8

DEPARTMENT OF EDUCATION

Lesson Exemplar for Mathematics

Quarter 1

Lesson

8

Lesson Exemplar for Mathematics Grade 8
Quarter 1: Lesson 8 (Week 8)
SY 2025-2026

Development Team

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I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES

A. Content Standards	The learners should have knowledge and understanding of rules for obtaining terms in sequences.
B. Performance Standards	By the end of the quarter, the learners are able to obtain the rule for finding the next term in a sequence.
C. Learning Competencies and Objectives	***Learning Competencies*** 1. The learners formulate the rule for finding the next term in a sequence by looking for patterns. ***Learning Objectives*** By the end of the lesson, the learners are expected to: 1. formulate the rule for finding the next term of a sequence; 2. solve for the nth term of an Arithmetic Sequence; and 3. solve for the nth term of a Geometric Sequence.
D. Content	**Sequence** 1. Finding the Rule of a Sequence 2. Arithmetic Sequence 3. Geometric Sequence
E. Integration	None

II. LEARNING RESOURCES

Admin. (2022, October 4). Sequence and Series-Definition, Types, Formulas and Examples. BYJUS. https://byjus.com/maths/sequence-and-series/

Maths with Jay. (2018, May 8). Find the nth term in a sequence [Video]. YouTube. https://www.youtube.com/watch?v=VgBSzYBMbh4

Sequences intro. (n.d.). [Video]. Khan Academy. https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:sequences/x2f8bb11595b61c86:introduction-to-arithmetic-sequences/v/explicit-and-recursive-definitions-of-sequences

The Math Sorcerer. (2020, November 2). *How to find the general term of an arithmetic sequence given the sequence 7, 10, 13, 16, 19, . . .* [Video]. YouTube. https://www.youtube.com/watch?v=e45RY0DwaU4

III. TEACHING AND LEARNING PROCEDURE		**NOTES TO TEACHERS**
A. Activating Prior Knowledge	**DAY 1** **1. Short Review** **Activity 1: Do You Remember?** Let the learners solve the problem below. The denominator of a fraction is 3 more than the numerator. If both numerator and denominator are increased by 2, the resulting fraction is 2/3. Find the fraction.	This activity is intended to recall the concept of problems involving rational algebraic expressions. **Answer:** The fraction is $\frac{4}{7}$ since x = 4
B. Establishing Lesson Purpose	**1. Lesson Purpose** **Activity 2: What's Next?** Analyze the set of numbers below and answer the question that follows. 5, 8, 11, 14, ... 2, 4, 8, 16, ... **Guide Questions:** 1. Does each set of numbers follow a specific rule or pattern? 2. What will be the next number in the set of numbers in the left? How were you able to find it? 3. What will be the next number in the set of numbers in the right? How were you able to find it? **2. Unlocking Content Vocabulary** • **Sequence** is a list or set of numbers that follows a specific order or pattern. Sequences can be either finite or infinite. • **Finite Sequence** contains a limited number of terms. • **Infinite Sequence** contains countless number of terms. • **Arithmetic Sequence** is a list or set of numbers in which each succeeding term is obtained by adding a fixed number. The fixed number is called common difference. • **Geometric Sequence** is a set of terms in which each term after the first is obtained by multiplying a fixed number called the common ratio.	Activity 2 is intended to give the learners an idea of what is a sequence without introducing yet the concept to the class. You may also add other questions if necessary. **Answer Key:** 1. Yes 2. 17, by adding 3 3. 64, by multiplying 2

C. Developing and Deepening Understanding

DAY 2

SUB-TOPIC 1: Finding the Rule of a Sequence

1. Explicitation

A **sequence** is a list or set of numbers that follows a specific order or pattern. It can be classified as either finite or infinite. Below are examples of finite and infinite sequence.

Finite Sequence	Infinite Sequence
3, 6, 9, 12	5, 10, 15, 20, …
8, 10, 12, 14, … 30	2, -2, 2, -2, 2, …
	11, 15, 19, 23, 27, …

Note: A sequence is different from a series in a sense that the latter is generalized as the sum of all the terms of a sequence. However, there has to be a definite relationship between all the terms.

As mentioned earlier, a sequence follows a pattern and we call this as the **rule** or **nth term** of the sequence. We ca also express that rule or nth term as **a_n**.

2. Worked Example

Example 1: Find the rule or nth term of the sequence 5, 8, 11, 14, …

Solution: Notice that 3 is added to the previous term to get the next term. So, in tabular form we can search for the pattern.

Term	*Given*	*Pattern*	
1	5	5	5 + 7(0)
2	8	5 + 3	5 + 7(1)
3	11	5 + 3 + 3	5 + 7(2)
4	14	5 + 3 + 3 +3	5 + 7(3)

In the pattern, the number of times 7 is added to the first term is one less than the next term or (n – 1). Equating a_n and 5 + 3(n-1) and simplifying it

$$a_n = 5 + 3(n-1)$$
$$a_n = 5 + 3n-3$$
$$a_n = 3n + 2$$

Thus, the rule or nth term is **$a_n = 3n + 2$**

Example 2: Find the rule or nth term of the sequence 10, 7, 4, 1, …

In the solution for each example, emphasize to the learners the following:

- the numbers 1, 2, 3, 4 represents the first term, second term, third term, and fourth term of the sequence.
- if the terms of the sequence is increasing, then a positive number is added. When it is decreasing, a negative number is added. (Examples 1 and 2)
- if the terms of the sequence is increasing, then a positive number is multiplied. When it is decreasing, a fraction is

Solution: Notice that -3 is added to the previous term to get the next term. So, in tabular form we can search for the pattern.

Term	*Given*	*Pattern*	
1	10	10	10 + (-3)(0)
2	7	10 + (-3)	10 + (-3)(1)
3	4	10 + (-3) + (-3)	10 + (-3)(2)
4	1	10 + (-3) + (-3) + (-3)	10 + (-3)(3)

In the pattern, the number of times -3 is added to the first term is one less than the next term or (n – 1). Equating a_n and 10 + (-3)(n-1) and simplifying it

$$a_n = 10 + (-3)(n-1)$$
$$a_n = 10 - 3n + 3$$
$$a_n = -3n + 13$$

Thus, the rule or nth term is **$a_n = -3n + 13$**

Example 3: Find the rule or nth term of the sequence 2, 4, 8, 16, …
Solution: In this example, notice that 2 is multiplied to the previous term to get the next term. So, in tabular form we can search for the pattern.

Term	*Given*	*Pattern*	
1	3	3	3
2	6	3 (2)	$3\ (2)^1$
3	12	3 (2)(2)	$3\ (2)^2$
4	24	3 (2)(2)(2)	$3\ (2)^3$

In the pattern, the number of times 2 is multiplied to the first term is one less than the next term or (n – 1). Equating a_n and $3(2)^{n-1}$ gives us the rule or nth term **$a_n = 3\ (2)^{n-1}$**.

Example 4: Find the rule or nth term of the sequence 64, 16, 4, 1, …
Solution: Notice that 1/4 is multiplied to the previous term to get the next term. So, in tabular form we can search for the pattern.

Term	*Given*	*Pattern*	
1	64	64	64
2	16	64 (1/4)	$64\ (1/4)^1$
3	4	64 (1/4)(1/4)	$64\ (1/4)^2$
4	1	64 (1/4)(1/4)(1/4)	$64\ (1/4)^3$

multiplied. (Examples 3 and 4)

- if the rule or nth term of a sequence is given, you can solve for any of its term.

You may add more examples if needed.

In the pattern, the number of times 1/4 is multiplied to the first term is one less than the next term or (n – 1). Equating a_n and $64(1/4)^{n-1}$ gives us the rule or nth term **$a_n = 64(1/4)^{n-1}$**.

Example 5: Write the first 4 terms of the sequence $a_n = 2n + 1$.
Solution: Since 1, 2, 3 and 4 represents the first to fourth term of the sequence, we will use these as the value of "*n*".

If n = 1	If n = 2	If n = 3	If n = 4
$a_1 = 2(1) + 1$	$a_2 = 2(2) + 1$	$a_3 = 2(3) + 1$	$a_4 = 2(4) + 1$
$a_1 = 2 + 1$	$a_2 = 4 + 1$	$a_3 = 6 + 1$	$a_4 = 8 + 1$
$a_1 = 3$	$a_2 = 5$	$a_3 = 7$	$a_4 = 9$

Thus, the first 4 terms of the sequence are **3, 5, 7, and 9**.

3. **Lesson Activity**

Activity 3A: Try This!

A. Let the learners determine whether the following sequence is FINITE or INFINITE.

1. 5, 15, 25, 35
2. 2, 4, 8, 16, …
3. 1, 9, 17, 25
4. -9, -4, 1, 6, …
5. 2, 9, 16, 23
6. 2, 6, 18, 54, …
7. 3, 6, 9, 12, …, 30
8. 7, 7, 7, 7, 7
9. 16, 21, 26, 31
10. 24, 19, 14, 9, …

B. Let the learners determine the rule or nth term of the following sequences.

1. 1, 3, 5, 7, …
2. 1, -3, -7, -11, …
3. 5, 8, 11, 14, 17, …
4. 4, 12, 36, 108, …
5. 20, 10, 0, -10,

C. Given the rule or nth term, let the learners find the first four terms of the sequence.

1. $a_n = -2n + 8$
2. $a_n = 5n + 2$
3. $a_n = n + 20$
4. $a_n = 4(5)^{n-1}$
5. $a_n = 2(-3)^{n-1}$

Provide enough time for the learners to accomplish this activity. You may adjust the indicated time in the worksheet for this activity if necessary.

Activity 3A Answer Key:

A.
1. FINITE
2. INFINITE
3. FINITE
4. INFINITE
5. FINITE
6. INFINITE
7. FINITE
8. FINITE
9. FINITE
10. INFINITE

B.
1. $a_n = 2n - 1$
2. $a_n = -4n - 1$
3. $a_n = 3n + 2$
4. $a_n = 4(3)^{n-1}$
5. $a_n = 20(1/2)^{n-1}$

C.
1. 6, 4, 2, 0
2. 7, 12, 17, 22
3. 20, 21, 22, 23
4. 4, 20, 100, 500
5. 2, -6, 18, -64

DAY 3

SUB-TOPIC 2: Arithmetic Sequence

1. **Explicitation**

An **arithmetic sequence** is a list or set of numbers in which each succeeding term is obtained by adding a fixed number. The fixed number is called common difference.

In the previous examples we were task to find the nth term of the sequence 5, 8, 11, 14, …. This sequence is an example of an arithmetic sequence since we add a fixed number 3 to get the next term. Analyzing it in tabular form,

Term	*Given*	*Pattern*	
1	5	5	5 + 7(0)
2	8	5 + 3	5 + 7(1)
3	11	5 + 3 + 3	5 + 7(2)
4	14	5 + 3 + 3 +3	5 + 7(3)

In the pattern, the number of times 7 is added to the first term is one less than the next term or (n – 1). Equating a_n and 5 + 3(n-1)…

$$a_n = 5 + 3(n-1)$$

From this point, since 5 is the first term we represent it as $\mathbf{a_1}$ and the common difference as **d**. Thus,

$$\mathbf{a_n = a_1 + d(n - 1)}$$

With these, we can determine any term of an arithmetic sequence.

2. **Worked Example**

Example 1: Determine the 15th term of the arithmetic sequence 10,13,16,19, …

Solution: From the given arithmetic sequence, $a_1 = 10$, $d = 3$, and $n=15$.

$$\begin{aligned} a_n &= a_1 + d(n - 1) \\ a_{15} &= 10 + 3(15 - 1) \\ &= 10 + 3(14) \\ &= 10 + 42 \\ a_{15} &= 52 \end{aligned}$$

Thus, the 15th term of the arithmetic sequence is **52**.

In the solution for each example, emphasize to the learners that the common difference can be determined by getting the difference of the succeeding term and preceding term of a sequence.

You may add more examples if needed.

Example 2: Determine the 20th term of the arithmetic sequence 12, 10, 8, 16, …
Solution: From the given arithmetic sequence, $a_1 = 12$, $d = -2$, and $n=20$.

$$\begin{aligned} a_n &= a_1 + d(n - 1) \\ a_{20} &= 12 + (-2)(20 - 1) \\ &= 12 + (-2)(19) \\ &= 12 + (-38) \\ a_{20} &= -26 \end{aligned}$$

Thus, the 20th term of the arithmetic sequence is **-26**.

Example 3: 42 is what term of the arithmetic sequence 2, 6, 10, 14 …
Solution: From the given arithmetic sequence, $a_1 = 22$, $d = 4$, and $a_n = 42$.

$$\begin{aligned} a_n &= a_1 + d(n - 1) \\ 42 &= 22 + 4\ (n - 1) \\ 42 &= 22 + 4n - 4 \\ 42 &= 4n + 18 \\ 42 - 18 &= 4n \\ 24 &= 4n \\ \frac{24}{4} &= \frac{4n}{4} \\ 6 &= n \end{aligned}$$

Thus, 42 is the **6th term** of the arithmetic sequence.

Example 4: The 3rd term of an arithmetic sequence is 8 while the 16th term is 47. What is the first term and common difference?
Solution: From the given, $a_3 = 8$, $a_{16} = 47$. These implies that

Equation 1	*Equation 2*
$a_3 = a_1 + d(3 - 1)$	$a_{16} = a_1 + d(16 - 1)$
$8 = a_1 + 2d$	$47 = a_1 + 15d$

By Elimination

$$\begin{aligned} &-(8 = a_1 + 2d) \\ &47 = a_1 + 15d \\ &39 = 13d \\ &\frac{39}{13} = \frac{13d}{13} \\ &3 = d \end{aligned}$$

By Substituting d to Equation 1

$8 = a_1 + 2d$
$8 = a_1 + 2(3)$
$8 = a_1 + 6$
$8 - 6 = a_1$
$2 = a_1$

Thus, first term is **2** and the common difference is **3**.

3. Lesson Activity

Activity 3B: Solve It!

Instruction: Let the learners analyze and solve each problem.

1. What is the 18th term of the arithmetic sequence 13, 16, 19, 22, …?
2. Solve for the 12th term of the arithmetic sequence 99, 87, 75, 63, …
3. Determine the 10 term of the arithmetic sequence if $a_1 = -15$ and $d = 6$.
4. If $a_1 = -1$ and $a_6 = 14$, what is the common difference?
5. After knee surgery, your trainer tells you to return to your jogging program slowly. He suggests jogging for 12 minutes each for the first week. Each week thereafter, he suggests you increase that time by 6 minutes. How many weeks will it be before you are up to jogging 60 minutes per day?

Rubrics (Max of 3 points for each item)

Score	Indicator/s
3	Provided a complete solution with correct procedure and arrived at the correct answer.
2	Provided a complete solution with minor error in the procedure but still arrive at the correct answer.
1	Provided an incomplete with major error in the procedures and did not arrive at the correct answer.
0	Did not attempt to solve the problem.

DAY 4

SUB-TOPIC 3: Geometric Sequence

1. Explicitation

A **geometric sequence** is a set of terms in which each term after the first is obtained by multiplying a fixed number called the **common ratio** which is represented by **r**. To find the common ratio we divide any term of the geometric sequence by its preceding term.

Provide enough time for the learners to accomplish this activity. You may adjust the indicated time in the worksheet for this activity if necessary.

Activity 3B Answer Key:

1. 70
2. -33
3. 57
4. 3
5. 9 weeks

In the previous examples we were task to find the nth term of the sequence 3, 6, 12, 24, …. This sequence is an example of a geometric sequence since we multiply a fixed number 2 to get the next term. Analyzing it in tabular form,

Term	*Given*	*Pattern*	
1	3	3	3
2	6	3 (2)	$3\ (2)^1$
3	12	3 (2)(2)	$3\ (2)^2$
4	24	3 (2)(2)(2)	$3\ (2)^3$

In the pattern, the number of times 2 is multiplied to the first term is one less than the next term or (n – 1). Equating a_n and $3(2)^{n-1}$…

$$a_n = 3\ (2)^{n-1}$$

From this point, since 5 is the first term we represent it as $\mathbf{a_1}$ and the common ratio as **r**. Thus,

$$\mathbf{a_n = a_1\ (r)^{n-1}}$$

With these, we can determine any term of a geometric sequence.

2. Worked Example

Example 1: Determine the 8th term of the geometric sequence 4, 20,100,500, …

Solution: From the given geometric sequence, a_1 = 4, r = 5, and n=8.

$$\begin{aligned} a_n &= a_1\ (r)^{n-1} \\ a_8 &= 4\ (5)^{8-1} \\ &= 4\ (5)^7 \\ &= 4\ (78\ 125) \\ a_8 &= 312\ 500 \end{aligned}$$

Thus, the 18th term of the geometric sequence is **312 500**.

Example 2: What is the 10th term of the geometric sequence 256,128,64,32, …?

Solution: From the given geometric sequence, a_1 = 256, r = 1/2, and n=10. (Note: r = 128/256 expressed in lowest term is 1/2)

$$\begin{aligned} a_n &= a_1\ (r)^{n-1} \\ a_{10} &= 256\ (1/2)^{10-1} \\ &= 256\ (1/2)^9 \\ &= 256\ (1/512) \\ a_{10} &= 1/2 \end{aligned}$$

Thus, the 10th term of the geometric sequence is **1/2**.

In the solution for each example, emphasize to the learners that the common ratio can be determined by getting the quotient of the succeeding term and preceding term of a sequence.

You may add more examples if needed.

Example 3: Find the common ratio of a geometric sequence whose $a_1=4$ and $a_4=32$.
Solution: From the given, $a_1 = 4$ and $a_4 = 32$.

$$\begin{aligned} a_n &= a_1 (r)^{n-1} \\ a_4 &= 4 (r)^{4-1} \\ 32 &= 4 (r)^3 \\ \frac{32}{4} &= \frac{4r^3}{4} \\ 8 &= r^3 \\ \sqrt[3]{8} &= \sqrt[3]{r^3} \\ 2 &= r \end{aligned}$$

Thus, the common ratio is **2**.

3. **Lesson Activity**

Activity 3C: Complete Me!

Instruction: Let the learners complete the table below.

Given	a_1	r	Solution and Answer
1. 4, 12, 36, 108, … ; 7th term			
2. -3, 6, -12, 24, … ; 10th term			
3. 2187, 729, 243, 81, … ; 11th term			
4. -5, 5, -5, 5, … ; 100th term			
5. -2, -4, -8, -16, … ; 9th term			

Provide enough time for the learners to accomplish this activity. You may adjust the indicated time in the worksheet for this activity if necessary.

Activity 3C Answer Key:
1. 4, 3, 2916
2. -3, -2, 1536
3. 2187, 1/3, 1/27
4. -5, -1, 5
5. -2, 2, -512

D. Making Generalizations

Learners' Takeaways and Reflection on Learning

Activity 4: Closing the Loop!

Instruction: Let the learners answer the following questions.
1. What are the key concepts of our lesson?
2. Which part of the lesson is the easiest for you? Why?
3. Which part of the lesson is the hardest for you? Why?
4. How are we as a class today?

The activity is intended to determine what the learners have learned as well as to give feedback to their experiences during the lesson. Allot enough time to listen and process the responses of your learners.

You may also add questions if needed.

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION

NOTES TO TEACHERS

A. Evaluating Learning

1. **Formative Assessment**

Activity 5: Let's Solve It!

Instruction: Let the learners analyze and solve each problem.

1. 78 is what term of the arithmetic sequence 3, 8, 13, 18, …
2. There are 38 logs in the bottom layer of a pile of logs, 35 in the next layer, 32 in the next, and so on to the top which has 2 logs. How many logs are there in the 9th layer?
3. Find the first term of the geometric sequence if the 6th term is 3072 and the common ratio is 4.
4. Find the number of terms in the geometric sequence 1, 2, 4, 8, … , 262144

Rubrics (Max of 5 points for each item)

Score	Indicator/s
5	Provided a complete solution with correct procedure and arrived at the correct answer.
4	Provided a complete solution with one incorrect procedure but still arrive at the correct answer.
3	Provided a partially completed the solution with 2-3 incorrect procedures and arrive at the correct answer.
2	Provided an incomplete solution with 1-2 correct procedures but did not arrive at the correct answer.
1	Provided an incomplete solution with an attempt to solve the problem but did not arrive at the correct answer.
0	Did not attempt to solve the problem.

2. **Homework (Optional)**

Activity 5 Answer Key:

1. 16
2. 22 logs
3. 3
4. 19

B. Teacher's Remarks

Note observations on any of the following areas:	**Effective Practices**	**Problems Encountered**
strategies explored		
materials used		

The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff.

	learner engagement/ interaction			Teachers may also suggest ways to improve the different activities explored/lesson exemplar.
	others			
C. Teacher's Reflection	*Reflection guide or prompt can be on:* • *principles behind the teaching* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* • *students* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* • *ways forward* *What could I have done differently?* *What can I explore in the next lesson?*			Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.