Halloween maths activities for IB Maths SL and HL: IGCSE / GCSE: answers

IB Math Revision · IGCSE and GCSE (Higher and Extended) · 31 October · Teacher answers and notes

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

Teacher notes

- Common slip in the zombie task: adding 40% of the original 50 every hour (linear growth) instead of multiplying by 1.4.
- In the pumpkin task, students often use the diameter as the radius. Ask them to say the radius out loud first.
- The percentage in part (c) needs no π at all: let students spot that the $\frac{4}{3}\pi$ cancels.
- Extension 1 is a first look at a fixed point: a good bridge to iteration.

Starter

1. **£1.80**
   - 25% of £2.40 is £0.60.
   - £2.40 − £0.60 = £1.80
2. **3/8**
   - There are 5 + 3 = 8 sweets, and 3 are eyeballs, so the probability is 3/8.
3. **(2, 4)**
   - Average the x-coordinates: (−2 + 6) ÷ 2 = 2.
   - Average the y-coordinates: (7 + 1) ÷ 2 = 4.
4. **$2^7 = 128$**
   - Add the powers: 3 + 4 = 7, so $2^3 \times 2^4 = 2^7$.
   - $2^7 = 128$

Task A: Zombie outbreak

a. **70**

- An increase of 40% means multiplying by 1.4.
- 50 × 1.4 = 70

b. **376 zombies**

- Each hour the number is multiplied by 1.4, so after *t* hours it has been multiplied by 1.4 a total of *t* times.
- $50 \times 1.4^6 = 50 \times 7.529536 = 376.4768$
- So about 376 zombies.

c. **17 hours**

- Try values: $50 \times 1.4^{16} \approx 10\,889$, which is less than 12 000.
- $50 \times 1.4^{17} \approx 15\,245$, which is more than 12 000.
- So it first goes above 12 000 after 17 hours.

Task B: Pumpkin geometry

a. **7240 cm³**

- The radius is 24 ÷ 2 = 12 cm.
- $\frac{4}{3} \times \pi \times 12^3 = 2304\pi = 7238.2...$
- 7240 cm^3 (3 s.f.)

b. **1810 cm²**

- $4 \times \pi \times 12^2 = 576\pi = 1809.5...$
- 1810 cm^2 (3 s.f.)

c. **57.9%**

- Volume removed = $\frac{4}{3}\pi \times 10^3$; whole pumpkin = $\frac{4}{3}\pi \times 12^3$.
- The $\frac{4}{3}\pi$ cancels: $1000 \div 1728 = 0.5787...$
- 57.9%

d. **3050 cm³**

- Length scale factor = $18 \div 24 = 3/4$, so the volume scale factor is $(3/4)^3 = 27/64$.
- $2304\pi \times 27/64 = 972\pi = 3053.6...$
- 3050 cm^3 (3 s.f.)

Task C: Trick or treat

a. **0.49**

- $0.7 \times 0.7 = 0.49$

b. **0.42**

- Treat then trick: $0.7 \times 0.3 = 0.21$. Trick then treat: $0.3 \times 0.7 = 0.21$.
- $0.21 + 0.21 = 0.42$

c. **7/15**

- Both toffees: $6/10 \times 5/9 = 30/90$.
- Both lollipops: $4/10 \times 3/9 = 12/90$.
- $30/90 + 12/90 = 42/90 = 7/15$

Task D: Haunted house maze

a. **10 units**

- Across 8, up 6.
- $\sqrt{(8^2 + 6^2)} = \sqrt{100} = 10$

b. **$y = 3/4x + 5/4$**

- Gradient = $6 \div 8 = 3/4$.
- Through (1, 2): $2 = 3/4 \times 1 + c$, so $c = 5/4$.

c. **$4x + 3y = 35$**

- Midpoint M = (5, 5).
- Perpendicular gradient = $-4/3$.
- $y - 5 = -4/3(x - 5)$ gives $3y - 15 = -4x + 20$, so $4x + 3y = 35$.

d. **Yes**

- $4 \times 8 + 3 \times 1 = 32 + 3 = 35$, so T satisfies the equation and lies on the wall.

Extension

1. **76 zombies**

- $75 \times 1.4 - 30 = 105 - 30 = 75$, so 75 stays at 75.
- With Z zombies the next hour has $1.4Z - 30$. This is bigger than Z when $0.4Z > 30$, that is when $Z > 75$.
- So the smallest whole number is 76.

2. **5 units**

- T lies on the secret wall, which meets DC at right angles at M(5, 5).
- So the shortest distance is TM = $\sqrt{(3^2 + 4^2)} = 5$.

Every question is original and every answer was checked before publishing.