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Lesson Exemplar for Mathematics

Quarter 4

Lesson

5

Lesson Exemplar for Mathematics Grade 7
Quarter 4: Lesson 5 (Week 5)
SY 2024-2025

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MATHEMATICS / QUARTER 4 / GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learner should understand the rearrangement of a formula to make a different variable the subject of the formula.
B. Performance Standards	By the end of the lesson, the learners are able to rearrange a formula to make a different variable the subject of the formula. (NA)
C. Learning Competencies and Objectives	Learning Competency By the end of the lesson, the learners are able to: LC 6. Solve one variable in terms of the other variables in a formula. 1. Define a literal equation. 2. Apply steps for solving linear equations to solve the literal equation. 3. Accurately isolate one variable and express the solution in terms of the remaining variable LC 9. Solve Problems Involving literal equations. 1. Accurately solve problems involving literal equations.
D. Content	Solving Literal Equations
E. Integration	Concept of Equality and Justice

II. LEARNING RESOURCES
Amusing Algebra. (2024). <i>Solving literal equations clue mystery activity</i>. https://www.teacherspayteachers.com/Product/Solving-Literal-Equations-Clue-Mystery-Activity-6109358?st=e2ed7bee0bf6ad1824978c9f5fd01822 Cachet. (2014, July 25). Rate-Time-Distance problems (<i>Powerpoint slides</i>). https://www.slideserve.com/cachet/4-8-rate-time-distance-problems Chilimath. (2024). Solving Literal Equations. <i>Chilimath</i>. https://www.chilimath.com/lessons/intermediate-algebra/literal-equations/ Glencoe & McGraw-Hill. (n.d.). Teaching Algebra with Manipulatives. <i>Sault Area Public Schools</i>. https://www.saultschools.org/cms/lib/mi17000143/centricity/domain/137/a2tam.pdf Metropolitan Community College. (n.d.). Solving Literal Equations. <i>Metropolitan Community College</i>. https://mcckc.edu/tutoring/docs/blue-river/math/equat_inequ/Practice_Solving_Literal_Equations.pdf Oronce, O.A., et al (2007). e-math I Elementary Algebra. Rex Bookstore, Inc. Sampaloc, Manila Pleacher, D. (n.d.). Equation Analysis Test #2. <i>Pleacher</i>. https://www.pleacher.com/mp/puzzles/mathpuz/eqtstan3.html

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	DAY 1 1. Short Review Activity 1: Find My Match Activity Directions: Fill in each circle to make each given equation correct. Use the numbers at the right. 1. $2a + 4 = 10$ $a = \bigcirc$ 2. $3x + 5 = x + 15$ $x = \bigcirc$ 3. $7a - \bigcirc = 6$ $a = 1$ 4. $3x - \bigcirc = \bigcirc$ $x = 2$ 1 2 3 4 5 Activity 2: Math Riddle Direction: Solve for the value of x, then match the equation in Column A with the correct answer in Column B. Use your answers to break the code. 4 -3 2 -11 Column A 1. $4(x-2) = 12$ 2. $-4 = 5x + 6$ 3. $-3x + 8 = 2(x-1)$ 4. $2x - 4 = 3(x-1)$ 5. $2 - 3x = -7$ 3 -1 5 -2 5 Column B A. $x = -3$ F. $x = 5$ H. $x = 11$ I. $x = 3$ M. $x = 4$	The teacher may allow group work in performing the activities. The teacher can give hints or clues if he/she finds that learners have difficulty answering the activity. 1. $2a + 4 = 10$ $a = \bigcirc 3$ 2. $3x + 5 = x + 15$ $x = \bigcirc 5$ 3. $7a - \bigcirc 1 = 6$ $a = 1$ 4. $3x - \bigcirc 2 = \bigcirc 4$ $x = 2$ The teacher can assign this activity in pairs. Guide them on how to answer by giving #1 as an example. M A T H I S F U N 4 -3 2 -11 3 -1 5 -2 -5

	$6. -17 = 7 + 8x$ $7. \frac{x-3}{7} = -2$ $8. \frac{2x-5}{3} = 1$ $9. 3 - \frac{x}{5} = 2$	$N. x = -5$ $S. x = -1$ $T. x = 2$ $U. x = -2$	
	2. Feedback (Optional)		
B. Establishing Lesson Purpose	1. Lesson Purpose The Road Trip Query Two friends Angelo and John are having a road trip when they pass a road sign that says "Speed Limit 60kph". Angelo asked his friend "If we need to travel for 240 kilometers to our destination? How long are we going to travel?" Guide Question: 1. Give the distance formula. 2. What is asked in the problem? 3. How would you answer Ben's question if you were John? 2. Unlocking Content Vocabulary Literal Equations - an equation involving two or more variables. Unlike traditional equations where you often solve for one variable in terms of numbers, in literal equations, you solve for one variable in terms of the other variable.		
C. Developing and Deepening Understanding	DAY 2 SUB-TOPIC 1: Solving One Variable in Terms of the other Variable 1. Explicitation Example 1: Below is the solution to finding the rate using the distance formula $d = rt$. Fill in the blank with the Property of Equality to explain its steps. $d = (r)(t)$ $(d)\left(\frac{1}{r}\right) = (r)(t)\left(\frac{1}{r}\right)$ $\frac{d}{r} = t$ Given Multiplication Property of Equality (Multiply $\left(\frac{1}{r}\right)$ to both sides of the equation.) Simplify. By Symmetric Property of Equality, therefore, if the time is to be solved, the formula will be $t = \frac{d}{r}$.		
			After giving the meaning of a literal equation, ask them about formulas they know or used in their math lessons. You can also ask them the meaning of the variables used in the formula. Let the learners recall the properties of equality they have discussed in the previous lessons. Take Note! If learners are not familiar with the Symmetric Property of Equality, inform them that if $a = b$, then $b = a$. In other words, if one side of an equation is

Example 2: Solve for l in the literal equation $P = 2l + 2w$. Some solutions and Properties of Equality used in its steps are given.

$P = 2l + 2w$	Given
$P - 2w = 2l + 2w - 2w$	_____
$P - 2w = 2l$	_____
_____	Multiplication Property of Equality
_____	Simplify

By Symmetric Property of Equality, therefore, if the time is to be solved, the formula will be $l = \frac{P-2w}{2} - w$ or _____.

Example 3: Solve for height h in the formula of the area of a triangle

$A = \frac{1}{2}bh$. Fill in the blank with the Property of Equality to explain its steps.

$A = \frac{1}{2}bh$	Given.
$A(2) = \left(\frac{bh}{2}\right)(2)$	_____
$2A = bh$	_____
$2A\left(\frac{1}{b}\right) = bh\left(\frac{1}{b}\right)$	_____
$\frac{2A}{b} = h$	_____

By Symmetric Property of Equality, therefore, if h is to be solved in $A = \frac{1}{2}bh$, the formula will be $h = \frac{2A}{b}$.

2. Worked Example

A. Solve each literal equation.

Unknown Variable	Formula	Concept
1. d	$C = \pi d$	Circumference of a Circle
2. s	$P = 4s$	Perimeter of a Square
3. m	$y = mx + b$	Slope of a Line
4. w	$P = 2l + 2w$	Perimeter of a Rectangle
5. b	$P = a + b + c$	Perimeter of a Triangle

equal to the other side, then the two sides are interchangeable.

If learners are confused about solving for the unknown, give them hints on what to do next. They can follow the step-by-step process and emphasize the property of equality being applied in each step.

Solution for #2

Given: $P = 4s$

$$P\left(\frac{1}{4}\right) = 4s\left(\frac{1}{4}\right)$$

$$\frac{P}{4} = s \quad \text{Therefore, applying Symmetric Property of Equality, } s = \frac{P}{4}.$$

Solution for #4

Given: $A = 2l + 2w$; $w = ?$

$$A - 2l = 2l - 2l + 2w$$

$$A - 2l = 2w$$

$$(A - 2l)\left(\frac{1}{2}\right) = (2w)\left(\frac{1}{2}\right)$$

$$\frac{A-2l}{2} = w$$

Therefore, applying Symmetric Property of Equality, $w = \frac{A-2l}{2}$ or $w = \frac{A}{2} - l$.

B. Solve each equation for the indicated variable.

1. Solve $6 = mx - b$ for x

2. Solve $2(a + 3c) = 4a$ for a

3. Solve $3x - 2a = 7a$ for x

4. Solve $-3x + 3y = 12$ for y

5. Solve $6f + 3q = 16f - 2q$ for q

Solution for #1

Given: Solve $6 = mx - b$ for x

$$6 + b = mx - b + b$$

$$6 + b = mx$$

$$(6 + b)\left(\frac{1}{m}\right) = mx\left(\frac{1}{m}\right)$$

$$\frac{6+b}{m} = x$$

$$\text{Therefore, } x = \frac{6+b}{m}.$$

Solution for #2

Given: Solve $2(a + 3c) = 4a$ for a

$$2a + 6c = 4a$$

$$2a - 2a + 6c = 4a - 2a$$

$$6c = 2a$$

$$\frac{6c}{2} = \frac{2a}{2}$$

$$3c = a$$

$$\text{Therefore, } a = 3c.$$

Answer:

A

1. $C = \pi d$

$$d = \frac{C}{\pi}$$

2. $P = 4s$

$$s = \frac{P}{4}$$

3. $y = mx + b$

$$m = \frac{y-b}{x}$$

5. $P = a + b + c$

$$b = P - a - c$$

B.

3. Solve $3x - 2a = 7a$ for x

$$\text{Answer: } \mathbf{x = 3a}$$

4. Solve $-3x + 3y = 12$ for y

$$\text{Answer: } \mathbf{y = x + 4}$$

5. Solve $6f + 3q = 16f - 2q$ for q

$$\text{Answer: } \mathbf{q = 2f}$$

3. Lesson Activity

Activity 3: Who Found It?

Gavin has a mathematics class in the fourth period. Before he arrived in his math class after recess, he found out that his math project was missing. Help Gavin by pretending you are an investigator who will help him find his Math project. Solve for x in the literal equations. Then mark an “X” on the correct answers to verify who got his project, where he left it, and what time he lost it.

- | | |
|-----------------------|--------------------|
| 1. $z = mx + y$ | 5. $xy = wv$ |
| 2. $x - m = n + p$ | 6. $u = v - w + x$ |
| 3. $xm = n + p$ | 7. $cx + d = b$ |
| 4. $xm = \frac{p}{n}$ | 8. $p = mn - x$ |

Who?	Where?	When?
☐ Tom $x = \frac{np}{m}$	☐ Canteen $x = u - v - w$	☐ First Period $x = mn + p$
☐ Joy $x = \frac{z - y}{m}$	☐ Gym $x = \frac{b - d}{c}$	☐ Second Period $x = m + n + p$
☐ Alex $x = \frac{b + d}{c}$	☐ Library $x = \frac{wv}{y}$	☐ Third Period $x = c - bd$

DAY 3

SUB-TOPIC 2: Solving Problems Involving Literal Equations

1. Explicitation

Recall the Activity “The Road Trip Query” from the previous lesson. From the formula $d = rt$, you were able to solve for t. This time, continue to solve the problem.

Questions:

- What is the formula for finding “t” in $d = rt$?
- What are the given data in the problem?
- How will you solve for its time?
- How long will they travel for the 240-kilometer trip?

Values Integration for Lesson Activity “Who Found It”

The teacher may ask the following questions before presenting the activity to the class.

- If your classmate lost something valuable while you were in the classroom, and your seatmate suspects your friend stole it what do you usually do?
- Are you fair in making judgments?

Tell the learners that fair judgment is important to exercise in our everyday life.

Who?	Where?	When?
☐ Tom $x = \frac{np}{m}$	☐ Canteen $x = u - v - w$	☐ First Period $x = mn + p$
☒ Joy $x = \frac{z - y}{m}$	☐ Gym $x = \frac{b - d}{c}$	☒ Second Period $x = m + n + p$
☐ Alex $x = \frac{b + d}{c}$	☒ Library $x = \frac{wv}{y}$	☐ Third Period $x = c - bd$

Answer: **Joy** found the Math project in the **library** during the **second period**.

To solve word problems, we can follow George Polya's steps.

1. Understand the problem.
2. Make a plan.
3. Carry out the plan.
4. Look back and reflect.

2. Worked Example

1. Two friends Ben and John are having a road trip when they pass by a road sign "Speed Limit 60kph". Ben asked his friend "If we need to travel for 240 kilometers to our destination? How long are we going to travel?"

Solution:

Given: distance = 240 km. , rate = 60kph

Formula: $d = rt$, $t = ?$

$$t = \frac{d}{r}$$
$$t = \frac{240}{60}$$
$$\mathbf{t = 4}$$

Therefore, it will take Ben and John **4 hours** for their road trip.

Check:

$$d = rt$$

$$240 = (60)(4)$$

$$240 = 240$$

2. The area of a triangle has the formula $A = \frac{1}{2}bh$. If the height of a triangular paper whose area is 21 square inches and with a base of 7 inches.

Solution:

Given: $A = 21 \text{ in}^2$, $b = 7$ inches

Formula: $A = \frac{1}{2}bh$, $h = ?$

$$h = \frac{2A}{b}$$
$$h = \frac{2(21)}{7}$$
$$h = \frac{2(21)}{7}$$
$$\mathbf{h = 6}$$

Therefore, the height of the triangular paper is **6 inches**.

Check:

$$A = \frac{1}{2}bh$$

$$21 = \frac{1}{2}(7)(6)$$

$$21 = \frac{1}{2}(42)$$

$$21 = 21$$

You can ask the learners, what steps in solving problems they used in their elementary. Then connect it to George Polya's steps.

Let the learners apply the literal equations they solved in dealing with the word problems. Emphasize that a unit of measure is needed in giving the final answer.

3. The perimeter of a rectangle has the formula $P = 2l + 2w$. Find the width of the plot if the perimeter is 100 square feet with a length of 30 feet.

Solution:

Given: Perimeter = 100 square feet, length = 30 feet

Formula: $P = 2l + 2w$, $w = ?$

$$w = \frac{A - 2l}{2}$$

$$w = \frac{100 - 2(30)}{2}$$

$$w = \frac{40}{2}$$

$$w = 20$$

Check:

$$P = 2l + 2w$$

$$100 = 2(30) + 2(20)$$

$$100 = 100$$

Therefore, the width of the rectangular plot is **20 feet**.

3. Lesson Activity

Activity 4: Let's Solve!

A. Solve the following problems.

- Find the diameter of a coin if the circumference is 22 centimeters. (Use $\pi = 3.14$)
- The perimeter of a square picture frame is 44 cm. Find the length of a side of the picture frame.
- The perimeter of a rectangular swimming pool is 56 meters. Its length is 12 meters. Find the width of the swimming pool.
- Two sides of a triangle have lengths 5dm and 8dm. The perimeter is 20 dm. Find the length of the third side of the triangle.
- The area of a rectangular lot is 63 square meters. The width of the lot measures 7 meters. Find its length.

B. Degree Fahrenheit is $^{\circ}\text{F} = ^{\circ}\text{C} \left(\frac{9}{5} \right) + 32$.

- Convert $^{\circ}\text{F}$ to $^{\circ}\text{C}$.
- If $^{\circ}\text{F} = 98.6$, what is its equivalent temperature in degrees Celsius?
- If a human has a temperature of 98.6°F , does he/she have a fever? Why?

Answers:

- 7 cm
- 11 cm.
- 16 meters
- 7 dm
- 9 meters

B. Guide the students in solving for $^{\circ}\text{C}$ in the literal equation $^{\circ}\text{F} = ^{\circ}\text{C} \left(\frac{9}{5} \right) + 32$

$$1. ^{\circ}\text{C} = (^{\circ}\text{F} - 32) \left(\frac{5}{9} \right).$$

$$2. 37^{\circ}\text{C}$$

3. No. Because it is the normal body temperature of a human.

D. Making Generalizations	DAY 4 1. Learners' Takeaways Use the Frayer Diagram to show what you learned. 2. Reflection on Learning Give instances when these lessons can be of help to you.	The teacher will ask the learners of the important lessons they've learned.
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IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		NOTES TO TEACHERS
A. Evaluating Learning	1. Formative Assessment A. Solve the following literal equations. $d = rt$ for r $V = lwh$ for w $R = \frac{cs}{d}$ for c $ax + by = c$ for x $I = prt$ for r B. Given: The volume of a rectangular prism is $V = lwh$. - Solve for l. - Find the length of a rectangular box if the width is 5 inches, the height is 6 inches and the volume is 270 cubic inches - If the length of the rectangular box is 7 inches, the height is 5 inches and the width is 3 inches, what is its volume?	Answer: A. $r = \frac{d}{t}$ $w = \frac{V}{lh}$ $c = \frac{Rd}{s}$ $x = \frac{c-by}{a}$ $r = \frac{I}{pt}$ B. $l = \frac{V}{wh}$ 9 inches 105 cubic inches

