Arithmetic Sequences and Series: Common Difference, nth Term, and Sums

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Name: _____ Date: _____ Score: / 10

Learning Objectives

- Identify number patterns and determine whether a sequence is arithmetic
- Find the common difference of an arithmetic sequence
- Apply the nth-term formula to find specific terms of an arithmetic sequence
- Compute partial sums (arithmetic series) using the appropriate formula

Solve each problem, showing the common difference, formula, and final value where applicable.

1. Identify the next two terms in the number pattern.

3, 7, 11, 15, ...

Answer: _____

2. Find the common difference of the arithmetic sequence.

5, 12, 19, 26, ...

Answer: _____

3. Find the common difference of the arithmetic sequence.

20, 14, 8, 2, ...

Answer: _____

4. Write the explicit formula for the nth term of the arithmetic sequence with first term 4 and common difference 5.

$a_1 = 4,\ d = 5$

Answer: _____

5. Find the 21st term of the arithmetic sequence.

2, 5, 8, 11, ...

Answer: _____

6. Find the 93rd term of the arithmetic sequence.

7, 10, 13, 16, ...

Answer: _____

7. Find the 50th term of the arithmetic sequence.

100, 96, 92, 88, ...

Answer: _____

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8. Determine which term of the sequence equals 100.

$4,\ 7,\ 10,\ 13,\ \ldots$

Answer: _____

9. Find the sum of the first 20 terms of the arithmetic series.

$3 + 7 + 11 + 15 + \ldots$

Answer: _____

10. Find the sum of the first 15 terms of the arithmetic series with first term 6 and common difference 2.

$a_1 = 6,\ d = 2,\ n = 15$

Answer: _____

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ANSWER KEY & SOLUTIONS

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This worksheet mirrors Part 1 of the lecture: recognizing number patterns, finding the common difference d, using the nth-term formula a_n = a_1 + (n-1)d, and finding requested terms such as the 21st and 93rd. A few problems extend to the arithmetic series sum formula to round out the topic.

Solutions

1. Identify the next two terms in the number pattern.

3, 7, 11, 15, ...

→ *Subtract consecutive terms to see the pattern increases by four each time.*
→ *Add four to fifteen to get nineteen, then add four again to get twenty-three.*

Answer: 19, 23

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2. Find the common difference of the arithmetic sequence.

5, 12, 19, 26, ...

→ *Subtract the first term from the second term: twelve minus five equals seven.*
→ *Verify with another pair such as nineteen minus twelve, which also equals seven.*

Answer: $d = 7$

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3. Find the common difference of the arithmetic sequence.

20, 14, 8, 2, ...

→ *Subtract the first term from the second term: fourteen minus twenty equals negative six.*
→ *Check another pair such as eight minus fourteen, which also equals negative six.*

Answer: $d = -6$

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4. Write the explicit formula for the nth term of the arithmetic sequence with first term 4 and common difference 5.

$a_1 = 4,\ d = 5$

→ *Start with the general nth-term formula a sub n equals a sub one plus the quantity n minus one times d.*
→ *Substitute four for a sub one and five for d, then distribute and simplify to get five n minus one.*

Answer: $a_n = 5n - 1$

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5. Find the 21st term of the arithmetic sequence.

2, 5, 8, 11, ...

→ *Identify a sub one equals two and the common difference d equals three.*
→ *Apply the formula a sub twenty-one equals two plus twenty times three to get sixty-two.*

Answer: $a_{21} = 62$

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6. Find the 93rd term of the arithmetic sequence.

$7,\ 10,\ 13,\ 16,\ \ldots$

→ *Identify a sub one equals seven and common difference d equals three.*
→ *Use a sub ninety-three equals seven plus ninety-two times three, which gives two hundred eighty-three.*

Answer: $a_{93} = 283$

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7. Find the 50th term of the arithmetic sequence.

$100,\ 96,\ 92,\ 88,\ \ldots$

→ *Identify a sub one equals one hundred and common difference d equals negative four.*
→ *Apply a sub fifty equals one hundred plus forty-nine times negative four to get negative ninety-six.*

Answer: $a_{50} = -96$

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8. Determine which term of the sequence equals 100.

$4,\ 7,\ 10,\ 13,\ \ldots$

→ *Set the nth-term equation equal to one hundred: four plus the quantity n minus one times three equals one hundred.*
→ *Solve for n: subtract four, divide by three, then add one to obtain n equals thirty-three.*

Answer: $n = 33$

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9. Find the sum of the first 20 terms of the arithmetic series.

$3 + 7 + 11 + 15 + \ldots$

→ *Identify a sub one equals three, common difference d equals four, and number of terms n equals twenty.*
→ *Find the twentieth term, then apply S sub n equals n divided by two times the sum of the first and last terms to get eight hundred twenty.*

Answer: $S_{20} = 820$

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10. Find the sum of the first 15 terms of the arithmetic series with first term 6 and common difference 2.

$a_1 = 6,\ d = 2,\ n = 15$

→ *Compute the fifteenth term: six plus fourteen times two equals thirty-four.*
→ *Apply S sub fifteen equals fifteen divided by two times the sum of six and thirty-four, which equals three hundred.*

Answer: $S_{15} = 300$