Christmas maths escape room for IB Maths: Beyond school: answers

IB Math Revision · Beyond school: for adults and maths fans · Teacher answers and notes

No calculator needed: every code is a whole number.

Teacher notes

- A stretch set for anyone past school maths: adults, maths clubs and keen sixth-formers. Competition style, no calculator, every answer exact.
- How to run it: print the student sheet and cut out the six lock cards. Give each team lock 1. When a team brings you the right code, give them the next card (the answer key is in the answers PDF). The first team to open lock 6 escapes.
- Each code is used in the next lock, so check every code before the team moves on: one slip early on breaks the chain.

Starter

1. **1024**
   - $2^{10} = 1024$
2. **10**
   - 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
3. **121**
   - $11 \times 11 = 121$

Lock 1: The stocking count

a. **24**

- $360 = 2^3 \times 3^2 \times 5$
- $(3 + 1)(2 + 1)(1 + 1) = 24$

Lock 2: The elf handshakes

a. **276**

- ${}^{24}C_2 = 24 \times 23 \div 2 = 276$

Lock 3: The base-5 lock

a. **4**

- $276 = 2 \times 125 + 1 \times 25 + 0 \times 5 + 1$, so it is 2101 in base 5.
- $2 + 1 + 0 + 1 = 4$

Lock 4: The snowflake

a. **229**

- Each step multiplies the perimeter by 4/3: $3 \times (4/3)^4 = 256/27$.
- $256 - 27 = 229$

Lock 5: The remainder

a. **13**

- $229 = 9 \times 24 + 13$

Lock 6: The workshop door

a. **377**

- The number of ways for n is the $(n + 1)$th Fibonacci number.
- For 13: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377

Extension

1. **61**
   - It is 1 more than a multiple of LCM(2, 3, 4, 5, 6) = 60.

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