

Maths about me: a first-lesson icebreaker for A Level Maths: answers

A Level Math Revision · A Level Maths (Year 12 and Year 13) · Teacher answers and notes

The starter is non-calculator. A calculator is useful for task A.

Teacher notes

- Nothing personal is collected: students work on paper, and nothing is typed into the site or stored. If a student would rather not use a real birthday, any date works.
- Pairs for task B: each student writes one riddle with exactly one answer and swaps with a partner, who checks that only one number fits.
- Mindset prompts for the first lesson (for you to read out or put on the board; nothing is collected or stored): 'A time maths felt hard, and what helped'; 'One topic from last year I could teach a friend'; 'What I do when I am stuck'; 'How I want this class to feel'.
- The extension proofs are direct proofs of the kind in the Proof topic: ask for a concluding sentence each time.

Starter

1. **3**

- $x^2 - x - 6 = (x - 3)(x + 2) = 0$
- $x = 3$

2. **210**

- $20 \times 21 / 2 = 210$

3. **3**

- $5 - 2 = 3$

4. **15**

- ${}^6C_2 = 15$

Task A: Maths about me

a. **$12 = 2^2 \times 3$, $2008 = 2^3 \times 251$; HCF = 4, LCM = 6024**

- $2008 = 8 \times 251$, and 251 is prime (not divisible by 2, 3, 5, 7, 11 or 13, and $17^2 > 251$)
- $\text{HCF} = 2^2 = 4$; $\text{LCM} = 2^3 \times 3 \times 251 = 6024$

b. **11111011000**

- $2008 = 1024 + 512 + 256 + 128 + 64 + 16 + 8$

c. **333 terms; sum 335 664**

- $12 + 6(n - 1) < 2008$ gives $n - 1 < 332.67$, so $n = 333$ (the last term is 2004).
- $S = 333/2 \times (12 + 2004) = 335\,664$

Task B: 'Who am I?' in pairs

a. **5**

- Try $n = 1, 2, 3, 4, 5$: $2^n - n^2 = 1, 0, -1, 0, 7$.
- For $n \geq 5$ the gap keeps growing, so 5 is the only answer.

b. **19, 29, 39, 49, 59, 69, 79, 89 and 99**

- $10a + b = a + b + ab$ gives $9a = ab$, so $b = 9$.

c. **18**

- $6 + 6r = 10$ gives $r = 2/3$
- $S_{\infty} = 6 / (1 - 2/3) = 18$

Task C: Four 4s

a. **$44 - 44 = 0$ and $4 \times 4 + 4 + 4 = 24$**

- $44 - 44 = 0$
- $16 + 8 = 24$

b. **$4! - 4 - 4/4 = 19$**

- $24 - 4 - 1 = 19$

c. **$4^4 + 4/4 = 1024$**

- $4^5 = 1024$

d. **$44/(\sqrt{4} \times \sqrt{4}) = 11$**

- $\sqrt{4} \times \sqrt{4} = 4$, and $44 \div 4 = 11$

Extension

1. **$(10a + b) - (10b + a) = 9(a - b)$**

- The number is $10a + b$; its reverse is $10b + a$.
- The difference is $9a - 9b = 9(a - b)$, a multiple of 9.

2. **$n^3 - n = (n - 1)n(n + 1)$**

- It is the product of three consecutive integers.
- One of any two consecutive integers is even, and one of any three is a multiple of 3, so the product is a multiple of $2 \times 3 = 6$.

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