MATHEMATICS · GRADES 10-12

General terms of arithmetic sequences

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you jump straight to any term in a steady pattern, like the cost of the twentieth week of a savings plan that adds the same amount each week. You do not have to add week by week all the way to week twenty, you can work out the answer in one go. That is how you check what a savings plan will be worth after a year, what a staircase will cost if each step adds the same amount of material, or where a steady pattern lands after many steps.



Rule

General term of an arithmetic sequence: term n = a + (n - 1) × d, where a is the first term and d is the common difference.

It jumps straight to any term without adding step by step.

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Worked examples

EXAMPLE 1

Q Sequence 3, 7, 11. Find the 10th term.

SOLUTION

First term a = 3, common difference d = 4.

$term_n = a + (n - 1) \times d$

10th term = 3 + 9 × 4 = 3 + 36 = 39

EXAMPLE 2

Q Sequence 20, 17, 14. Find the 8th term.

SOLUTION

Here a = 20 and d = -3.

8th term = 20 + 7 × (-3) = 20 - 21

20 – 21 = –1

8th term = –1

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Practice questions

1. Mia saves money each week. In her first three weeks she saves $2, $5, and $8. Her savings go up by the same amount every week. How much does she save in week 6?

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2. A sequence goes 7, 13, 19, and so on. What is the common difference?

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3. The 5th term of an arithmetic sequence is 29 and the common difference is 6. What is the first term?

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4 In the sequence 3, 8, 13, and so on, which term is 48?

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5 Write the formula for the nth term of an arithmetic sequence that starts with a and goes up by d each time.

A. Term n = a + (n – 1) × d

B. Term n = a + n × d

C. Term n = a × (n – 1) + d

D. Term n = a – (n – 1) × d

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6 Term 3 of an arithmetic sequence is 11 and term 7 is 27. What is the common difference?

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7 An arithmetic sequence starts with 6 and goes up by 4 each time. What are the first three terms?

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8 A parking meter charges $8 every hour, so the hourly charges are $8, $8, $8, and so on. What is the charge in hour 100?

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9 A sequence goes 9, 14, 19, and so on. What is the term before 9?

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10 **The sequence 4, 9, 14, and so on keeps going. What is the first term bigger than 50?**

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ANSWER KEY

1. $17

2. 6

3. 5

4. 10

5. Term n = a + (n – 1) × d

6. 4

7. 6, 10, 14

8. $8

9. 4

10. 54

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