

### 2.8 Formulas and Literal Equations

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

**ESSENTIAL UNDERSTANDING:** When you work with literal equations, we can use the SAME methods that we have been using to solve one variable equations.

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Solve for y:

1.  $2x + y = 4$   
 ~~$-2x$~~   $-2x$

$$y = -2x + 4$$

2.  $3x + 2y = 8$   
 ~~$-3x$~~   $-3x$

$$\frac{2y}{2} = \frac{-3x+8}{2}$$

$$y = \frac{-3}{2}x + 4$$

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3.  $3x + y = 12$   
 ~~$-3x$~~   $-3x$

$$y = -3x + 12$$

4.  $2 + y = 4x$   
 ~~$-2$~~   $-2$

$$y = 4x - 2$$

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5.  $3 = 3y - x$   
 $+x$   ~~$+x$~~

$$\frac{x+3}{3} = \frac{3y}{3}$$

$$\frac{1}{3}x + 1 = y$$

6.  $8 = 4x + 2y$   
 ~~$-4x$~~   $-4x$

$$\frac{-4x+8}{2} = \frac{2y}{2}$$

$$-2x + 4 = y$$

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7.  $\frac{4y}{4} = \frac{12x}{4} + \frac{4}{4}$

$$y = 3x + 1$$

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

$$\frac{2}{1}(\frac{1}{2}y) = (-2x+2) \cdot 2$$

$$y = -4x + 4$$

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Now for solving equations with all variables.

Solve the following equations for x.

1.  $x + y = w$   
 ~~$-y$~~   $-y$

$$x = w - y$$

2.  $\frac{wx}{w} = \frac{a}{w}$

$$x = \frac{a}{w}$$

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**Solve the following equations for x.**

3.  $y = mx + b$   
~~-b~~ ~~xb~~  
 $\frac{y-b}{m} = \frac{mx}{m}$   
 $\frac{y-b}{m} = x$

4.  $3x^2 = y$   
~~3~~ ~~3~~  
 $\sqrt{x^2} = \sqrt{\frac{y}{3}}$   
 $x = \sqrt{\frac{y}{3}}$

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**Below are some common formulas.**

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

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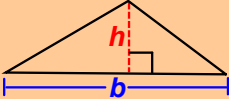
**Re-writing Formulas!**  
 You just have to isolate the indicated variable using the same processes as solving an equation.

$A = LW$ ; solve for L  
~~w~~ ~~w~~  
 $\frac{A}{w} = L$

$P = 2L + 2w$ ; solve for w  
~~2L~~ ~~2L~~  
 $\frac{P-2L}{2} = \frac{2w}{2}$   
 $\frac{P}{2} - L = w$

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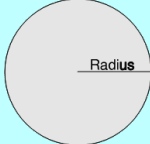
The formula for the area of a triangle is  $A = \frac{1}{2}bh$ .  
 Solve for b.



$2(A) = (\frac{1}{2}bh) \cdot 2$   
 $\frac{2A}{h} = \frac{bh}{h}$   
 $\frac{2A}{h} = b$

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**Solve for r.**



$C = 2\pi r$   
~~2\pi~~ ~~2\pi~~  
 $\frac{C}{2\pi} = r$

$A = \pi r^2$   
~~\pi~~ ~~\pi~~  
 $\sqrt{\frac{A}{\pi}} = \sqrt{r^2}$   
 $\sqrt{\frac{A}{\pi}} = r$

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**Solve the temperature formula for F:**

$\frac{9}{5}(C) = (\frac{5}{9}(F - 32)) \cdot \frac{9}{5}$  **NOTE: With formulas... do not distribute values!**  
 $\frac{9}{5}C = F - 32$   
~~+32~~ ~~+32~~  
 $\frac{9}{5}C + 32 = F$

**Convert 10°C into °F**  
 $\frac{9}{5}(10) + 32 = F$   
 $18 + 32 = F$   
 $50^\circ F$

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Classwork: worksheet (a - o)

p.129 # 12 - 24 even  
put on back of worksheet

**Final Five**

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

Sep 4-1:52 PM