GCSE Maths: Sequences in context, reasoning and proof (Higher): answers

GCSE Maths - Sequences and nth Term - Higher - Lesson 11.9

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at **websink.site/gcse/maths/ch11-sequences/higher/sequences-in-context-reasoning-and-proof/**

Exercise 11I Sequences in context and reasoning (Non-calculator)

1 **Rhys earns £2150 a month in year 1 at a company, £2300 a month in year 2, £2450 a month in year 3, and so on (a £150 rise each year). Find the nth term and his monthly pay in year 10.**

Answer: nth term 150n + 2000; year 10 pay £3500

2 **A tank holds 500 litres. Water drains out at 20 litres every minute. Term 1 is 500 (the start), term 2 is 480 (after 1 minute), term 3 is 460, and so on. After how many minutes is the tank empty?**

Answer: The tank is empty after 25 minutes (term 26 is 0).

3 **Sequence A is 4, 7, 10, 13, ... and sequence B is 30, 28, 26, 24, ... In which position does A first have a bigger term than B? Show your working.**

Answer: Position 7 (A = 22, B = 18)

4 **A stack of identical chairs is 90 cm high with one chair. Each extra chair adds 8 cm, so a stack of n chairs is $(8n + 82)$ cm high. The roof of a van is 300 cm high. What is the height of the tallest stack that will fit, and how many chairs is that?**

Answer: 298 cm (a stack of 27 chairs)

5 **A theatre has 14 seats in the first row, 16 in the second row, 18 in the third row, and so on. The number of seats in row n is $2n + 12$.**

(a) How many seats are in row 20?

Answer: 52

(b) A row has 40 seats. Which row is it?

Answer: Yes, it is the 14th term

6 **A video gets 5 views on day 1, 15 on day 2 and 45 on day 3. The number of views triples each day. How many views does it get on day 5?**

Answer: 405 views

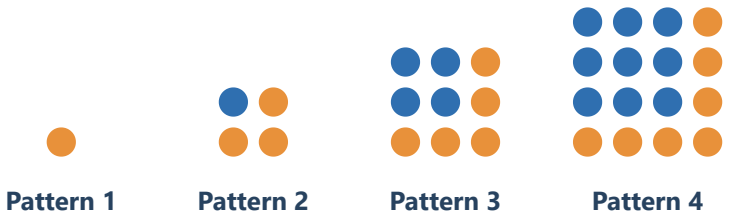
7 **Show that every term of the sequence with nth term $6n + 3$ is a multiple of 3.**

Answer: $6n + 3 = 3(2n + 1)$, a multiple of 3.

8 **Mia says the nth term of 10, 7, 4, 1, ... is $3n + 7$. What mistake has she made? Find the correct nth term.**

Answer: She used +3, but the sequence goes down by 3. The nth term is $-3n + 13$.

9 **Each pattern in the picture is a square of dots. The orange dots show the new dots added to make each square. Explain why the number of orange dots in pattern n is $2n - 1$, and use this to explain why $1 + 3 + 5 + 7 = 4^2$.**



Answer: The L-shape has n dots down one side and n along the other, but the corner is shared, so 2n − 1. Adding the L-shapes builds the square, so 1 + 3 + 5 + 7 = 16 = 4^2.

10 **Fill in the table for each description and say whether the sequence is arithmetic, geometric or quadratic.**

(a) The nth term is $5n + 1$

Answer: Arithmetic: 6, 11, 16, 21 (add 5)

(b) The nth term is 3×2^n

Answer: Geometric: 6, 12, 24, 48 (multiply by 2)

(c) The nth term is $n^2 + 1$

Answer: Quadratic (differences go up): 2, 5, 10, 17

11 **The 4th term of an arithmetic sequence is 17 and the 10th term is 41. Find the nth term and the first term.**

Answer: nth term 4n + 1; first term 5

12 **Hire company A charges £20 plus £8 per day, so *n* days cost 8*n* + 20 pounds. Company B charges £5 plus £11 per day, so *n* days cost 11*n* + 5. After how many days do the two companies charge the same? Which is cheaper for 10 days?**

Answer: They charge the same after 5 days (£60). For 10 days A costs £100 and B costs £115, so A is cheaper.

13 **The nth term of a sequence is 2^n. Show that each term is double the previous term.**

Answer: 2^(n+1) = 2 × 2^n

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