

Spring egg geometry for IGCSE and GCSE: answers

IGCSE Math Revision · IGCSE and GCSE (Higher and Extended) · Teacher answers and notes

The starter is non-calculator. A calculator is needed for the main activity.

Teacher notes

- Bring in a real egg and a ruler: students can compare their measurements with the models.
- In task A (b), the flat circle where the hemisphere meets the cone is inside the egg, so it is not part of the surface area.
- In task C, the common slip is to use the length scale factor for volume or area.

Starter

1. **$36\pi \text{ cm}^3$**

- $\frac{4}{3}\pi \times 27 = 36\pi$

2. **$18\pi \text{ cm}^3$**

- Half of 36π

3. **$12\pi \text{ cm}^3$**

- $\frac{1}{3}\pi \times 9 \times 4 = 12\pi$

4. **It is multiplied by 8**

- $2^3 = 8$

Task A: A hemisphere-and-cone egg

a. **$33\pi \approx 104 \text{ cm}^3$**

- Hemisphere: 18π . Cone: $\frac{1}{3}\pi \times 9 \times 5 = 15\pi$.
- $33\pi = 103.67\dots$

b. **112 cm^2**

- Curved hemisphere: $2\pi \times 9 = 18\pi$.
- Slant height $l = \sqrt{9 + 25} = \sqrt{34}$; curved cone: $\pi \times 3 \times \sqrt{34}$.
- $18\pi + 3\pi\sqrt{34} = 56.55\dots + 54.95\dots = 111.5\dots$

c. **622 cm^3**

- $6 \times 33\pi = 198\pi = 622.0\dots$

Task B: Ellipse eggs

a. **18.8 cm^2**

- $\pi \times 3 \times 2 = 6\pi = 18.84\dots$

b. **42.4 cm^2**

- Scale factor 1.5, so area scale factor 2.25.
- $6\pi \times 2.25 = 13.5\pi = 42.41\dots$

c. **50.3 cm^3**

- $\frac{4}{3}\pi \times 3 \times 4 = 16\pi = 50.26\dots$

Task C: Similar chocolate eggs

a. **1.5 and 3.375**

- $9 \div 6 = 1.5$; $1.5^3 = 3.375$

b. **135 g**

- $40 \times 3.375 = 135$

c. **40 cm²**

- Area scale factor $1.5^2 = 2.25$. $90 \div 2.25 = 40$

Extension

1. **2.96 cm**

- Volume = $\frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 \times 5r/3 = (2/3 + 5/9)\pi r^3 = (11/9)\pi r^3$.
- $r^3 = 900/(11\pi) = 26.04\dots$, so $r = 2.964\dots$

2. **10 cm**

- Length scale factor = $\sqrt[3]{8} = 2$, so $5 \times 2 = 10$ cm.

Every question is original and every answer was recomputed by computer before publishing.