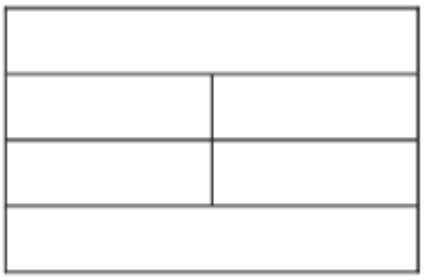
Unit and Lesson Context

- This lesson is from Algebra I, Unit 01 - Linear Equations and Inequalities, Lesson 6 - 1.2.1 Rewriting Literal Equations
- The Exit Ticket was originally created in Schoology. The questions have been snipped into the student facing materials.
- I have recorded two videos that demonstrate how to use the Math Tile Mat Strategy referenced in this lesson.
- Rewriting Literal Equations Example 1
- Rewriting Literal Equations Example 2

Unit Plan Daily Details

Day 6: 1.2.1 Rewriting Equations and Formulas (Literal) Day 1	
What	
Standards: *What knowledge and/or skills are students working towards?*	Daily Objectives: *What will students do today?*
A.12.E solve mathematic and scientific formulas, and other literal equations, for a specified variable	• Rewrite literal equations • Rewrite and use common formulas to solve mathematical and real-world problems
Key Points: *What will students know today?*	
Key Point 1 An equation that has two or more variables is called a *literal equation*. To rewrite a literal equation, solve for one variable in terms of the other variable(s) using inverse operations.	
How	

NOTES:
To accommodate this lesson for all students, use the Math Tile Mat Strategy to help students rewrite literal equations by simply listing the math operations associated with each term and undoing that term. In the first row should be the variable that is being solved for. In the second row, list what is being multiplied by the variable that you are solving for. In the third row, list the addition or subtraction of the other term. In the 4th row list =_____; this will be whatever the equation is equal to which can be a variable, constant, or combination both. This lesson uses formulas that should be familiar to students, in order to practice the skill of rewriting equations. In addition, students will rewrite an equation in two variables, x and y, to solve for y. Rewriting an equation in function form is an important skill that you want students to be secure with now. Any weaknesses in rational number operations will surface, so it is important to differentiate where students are having a problem in this lesson. Is the challenge with using inverse operations correctly, or is it problems with rational numbers, or both? Continue to refer to conceptual understanding of rational number operations from Unit 0 when working with students.



Reminders for students when solving literal equations:

- When solving a literal equation, first identify the variable you are solving for. It may be helpful for students to underline or circle that specific variable.
- Once the variable has been identified, solve the equation as if the variables were numbers. It may be necessary to go over the steps to solving an equation here.
- It could be helpful to have students work an equation with numbers and only one variable side by side with a literal equation so that they can see the correlation between the two.

Do First (5 minutes): Have students complete the Do First independently. This is spiraled practice of solving equations. Remind students to check their solutions.

Engage (5 minutes): Have students complete the Engage in pairs. Allow students to share their responses to Question 2 whole group. Explain that today they will be rewrtiting familiar formulas and solving for variables, just as the familiar formula $d = rt$ can be solved for r or t.

Explore (15 minutes): Students will work in pairs to solve the common formulas for the specified variable. Note: Each table should be given a different formula. If students finish early, encourage them to work on another equation. Students will write how they solved the equations and describe how the processes are similar or different. Students will share their responses on the board and a spokesperson will present their findings to the class which will drive the discussion.

Explain (25 minutes): Introduce Key Point 1. Model Example 1a for the class using the Math Tile Mat Strategy to do/undo the equation. To accommodate this lesson for all students, use the Math Tile Mat Strategy to help students rewrite literal equations by simply listing the math operations associated with each term and undoing that term. In the first row should be the variable that is being solved for. In the second row, list what is being multiplied by the variable that you are solving for. In the third row, list the addition or subtraction of the other term. In the 4th row list =_____; this will be whatever the equation is equal to which can be a variable, constant, or combination both. Note: When solving literal equations, you want students to verbalize the operations represented. For example, when solving 3y + 4x = 9, students should understand there are two variable terms. To isolate the 3y-term, subtract 4x. In other words, approach solving 3y + 4x = 9 for y in the same way as you would solve 3y + 4 = 9 for y. Cold call on students to give responses to the questions listed before students solving Example 1(b) independently. Students complete CFU 1to solve each equation for y. Model Example 2 included the thought process then have students complete CFU 2. Actively monitor students to address misconceptions and positively narrate behaviors. Model Example 3 and be sure to emphasize the problem-solving strategy that you are utilizing.

Elaborate / Independent Practice (20 minutes): Allow students to complete the Additional Practice section independently. Pull struggling students into a small group.

Evaluate (10 minutes):
This Exit Ticket was originally created in Schoology. The questions have been snipped into the Student Hanout for the model lesson.

Student Facing Materials

Objectives:

- Rewrite literal equations
- Rewrite and use common formulas to solve mathematical and real-world problems

Do First

Solve each equation.

$y - 4 = 9$	$p + 5 = -6$
$\frac{p+5}{-2} = 9$	$8h + 5 - 3h = 8h - 4$

In the equation $35t + 70(7 - t) = 385$, the variable ***t*** represents the number of hours you drove at 35 miles per hour on a 385-mile trip. How many hours did you drive at 35 miles per hour?

Engage

1. Answer the following questions:
    a) I drove 2.1 hours at 65 miles per hour. How far did I go?

    b) It took me 32 minutes to walk 4 kilometers. How fast was I walking on average?

    c) At 8 miles per hour, how long will it take me to bike 6 miles?

2. How are these three equations alike?

Explore

Essential Question **–** How can you use a formula for one measurement to write a formula for a different measurement?

$y = mx + b$	$S = Ph + 2B$	$ax + by = c$
a. Solve for x	a. Solve for h	a. Solve for b
b. Solve for b	b. Solve for P	b. Solve for x
c. Solve for m	c. Solve for B	c. Solve for y

Reflection: Compare how you solved the equations in parts a – c. How are the processes similar? How are they different?

The similarity in how I solved the equation is _____

_____

The difference in how I solved the equation is _____

_____

Explain

Key Point 1

An equation that has two or more variables is called a _____. To rewrite a literal equation, solve for one variable in terms of the other variable(s) using inverse operations.

Examples:

Solve for x: $y = 2x + 4$ **Solve for t:** $D = rt$ **Solve for b:** $A = \frac{1}{2}bh$

Example 1	
a. Solve the literal equation $3y + 4x = 9$ for *y*.	b. Solve the literal equation $12x + 8y = 20$ for *y*. 1) Which variable are you trying to isolate? 2) What is the most appropriate first step? Why? 3) Solve the equation $12x + 8y = 20$ for *y*

CFU 1

Monitoring Progress: Solve each equation for *y.*

$3y - x = 9$	$2x - 2y = 5$	$20 = 8x + 4y$	$5y + 3 = 2t$

Example 2
a. Solve the literal equation $y = 3x + 5xz$ for x. 1) Which variable are you trying to isolate?

2) What is the most appropriate first step? Why?

3) Solve the equation $y = 3x + 5xz$ for x.

CFU 2

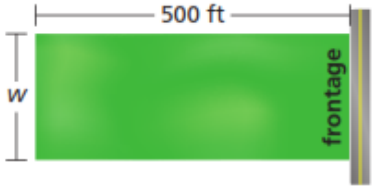
Monitoring Progress: Solve each equation for *x.*

$2x + k = m$	$3 + kx = y$	$3 - kx = y$

Example 3

You own a rectangular lot that is 500 feet deep. It has an area of 100,000 square feet. To pay for a new water system, you are assessed $5.50 per foot of lot frontage

a) Find the frontage of your lot.



b) How much are you assessed for the new water system?

Elaborate

1. Solve the literal equation for the specified variable.

(a)	$2p + 5r = q$ for p	(b)	$n - 6m = 8$ for n.
(c)	$-10 = xy + z$ for *x*.	(d)	$\frac{h-4}{j} = k$ for *j*.
(e)	$S = 2\pi r^2 + 2\pi rh$ for h.	(f)	$P = R - C$ for C.

Evaluate

Exit Ticket

2. Solve the literal equation for *y*.

$16x + 9 = 9y - 2x$

3. Solve the literal equation for *x.*

$z = 8 + 6x$

4. Solve the literal equation for *y*

$4x + 1 = 9 + 4y$

5. The penny size of a nail indicates the length of the nail. The penny size *d* is given y the literal equation *d=4n-2* where *n* is the length (in inches) of the nail.

a. Solve the equation for *n.*

b. Use the equation from part (a) to find the lengths of nails with the following penny sizes: 3, 6, and 10.

6. The density *d* of a substance is given by the formula $d = \frac{m}{V}$, where *m* is its mass and *V* is its volume.

a. Solve the formula for *m.*

b. Find the mass of the pyrite sample.