Year 9 Circles, Area and Volume – Challenge

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Answers and worked solutions · 8 questions

A. Think like a mathematician

1. **The perimeter also includes the straight edge, the diameter 8 cm: 12.56 + 8 = 20.56 cm.**
   Error: only the curved edge was counted
   Diameter = 2 × 4 = 8 cm
   Perimeter = 12.56 + 8 = 20.56 cm

2. **The formula uses the radius: r = 6 cm, so A = 3.14 × 36 = 113.04 cm^2.**
   Error: the diameter was used instead of the radius
   r = 12 ÷ 2 = 6
   A = 3.14 × 6^2 = 113.04 cm^2

3. **Yes. A 10 cm cube holds exactly 1 litre, and 10 × 10 × 10 = 1000 cm^3.**
   Test an example
   A 10 cm cube holds exactly 1 litre, and 10 × 10 × 10 = 1000 cm^3.
   Decide

4. **Yes. Every plane through the central axis is a plane of symmetry (and so is the plane halfway up).**
   Test an example
   Every plane through the central axis is a plane of symmetry (and so is the plane halfway up).
   Decide

5. **A cylinder is a prism with a circular cross-section. Volume of a prism = area of cross-section × length; the circle has area πr^2, and the length is h, so $V = \pi r^2 h$.**
   The cross-section is a circle of area πr^2
   Volume of a prism = cross-section × length
   $V = \pi r^2 \times h = \pi r^2 h$

6. **314 cm^3**
   Cross-section: 3.14 × 1^2 = 3.14 cm^2
   Volume: 3.14 × 100 = 314 cm^3

7. **100.48 litres**
   V = 3.14 × 20^2 × 80 = 100 480 cm^3
   100 480 ÷ 1000 = 100.48 litres

8. **62.13 cm^2**
   Rectangle 6 × 8 = 48 cm^2; semicircle ½ × 3.14 × 3^2 = 14.13 cm^2
   Total: 48 + 14.13 = 62.13 cm^2