Algebra II
Lesson #5 Unit 9
Class Worksheet #5
For Worksheet #6

Algebra 2 Class Worksheet #5 Unit 9

Algebra 2   Class Worksheet #5   Unit 9

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$$S_{30} = [3(1)+1]$$

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$$S_{30} = 4$$

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$$S_{30} = 4 + 7$$

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$$S_{30} = 4 + 7 + 10$$

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$$S_{30} = 4 + 7 + 10 + \ldots + 85$$

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$$S_{30} = 4 + 7 + 10 + \ldots + 85 + 88$$

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We will pair up the terms to help calculate the sum.

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The sum of the terms in each pair is 95.

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Since there are 15 pairs,

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The number of pairs.

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For any arithmetic series, $S_n = \frac{n}{2}(a_1 + a_n)$

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The sum of the terms in each pair.

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What if n is odd????

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For any arithmetic series, $S_n = \frac{n}{2}(a_1 + a_n)$

Find the sum of the first 7 terms of a sequence defined by

$a_n = 3n + 1.$

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$$S_7 = [3(1)+1]+[3(2)+1]+[3(3)+1]+[3(4)+1]+[3(5)+1]+[3(6)+1]+[3(7)+1]$$

$$S_7 = 4$$

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$$S_7 = 4 + 7 + 10$$

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Notice that the 'odd' term, the middle term, is half of 26 !

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Therefore, we have 3½ groups of 26.

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Algebra 2 Class Worksheet #5 Unit 9

This lesson involves <u>arithmetic series</u>. Here is the definition. An <u>arithmetic series</u> is an indicated sum of the terms of an <u>arithmetic sequence</u>. Here is an example.

For any arithmetic series, $S_n = \frac{n}{2}(a_1 + a_n)$

Find the sum of the first 7 terms of a sequence defined by

$$a_n = 3n + 1.$$

$$S_7 = a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7$$

$$S_7 = [3(1)+1]+[3(2)+1]+[3(3)+1]+[3(4)+1]+[3(5)+1]+[3(6)+1]+[3(7)+1]$$

$$S_7 = 4 + 7 + 10 + 13 + 16 + 19 + 22 = \frac{7}{2}(4 + 22) =$$

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This sequence starts at 7 and adds 5 recursively.

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The sequence is arithmetic

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$S_{60} = \frac{60}{2}(7 + 302) = (30)(309)$

$S_{60} = 9{,}270$

2. Find the sum of the first 40 terms of an arithmetic sequence in which $a_1 = 3$ and $d = 5$.

The series is arithmetic. $\Rightarrow$ $S_n = \frac{n}{2}(a_1 + a_n)$

$n = 40$

$a_n = a_1 + (n - 1)d$

$a_{40} = 3$

Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

1. Find the sum of the first 60 terms of the sequence defined by $a_n = 5n + 2$.

The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$n = 60$

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Algebra 2 Class Worksheet #5 Unit 9

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Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

3. Find the sum of the first 35 terms of the sequence defined by $a_{n+1} = a_n + 4$ where $a_1 = 10$.

4. Find the sum of the first 60 terms of the sequence 1, 1.3, 1.6, 1.9, ...

Algebra 2 Class Worksheet #5 Unit 9

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The first term is 10.

Algebra 2 Class Worksheet #5 Unit 9

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Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

3. Find the sum of the first 35 terms of the sequence defined by $a_{n+1} = a_n + 4$ where $a_1 = 10$.

The first term is 10. Then add 4 recursively.

Algebra 2 Class Worksheet #5 Unit 9

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$\Rightarrow$ **The sequence is arithmetic.**

Algebra 2 Class Worksheet #5 Unit 9

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$a_{35} = a_1$

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$d = 4 \qquad n = 35$

The series is arithmetic. ⇒ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{35} = a_1 + 34d$

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$d = 4 \quad n = 35$

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$a_{35} = a_1 + 34d$

$a_{35} =$

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$a_{35} = 10 + 34(4)$

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$a_{35} = 10 + 34(4) = 146$

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$a_{35} = a_1 + 34d$

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3. Find the sum of the first 35 terms of the sequence defined by $a_{n+1} = a_n + 4$ where $a_1 = 10$.

$d = 4 \quad n = 35$

The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{35} = a_1 + 34d$

$S_{35} = \frac{35}{2}(10 + 146) = (17.5)(156)$

$a_{35} = 10 + 34(4) = 146$

$\boxed{S_{35} = 2{,}730}$

4. Find the sum of the first 60 terms of the sequence 1, 1.3, 1.6, 1.9, ...

$a_1 = 1 \quad d = 0.3$

The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$n = 60 \quad a_n = a_1 + (n - 1)d$

$a_{60} = 1 + 59(0.3)$

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Solve each of the following problems.

5. Evaluate the series $5 + 8 + 11 + 14 + ... + 200$.

6. Evaluate: $\sum_{i=1}^{60} (3i + 7)$

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The first term is 5.

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6. Evaluate: $\sum_{i=1}^{60}(3i + 7) = 10 + 13 + 16 + \ldots + \underset{i=60}{187}$

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$200 = 3n + 2$ ⇨ $3n = 198$ ⇨ $n = 66$

$S_{66} = \frac{66}{2}(5 + 200) = (33)(205)$

$S_{66} = 6{,}765$

6. Evaluate: $\sum_{i=1}^{60} (3i + 7) = 10 + 13 + 16 + \ldots + 187$

$n = 60$

$a_1 = 10$

$a_{60} = 187$

The number 3 is added recursively.

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Solve each of the following problems.

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a_1 , a_2 , a_3 , …

2 , 5 , 8 , …

The sequence is arithmetic.

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2 , 5 , 8 , …

The sequence is arithmetic. $a_1 = 2$

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Let a_n represent the distance the object travels during the n^{th} second. → a_1 , a_2 , a_3 , …

2 , 5 , 8 , …

The sequence is arithmetic. $a_1 = 2$ **and**

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2 , 5 , 8 , …

The sequence is arithmetic. $a_1 = 2$ **and** $d = 3$.

We need to find the sum of the first 30 terms of this sequence.

Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

7. An object accelerates in such a way that it travels 2 feet during the first second, 5 feet during the next second, and 8 feet during the third second. If this pattern continues, then how far will the object have moved during the first 30 seconds?

Let a_n represent the distance the object travels during the n^{th} second. ⇨ $a_1, \ a_2, a_3, \ldots$

$2, \ 5, \ 8, \ \ldots$

The sequence is arithmetic. $a_1 = 2$ **and** $d = 3$.

We need to find the sum of the first 30 terms of this sequence.

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$a_{30} = 89$

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The object will travel 1,365 feet during the first 30 seconds.

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Algebra 2   Class Worksheet #5   Unit 9

Solve each of the following problems.

8. A job has a starting salary of \$29,000 with a guaranteed increase of \$500 per year. Find the total salary for the first 18 years.

Algebra 2 Class Worksheet #5 Unit 9

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Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

8. A job has a starting salary of $29,000 with a guaranteed increase of $500 per year. Find the total salary for the first 18 years.

Let a_n represent the salary, in dollars, for the n^{th} year.

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The sequence is arithmetic. $a_1 = 29{,}000$ and $d = 500$.

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The series is arithmetic. ⇒ $S_n = \frac{n}{2}(a_1 + a_n)$

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$a_{18} =$

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The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

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Algebra 2 Class Worksheet #5 Unit 9

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The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d$

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The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000$

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We need to find the sum of the first 18 terms of this sequence.

The series is arithmetic. ⇒ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000 + 17($

Algebra 2 Class Worksheet #5 Unit 9

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The sequence is arithmetic. $a_1 = 29,000$ and $d = 500$.

We need to find the sum of the first 18 terms of this sequence.

The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29,000 + 17(500)$

Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

8. A job has a starting salary of $29,000 with a guaranteed increase of $500 per year. Find the total salary for the first 18 years.

Let a_n represent the salary, in dollars, for the n^{th} year. ⇨ $a_1 = 29{,}000$, $a_2 = 29{,}500$, $a_3 = 30{,}000$

The sequence is arithmetic. $a_1 = 29{,}000$ and $d = 500$.

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$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

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Let a_n represent the salary, in dollars, for the n^{th} year. $\Rightarrow$

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The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

$a_{18} = 37{,}500$

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$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

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$S_{18} = (9)($

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We need to find the sum of the first 18 terms of this sequence.

The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

$a_{18} = 37{,}500$

$S_{18} = \frac{18}{2}(29{,}000 + 37{,}500)$

$S_{18} = (9)(66{,}500)$

Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

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$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

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The sequence is arithmetic. $a_1 = 29{,}000$ **and** $d = 500$.

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The series is arithmetic. ⇨ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

$a_{18} = 37{,}500$

$S_{18} = \frac{18}{2}(29{,}000 + 37{,}500)$

$S_{18} = (9)(66{,}500) = \$598{,}500$

Algebra 2 Class Worksheet #5 Unit 9

Solve each of the following problems.

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Let a_n represent the salary, in dollars, for the n^{th} year. ⇒

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The sequence is arithmetic. $a_1 = 29{,}000$ and $d = 500$.

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The series is arithmetic. ⇒ $S_n = \frac{n}{2}(a_1 + a_n)$

$a_{18} = a_1 + 17d = 29{,}000 + 17(500)$

$a_{18} = 37{,}500$

$S_{18} = \frac{18}{2}(29{,}000 + 37{,}500)$

$S_{18} = (9)(66{,}500) = \$598{,}500$

The total salary for the first 18 years is \$598,500.

Algebra 2 Class Worksheet #5 Unit 9

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The total salary for the first 18 years is \$598,500.