Year 8 Circles, Area and Volume – Challenge

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Answers and worked solutions · 8 questions

A. Think like a mathematician

1. Euler's formula is V – E + F = 2, so F = 2 – 16 + 24 = 10.

Error: the edges must be subtracted
16 – 24 + F = 2
F = 10

2. C = πd and the diameter is 24 cm, so C = 3.14 × 24 = 75.36 cm.

Error: the radius was used instead of the diameter
d = 2 × 12 = 24
C = 75.36 cm

3. Euler's formula is V – E + F = 2, so F = 2 – 7 + 12 = 7.

Error: the edges must be subtracted
7 – 12 + F = 2
F = 7

4. No. 3.14 is only an approximation; π = 3.14159... and its decimals never end or repeat.

Test an example
3.14 is only an approximation; π = 3.14159... and its decimals never end or repeat.
Decide

5. No. Use the perpendicular height, not the sloping side: area = base × perpendicular height.

Test an example
Use the perpendicular height, not the sloping side: area = base × perpendicular height.
Decide

6. Yes. A cube has 8 vertices, 12 edges and 6 faces: 8 – 12 + 6 = 2.

Test an example
A cube has 8 vertices, 12 edges and 6 faces: 8 – 12 + 6 = 2.
Decide

7. 192 cm^2

Two triangles: 2 × ½ × 8 × 6 = 48 cm^2
Three rectangles: (8 + 6 + 10) × 6 = 144 cm^2
Total: 192 cm^2

8. 324 cm^3

Area of the triangle: ½ × 12 × 9 = 54 cm^2
Volume = area of cross-section × length = 54 × 6 = 324 cm^3