SECONDARY
JHS

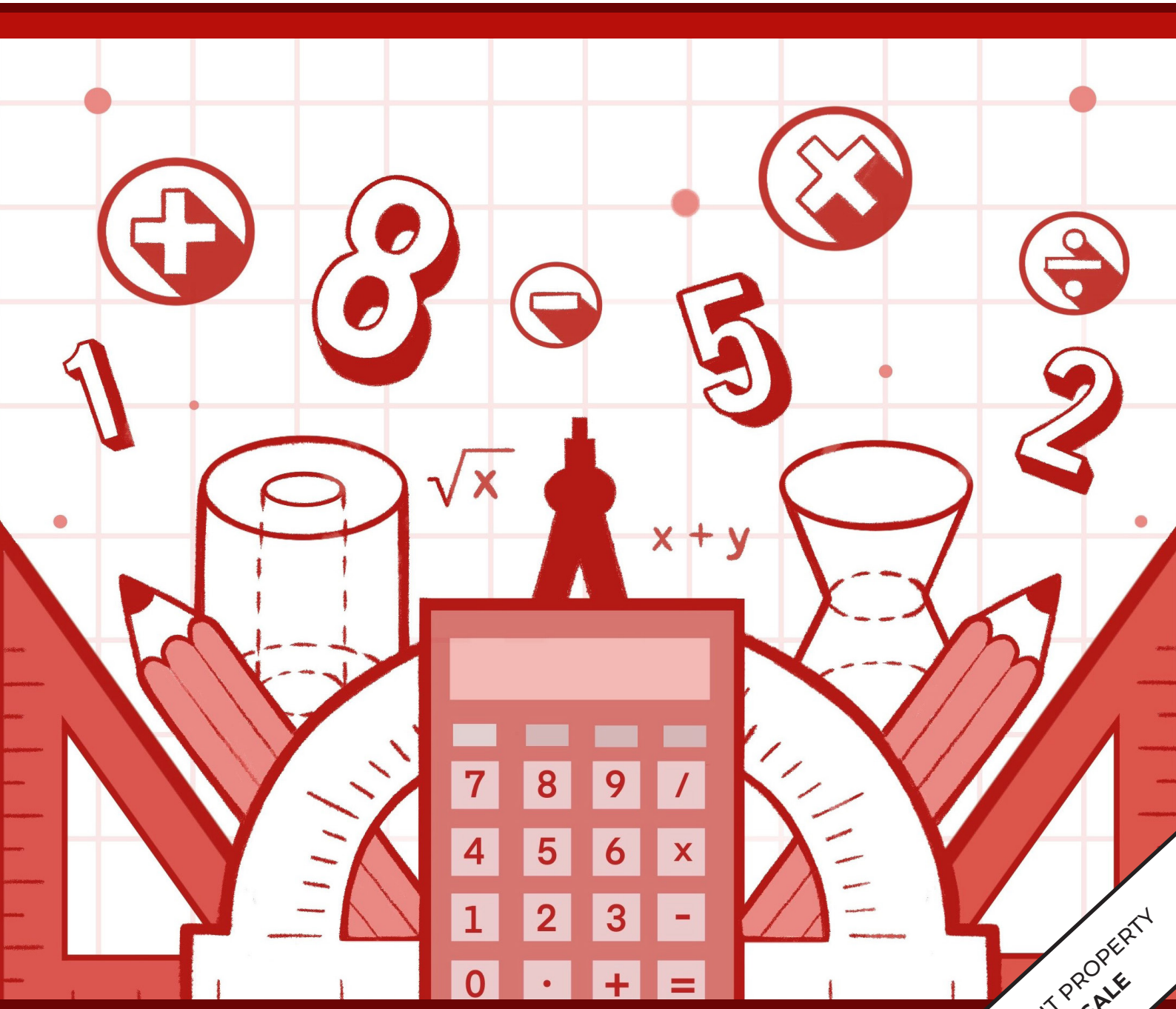
DepED DEPARTMENT OF EDUCATION

ALS Alternative Learning System LIFELONG LEARNING

LEARNING STRAND 3
MATHEMATICAL & PROBLEM-SOLVING SKILLS

SESSION GUIDES FOR MODULE 5:
HOW MUCH WILL IT GROW?

ALS Accreditation and Equivalency Program: Junior High School



UNESCO United Nations Educational, Scientific and Cultural Organization

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LEARNING STRAND 3

SESSION GUIDES

Alternative Learning System - Accreditation and Equivalency (ALS-A&E)

JUNIOR HIGH SCHOOL: MATHEMATICAL AND PROBLEM-SOLVING SKILLS

SESSION GUIDES FOR MODULE 5 (HOW MUCH WILL IT GROW?)

ALS Accreditation and Equivalency Program: Junior High School
Learning Strand 3: Mathematical and Problem-Solving Skills
Session Guides for Module 5 (How Much Will It Grow?)

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User's Guide

For the ALS Teacher/Instructional Managers/Learning Facilitator:

Welcome to the session guide of this module entitled How Much Will It Grow? under Learning Strand 3 Math and Problem-Solving Skills of the ALS K to 12 Basic Education Curriculum (BEC).

The module and the session guides were collaboratively designed, developed and reviewed by select DepEd field officials and teachers from formal school and ALS, and private institutions to assist in helping the ALS learners meet the standards set by the ALS K to 12 Basic Education Curriculum (BEC) while overcoming their personal, social, and economic constraints in attending ALS learning interventions.

This learning resource hopes to engage the learners in guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st Century skills while taking into consideration their needs and circumstances.

As an ALS Teacher/Instructional Manager/Learning Facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their learning. Moreover, you are expected to encourage and assist the learners as they do the tasks included in the module.

SUMMING IT UP!
Session Guide No. 1

I. **Duration of Session:** 3 hours

II. **Key Understandings to be Developed**
- Arithmetic sequence and series
- Arithmetic means

III. **Learning Objectives**
1. illustrates an arithmetic sequence. (LS3MP-PA-PSE-JHS-74)
2. finds the unknown term/s of an arithmetic sequence. (LS3MP-PA-PSE-JHS-77)
3. finds the arithmetic series and other related unknown values. (LS3MP-PA-PSE-JHS-78)
4. finds arithmetic means. (LS3MP-PA-PSE-JHS-79)

IV. **Resources** (none)

V. **Activity**

1. Ask the learners to help Abdul and Sahaya in their Kuripot Challenge (page 5).

   The activity aims to test the mathematical accuracy of learners in adding values and at the same time make them realize the risk in committing errors of adding many values in a sequence when doing it manually. To minimize such risks, the goal is to find patterns and shortcuts.

2. Form 5 groups of seven members and have each group do manual computations of the amounts that Sahaya and Abdul will be able to save at the end of the year by adding the monthly amount in the list. Tell them not to use their calculators except after the activity to check. Give each group at least 5 minutes to finish the group activity.

VI. Analysis

1. Based on the activity, call at least two (2) groups and make them decide who will present the group activity in front of the class, ask the following questions: *How did you come up with the computed amounts? Who has a bigger amount saved after a year?*

2. Put emphasis on adding the numbers correctly and how many values are being added for each situation such as 12 for monthly (Abdul) and 4 for quarterly (Sahaya). See page 14 for the solution.

    - Abdul will get ₱5,100 while Sahaya gets ₱5,000. So Abdul will have a bigger amount by ₱100. Together they can save up ₱10,100.

3. Ask the following question: *What if the challenge is turned into a weekly deal (something learners can do in real life), what could be a possible challenge given that there are 52 weeks in a year?* You may ask the other group to answer this question as possible.

    - Possible answer is that there are so many values to add manually which makes it prone to committing errors. Declare that the goal of the lesson is to find patterns and formulas to minimize the possibility of errors.

VII. Abstraction/Generalization

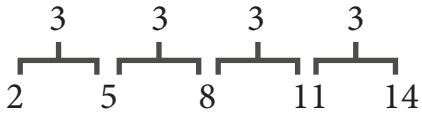
1. Present the definition and examples. See page 7–16
2. **Sequence of numbers:**
    - Emphasize that the Kuripot Challenge portrays a sequence.

3. **Arithmetic sequence and series:**
    - Explain that in the activity, the common difference for Abdul is 50 and the common difference for Sahaya is 500.
    - Guide the learners carefully on the importance of the notations: a_1, a_n, n, d

a_1 = first term of the arithmetic sequence
n = order of the term in the sequence
a_n = n^{th} term of the sequence
d = the common difference

- Explain the role of formulas in dealing with arithmetic sequence. See page 7–12 for the example
- Use the given sequence below to illustrate an example on finding the common ratio and the next term. You may use at least two examples. See page 9 for more examples.

a. 2, 5, 8, 11, 14,...



second term − first term = 5 − 2 = 3
third term − second term = 8 − 5 = 3
fourth term − third term = 11 − 8 = 3…

14 + 3 = 17.

- Emphasize that the common difference can be computed by getting the difference between any two consecutive numbers in an arithmetic sequence.
- Emphasize that the next can be computed by adding the common difference to the last term
- Ask the learners to provide an example of an arithmetic sequence.
- Emphasize that an arithmetic series is the sum of all the terms in an arithmetic sequence. So, an arithmetic series is a single number.
- Challenge the learners to compute a simple Kuripot Challenge using smaller values of common differences (such as 5 or 10-peso values) over a short period of time.

4. **Arithmetic means:**
   - Explain the importance of inserting arithmetic means in an arithmetic sequence. See page 17 for the example

VIII. Application

1. Ask the learners to discuss arithmetic sequence and series.
2. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments on pages 18–19 which aims to practice the following skills:

   a. finding the missing term of an arithmetic sequence.
   b. finding the arithmetic series using the given values.
   c. finding the arithmetic mean of a sequence.

3. Process the activity by allowing learners to explain their answers. See page 12 for the answer key

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of arithmetic sequence to real-life scenarios. *Best if the key understanding comes from the learners and encourage them to cite another real-life application of arithmetic sequence.*

MULTIPLY IT CONTINUOUSLY
Session Guide No. 2

I. **Duration of Session:** 3 hours

II. **Key Understandings to be Developed**
- Geometric sequence
- Geometric series

III. **Learning Objectives**
1. Illustrates a geometric sequence. (LS3MP-PA-PSE-JHS-80)
2. Finds the unknown terms of geometric sequence. (LS3MP-PA-PSE-JHS-83)
3. Finds the geometric and other unknown values. (LS3MP-PA-PSE-JHS-84)

IV. **Resources** (none)

V. **Activity**

1. Ask the learners to help Abdul and Sahaya: which is a better option in investing their money, stock investment or mutual fund?

   The activity aims to test the mathematical accuracy of learners in multiplying a value to the same number repeatedly and at the same time make them realize the risk in committing errors when doing the process even with the help of a calculator. To minimize such risk, the goal is to find patterns and shortcuts.

2. Ask the learners to look for a partner to collaborate with and ask them to compute for the amounts Sahaya and Abdul will be able to gain at the end of the terms for both the stocks and investment. Learners may use calculators to help in computing correctly. The learners then need to answer and compare which of the two terms is better using the calculated amounts. See page 21

VI. Analysis

1. Based on the activity, ask the learners the following questions: How did you come up with the computed amounts? What is a better choice for investment?
2. Put emphasis on how many times a value should be multiplied to the given number correctly. The stocks investment multiplies by 3 yearly while the mutual fund multiplies by 2 yearly. See page 24 for the solution

    - The stocks will gain 6,480, while the mutual fund gains 6,400 at the time of their maturity. Therefore, investing on the stocks is the better choice between the two as it gives a larger amount at its maturity.

VII. Abstraction/Generalization

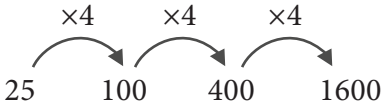
1. Present the definition and examples.
2. **Geometric sequence:**
    - Explain that in the activity, the common ratio for the stocks is 3 while the common ratio for the mutual fund is 2.
    - Guide the learners carefully on the importance of the notations: a_1, a_n, n, r

        $\boldsymbol{a_1}$ = first term of the geometric sequence
        $\boldsymbol{n}$ = order of the term in the sequence
        $\boldsymbol{a_n}$ = n^{th} term of the sequence
        $\boldsymbol{r}$ = the common ratio

    - Explain the role of formulas in dealing with geometric sequence. See page 22–28 for more examples
    - Use the given sequence below to illustrate an example on finding the common ratio and the next term. You may use at least two examples. See page 22–28 for more examples
    - Emphasize that the common ratio can be computed by dividing a term by the term preceding it.

- Emphasize that the next term can be computed by multiplying the common ratio to the last term of the sequence.

  a. 25, 100, 400, 1600,…



second term ÷ first term = 100 ÷ 25 = 4
third term ÷ second term = 400 ÷ 100 = 4
fourth term ÷ third term = 1600 ÷ 400 = 4

1600(4) = 6400

- Ask the learners to provide an example of a geometric sequence based on your given examples.

3. **Geometric series:**
   - Emphasize that a geometric series is the sum of all the terms in a geometric sequence. So, a geometric series is a single number. See page 29–32 for some examples
   - Challenge the learners to compute for the value of an investment or debt interest using small multiplier values (r = 1.5, 2, 3) over a short period of time such as 3 months or 6 months which is common in banking practices.

AMOUNT SCHEDULE	FOR 3 MONTHS with a multiplier value of 1.5	FOR 6 MONTHS with a multiplier value of 2
1st month	70	90
2nd month	70(1.5) = 105	90(2) = 180
3rd month	105(1.5) = 157.5	180(2) = 360
4th month	157.5(1.5) = 236.25	360(2) = 720
5th month		720(2) = 1440
6th month		1440(2) = 2880

VIII. Application

1. Ask the learners to define a geometric sequence.
2. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments on pages 33–34 which aim to practice the following skills:

   a. determining the common ratio of a geometric sequence.
   b. solving for the missing term in the geometric sequence using the given values.
   c. solving for the geometric series.

3. Process the activity by allowing the learners to explain their answers. See page 12 for the answer key

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of geometric sequence to real-life scenarios. *Best if the key understanding comes from the learners and encourage them to cite another real-life application of geometric sequence.*

APPLYING SEQUENCES AND SERIES
Session Guide No. 3

I. **Duration of Session:** 3 hours

II. **Key Understandings to be Developed**
- Problems on arithmetic and geometric sequence

III. **Learning Objectives**
1. Solve problems that involve arithmetic and geometric sequence/ series. (LS3MP-PA-PSE-JHS-86)
2. Express satisfaction in the mastery of new ways of thinking through the application of mathematics. (LS3MP-NS-PSE-BL/LE/AE/JHS-3)

IV. **Resources** (none)

V. **Activity**
1. Ask the learners to share or identify some problems involving an arithmetic sequence or a geometric sequence based on their daily lives. For example: savings, sales of a sari-sari store and growth of bacteria.

2. After a short sharing, Ask the learners to look for a partner for the activity 'Think, Pair, Share'

3. Ask each pair to identify and answer the problems posted in the Learner's Module involving an arithmetic sequence or a geometric sequence. *The goal of the activity is to correctly distinguish word problem situations that involve arithmetic and geometric sequences by correctly interpreting the operations involved in them.* See page 36

4. The activity aims to put together the concepts in the first two lessons (arithmetic & geometric sequence) using applications through word problems by trying to determine the difference between the concepts.

VI. Analysis

1. Based on the activity, ask the question: *What terms or words did you encounter to identify that the problem involves an arithmetic sequence? a geometric sequence?*

2. Point out words that indicate the operations involved in a word problem such as recruiting (adding people), decrease by (adding negative), and stacking (shows addition of box per layer) all involved addition. Meanwhile, problems involving concepts such as dividing, and money interest involve multiplication.

3. In summary, sequences that use addition (or subtraction) is arithmetic as observed in problems 1, 2, and 3. Sequences that use multiplication (or division) is geometric as observed in problems 4 and 5.

   This is important because each concept uses a different set of formulas to compute missing values. See page 38 for the solution.

VII. Abstraction/Generalization

1. Word problems apply the different concepts and formulas to solve for what is missing.
2. **In solving the word problems:**
   - Emphasize the need to distinguish what type of sequence is presented in each problem, whether arithmetic or geometric.
   - After identifying the concept involved, determine what is asked or missing in the problem.
   - Determine the given values and what information they represent in the problem related to the concept involved.
   - Use the correct formula to solve the missing value (or derive if needed). Then, substitute the values correctly. Finally, solve for what is asked.

VIII. Application

1. Ask the learners to discuss how to identify if a problem involves an arithmetic sequence or a geometric sequence.
2. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments on pages 43–46 which aim to practice the following skills:

    a. identifying what is asked in a world problem involving arithmetic sequence and applying formulas related to arithmetic sequence to solve word problems.
    b. identifying what is asked in a world problem involving geometric sequence and applying formulas related to geometric sequence to solve word problems.
    c. solving word problems involving sequences.

3. Allow the learners to explain their solutions in each problem. Guide them in some misconceptions and mistakes. See page 12 for the answer key

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of arithmetic sequence and geometric sequence in real-life scenarios. *Best if the key understanding comes from the learners and encourage them to cite another real-life scenario involving arithmetic and geometric sequence.*

PRE-ASSESSMENT

PAGE 2

1. b
2. c
3. a
4. c
5. c
6. b
7. b
8. b
9. d
10. b
11. c
12. a
13. c
14. b
15. c

LESSON 1: SUMMING IT UP!

SHARPENING YOUR SKILLS

PAGE 19

ACTIVITY I

1. $a_8 = 16$
2. $a_{15} = -49$
3. $a_{33} = 267$
4. $a_{12} = -116$
5. $a_{50} = 454$

ACTIVITY II

1. $S_{11} = 462$
2. $S_9 = 153$
3. $S_{15} = -285$
4. $S_{16} = 40$
5. $S_5 = 135$

TREADING THE ROAD TO MASTERY

PAGE 20

1. 31, 46, 61
2. 70, 85, 100
3. 4, −2
4. −5, −2, 1, 4
5. 7, 11, 15, 19, 23

LESSON 2: MULTIPLY IT CONTINUOUSLY!

SHARPENING YOUR SKILLS

PAGE 34

ACTIVITY I

1. -6
2. $\frac{1}{3}$
3. $\frac{1}{2}$
4. -1
5. $-\frac{1}{4}$

ACTIVITY II

1. **A.** $a_8 = 409{,}600$
   B. $a_{12} = 104{,}857{,}600$
2. **A.** $a_9 = 768$
   B. $a_{14} = -24{,}576$
3. **A.** $a_8 = \frac{1}{64}$
   B. $a_{11} = \frac{1}{512}$

TREADING THE ROAD TO MASTERY

PAGE 35

1. $r = -3$
2. $r = 2$
3. $S_{10} = 59{,}048$
4. $S_8 = \frac{255}{16}$

LESSON 3: APPLYING SEQUENCES AND SERIES

SHARPENING YOUR SKILLS

PAGE 44

ACTIVITY I

1. $S_{100} = 10{,}000$
2. $a_8 = 32{,}350$
3. $S_5 = 105$
   Price = ₱15,750,000

ACTIVITY II

1. $a_5 = 7{,}203$
2. $a_3 = 10.84$ ft
3. $a_{10} = 51{,}200$

TREADING THE ROAD TO MASTERY

PAGE 46

1. Arithmetic, $a_{10} = 10$ blocks
2. Geometric, $a_{10} = 512$ virus
3. Geometric, $a_5 = 6{,}561$
4. Arithmetic, $S_{750} = 14{,}231{,}250$

REACH THE TOP

PAGE 52

1. c	**6.** c	**11.** c
2. d	**7.** b	**12.** c
3. a	**8.** d	**13.** a
4. b	**9.** d	**14.** a
5. b	**10.** c	**15.** a

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