

Geometry: labelled facts, coordinates, circles and solids

Original classroom teaching; not an official form or score predictor

1. Scope and task

Scope and task

Original classroom practice within the reviewed shorter-test task types. This does not simulate an adaptive test or predict a scaled or writing score. Earlier official public forms remain exposed practice; their version and writing-source holds still apply.

2. Scope and task

Scope and task

Use given relationships rather than a diagram's apparent scale Connect coordinate distances, slopes and geometric properties Distinguish linear, area and volume scale factors

3. Scope and task

Scope and task

sector : A circle region bounded by two radii and their included arc.

4. Scope and task

Scope and task

scale factor : The multiplier relating corresponding lengths of similar figures.

5. Read the evidence and choose a method

Read the evidence and choose a method

Extract the facts a diagram supplies: lengths, right-angle marks, parallel lines, circle radii and stated shape properties. Avoid measuring the screen. Angle sums and similarity give relationships when their conditions hold. Pythagorean reasoning needs a right triangle; it does not apply to every drawn triangle.

6. Read the evidence and choose a method

Read the evidence and choose a method

For two coordinates, use midpoint $((x_1+x_2)/2, (y_1+y_2)/2)$ and distance $\sqrt{((x_2-x_1)^2 + (y_2-y_1)^2)}$. Slope is $\Delta y/\Delta x$ when $\Delta x \neq 0$. A vertical line has no finite slope. Combine coordinate and shape facts where useful; perpendicular nonvertical lines have slopes whose product is -1 .

7. Read the evidence and choose a method

Read the evidence and choose a method

A circle has circumference $2\pi r$ and area πr^2 . An arc or sector uses its fraction of a full turn. Rectangular solids use volume lwh ; cylinders use $\pi r^2 h$. Surface area counts exposed faces or surfaces, not the enclosed volume. Attach units so an area answer is not confused with a length or volume.

8. Read the evidence and choose a method

Read the evidence and choose a method

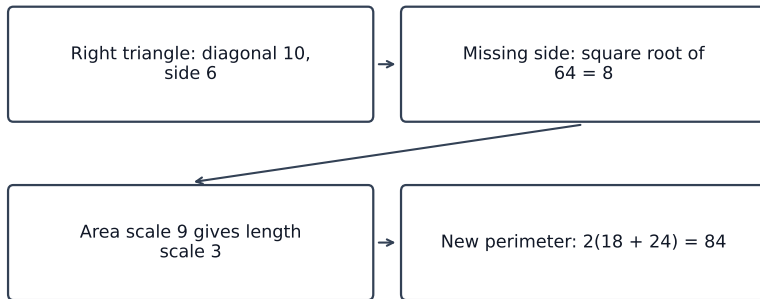
For similar figures with linear factor k , corresponding areas multiply by k^2 and volumes by k^3 . If a question provides only an area ratio, take a square root to recover the length ratio; do not copy the area ratio directly. General-test geometry uses elementary relationships, with no trigonometry or calculus required for this lesson's tasks.

9. Worked reasoning

Worked reasoning

Points $A(-1,2)$ and $B(5,10)$ have $\Delta x=6$, $\Delta y=8$. Distance $d=\sqrt{(6^2+8^2)}=10$ and midpoint $M=((-1+5)/2,(2+10)/2)=(2,6)$. For a circle of radius 6, a 60° sector is $1/6$ of a full circle: area $=(60/360)\pi 6^2=6\pi$; arc length $=(60/360)2\pi 6=2\pi$. Enlarging every length by 3 multiplies area by 9 and volume by 27, not 3.

Figure 10: Worked reasoning



Check the labelled values and conditions.

11. Conditions and common errors

Conditions and common errors

Use labelled facts, include required π or units, and distinguish a perimeter from an area or a sector from its arc.

12. Original application

Original application

Points $A=(-1,2)$ and $B=(5,10)$ are given. Find their distance and midpoint. A right circular cylinder has radius 3 cm and height 4 cm. Find its volume and total surface area, including both ends.

13. Model and reasoning

Model and reasoning

Coordinate differences are six and eight. Distance is $\sqrt{6^2 + 8^2} = 10$ and midpoint $((-1 + 5)/2, (2 + 10)/2) = (2, 6)$. Cylinder volume is

$V = \pi r^2 h = \pi(3 \text{ cm})^2(4 \text{ cm}) = 36\pi \text{ cm}^3$. Total area is

$S = 2\pi r^2 + 2\pi rh = 2\pi(3 \text{ cm})^2 + 2\pi(3 \text{ cm})(4 \text{ cm}) = 42\pi \text{ cm}^2$. Volume and surface area measure different quantities.

14. Try independently

Try independently

A rectangle has diagonal 10 cm and one side 6 cm. A similar rectangle has area nine times as large. Find its perimeter. Explain which labelled facts permit Pythagoras, and whether the same calculation would hold for an arbitrary quadrilateral.

15. Reasoning and check

Reasoning and check

A rectangle's adjacent sides are perpendicular. Its diagonal forms a right triangle, so the other side is $b = \sqrt{d^2 - a^2} = \sqrt{(10 \text{ cm})^2 - (6 \text{ cm})^2} = 8 \text{ cm}$. Area scale nine means length scale three. The new sides are 18 and 24 cm, giving perimeter $P = 2(a + b) = 2(18 + 24) \text{ cm} = 84 \text{ cm}$. An arbitrary quadrilateral need not supply a right angle, so its drawing alone would not justify the equation.

Check yourself

Reconstruct the method without looking back

A rectangle has diagonal 10 cm and one side 6 cm. A similar rectangle has area nine times as large. Find its perimeter. Explain which labelled facts permit Pythagoras, and whether the same calculation would hold for an arbitrary quadrilateral.