Arithmetic Sequences

Algebra Worksheet · Grade 8–10

Name: _____ Date: _____

Learning Objectives

- Identify whether a sequence is arithmetic by finding common differences
- Use the nth-term formula to find specific terms of an arithmetic sequence
- Derive the formula for the nth term given the first term and common difference

Problems

1. Find the common difference of the arithmetic sequence below.

$3, 7, 11, 15, 19$

2. Determine whether the following sequence is arithmetic. Explain your reasoning.

$2, 5, 9, 14, 20$

3. Determine whether the following sequence is arithmetic. If yes, state the common difference.

$20, 15, 10, 5, 0$

4. Write the next two terms of the arithmetic sequence below.

5. Find the nth-term formula for an arithmetic sequence with first term 5 and common difference 3.

$a_1 = 5, \quad d = 3$

6. Find the nth-term formula for an arithmetic sequence with first term 20 and common difference negative 4.

$a_1 = 20, \quad d = -4$

Scan to watch

7. Find the 15th term of the arithmetic sequence below.

$5, 8, 11, 14, \ldots$

8. Find the 30th term of the arithmetic sequence below.

$10, 7, 4, 1, \ldots$

9. The 5th term of an arithmetic sequence is 27 and the common difference is 4. Find the first term and then write the nth-term formula.

$a_5 = 27, \quad d = 4$

10. The 4th term of an arithmetic sequence is 3 and the 10th term is 33. Find the common difference, the first term, and the 20th term.

$a_4 = 3, \quad a_{10} = 33$

Scan to watch

Arithmetic Sequences — Answer Key

Algebra Worksheet · Grade 8–10

Answer Key

1. Answer: d = 4
- Subtract consecutive terms: 7 - 3 = 4
- Check: 11 - 7 = 4, 15 - 11 = 4, 19 - 15 = 4
- The common difference is 4

2. Answer: Not arithmetic
- Find differences: 5 - 2 = 3, 9 - 5 = 4, 14 - 9 = 5
- The differences are not the same
- Since there is no common difference, this is NOT an arithmetic sequence

3. Answer: Arithmetic; d = -5
- Find differences: 15 - 20 = -5, 10 - 15 = -5, 5 - 10 = -5
- All differences are equal
- This is arithmetic with a common difference of -5

4. Answer: 26 and 31
- Find the common difference: 11 - 6 = 5
- Add 5 to 21: 21 + 5 = 26
- Add 5 to 26: 26 + 5 = 31

5. Answer: a_n = 3n + 2
- Use the formula: a_n = a_1 + (n - 1)d
- Substitute: a_n = 5 + (n - 1)(3)
- Distribute: a_n = 5 + 3n - 3
- Simplify: a_n = 3n + 2

6. Answer: a_n = -4n + 24
- Use the formula: a_n = a_1 + (n - 1)d
- Substitute: a_n = 20 + (n - 1)(-4)
- Distribute: a_n = 20 - 4n + 4
- Simplify: a_n = -4n + 24

7. Answer: 47
- Identify: a_1 = 5, d = 3, n = 15
- Use the formula: a_n = a_1 + (n - 1)d
- Substitute: a_15 = 5 + (15 - 1)(3)
- Simplify: a_15 = 5 + 42 = 47

8. Answer: -77

Scan to watch

- Identify: $a_1 = 10$, $d = -3$, $n = 30$
- Use the formula: $a_n = a_1 + (n - 1)d$
- Substitute: $a_{30} = 10 + (30 - 1)(-3)$
- Simplify: $a_{30} = 10 + (-87) = -77$

---

9. Answer: $a_1 = 11$; $a_n = 4n + 7$

- Use: $a_5 = a_1 + (5 - 1)(4)$
- Solve: $27 = a_1 + 16$, so $a_1 = 11$
- Write formula: $a_n = 11 + (n - 1)(4)$
- Simplify: $a_n = 11 + 4n - 4 = 4n + 7$

---

10. Answer: $d = 5$, $a_1 = -12$, $a_{20} = 83$

- Set up two equations: $a_1 + 3d = 3$ and $a_1 + 9d = 33$
- Subtract the first from the second: $6d = 30$, so $d = 5$
- Substitute back: $a_1 + 3(5) = 3$, so $a_1 = -12$
- Find the 20th term: $a_{20} = -12 + (20 - 1)(5) = -12 + 95 = 83$

Scan to watch