

Valentine's Day maths activities for IGCSE and GCSE: answers

IGCSE Math Revision · IGCSE and GCSE (Higher and Extended) · 14 February · Teacher answers and notes

The starter is non-calculator. A calculator is allowed in the main activity.

Teacher notes

- Students can cut the heart from card: a square and two semicircles of diameter equal to its side.
- In task A (c), a common slip is to multiply the area by 1.5 instead of 1.5^2 .
- Run task B for real with three or four volunteers and name cards before working it out.

Starter

1. **$25\pi \text{ cm}^2$**
 - $\pi \times 5^2 = 25\pi$
2. **$8\pi \text{ cm}$**
 - $\pi \times 8 = 8\pi$
3. **$3/8$**
 - 3 out of 8
4. **18 and 30**
 - 8 parts: $48 \div 8 = 6$. $3 \times 6 = 18$ and $5 \times 6 = 30$.

Task A: Design a heart

- a. **$36 + 9\pi \approx 64.3 \text{ cm}^2$**
 - Square: $6 \times 6 = 36$. Two semicircles of radius 3 make one circle: $\pi \times 3^2 = 9\pi$.
 - $36 + 9\pi = 64.27\dots$, which is 64.3 cm^2 (3 s.f.).
- b. **30.8 cm**
 - Two straight sides: 12 cm. Two semicircle arcs make one circle of diameter 6: 6π .
 - $12 + 6\pi = 30.84\dots$
- c. **145 cm^2**
 - Length scale factor $9 \div 6 = 1.5$, so area scale factor $1.5^2 = 2.25$.
 - $(36 + 9\pi) \times 2.25 = 81 + 20.25\pi = 144.6\dots$, which is 145 cm^2 .

Task B: Secret card swap

- a. **6 ways; $1/3$**
 - ABC, ACB, BAC, BCA, CAB, CBA (the card that A, B and C get, in order).
 - Nobody has their own card in BCA and CAB: 2 out of 6 = $1/3$.
- b. **$1/6$**
 - Only ABC: 1 out of 6.
- c. **$3/8$: slightly more likely than $1/3$**
 - $9/24 = 3/8 = 0.375$, and $1/3 = 0.333\dots$

Task C: Sweet hearts

a. **2/15**

- $4/10 \times 3/9 = 12/90 = 2/15$

b. **8/15**

- Red then pink: $4/10 \times 6/9 = 24/90$. Pink then red: $6/10 \times 4/9 = 24/90$.
- $48/90 = 8/15$

c. **2/3**

- $P(\text{no red}) = 6/10 \times 5/9 = 30/90 = 1/3$.
- $1 - 1/3 = 2/3$

Extension

1. **4/9**

- $P(\text{all different}) = 6/6 \times 5/6 \times 4/6 = 120/216 = 5/9$.
- $1 - 5/9 = 4/9$

2. **7.48 cm**

- $\text{Area} = s^2 + \pi(s/2)^2 = s^2(1 + \pi/4) = 1.785...s^2$.
- $s^2 = 100 \div 1.785... = 56.0...$, so $s = 7.48$.

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