

PART I GET STARTED

Today's Mathematics

We will treat a formula as an equation, isolate a requested variable, and interpret the rewritten form.

Essential Question

How can inverse operations rewrite a formula for a different variable without changing the relationship?

DO NOW

Solve or classify each equation on graph paper.

1. $7x + 2 = 4x + 20$

2. $3(y - 4) = 3y - 12$

3. $5a + 9 = 2a - 6$

4. $25 + 8n = 55 + 5n$

SEE IT

The perimeter of a rectangle is $P = 2l + 2w$.

1. If P and l are known, which variable remains unknown?
2. List the operations being done to w . In what order would you undo them?
3. Use $P = 38$ and $l = 11$ to predict the width.

QUICK WRITE | 2 MINUTES

Describe a symbolic path that would isolate w . Do not substitute numbers yet.

PART II INVESTIGATE

FORMULA PATHS

For each formula, isolate the target variable. Record the inverse steps clearly enough that another student can follow them.

Formula	Target	Inverse steps	Rewritten formula
$P = 2l + 2w$	w		
$A = \frac{1}{2}bh$	h		
$V = lwh$	h		
$C = 2\pi r$	r		

TEST THE NEW FORMS

1. Use $P = 38$ and $l = 11$ to find w .
2. Use $A = 54$ and $b = 12$ to find h .
3. Use $C = 14\pi$ to find r .

COMPARE

Why is it usually clearer to isolate the target variable before substituting values?

PART III MAKE SENSE AND PRACTICE

WHAT WE CAN CONCLUDE

1. Identify the target variable and every operation acting on it.
2. Undo those operations while preserving equality.
3. Check the rewritten form with units or a convenient set of values.

WORKED MODEL

Solve $4x - 10y = 12$ for y .

$$\begin{aligned} -10y &= 12 - 4x \\ y &= \frac{12 - 4x}{-10} \\ y &= \frac{2x - 6}{5} \end{aligned}$$

TRY IT

Show a clear symbolic path before substituting values.

1. Solve $2x + y = -9$ for y .

2. Solve $A = \frac{1}{2}bh$ for h , then find h when $A = 54$ and $b = 12$.

MATH WRITE | 5 MINUTES

Explain how solving a formula for a variable is similar to solving a numerical equation and how it is different.

PART IV PUZZLE PRACTICE

Homework

Name _____

Date _____

WHAT CAN'T WALK, BUT CAN RUN?

Write the letter of each correct answer above its exercise number in the decoder.

SOLVE EACH EQUATION FOR y

1. $16 - 12x = 4y$

A. $y = -3x + 4$

B. $y = 3x + 4$

C. $y = 3x - 4$

2. $2x + \frac{6}{5} = 2y$

D. $y = 2x + \frac{6}{5}$

E. $y = x + \frac{3}{5}$

F. $y = 2x + \frac{3}{5}$

3. $7 = 14x - 42y$

G. $y = -\frac{2}{3}x - \frac{1}{6}$

H. $y = \frac{1}{3}x + \frac{1}{6}$

I. $y = \frac{1}{3}x - \frac{1}{6}$

4. $8.1x - 4.5y = 5.4$

R. $y = 1.8x - 1.2$

S. $y = -1.8x + 1.2$

T. $y = 1.8x + 1.2$

USE THE FORMULA

5. Body Mass Index is $BMI = \frac{w}{h^2} \cdot 703$, where w is weight in pounds and h is height in inches. Find the weight of a student who is 60 inches tall and has a BMI of 20.5.

Q. 98 pounds

R. 105 pounds

S. 112 pounds

6. The formula $d = rt$ relates distance, rate, and time. How long does it take an airplane to fly 375 miles at 500 miles per hour?

T. 35 minutes

U. 40 minutes

V. 45 minutes

CRACK THE CODE

1 _____ 5 _____ 3 _____ 6 _____ 2 _____ 4 _____