mocks in a TCS iON-style interface. No card required.

Prepping with friends? Send this sheet to your CAT group in one tap.

[WhatsApp](#)
[Telegram](#)


Lines & Angles

CAT questions from this topic, 2021-25

0

No standalone lines-and-angles question in CAT 2021-25. Angle chasing sits inside most triangle and polygon questions.

2021	2022	2023	2024	2025
0	0	0	0	0

CORE FORMULAS

- Complementary angles add to 90° ; supplementary angles add to 180°
- Angles on a straight line add to 180° ; angles around a point add to 360°
- Vertically opposite angles are equal
- Parallel lines cut by a transversal: corresponding and alternate angles are equal; co-interior angles add to 180°
- Triangle: angles add to 180° ; an exterior angle = the sum of the two opposite interior angles
- Isosceles: equal sides face equal angles
- Slopes: parallel if $m_1 = m_2$; perpendicular if $m_1 \times m_2 = -1$
- A point on a perpendicular bisector is equidistant from the segment's ends; on an angle bisector, from its arms

60-SECOND SHORTCUT

Chase angles with one letter

Call one unknown angle x and write every other angle in terms of x using the 180° rules. Isosceles triangles hand you equal pairs for free.

DON'T MAKE THESE MISTAKES

- ✗ Co-interior angles are equal
- ✓ They **add to 180°**
- ✗ Corresponding angles are equal for any two lines
- ✓ Only when the lines are **parallel**
- ✗ Vertically opposite angles add to 180°
- ✓ They are **equal**; adjacent angles add to 180°

PRACTISE IT NOW

Worked solutions on thinkcat.in

Geometry set

550+ practice questions

Triangles PYQs

CAT 2017-25 papers

Angles power every figure: practise 550+ Geometry questions



TOPIC 36 · GEOMETRY 2 OF 9

MOST ASKED

Triangles

11

CAT questions from this topic, 2021-25

#1 of 9 in Geometry · 3 TITA



CORE FORMULAS

- Area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} ab \sin C$
- Heron: area = $\sqrt{[s(s-a)(s-b)(s-c)]}$, where $s = (a+b+c)/2$
- Any two sides add to more than the third: $|b-c| < a < b+c$
- Pythagoras $a^2 + b^2 = c^2$; triples 3-4-5, 5-12-13, 8-15-17, 7-24-25, 20-21-29
- $c^2 < a^2 + b^2$: acute at C; $c^2 > a^2 + b^2$: obtuse at C
- Equilateral side a : height $(\sqrt{3}/2)a$, area $(\sqrt{3}/4)a^2$
- 30-60-90 sides $1 : \sqrt{3} : 2$; 45-45-90 sides $1 : 1 : \sqrt{2}$
- Similar triangles: sides in ratio $k \Rightarrow$ areas in ratio k^2
- Same height $\Rightarrow$ area ratio = base ratio
- Right triangle, altitude to the hypotenuse: $h = ab/c$; each leg² = hypotenuse $\times$ adjacent segment
- Sine rule $a/\sin A = 2R$; cosine rule $c^2 = a^2 + b^2 - 2ab \cos C$

60-SECOND SHORTCUT

Area ratios without heights

D on AB with $AD : DB = 2 : 1$, and E the midpoint of AC: area ADE = $(2/3) \times (1/2) = 1/3$ of ABC.

DON'T MAKE THESE MISTAKES

- ✗ Sides $1 : 2 \Rightarrow$ areas $1 : 2$
- ✓ Areas scale with the square: **1 : 4**
- ✗ 3, 4 and 8 form a triangle
- ✓ $3 + 4 < 8$: **no triangle**
- ✗ $\frac{1}{2}ab$ is the area of any triangle
- ✓ Only for a 90° angle between a and b ; else $\frac{1}{2}ab \sin C$

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2025 Slot 3

Q16 · Moderate · TITA

CAT 2024 Slot 2

Q22 · Moderate · MCQ

Solve every CAT Triangles PYQ, free



TOPIC 37 · GEOMETRY 3 OF 9 **REGULAR**

Triangle Centres

6 CAT questions from this topic, 2021–25
 #4 (tied) of 9 in Geometry · 5 TITA

Year	2021	2022	2023	2024	2025
Questions	1	1	1	3	0

CORE FORMULAS

- Centroid G: the medians meet there, and G divides each median 2 : 1 from the vertex
- The three medians split a triangle into 6 equal areas
- Median to side a : $m_a^2 = (2b^2 + 2c^2 - a^2)/4$ (Apollonius)
- Incentre I: the angle bisectors meet there; inradius $r = \text{area} \div s$
- Right triangle: $r = (a + b - c)/2$ and circumradius $R = c/2$
- $R = abc/(4 \times \text{area})$; equilateral: $R = a/\sqrt{3}$, $r = a/(2\sqrt{3})$
- The bisector of angle A cuts BC in the ratio AB : AC
- $\angle BIC = 90^\circ + A/2$; $\angle BOC = 2A$ (O = circumcentre, acute triangle)
- Orthocentre H: the altitudes meet there; $\angle BHC = 180^\circ - A$
- Joining the midpoints of the sides gives a triangle with $1/4$ of the area

60-SECOND SHORTCUT

3-4-5 in one breath

Right triangle 3-4-5: $r = (3 + 4 - 5)/2 = 1$, $R = 5/2$, and area = $r \times s = 1 \times 6 = 6$.

DON'T MAKE THESE MISTAKES

- ✗ The centroid is the midpoint of a median
- ✓ It sits **2/3 of the way** from the vertex
- ✗ The circumcentre is always inside
- ✓ Only for acute triangles; right ones: **midpoint of the hypotenuse**
- ✗ Inradius = area $\div$ perimeter
- ✓ Divide by the **semi**-perimeter s

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2024 Slot 2

Q19 · Easy · TITA

CAT 2021 Slot 1

Q10 · Moderate · TITA

Practise 110+ triangle questions on centres and theorems



TOPIC 38 · GEOMETRY 4 OF 9

MOST ASKED

Quadrilaterals

9

CAT questions from this topic, 2021–25

#2 of 9 in Geometry · 3 TITA



CORE FORMULAS

- The angles of any quadrilateral add to 360°
- Parallelogram: area = base $\times$ height = $ab \sin \theta$; the diagonals bisect each other
- Parallelogram: $d_1^2 + d_2^2 = 2(a^2 + b^2)$
- Rhombus: area = $d_1 d_2 / 2$; the diagonals are perpendicular; side² = $(d_1/2)^2 + (d_2/2)^2$
- Rectangle: diagonal = $\sqrt{l^2 + b^2}$. Square: diagonal = $a\sqrt{2}$, area = $d^2/2$
- Trapezium: area = $\frac{1}{2} \times (\text{sum of the parallel sides}) \times \text{height}$
- Trapezium: the diagonals cut each other in the ratio of the parallel sides
- Any quadrilateral: area = $\frac{1}{2} d_1 d_2 \sin \theta$, θ = angle between the diagonals
- With an incircle: $AB + CD = BC + AD$, and area = $r \times s$
- Joining the midpoints of any quadrilateral gives a parallelogram of half the area
- Each side is shorter than the sum of the other three

60-SECOND SHORTCUT

Rhombus from side and area

Side 5, area 24: $d_1 d_2 = 48$ and $d_1^2 + d_2^2 = 4 \times 25 = 100$, so $(d_1 + d_2)^2 = 196$
 $\Rightarrow d_1 + d_2 = 14 \Rightarrow$ diagonals **6 and 8**.

DON'T MAKE THESE MISTAKES

- ✗ Rhombus area = side²
- ✓ It is **$d_1 d_2 / 2$** (side² only for a square)
- ✗ Parallelogram diagonals are equal
- ✓ Only in a **rectangle**; they always bisect each other
- ✗ Trapezium height = the slant side
- ✓ Height is the **perpendicular** gap between the parallel sides

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2025 Slot 3

Q18 · Hard · MCQ

CAT 2025 Slot 1

Q12 · Moderate · TITA

[Practise 75+ Quadrilaterals questions](#)


TOPIC 39 · GEOMETRY 5 OF 9

REGULAR

Polygons

6

CAT questions from this topic, 2021–25

#4 (tied) of 9 in Geometry · 2 TITA

2	1	1	1	1
2021	2022	2023	2024	2025

CORE FORMULAS

- Sum of the interior angles = $(n - 2) \times 180^\circ$
- Sum of the exterior angles = 360° ; regular polygon: each exterior = $360^\circ/n$
- Regular polygon: each interior = $180^\circ - 360^\circ/n$
- Interior - exterior = $180^\circ - 720^\circ/n$
- Number of diagonals = $n(n - 3)/2$
- Regular hexagon, side a : 6 equilateral triangles, area $(3\sqrt{3}/2)a^2$
- Hexagon diagonals: long = $2a$, short = $\sqrt{3}a$
- Regular octagon, side a : area $2(1 + \sqrt{2})a^2$
- Any regular polygon: area = $\frac{1}{2} \times \text{perimeter} \times \text{apothem}$

60-SECOND SHORTCUT

Exterior angle first

Exterior angle $36^\circ \Rightarrow n = 360/36 = 10$
sides $\Rightarrow 10 \times 7/2 = \mathbf{35 \text{ diagonals.}}$

DON'T MAKE THESE MISTAKES

- ✗ Exterior angles add to $(n - 2) \times 180^\circ$
- ✓ They always add to **360°**
- ✗ Diagonals = $n(n - 1)/2$
- ✓ That counts the sides too: **$n(n - 3)/2$**
- ✗ Hexagon area = $6a^2$
- ✓ 6 equilateral triangles: **$6 \times (\sqrt{3}/4)a^2$**

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2023 Slot 3

Q19 · Moderate · TITA

CAT 2022 Slot 2

Q7 · Easy · TITA

Practise 75+ Polygons questions ↗



Circles

8

CAT questions from this topic, 2021-25

#3 of 9 in Geometry · 1 TITA

0	2	2	2	2
2021	2022	2023	2024	2025

CORE FORMULAS

- 1 Arc = $(\theta/360) \times 2\pi r$; sector = $(\theta/360) \times \pi r^2$
- 2 Segment = sector - triangle = $(\theta/360)\pi r^2 - \frac{1}{2}r^2 \sin \theta$
- 3 The perpendicular from the centre bisects a chord: chord = $2\sqrt{(r^2 - d^2)}$
- 4 Angle at the centre = $2 \times$ angle at the circumference on the same arc
- 5 Angles in the same segment are equal; the angle in a semicircle is 90°
- 6 Cyclic quadrilateral: opposite angles add to 180°
- 7 A tangent is perpendicular to the radius; the two tangents from a point are equal
- 8 Tangent length from P = $\sqrt{(OP^2 - r^2)}$
- 9 Chords AB and CD meeting at E: $AE \times EB = CE \times ED$; tangent-secant $PT^2 = PA \times PB$
- 10 Centres d apart: direct common tangent $\sqrt{(d^2 - (r_1 - r_2)^2)}$, transverse $\sqrt{(d^2 - (r_1 + r_2)^2)}$

60-SECOND SHORTCUT

Chord, radius, distance

Chord 8 in a circle of radius 5:
half-chord 4, so its distance from the centre is $\sqrt{(25 - 16)} = 3$.

DON'T MAKE THESE MISTAKES

- ✗ Segment area = sector area
- ✓ Subtract the triangle: $-\frac{1}{2}r^2 \sin \theta$
- ✗ Angle at the circumference = angle at the centre
- ✓ It is **half**
- ✗ Opposite angles of a cyclic quadrilateral are equal
- ✓ They add to **180°**

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2024 Slot 3

Q3 · Moderate · MCQ

CAT 2023 Slot 3

Q18 · Moderate · MCQ

[Solve every CAT Circles PYQ, free ↗](#)


TOPIC 41 · GEOMETRY 7 OF 9 **REGULAR**

Coordinate Geometry

4 CAT questions from this topic, 2021-25

#6 of 9 in Geometry · 0 TITA

0	1	1	1	1
2021	2022	2023	2024	2025

CORE FORMULAS

- Distance = $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$; midpoint = $((x_1 + x_2)/2, (y_1 + y_2)/2)$
- Section in the ratio $m : n$:
 $((mx_2 + nx_1)/(m + n), (my_2 + ny_1)/(m + n))$
- Slope = $(y_2 - y_1)/(x_2 - x_1)$; parallel lines: equal slopes; perpendicular: product -1
- Lines: $y = mx + c$; $y - y_1 = m(x - x_1)$; $x/a + y/b = 1$
- Point to line $ax + by + c = 0$: $|ax_1 + by_1 + c|/\sqrt{a^2 + b^2}$
- Parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ are $|c_1 - c_2|/\sqrt{a^2 + b^2}$ apart
- Triangle area = $\frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$; zero $\Leftrightarrow$ collinear
- Centroid = $((x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3)$
- Circle $x^2 + y^2 + 2gx + 2fy + c = 0$: centre $(-g, -f)$, radius $\sqrt{g^2 + f^2 - c}$
- Parallelogram ABCD: $D = A + C - B$ (the diagonals share a midpoint)

60-SECOND SHORTCUT

Fourth vertex in one line

$A(1, 2), B(4, 3), C(6, 7): D = A + C - B = (3, 6)$.

DON'T MAKE THESE MISTAKES

- ✗ Slope = $(x_2 - x_1)/(y_2 - y_1)$
- ✓ Rise over run: $(y_2 - y_1)/(x_2 - x_1)$
- ✗ Perpendicular slopes: 2 and -2
- ✓ Negative reciprocals: **2 and -1/2**
- ✗ $x^2 + y^2 - 6x + 8y = 0$ has centre $(-6, 8)$
- ✓ Halve and flip: centre **(3, -4)**, radius 5

SOLVE THE REAL ONES

Official CAT questions on thinkcat.in

CAT 2025 Slot 1

Q6 · Moderate · MCQ

CAT 2022 Slot 1

Q11 · Easy · MCQ

[Practise 65+ Coordinate Geometry questions ↗](#)


TOPIC 42 · GEOMETRY 8 OF 9

NOT ASKED 2021-25

Mensuration 2D

CAT questions from this topic, 2021-25

0

No standalone 2D mensuration question in CAT 2021-25, but these area formulas finish most geometry questions.

0	0	0	0	0
2021	2022	2023	2024	2025

CORE FORMULAS

- 1 Square: area a^2 , diagonal $a\sqrt{2}$. Rectangle: area lb , perimeter $2(l + b)$
- 2 Triangle: $\frac{1}{2}bh$; equilateral $(\sqrt{3}/4)a^2$; three sides given $\rightarrow$ Heron
- 3 Parallelogram: bh . Rhombus: $d_1d_2/2$. Trapezium: $\frac{1}{2}(a + b)h$
- 4 Circle: area πr^2 , circumference $2\pi r$
- 5 Semicircle: area $\frac{1}{2}\pi r^2$, perimeter $\pi r + 2r$
- 6 Sector: $(\theta/360)\pi r^2 = \frac{1}{2} \times \text{arc} \times r$
- 7 Ring: $\pi(R^2 - r^2)$
- 8 Path of width w around an $l \times b$ field: $(l + 2w)(b + 2w) - lb$
- 9 Lengths $\times k \Rightarrow$ areas $\times k^2$
- 10 Fixed perimeter: the square beats every other rectangle; the circle beats every shape

60-SECOND SHORTCUT

Fixed perimeter, biggest area

Perimeter 40: a 10×10 square gives **100**, more than any other rectangle (12×8 gives 96).

DON'T MAKE THESE MISTAKES

- ✗ Double the side $\Rightarrow$ double the area
- ✓ The area goes up **4 times**
- ✗ Semicircle perimeter = πr
- ✓ Add the diameter: **$\pi r + 2r$**
- ✗ Sector area = $\theta \times r^2$ (θ in degrees)
- ✓ It is **$(\theta/360) \times \pi r^2$**

PRACTISE IT NOW

Worked solutions on thinkcat.in

Geometry set

550+ practice questions [↗](#)

Geometry PYQs

CAT 2017-25 papers [↗](#)

Practise 550+ Geometry & Mensuration questions [↗](#)



Mensuration 3D

1 CAT question from this topic, 2021–25

#7 of 9 in Geometry · 0 TITA

0	0	0	1	0
2021	2022	2023	2024	2025

CORE FORMULAS

- 1 Cube: $V = a^3$, TSA = $6a^2$, space diagonal $a\sqrt{3}$
- 2 Cuboid: $V = lbh$, TSA = $2(lb + bh + hl)$, diagonal $\sqrt{l^2 + b^2 + h^2}$
- 3 Cylinder: $V = \pi r^2 h$, CSA = $2\pi rh$, TSA = $2\pi r(r + h)$
- 4 Cone: $V = \frac{1}{3}\pi r^2 h$, slant $l = \sqrt{r^2 + h^2}$, CSA = πrl , TSA = $\pi r(r + l)$
- 5 Sphere: $V = \frac{4}{3}\pi r^3$, SA = $4\pi r^2$.
Hemisphere: $V = \frac{2}{3}\pi r^3$, TSA = $3\pi r^2$
- 6 Frustum: $V = \frac{1}{3}\pi h(R^2 + r^2 + Rr)$, CSA = $\pi(R + r)l$
- 7 Prism $V = \text{base area} \times \text{height}$; pyramid $V = \frac{1}{3} \times \text{base area} \times \text{height}$
- 8 Melting and recasting keeps the volume the same
- 9 Box in a sphere: space diagonal = diameter. Sphere in a cube: diameter = side
- 10 $(l + b + h)^2 = l^2 + b^2 + h^2 + 2(lb + bh + hl)$

60-SECOND SHORTCUT

Melt and count

A sphere of radius 3 is recast into cones of radius 3 and height 3: $36\pi \div 9\pi = \mathbf{4 \text{ cones}}$.

DON'T MAKE THESE MISTAKES

- ✗ Cone volume = $\pi r^2 h$
- ✓ One third of it: $\frac{1}{3}\pi r^2 h$
- ✗ Hemisphere TSA = $2\pi r^2$
- ✓ Add the flat face: $3\pi r^2$
- ✗ Cube diagonal = $a\sqrt{2}$
- ✓ That is a face diagonal; the space diagonal is $a\sqrt{3}$

SOLVE THE REAL ONES

PYQs and practice on thinkcat.in

CAT 2024 Slot 1

Q13 · Hard · MCQ

3D Solids set

95+ practice questions

[Practise 95+ 3D Solids questions ↗](#)


SCREENSHOT THIS PAGE

12x = asked 12 times in CAT 2021-25

The Geometry Formula Wall

35 Lines & Angles

0x

p.2

- Straight line 180° ; full turn 360°
- Parallel lines: alternate and corresponding angles equal
- Co-interior angles add to 180°
- Exterior angle = sum of opposite interiors

36 Triangles

11x

p.3

- $\frac{1}{2}ab \sin C$; Heron $\sqrt{[s(s-a)(s-b)(s-c)]}$
- Equilateral: $(\sqrt{3}/4)a^2$
- Similar: area ratio = k^2
- Triples 3-4-5, 5-12-13, 8-15-17

37 Triangle Centres

6x

p.4

- Centroid: 2 : 1 from the vertex
- $r = \text{area}/s$; right triangle $r = (a + b - c)/2$
- $R = abc/(4 \times \text{area})$; right triangle $R = c/2$
- Bisector: $BD : DC = AB : AC$

38 Quadrilaterals

9x

p.5

- Parallelogram: $d_1^2 + d_2^2 = 2(a^2 + b^2)$
- Rhombus: area $d_1d_2/2$, diagonals $\perp$
- Trapezium: $\frac{1}{2}(a + b)h$
- Incircle: $AB + CD = BC + AD$

39 Polygons

6x

p.6

- Interior sum $(n - 2)180^\circ$; exterior sum 360°
- Diagonals $n(n - 3)/2$
- Hexagon $(3\sqrt{3}/2)a^2$
- Octagon $2(1 + \sqrt{2})a^2$

40 Circles

8x

p.7

- Chord = $2\sqrt{(r^2 - d^2)}$
- Centre angle = 2 $\times$ circumference angle
- Cyclic quad: opposite angles add to 180°
- $PT^2 = PA \times PB$

41 Coordinate Geometry

4x

p.8

- Section: $(mx_2 + nx_1)/(m + n)$
- Point to line: $|ax_1 + by_1 + c|/\sqrt{(a^2 + b^2)}$
- Area: $\frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$
- Circle centre $(-g, -f)$

42 Mensuration 2D

0x

p.9

- Trapezium $\frac{1}{2}(a + b)h$; rhombus $d_1d_2/2$
- Sector $(\theta/360)\pi r^2 = \frac{1}{2} \times \text{arc} \times r$
- Path: $(l + 2w)(b + 2w) - lb$
- Scale $k \Rightarrow \text{area} \times k^2$

43 Mensuration 3D

1x

p.10

- Cone $\frac{1}{3}\pi r^2 h$; sphere $(4/3)\pi r^3$
- Frustum $\frac{1}{3}\pi h(R^2 + r^2 + Rr)$
- Cuboid diagonal $\sqrt{(l^2 + b^2 + h^2)}$
- Recasting keeps the volume

FREE FULL CAT MOCK

TCS iON-style · 120 minutes

Free CAT mock ↗

WhatsApp

Telegram

