Algebra 2 Math Week 1

Dear Parent/Guardian,

During Week 1, we will review and support mastery of the Arithmetic Sequences. Your child will work towards understanding and using patterns to identify the common difference in a sequence and write the recursive definition and explicit formula for the sequence. The table below lists this week's tasks and practice problems. Resource documents are included there, your child can find targeted support for the lesson.

Additionally, students can access both Math Nation and the Pearson textbook through ClassLink. Both sites offer instructional support including video lessons, practice quizzes and more.

We also suggest that students have an experience with math each day. Practicing at home will make a HUGE difference in your child's school success! Make math part of your everyday routine. Choose online sites that match your child's interests. Online math games, when played repeatedly, can encourage strategic mathematical thinking, help develop computational fluency, and deepen their understanding of numbers.

Links for additional resources to support students at home are listed below:
https://www.brainpop.com/games/sortifyangles/
https://www.hoodamath.com/games/highschool.html
https://www.khanacademy.org/resources/teacher-essentials
http://www.learnalberta.ca/content/mejhm/index.html
https://www.mangahigh.com/en-us/games/wrecksfactor
http://www.xpmath.com/forums/arcade.php?do=play&gameid=115

Week 1 At A Glance	
	Standards: MAFS.912.A-SSE.2.4 MAFS.912.F-IF.1.3
Day 1	• Lesson 9-1 Mathematical Patterns • Practice 9-1 Form K
Day 2	• Lesson 9-2 Arithmetic Sequences • Practice 9-2 Form K
Day 3	• Practice 9-1 #1-18 every third problem • Practice 9-2 #2-20 evens
Day 4	• Practice 9-1 #19-37 odds • Practice 9-2 #22-34 evens
Day 5	• 9-1 Standardized Test Prep #1-6 • 9-2 Standardized Test Prep #1-6

Lesson 9-1 Mathematical Patterns

Some patterns are much easier to determine than others. Here are some tips that can help with unfamiliar patterns.

- If the terms become progressively smaller, subtraction or division may be involved.
- If the terms become progressively larger, addition or multiplication may be involved.

Problem

What is the next term in the sequence 6, 8, 11, 15, 20, . . .?

| 6 | 8 | 11 | 15 | 20 | Spread the numbers in the sequence apart, leaving space between numbers. |

| +2 | +3 | +4 | +5 | Beneath each space, write what can be done to get the next number in the sequence. |

In each term, the number that is added to the previous term increases by one.   Find a pattern.

If the pattern is continued, the next term is 20 + 6, or 26.

Exercises

Describe the pattern that is formed. Find the next three terms.

1. 5, 6, 8, 11, 15

Each term is increased by one more than the previous term; 20, 26, 33

2. 1, −2, 4, −8, 16, −32

Each term is multiplied by -2 to get the next term; 64, 192, 384

3. 15, 18, 21, 24, 27

Each term is increased by 3 to get to the next term; 30, 33 36

4. 240, 120, 60, 30, 15

Each term is divided by 2 to get the next term; 7.5, 3.75, 1.875

To find a recursive definition for a sequence, you compare each term to the previous term.

Problem

What is the recursive definition for the sequence?

$$800, -400, 200, -100, 50, \ldots$$

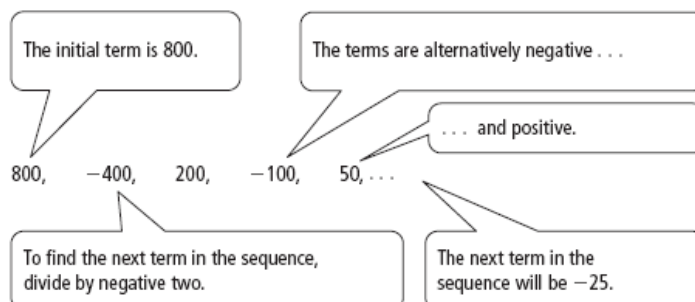To find the recursive definition for a sequence, first describe the sequence in words.

Now translate the description into the parts of the recursive formula.

$a_1 = 800$

The initial term is 800.

$a_n = a_{n-1} \div (-2)$

To find the next term, divide the previous term by −2.

The initial term is 800.

The terms are alternatively negative . . .

. . . and positive.

$$800, \quad -400, \quad 200, \quad -100, \quad 50, \ldots$$

To find the next term in the sequence, divide by negative two.

The next term in the sequence will be −25.

Practice

Write a recursive definition for each sequence.

1. 38, 33, 28, 23, . . .   **2.** 7, 14, 28, 56, . . .   **3.** −5, −7, −9, −11, . . .

4. 2, 6, 18, 54, . . .   **5.** 4.5, 5, 5.5, 6, . . .   **6.** 17, 20, 24, 29, . . .

Practice Problem Solutions

1. 38, 33, 28, 23, . . .   **2.** 7, 14, 28, 56, . . .   **3.** −5, −7, −9, −11, . . .

$a_n = a_{n-1} - 5$ where $a_1 = 38$

$a_n = 2a_{n-1}$ where $a_1 = 7$

$a_n = a_{n-1} - 2$ where $a_1 = -5$

4. 2, 6, 18, 54, . . .   **5.** 4.5, 5, 5.5, 6, . . .   **6.** 17, 20, 24, 29, . . .

$a_n = 3a_{n-1}$ where $a_1 = 2$

$a_n = a_{n-1} + 0.5$ where $a_1 = 4.5$

$a_n = a_{n-1} + (n + 1)$ where $a_1 = 17$

9-1 Mathematical Patterns Practice, *Form K*

Find the first five terms of each sequence.

1. $a_n = 4n - 1$

Substitute 1 for n and simplify.

$a_1 = 4(1) - 1 = 3$

Substitute 2 for n and simplify.

$a_2 = 4(2) - 1 = 7$

Continue for the numbers 3, 4, and 5.

The first five terms are 3, 7, ☐ , ☐ , and ☐ .

2. $a = \dfrac{1}{2}n + 2$ **3.** $a_n = 3^n$ **4.** $a_n = -6n^2$

5. Write an explicit formula for a sequence with 3, 5, 7, 9, and 11 as its first five terms.

Write a recursive definition for each sequence.

6. 2, 6, 12, 20, …   **7.** 120, 60, 30, 15, …

Identify the initial condition.

$a_1 = 2$

Use n to express the relationship between successive

terms.

8. 3, 8, 13, 18, …   **9.** 1, 3, 9, 27, …

10. Writing Explain the difference between a recursive definition and an explicit formula.

Write an explicit formula for each sequence. Then find the tenth term.

11. 7, 10, 13, 16,…   **12.** 8, 9, 10, 11, 12, …   **13.** $-\dfrac{1}{2}, 0, \dfrac{1}{2}, 1, 1\dfrac{1}{2}, …$

$a_n = 3n + 4$

$a_{10} = 3(10) + 4 =$ ☐

14. 3, 1, − 1, − 3, − 5, …   **15.** 1, 7, 25, 79, 241

Lesson 9-2 Arithmetic Sequences

Arithmetic Sequence

An arithmetic sequence is a sequence where the difference between consecutive terms is constant.

$$a, a + d, a + 2d, a + 3d,…$$

Sample   2, 5, 8, 11, 14, …

Determine whether or not each sequence is arithmetic.

1. 1, 4, 7, 9, 11, …   NOT ARITHMETIC

2. 3, 9, 15, 21, 27, …   ARITHMETIC

1. 0, 15, 30, 45, 60, …   _____

2. 0, 1, 3, 6, 10, …   _____

Use the formula $a_n = a_1 + d(n − 1)$ to find the indicated term in each arithmetic sequence.

5. Find the 12th term in the sequence that begins 3, 6, 9, … $a_{12} = 3 + 3(12 − 1)$

$$a_{12} = 3 + 3(11) \quad a_{12} = 3+33 \qquad a_{12} = 36$$

6. Find the 38th term in the sequence that begins 4, 10, 16, …   _____

7. Find the 104th term in the sequence that begins 5, 9, 13, …   _____

Arithmetic Mean

An arithmetic mean is the average of a set of numbers. The arithmetic mean of two numbers x and y is found using the formula displayed below.

$$\frac{x + y}{2}$$

Sample   The arithmetic mean of 4 and 6 is $\dfrac{4 + 6}{2} = \dfrac{10}{2} = 5$.

Find the missing number in the arithmetic sequence. This number is the arithmetic mean of the two given numbers.

8. …, 13, _____ , 37,...   37 + 13=50 and 50 ÷ 2 = **25**

9. …, 26, _____ , 42,…   _____

10. …, 45, _____ , 99, ...   _____

9-2 Arithmetic Sequences Practice, *Form K*

Determine whether each sequence is arithmetic. If so, identify the common difference.

1. 1, 4, 7, 10, …

$4 - 1 = 3$

$7 - 4 = 3$

$10 - 7 = 3$

This sequence is arithmetic.
The common difference is ☐

2. 1, 3, 6, 10, 15, …

3. − 16, − 13, − 9, − 4, 2, …   **4.** 2, 9, 16, 23, 30, …

5. Reasoning Is the sequence represented by the formula $a_n = 4n + 8$ arithmetic? Explain.

Find the 24th term of each arithmetic sequence.

6. 4, 6, 8, 10, 12, …

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

$a_{24} = 4 + (24 - 1)2$

$a_{24} = 4 + 46$

$a_{24} =$ ☐

7. 2, 5, 8, 11, 14, …

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

8. 9, 5, 1, − 3, − 7, …

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

Find the missing terms in the following arithmetic sequences.

9. 2, ____, ____, 14, …

$14 = 2 + 3d$

$12 = 3d$

$d = 4$

$2 + 4 =$ ☐

$6 + 4 =$ ☐

10. 3, ☐ , ☐ , 21, …   **11.** 65 , ☐ ☐ , 32, …

12. Error Analysis Noah used the formula $a_n = a + (n - 1)d$ to find the 12th term in the sequence 2, 4, 7, 11, 16, …. Did Noah find the correct term? How do you know?

Find the missing term of each arithmetic sequence.

13. … 4, ____, 18, …   **14.** … 9, ☐ , 37, …

Find the arithmetic mean of the given terms.

$4 + 18 = 22$

$22 \div 2 = 11$

The missing term is. ☐

15. −12, ☐ , −4, …

9-1 Mathematical Patterns Practice, *Form G*

Find the first six terms of each sequence.

1. $a_n = -2n + 1$

2. $a_n = n^2 - 1$

3. $a_n = 2n^2 + 1$

4. $a_n = 1^n + 1$

5. $a_n = 2^n + 2$

6. $a_n = 2n^2 - n$

7. $a_n = 4n + n^2$

8. $a_n = \frac{1}{3}n^3$

9. $a_n = (-2)^n$

Write a recursive definition for each sequence.

10. $-14, -8, -2, 4, 10, \ldots$

11. $6, 5.7, 5.4, 5.1, 4.8, \ldots$

12. $1, -2, 4, -8, 16, \ldots$

13. $1, 3, 9, 27, \ldots$

14. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots$

15. $\frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, 2, \ldots$

16. $36, 39, 42, 45, 48, \ldots$

17. $36, 30, 24, 18, 12, \ldots$

18. $9.6, 4.8, 2.4, 1.2, 0.6, \ldots$

Write an explicit formula for each sequence. Find the twentieth term.

19. $7, 14, 21, 28, 35, \ldots$

20. $2, 8, 14, 20, 26, \ldots$

21. $5, 6, 7, 8, 9, \ldots$

22. $-1, 0, 1, 2, 3, \ldots$

23. $3, 5, 7, 9, 11, \ldots$

24. $0.8, 1.6, 2.4, 3.2, 4, \ldots$

25. $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4}, \ldots$

26. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \ldots$

27. $\frac{2}{3}, 1\frac{2}{3}, 2\frac{2}{3}, 3\frac{2}{3}, 4\frac{2}{3}, \ldots$

Find the eighth term of each sequence.

28. $1, 3, 5, 7, 9, \ldots$

29. $400, 200, 100, 50, 25, \ldots$

30. $0, -2, -4, -6, -8, \ldots$

31. $1, 2, 4, 8, 16, \ldots$

32. $44, 39, 34, 29, 24, \ldots$

33. $0.7, 0.8, 0.9, 1.0, 1.1, \ldots$

34. $4, 11, 18, 25, 32, \ldots$

35. $1\frac{1}{4}, 2\frac{1}{2}, 5, 10, 20, \ldots$

36. $-6, -9, -12, -15, -18, \ldots$

37. A man swims 1.5 mi on Monday, 1.6 mi on Tuesday, 1.8 mi on Wednesday, 2.1 mi on Thursday, and 2.5 mi on Friday. If the pattern continues, how many miles will he swim on Saturday?

9-2 Arithmetic Sequences Practice, *Form G*

Determine whether each sequence is arithmetic. If so, identify the common difference.

1. 2, 3, 5, 8, …

2. 0, −3, −6, −9, …

3. 0.9, 0.5, 0.1, −0.3, …

4. 3, 8, 13, 18, …

5. 14, −15, −44, −73, …

6. 3.2, 3.5, 3.8, 4.1, …

7. −34, −28, −22, −16, …

8. 2.3, 2.5, 2.7, 2.9, …

9. 127, 140, 153, 166, …

10. 11, 13, 17, 25, …

Find the 43rd term of each sequence.

11. 12, 14, 16, 18, …

12. 13.1, 3.1, −6.9, −16.9, …

13. 19.5, 19.9, 20.3, 20.7, …

14. 27, 24, 21, 18, …

15. 2, 13, 24, 35, …

16. 21, 15, 9, 3, …

17. 1.3, 1.4, 1.5, 1.6, …

18. −2.1, −2.3, −2.5, −2.7, …

19. 45, 48, 51, 54, …

20. −0.073, −0.081, −0.089, …

Find the missing term of each arithmetic sequence.

21. … 23, ■ , 49, …

22. 14, ■ , 28, …

23. … 29, ■ , 33, …

24. … 14, ■ , 15, …

25. … −45, ■ , −39, …

26. … −5, ■ , −2, …

27. −2, ■ , 2, …

28. … −6, ■ , 2, …

29. −34, ■ , 77, …

30. … −45, ■ , −12, …

31. −2, ■ , 456, …

32. … 34, ■ , 345, …

33. A teacher donates the same amount of money each year to help protect the rainforest. At the end of the second year, she has donated enough money to protect 8 acres. At the end of the third year, she has donated enough money to protect 12 acres. How many acres will the teacher's donations protect at the end of the tenth year?

34. Writing Explain how you know that the sequence 109, 105, 101, 97, 93, … is arithmetic.

9-1 Standardized Test Prep

Week 1 Day 5

Mathematical Patterns

Multiple Choice

For Exercises 1–6, choose the correct letter.

1. What are the first five terms of the sequence?

$$a_n = 3^n - 1$$

Ⓐ 2, 5, 8, 11, 14   Ⓒ 2, 8, 26, 80, 242

Ⓑ 3, 9, 27, 81, 243   Ⓓ 2, 4, 8, 16, 32

2. The formula $a_n = 3n + 2$ best represents which sequence?

Ⓕ 3, 6, 9, 12, 15   Ⓗ 4, 7, 10, 13, 16

Ⓖ 5, 8, 11, 14, 17   Ⓘ 5, 9, 29, 83, 245

3. Which pattern can be represented by $a_n = n^2 - 3$?

Ⓐ −1, 0, 5, 12, 21   Ⓑ 4, 7, 12, 19, 28   Ⓒ 1, 4, 9, 16, 25   Ⓓ −2, 1, 6, 13, 22

4. The sequence 4, 16, 36, 64, 100, . . . can best be represented by which formula?

Ⓕ $a_n = 4n$ Ⓖ $a_n = 4n^2$ Ⓗ $a_n = 4n^3$ Ⓘ $a_n = 2n^4$

5. For the sequence 0, 6, 16, 30, 48, . . . , what is the 40th term?

Ⓐ 3198   Ⓑ 3200   Ⓒ 4000   Ⓓ 16,000

6. A student sets up a savings plan to transfer money from his checking account to his savings account. The first week $10 is transferred, the second week $12 is transferred, the third week $16 is transferred, and the fourth week $24 is transferred. If this pattern continues and he starts with $100 in his checking account, how many weeks will pass before his balance is zero?

Ⓕ 4   Ⓖ 5   Ⓗ 6   Ⓘ 7

Short Response

7. After training for and running a marathon, an athlete wants to reduce her daily run by half each day. The marathon is about 26 mi. How many days will it take after the marathon before she runs less than a mile a day? Show your work.

9-2 Standardized Test Prep
Arithmetic Sequences

Multiple Choice

For Exercises 1–6, choose the correct letter.

1. Which sequence is an arithmetic sequence?

   Ⓐ 7, 10, 13, 16, 19, . . .   Ⓒ 7, 14, 28, 56, 112, . . .

   Ⓑ 7, 8, 10, 13, 17, . . .   Ⓓ 1, 7, 14, 22, 31, 41, . . .

2. An arithmetic sequence begins 4, 9, ... What is the 20th term?

   Ⓕ 76   Ⓖ 80   Ⓗ 84   Ⓘ 99

3. What are the missing terms of the arithmetic sequence 5, __, __, 62, . . . ?

   Ⓐ 19, 24   Ⓑ 19, 34   Ⓒ 24, 43   Ⓓ 43, 62

4. What is the missing term of the arithmetic sequence 25, __, 45, . . . ?

   Ⓕ 30   Ⓖ 35   Ⓗ 37   Ⓘ 40

5. The seventh and ninth terms of an arithmetic sequence are 197 and 173. What is the eighth term?

   Ⓐ 161   Ⓑ 180   Ⓒ 185   Ⓓ 221

6. An artist is creating a tile mosaic. She uses 4 green tiles in the first row, 11 green tiles in the second row, 18 green tiles in the third row, and 25 green tiles in the fourth row. If she continues the pattern, how many green tiles will she use in the 20th row?

   Ⓕ 32   Ⓖ 58   Ⓗ 134   Ⓘ 137

Extended Response

7. What is the 100th term in the arithmetic sequence beginning with 3, 19, . . . ? Show your work.