

Objective

1 Key knowledge and worked examples

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.

Solutions

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

3.1 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.

Local review checklist: follow every response instruction; support the answer with the stated evidence; explain rejected alternatives or an opposing view; check scope, restrictions and clarity. For writing, this is a formative checklist, not an official rubric score.