Christmas maths escape room for IB Maths: HL

IB Math Revision · IB HL and A Level Further Maths (no calculator) · Student sheet

Name _____ Class _____ Date _____

No calculator needed: every code is a whole number.

Starter (5 minutes)

1. Find $|4 + 3i|$.

2. Find ${}^{6}C_{2}$.

3. Find the gradient of $y = x^3$ at $x = 2$.

Main activity (36 minutes)

Cut out the cards. Each code unlocks the next card.

Lock 1: The sorting machine

Presents go through the machine in numbered batches.

a. Find the sum of the whole numbers from 1 to 15. This is code 1.

Code for lock 1: _____

Lock 2: The complex cracker

Inside the cracker is a complex number.

a. $z = a + 5i$, where a = code 1 ÷ 10. Find $|z|$. This is code 2.

Code for lock 2: _____

Lock 3: The endless tinsel

Each strand of tinsel is 3/4 as long as the one before.

a. The first strand is code 2 metres long. Find the total length of all the strands, going on for ever. This is code 3.

Code for lock 3: _____

Lock 4: The elf integral

The elves set an integral.

a. Let $k = \sqrt{(\text{code 3} - 3)}$. Find $\int_0^k 2x \, dx$. This is code 4.

Code for lock 4: _____

Lock 5: The sack of crackers

Each cracker has a joke inside with probability 1/7.

a. $X \sim B(n, 1/7)$ where n = code 4. Find $\text{Var}(X)$. This is code 5.

Code for lock 5: _____

Lock 6: The workshop door

The last lock.

a. The door opens with the coefficient of x^2 in the expansion of $(1 + x)^n$, where n = code 5.

Code for lock 6: _____

Extension

1. Add up all six codes and write the total in binary. What do you notice?