Algebra 2 Math Week 2

Dear Parent/Guardian,

During Week 2, we will review and support mastery of the Geometric Sequences. Your child will work towards understanding and using patterns to identify the common ratio 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 2 At A Glance	
	Standards: MAFS.912.A-SSE.2.4 MAFS.912.F-IF.1.3
Day 1	☐ Lesson 9-3 Geometric Sequences ☐ Practice Problems
Day 2	☐ Practice 9-3 Form K #1, 2-16 evens
Day 3	☐ Practice 9-3 Form G #1-25 odds
Day 4	☐ Practice 9-3 Form G #32-50 odds
Day 5	☐ 9-3 Standardized Test Prep

Lesson 9-3 Geometric Sequences

- A geometric sequence has a constant ratio between consecutive terms. This number is called the common ratio.
- A geometric sequence can be described by a recursive formula, $a_n = a_{n-1} \cdot r$, or as an explicit formula, $a_n = a \cdot r^{n-1}$.

Example 1

Find the 12th term of the geometric sequence 5, 15, 45, ...

5, 15, 45, . . .

$r = \frac{15}{5} = \frac{45}{15} = 3$ — Find r by calculating the common ratio between consecutive terms. This is a geometric sequence because there is a common ratio between consecutive terms.

$a_n = 5(3)^{n-1}$ — Substitute $a = 5$ and $r = 3$ into the explicit formula to find a formula for the nth term of the sequence.

$a_{12} = 5(3)^{11}$ — Substitute $n = 12$ to find the 12th term of the sequence.

$a_{12} = 885{,}735$ — Remember to first calculate 3^{11}, then multiply by 5.

Exercises

Find the indicated term of the geometric sequence.

1. 4, 2, 1, . . . Find a_{10}.

2. $5, \frac{15}{2}, \frac{45}{4}, \ldots$ Find a_8.

3. $6, -2, \frac{2}{3}, \ldots$ Find a_{12}.

Write the explicit formula for each sequence. Then generate the first five terms.

7. $a_1 = 1, r = \frac{1}{2}$

8. $a_1 = 2, r = 3$

9. $a_1 = 12, r = 3$

Solutions:

1. $4, 2, 1, \ldots$ Find a_{10}. $\frac{1}{128}$

2. $5, \frac{15}{2}, \frac{45}{4}, \ldots$ Find a_8. $\frac{10{,}935}{128}$

3. $6, -2, \frac{2}{3}, \ldots$ Find a_{12}. $-\frac{2}{59{,}049}$

7. $a_1 = 1, r = \frac{1}{2}$
$a_n = 1\left(\frac{1}{2}\right)^{n-1}$; 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$

8. $a_1 = 2, r = 3$
$a_n = 2(3)^{n-1}$; 2, 6, 18, 54, 162

9. $a_1 = 12, r = 3$
$a_n = 12(3)^{n-1}$; 12, 36, 108, 324, 972

Example 2

From 2000 to 2009, your friend's landlord has been allowed to raise her rent by the same percent each year. In 2000, her rent was \$1000, and in 2003, her rent was \$1092.73. What was her rent in 2009?

Step 1 Identify key information in the problem.

You know that your friend's rent was \$1000 in 2000. This means $a = 1000$. You also know that her rent in 2003 was \$1092.73. This means that $a_4 = 1092.73$. Her rent is raised by the same percent each year, which is the same as multiplying by a constant (e.g., *a* 5% increase is the same as multiplying by 1.05).

Step 2 Identify missing information.

You need to find the common ratio *r* in order to find the rent in 2009, a_{10}.

Step 3 Use the explicit formula to find *r*.

$a_n = ar^{n-1}$	Write the explicit formula.
$1092.73 = (1000)r^{4-1}$	Substitute $a = 1000$, $a_4 = 1092.73$, and $n = 4$.
$1092.73 = 1000r^3$	Simplify.
$1.09273 = r^3$	Divide each side by 1000.
$1.03 = r$	Take the cube root of both sides.

Step 4 Use the value of r to find the rent in 2009, a_{10}.

$a_n = ar^{n-1}$	Write the explicit formula.
$a_{10} = (1000)(1.03)^{10-1}$	Substitute $a = 1000$, $r = 1.03$, and $n = 10$.
$a_{10} = (1000)(1.03)^9$	Simplify.
$a_{10} \approx 1304.77$	Compute. Round to the nearest hundredth.

Your friend's rent was \$1304.77 in 2009.

Lesson 9-3 Geometric Sequences Practice

Find the indicated term of the geometric sequence.

1. $1, -\frac{2}{3}, \frac{4}{9}, \ldots$ Find a_7.

2. 100, 200, 400, . . . Find a_9.

3. 8, 32, 128, . . . Find a_4.

Write the explicit formula for each sequence. Then generate the first five terms.

4. $a_1 = 3, r = 3$

5. $a_1 = 2, r = 2$

6. $a_1 = 2, r = \frac{1}{2}$

7. $a_1 = 1, r = \frac{1}{5}$

8. $a_1 = 3, r = 4$

9. $a_1 = 5, r = \frac{1}{4}$

10. By clipping coupons and eating more meals at home, your family plans to decrease their monthly food budget by the same percent each month. If they budgeted $600 in January and $514.43 in April, how much will they budget in December?

Lesson 9-3 Geometric Sequences Practice, *Form K*

Determine whether each sequence is geometric. If so, find the common ratio.

1. 1, 3, 9, 27,…

Find the ratios between consecutive terms.

$$\frac{3}{1}=\frac{9}{3}=\frac{27}{9}$$

The sequence is geometric.

The common ratio is ☐.

2. 2, 5, 8, 11, 14, …

3. − 2, − 4, − 8, − 16,…

4. 500, 50, 5, 0.5,… …

Find the ninth term of each geometric sequence.

5. 3, 12, 48, 192,…

6. 2, 6, 18, 54,…

7. 1875, 375, 75, 15, …

Use the explicit formula.

$a_n = a_1 \cdot r^{n-1}$

$a_9 = 3(4^8)$

$a_9 = 3(65,536)$

a_9 = ☐

Find the missing terms of each geometric sequence.

8. 2, ___, ___, 128,…

9. 1, ☐, ☐, 8, …

10. 108, ☐, ☐, 4, …

Identify the common ratio.

$a_n = a_1 \cdot r^{n-1}$

$a_4 = 2r^{4-1}$

$128 = 2r^3$

$64 = r^3$

$4 = r$

The second term is ☐.

The third term is ☐ .

Find the missing term of each geometric sequence. It could be the geometric mean or its opposite.

11. 5, ____, 45,**…**

Find the geometric mean of 5 and 45.

$\sqrt{xy}$

$\sqrt{45.5}$

$\sqrt{225}$

$\square$

12. 2, $\square$, 72, **…**

13. $\frac{1}{4}$, $\square$, $2\frac{1}{4}$, …

14. 175, $\square$., 7,**…**

15. Error Analysis On a recent math test, your classmate was asked to find the missing term in the geometric sequence 4, _____, 256. Her answer was 130. What error did your classmate make? What is the correct answer?

16. The bacteria population in a petri dish was 14 at the beginning of an experiment. After 30 min, the population was 28, and after an hour the population was 56.

a. Write an explicit definition to represent this sequence.

b. If this pattern continues, what will be the bacteria population after 4 h?

Lesson 9-3 Geometric Sequences Practice, *Form G*

Determine whether each sequence is geometric. If so, find the common ratio.

1. 3, 9, 27, 81, …

2. 4, 8, 16, 32, …

3. 4, 8, 12, 16, ...

4. 4, –8, 16, –32, ...

5. 1, 0.5, 0.25, 0.125, ...

6. 100, 30, 9, 2.7, ...

7. –5, 0, 5, 10, ...

8. 64, –32, 16, –8, ...

9. 1, 4, 9, 16, ...

Find the tenth term of each geometric sequence.

10. 2, 4, 8, ...

11. 1, 3, 9, ...

12. –2, 6, –18, ...

13. –3, 9, –27, ...

14. –3, –12, –48, ...

15. –5, 25, –125, ...

Find the missing term of each geometric sequence. It could be the geometric mean or its opposite.

16. 4, ▪ , 16, ...

17. 9, ▪, 16, ...

18. 2, ▪ , 8, ...

19. 3, ▪ , 12, ...

20. 2, ▪ , 50, ...

21. 4, ▪ , 5.76, ...

22. 625, ▪ , 25, ...

23. $\frac{1}{3}$, ▪ , 3, ...

24. 0.5, ▪ , 0.125, ...

25. Error Analysis A student says that the geometric sequence 30, __, 120 can be completed with 90. Is she correct? Explain.

Lesson 9-3 Geometric Sequences Practice, *Form G*

Identify each sequence as *arithmetic, geometric,* or *neither*. Then find the next two terms.

32. 9, 3, 1, $\frac{1}{3}$, …

33. 1, 0, –2, –5, …

34. 2, –2, 2, –2, ...

35. –3, 2, 7, 12, ...

36. 1, –2, –5, –8, ...

37. 1, –2, 3, –4, ...

Write an explicit formula for each sequence. Then generate the first five terms.

38. $a_1 = 3$, $r = -2$

39. $a_1 = 5$, $r = 3$

40. $a_1 = -1$, $r = 4$

41. $a_1 = -2$, $r = -3$

42. $a_1 = 32$, $r = -0.5$

43. $a_1 = 2187$, $r = \frac{1}{3}$

44. $a_1 = 9$, $r = 2$

45. $a_1 = -4$, $r = 4$

46. $a_1 = 0.1$, $r = -2$

47. The deer population in an area is increasing. This year, the population was 1.025 times last year's population of 2537.

a. Assuming that the population increases at the same rate for the next few years, write an explicit formula for the sequence.

b. Find the expected deer population for the fourth year of the sequence.

48. You enlarge the dimensions of a picture to 150% several times. After the first increase, the picture is 1 in. wide.

a. Write an explicit formula to model the width after each increase.

b. How wide is the photo after the 2nd increase?

c. How wide is the photo after the 3rd increase?

d. How wide is the photo after the 12th increase?

Find the missing terms of each geometric sequence. (*Hint:* The geometric mean of positive first and fifth terms is the third term. Some terms might be negative.)

49. 12, ■ , ■ , ■ , 0.75

50. –9, ■, ■ , ■ , –2304

Name _____ Class _____ Date _____

9-3 Standardized Test Prep

Geometric Sequences

Multiple Choice

For Exercises 1–6, choose the correct letter.

1. What is the 10th term of the geometric sequence 1, 4, 16, . . .?

(A) 40 (B) 180,224 (C) 262,144 (D) 2,883,584

2. Which sequence is a geometric sequence?

(F) 1, 3, 5, 7, 9, . . . (H) 2, 4, 8, 16, 32, . . .

(G) 12, 9, 6, 3, 0, . . . (I) $-2, -6, -10, -14, -18, \ldots$

3. Which could be the missing term of the geometric sequence 5, __, 125, . . .?

(A) 25 (B) 50 (C) 75 (D) 100

4. What could be the missing term of the geometric sequence -12, __, $-\frac{3}{4}$, . . .?

(F) -4 (G) -6.375 (H) 3 (I) 4

5. In the explicit formula for the 9th term of the geometric sequence 1, 6, 36, . . . what number is a?

(A) 1 (B) 6 (C) 36 (D) 1,679,616

6. In each successive round of a backgammon tournament, the number of players decreases by half. If the tournament starts with 32 players, which rule could predict the number of players in the nth round?

(F) $32 = (0.5)^n$ (G) $32 = 0.5r^{n-1}$ (H) $a_n = 15^{n-1}$ (I) $a_n = (32)(0.5)^{n-1}$

Short Response

7. What is the 6th term of the geometric sequence 100, 50, . . .? Show your work using the explicit formula.