

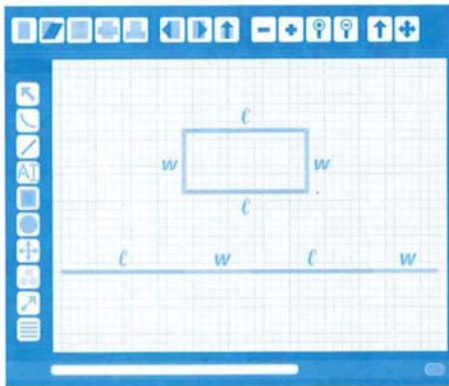
1-4

Literal Equations and Formulas

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MODEL & DISCUSS

Nora drew a nonsquare rectangle. Then she drew the length of each side from end to end to make a line segment to represent the perimeter.



Formula - equation
with two or more quantities (variables)

Literal Equation "rearrange the furniture"
ex) $d = rt$ or $\frac{d}{t} = r$ or $\frac{d}{r} = t$

distance around

A. Write an equation that represents the perimeter of the model shown.

$$p = \underbrace{l + w + l + w}$$

B. Rearrange the order of the sides so you can represent the perimeter with a different equation. Is this equation equivalent to your first equation?

$$p = 2l + 2w \quad \dots \quad p = 2(l + w)$$

↑
factor- (divide)

C. **Use Structure** How many different ways can you express the relationship in parts A and B? Are any of them more useful than others? © MP.7



HABITS OF MIND

Construct Arguments What mathematical argument supports your response in part C? © MP.3



Notes
principle

$$I = prt$$

Interest ↑
rate (decimal) ↑
time →

EXAMPLE 1 **Try It!** Rewrite Literal Equations

1. What equation can Janet use to calculate the principal amount?

$$\frac{I}{rt} = \frac{prt}{rt}$$

$$\frac{I}{rt} = P$$

P
PE ↑
MD ↑
AS ↑

distance ↑
rate (velocity or speed) ↑
time →

EXAMPLE 2 **Try It!** Use Literal Equations to Solve Problems

ex 2) $d = rt$

2. Sarah is going to the store 2.5 miles away. She has only 15 min to get there before they close. At what average speed must she ride to get to the store before they close?

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

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

$$\frac{2.5}{0.25} = r$$

$$\frac{25}{25} = r$$

$$\frac{250}{25} = \boxed{10} \frac{\text{mi}}{\text{hr}}$$

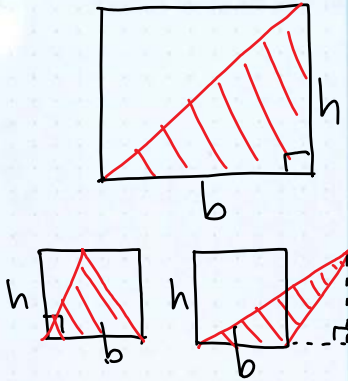
15 min. $\frac{1 \text{ hr}}{60 \text{ min}} = \frac{15 \text{ min}}{60} \text{ hr} = \frac{1}{4} \text{ hr}$
→ 0.25 hr

HABITS OF MIND

Use Structure How is solving equations with numbers the same as solving equations with only variables? © MP.7

EXAMPLE 3 Try It! Rewrite a Formula

3. Write the formula for the area of a triangle, $A = \frac{1}{2}bh$ in terms of h . Find the height of a triangle when $A = 18 \text{ in.}^2$ and $b = 9 \text{ in.}$



$$A = \frac{1}{2}bh \text{ (height)}$$

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

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

$$\frac{2(18)}{9} = h$$

$$4 \text{ in} = h$$

EXAMPLE 4 Try It! Apply Formulas

4. The high temperature on a given winter day is 5°F . What is the temperature in $^\circ\text{C}$?

$$F = \frac{9}{5}C + 32$$

Fahrenheit Celsius

$$F - 32 = \frac{9}{5}C$$

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

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

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

$$\frac{5}{9}(-27) = C$$

$$-15^\circ = C$$

HABITS OF MIND

Reason How are the variables in the temperature conversion formula related? © MP.2



Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How is rewriting literal equations useful when solving problems?



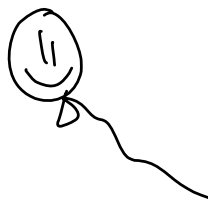
2. **Communicate Precisely** How is solving $2x + c = d$ similar to solving $2x + 1 = 9$ for x ? How are they different? How can you use $2x + c = d$ to solve $2x + 1 = 9$? **MP.6**



3. **Vocabulary** Explain how literal equations and formulas are related.



4. **Error Analysis** Dyani began solving the equation $g = \frac{x-1}{k}$ for x by using the Addition Property of Equality. Explain Dyani's error. Then describe how to solve for x . **MP.3**



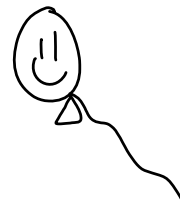
Do You KNOW HOW?

Solve each literal equation for the given variable.

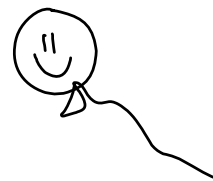
5. $y = x + 12; x$



6. $n = \frac{4}{5}(m + 7); m$



7. Use your equation from Exercise 6 to find m when $n = 40$.



8. William got scores of q_1 , q_2 , and q_3 on three quizzes.
- Write a formula for the average x of all three quizzes.
 - William got an 85 and an 88 on the first two quizzes. What formula can William use to determine the score he needs on the third quiz to get an average of 90? What score does he need?

