

Ada Lovelace Day maths activities for IGCSE and GCSE: answers

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

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

Teacher notes

- Ask students to write their own three-step flowchart for a friend to follow: writing exact instructions is the point of the lesson.
- In task B (c), students should use the n th term rather than keep adding 6.
- Ada Lovelace is widely known for her notes on the Analytical Engine. Keep the lesson about the maths.

Starter

1. **32, 39**
 - The terms go up by 7 each time.
2. **$7n - 3$**
 - The difference is 7, so start with $7n$. The first term is $4 = 7 - 3$, so the n th term is $7n - 3$.
3. **13**
 - $6^2 = 36$, $36 - 10 = 26$, $26 \div 2 = 13$
4. **2, 5, 10**
 - $1 + 1 = 2$, $4 + 1 = 5$, $9 + 1 = 10$

Task A: Follow the flowchart

- a. **1, 3, 6, 10, 15**
 - $n = 1, 2, 3, 4, 5$ give 1, 3, 6, 10, 15: the triangular numbers.
- b. **55**
 - $n = 9$ gives 45, which is not more than 50, so carry on.
 - $n = 10$ gives 55, which is more than 50, so stop.
- c. **10**
 - One for each of $n = 1$ to 10.

Task B: Loops that print sequences

- a. **$6n + 1$**
 - P prints 7, 13, 19, ...: difference 6, and $7 = 6 + 1$.
- b. **181**
 - $6 \times 30 + 1 = 181$
- c. **No**
 - $6n + 1 = 400$ gives $n = 66.5$, which is not a whole number.
- d. **1458**
 - Q prints 2, 6, 18, 54, ...: each number is 3 times the one before.
 - The 7th is $2 \times 3^6 = 2 \times 729 = 1458$.

Task C: Pixel patterns

a. **47**

- The differences are 5, 7, 9, 11, so the next difference is 13.
- $34 + 13 = 47$

b. **$n^2 + 2n - 1$**

- The second difference is 2, so start with n^2 .
- Subtract n^2 from each term: 1, 3, 5, 7, 9, which is $2n - 1$.
- So the n th term is $n^2 + 2n - 1$.

c. **Pattern 16**

- $n^2 + 2n - 1 = 287$ gives $n^2 + 2n - 288 = 0$.
- $(n + 18)(n - 16) = 0$, so $n = 16$.

Extension

1. **9 times; 1023**

- $1 \rightarrow 3 \rightarrow 7 \rightarrow 15 \rightarrow 31 \rightarrow 63 \rightarrow 127 \rightarrow 255 \rightarrow 511 \rightarrow 1023$
- That is 9 runs of the loop. (After k runs the number is $2^{k+1} - 1$.)

2. **5050**

- $100 \times 101 \div 2 = 5050$

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