

Ada Lovelace Day maths for CBSE Class 10: answers

CBSE Math Revision · CBSE Class 10 (Class 9 can try most of it) · Teacher answers and notes

No calculator. Every answer works out exactly.

Teacher notes

- Ask students to trace the algorithm in a table with columns n and S before using any formula.
- In task B (b), check that students include the last positive number, 1.
- Ada Lovelace is widely known for her notes on the Analytical Engine. Keep the lesson about the maths.

Starter

1. **52**

- $a = 7, d = 5: a_{10} = 7 + 9 \times 5 = 52$

2. **210**

- $20 \times 21 \div 2 = 210$

3. **5**

- $4 + 7d = 39$, so $7d = 35$ and $d = 5$.

4. **Yes, the 25th term**

- $a_n = 5 + 4(n - 1) = 4n + 1$.
- $4n + 1 = 101$ gives $n = 25$, a whole number.

Task A: Follow the algorithm

a. **1, 3, 5, ..., 29; 225**

- The odd numbers 1, 3, 5, ..., 29 are added: an AP with $a = 1, d = 2$ and 15 terms.
- $S_{15} = 15/2 \times (1 + 29) = 225$

b. **1600**

- The sum of the first n odd numbers is $n/2 \times (1 + 2n - 1) = n^2$.
- $40^2 = 1600$

c. **529**

- After n steps $S = n^2$.
- $22^2 = 484$ is not more than 500, but $23^2 = 529$ is.

Task B: A loop that counts down

a. **57**

- An AP with $a = 120$ and $d = -7: a_{10} = 120 - 9 \times 7 = 57$

b. **18**

- $120 - 7(n - 1) > 0$ gives $n - 1 < 120/7 = 17 \frac{1}{7}$, so $n \leq 18$.
- The 18th number is $120 - 119 = 1$; the next would be -6 .

c. **1089**

- $S_{18} = 18/2 \times (120 + 1) = 9 \times 121 = 1089$

Task C: Two loops race

a. **After 20 steps; 163**

- After k steps, P has $3 + 8k$ and Q has $63 + 5k$.
- $3 + 8k = 63 + 5k$ gives $3k = 60$, so $k = 20$ and the number is 163.

b. **1580**

- $a = 3, d = 8: a_{20} = 3 + 19 \times 8 = 155$.
- $S_{20} = 20/2 \times (3 + 155) = 1580$

c. **112**

- P writes 3, 11, 19, ...: the numbers that leave remainder 3 when divided by 8.
- The first three-digit one is 107 and the last is 995.
- $(995 - 107) \div 8 + 1 = 111 + 1 = 112$

Extension

1. **$n = 36$ (the sum is 666)**

- We need $n(n + 1)/2 = 111a = 3 \times 37 \times a$, so n or $n + 1$ is a multiple of 37.
- $n = 36: 36 \times 37 \div 2 = 666$. ($n = 37$ gives 703 and larger n give four digits.)

2. **728**

- 14, 21, ..., 98: an AP with 13 terms.
- $S = 13/2 \times (14 + 98) = 13 \times 56 = 728$

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