

2-5

Literal Equations
and Formulas

Vocabulary

● Review

Write the letter of each *formula* next to its description.

A. $C = 2\pi r$

B. $P = 2\ell + 2w$

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

D. $C = \frac{5}{9}(F - 32)$

1. perimeter (P) of a rectangle with length (ℓ) and width (w)

2. area (A) of a triangle with base (b) and height (h)

3. circumference (C) of a circle with radius (r)

4. temperature in degrees Celsius (C) given the same temperature in degrees Fahrenheit (F)

● Vocabulary Builder

literal (adjective) lit ur ul

Related Words: letter (noun), literature (noun), literary (adjective)

Definition: When something is **literal**, it uses the exact, or primary, meaning of a word or words. It is also something that uses or is expressed by letters.

Math Usage: A **literal** equation is an equation that involves two or more letters (variables).

Example: The formula in the box is a **literal** equation with three variables. You can solve for any of the three variables in terms of the other two.

Nonexample: $2x + 5 = 12$ is *not* a **literal** equation because it does *not* contain two or more variables.

These **literal** equations relate **distance** (d), **rate** (speed, r), and **time** (t).

$$d = r \cdot t$$

$$\frac{d}{r} = t$$

$$\frac{d}{t} = r$$

Use Your Vocabulary

Complete each statement with the appropriate word from the list.

letter literature literary literal equation

- The word *Boston* begins with the ? *B*.
- A novel is an example of a ? work.
- The equation $2x + 5 = 12$ is *not* an example of a ? because it has only one variable.
- You study classic ? in English class.



Problem 1 Rewriting a Literal Equation

Got It? Solve the equation $4 = 2m - 5n$ for m . What are the values of m when $n = -2, 0,$ and 2 ?

- The equation is solved below. Choose a justification from the box for each step.

$$4 = 2m - 5n$$

$$4 + 5n = 2m - 5n + 5n$$

$$4 + 5n = 2m$$

$$\frac{4 + 5n}{2} = \frac{2m}{2}$$

$$2 + \frac{5}{2}n = m$$

Simplify.
Divide each side by 2.
Add $5n$ to both sides.

Write the original equation.

- Complete the table to find the value of m for each given value of n .

n	Substitute the value of n into the equation.	m
-2	$\square + \frac{5}{2} \cdot \square = m$ $\square = m$	<div style="background-color: #fff9c4; width: 20px; height: 20px; margin: 0 auto;"></div>
0	$\square + \frac{5}{2} \cdot \square = m$ $\square = m$	<div style="background-color: #fff9c4; width: 20px; height: 20px; margin: 0 auto;"></div>
2	$\square + \frac{5}{2} \cdot \square = m$ $\square = m$	<div style="background-color: #fff9c4; width: 20px; height: 20px; margin: 0 auto;"></div>



Problem 2 Rewriting a Literal Equation With Only Variables

Got It? What equation do you get when you solve $-t = r + px$ for x ?

11. Use the justifications at the right to solve the equation.

$-t = r + px$	Write the original equation.
$-t - \square = r + px - \square$	Subtract the same amount from each side.
$-t - \square = px$	Simplify.
$\frac{-t - r}{\square} = \frac{px}{p}$	Divide each side by the same amount.
$\frac{-t}{p} - \frac{\square}{p} = x$	Simplify.



Problem 3 Rewriting a Geometric Formula

Got It? What is the height of a triangle that has an area of 24 in.^2 and a base with a length of 8 in. ?

12. Circle the formula for the area of a triangle.

$A = \pi r^2$

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

$d = rt$

$A = \ell w$

13. Circle the rewritten formula you will use to find the height of the triangle.

$\ell = \frac{P - 2w}{2}$

$r = \sqrt{\frac{A}{\pi}}$

$t = \frac{d}{r}$

$h = \frac{2A}{b}$

14. Now find the height of a triangle with an area of 24 in.^2 and a base of 8 in.



Problem 4 Rewriting a Formula

Got It? Pacific gray whales migrate annually from the waters near Alaska to the waters near Baja California, Mexico, and back. The whales travel a distance of about 5000 mi each way at an average rate of 91 mi per day . About how many days does it take the whales to migrate one way?

15. Write the formula that relates distance, rate, and time.

$\square = \square \cdot \square$

16. Circle what you are asked to find in the problem.

distance

rate

time

17. Complete the reasoning model below.

Think	Write
To isolate t , I divide each side of the formula by r .	$\frac{d}{r} = \frac{rt}{r}$
Then I simplify.	
Now I substitute 5000 for d and 91 for r .	

18. Simplify. The whales take about days to migrate one way.



Lesson Check • Do you UNDERSTAND?

Compare and Contrast How is the process of rewriting literal equations similar to the process of solving equations in one variable? How is it different?

19. When you rewrite a literal equation, you are solving it for one of the variables. How is this process similar to solving an equation in one variable?

20. Describe one difference between rewriting a literal equation and solving an equation in one variable.



Math Success

Check off the vocabulary words that you understand.

literal equation formula

Rate how well you can *rewrite literal equations*.

