Year 9 Sequences and Functions – Challenge

ANSWER KEY HappyKids.fit

Answers and worked solutions · 8 questions

A. Think like a mathematician

1. **Yes. The first terms are 2, 6, 12, 20. $n^2 + n = n(n + 1)$, and one of two consecutive whole numbers is even.**

   First terms: 2, 6, 12, 20

   $n^2 + n = n(n + 1)$, and one of two consecutive whole numbers is even.

   Decide

2. **No. The first terms are 11, 13, 17, 23. Counter-example: n = 11 gives $121 - 11 + 11 = 121 = 11 \times 11$.**

   First terms: 11, 13, 17, 23

   Counter-example: n = 11 gives $121 - 11 + 11 = 121 = 11 \times 11$.

   Decide

3. **Yes. Each input has exactly one output (two inputs may share an output).**

   A function gives exactly one output for each input

   Look for an input that appears with two different outputs

   Yes

4. **Mistake: the terms go down by 2, so the rule starts −2n. Correct: −2n + 34**

   Error: the terms go down by 2, so the rule starts −2n

   −2n gives −2, −4, ...; add 34

   −2n + 34

5. **Mistake: the difference gives the number of n's (the coefficient of n). Correct: 6n + 1**

   Error: the difference gives the number of n's (the coefficient of n)

   6n gives 6, 12, 18, ...; add 1

   6n + 1

6. **No. 2, 8, 18, 32 go up by 6, 10, 14: the differences change.**

   Test some terms or values

   2, 8, 18, 32 go up by 6, 10, 14: the differences change.

   Decide

7. **second difference 4; pattern 8 has 144 matchsticks**

   First differences 8, 12, 16; second difference 4 (constant, so quadratic)

   Continue the first differences up to pattern 8: 144

8. **36**

   Undo − 6, then × 3: $(12 + 6) \div 3 = 6$

   Undo the square root: $6^2 = 36$