

Lesson 2-5 Literal Equations and Formulas

A literal equation is an equation that involves two or more variables.

Rewriting a Literal Equation:

Rewrite the equation by solving for the given variable:

A. $-2x + 5y = 12$ Solve for y.

$-2x + 2x + 5y = 12 + 2x$ Add 2x to each side to "move" the x-term

$5y = 12 + 2x$ Simplify

$\frac{5y}{5} = \frac{12 + 2x}{5}$ Divide by 5

$y = \frac{12 + 2x}{5}$ Simplify

$y = \overset{OR}{12/5 + 2/5x}$

B. $a - 2b = -10$ Solve for b.

$a - a - 2b = -10 - a$ Subtract a from each side.

$-2b = -10 - a$ Simplify

$\frac{-2b}{-2} = \frac{-10 - a}{-2}$ Divide by -2

$b = \frac{-10}{-2} - \frac{a}{-2}$ Simplify

$b = 5 + \frac{a}{2}$

Factor each of the following expressions:

C. $-3x - 9 = -3(x + 3)$

D. $2xy + 6y = 2y(x + 3)$

E. $9x - 18 = 9(x - 2)$

F. $ax - bx = x(a - b)$

Rewriting a Literal Equation with only (mostly) Variables

G. $mx + 2nx = p$ Solve for x.

$x(m + 2n) = p$ Use the distributive property to factor out the x

$\frac{x(m + 2n)}{m + 2n} = \frac{p}{m + 2n}$ Divide both sides by $m + 2n$

$x = \frac{p}{m + 2n}$ Simplify

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TRY THESE ON YOUR OWN!

Practice:

- 1a. Solve the equation $4 = 2m - 5n$ for m .

Write the original equation.

Use the symmetric property (switch sides)

Add $5n$ to each side

Simplify

- 1b. Use the new equation to find the values of m when $n = -2, 0,$ and 2

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2. Solve $-t = r + px$ for x .

Write the original equation.

Use the symmetric property (switch sides)

Subtract

Simplify

3. $y + 2x = 5$. Solve for y . THEN, find the value of y when $x = -1,$ and $x = 3$

$x = -1:$

$x = 3:$

Rewriting Formulas:

A formula is an equation that states a relationship among quantities. Formulas are special types of literal equations.

Formula Name	Formula	Definitions of Variables
Perimeter of a rectangle	$P = 2l + 2w$	$P = \text{perimeter}, l = \text{length}, w = \text{width}$
Circumference of a circle	$C = 2\pi r$	$C = \text{circumference}, r = \text{radius}$
Area of a rectangle	$A = lw$	$A = \text{area}, l = \text{length}, w = \text{width}$
Area of a triangle	$A = \frac{1}{2}bh$	$A = \text{area}, b = \text{base}, h = \text{height}$
Area of a circle	$A = \pi r^2$	$A = \text{area}, r = \text{radius}$
Distance traveled	$d = rt$	$D = \text{distance}, r = \text{rate}, t = \text{time}$
Temperature	$C = \frac{5}{9}(F - 32)$	$C = \text{degrees Celsius}, F = \text{degrees Fahrenheit}$

H. Rewrite $C = \frac{5}{9}(F - 32)$ solving for F.

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

Use the symmetric property

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

Multiply by the reciprocal of $\frac{5}{9}$

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

Simplify

$$\begin{array}{r} +32 \qquad \qquad +32 \\ \hline F - 32 = \frac{9}{5}C \end{array}$$

Add 32 to each side.

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

Simplify

NOTE: IF YOU DO THESE VERTICALLY, THE "32" IS ALONE ON THE RIGHTSIDE (not under the $\frac{9}{5}C$)

I. Josh is planting a rectangular garden. The perimeter of the garden is 120 yd., and the width is 20 yd. What is the length of the garden?

Solve the formula for length:

$$P = 2L + 2W$$

$$2L + 2W = P$$

$$\begin{array}{r} -2W \quad -2W \\ \hline 2L + 2W = P \end{array}$$

$$\frac{2L}{2} = \frac{P - 2W}{2}$$

$$L = \frac{P - 2W}{2}$$

$$L = \frac{P - 2W}{2}$$

Substitute the value of P and w:

$$L = \frac{P}{2} - W$$

$$L = \frac{120}{2} - 20$$

$$L = 60 - 20$$

$$L = 40 \text{ yd.}$$

$$L = \text{OR } \frac{P}{2} - W$$

60

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TRY THESE ON YOUR OWN...

Practice:

Solve each equation for x:

4. $\frac{rx + sx}{t} = 1$

5. $S = C + xC$

6. $A = Bxt + C$

7. $\frac{x+2}{y-1} = 2$

8. What is the length of a rectangle with width 10in. and area 45in.²
