GEOMETRY AND TRIGONOMETRY / 01 UNDERSTAND

Circle area

An illustrated lesson ▪ Theory, reasoning and worked examples

Radius connects the centre to the boundary

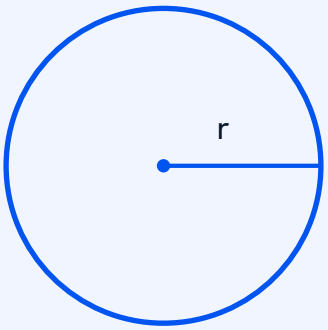
A circle is the set of points at a fixed distance r from its centre. That distance is the radius. A diameter passes through the centre and has length 2r. A chord joins any two points on the circle; only a chord through the centre is a diameter. These distinctions determine which length belongs in a formula.

Area and circumference measure different things

Area $A = \pi r^2$ measures the enclosed region in square units. Circumference $C = 2\pi r$ measures the boundary in length units. A question about covering a circular surface asks for area; a question about edging or one trip around the boundary asks for circumference.

Scaling reveals the squared relationship

Doubling the radius doubles circumference but quadruples area. Tripling the radius triples circumference and multiplies area by nine. This follows because radius appears to the first power in C and the second power in A. A sketch can make a larger circle look only slightly bigger, so use the formulas rather than visual estimates.



$\text{Area} = \pi r^2$

$\text{Circumference} = 2\pi r$

Diameter = 2r

Radius × 2 → area × 4

Radius × 2 → circumference × 2

Illustrative teaching diagram. Values and examples are explained in the lesson.

THE ESSENTIAL IDEA

The area of a circle is πr^2.

GEOMETRY AND TRIGONOMETRY / 02 BUILD THE METHOD

From idea to method

Translate the given measurement

If the diameter is 12, the radius is 6, so area is 36π rather than 144π. If circumference is 12π, solve $2\pi r = 12\pi$ to obtain $r = 6$ before finding the area. Work from the known quantity to radius, then from radius to the target.

Use fractions of a full turn

A central angle of theta degrees occupies theta/360 of a full circle. Its sector area is that fraction of πr^2, and its arc length is that fraction of $2\pi r$. The same fraction applies to different whole-circle measures; do not substitute area for arc length.

Read a circle equation

In $(x - h)^2 + (y - k)^2 = r^2$, the centre is (h, k) and the radius is r. The right side is the squared radius. Thus $(x - 2)^2 + (y + 3)^2 = 25$ has centre (2, -3) and radius 5, not 25.

WORKED EXAMPLE / A QUARTER-CIRCLE SECTOR

A circle has radius 6. Find the area and arc length of a sector with central angle 90 degrees.

01 Set up the reasoning

The sector is 90/360 = 1/4 of a full circle.

02 Apply the relationship

Its area is $(1/4)\pi(6^2) = 9\pi$ square units.

03 Interpret and check

Its arc length is $(1/4)2\pi(6) = 3\pi$ units. The complete sector perimeter also includes two radii, giving $3\pi + 12$.

Keep these distinctions handy

Whole circle	$A = \pi r^2$; $C = 2\pi r$; diameter = 2r.
Sector and arc	Multiply the full measure by theta/360 for degrees.
Coordinate form	$(x - h)^2 + (y - k)^2 = r^2$; centre (h, k).

GEOMETRY AND TRIGONOMETRY / 03 CONNECT & REMEMBER

See the deeper pattern

Keep exact values when possible

If the problem asks for k in an area of kπ, report the coefficient without multiplying by an approximation to π. For radius 7, area is 49π, so k = 49. Exact symbolic form also makes cancellation easier when comparing areas or solving for a radius.

ONE MORE WORKED APPLICATION

A circle has diameter 10. Its area is kπ. What is k?

1. Radius = 10 / 2 = 5.

2. Area = $\pi \times 5^2 = 25\pi$, so k = 25.

Answer: 25

Mistakes to recognize

- Halve the diameter before squaring the radius.
- Arc length is only the curved portion, not the whole sector perimeter.
- Read a squared radius from the equation, then take its positive square root.

A quick understanding check

How does area change if radius is multiplied by 3?

Explanation: It is multiplied by 9 because area is proportional to r^2.

MORE PRACTICE IN YOUR DASHBOARD

Open prepvora.com/app/ and use the SAT question bank. Work on Geometry and Trigonometry, then look for circle area questions. Solve independently before reviewing the explanation. Use this guide for the theory; use the dashboard for a longer practice session.

Open your dashboard → | Explore the resource library →

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