13.1 Geometry: labelled facts, coordinates, circles and solids

Name: _____ Class: _____ Date: _____

KEY WORDS sector • scale factor

Objective

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

Original public tasks and locally authored marking guidance. No official score is assigned.

1 Key knowledge and worked examples

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

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

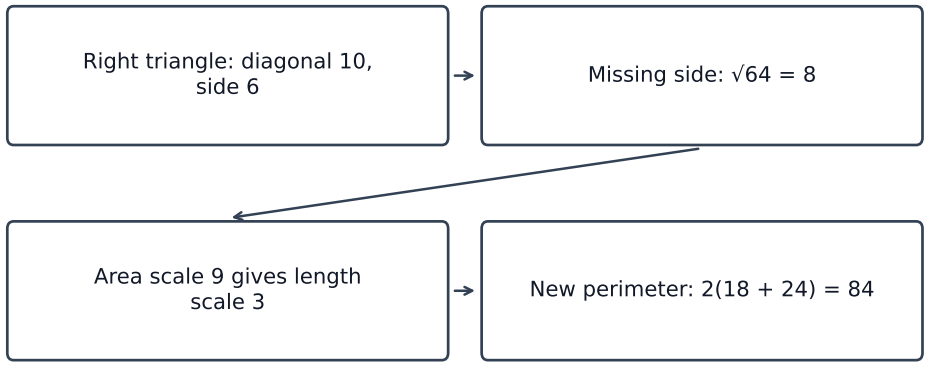
Extract the facts a diagram supplies: lengths, right-angle marks, parallel lines, circle radii and stated shape properties. Avoid measuring the screen. Angle sums and similarity give relationships when their conditions hold. Pythagorean reasoning needs a right triangle; it does not apply to every drawn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

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.

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.

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.

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.



Area scale 9 means length scale 3: the 6 by 8 rectangle becomes 18 by 24

2 Practice

2.1 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.

3 Exam-style questions

3.1 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.