Cool As A Cucumber or Hot Like A Tamale!

3.3

Literal Equations in Standard and Slope-Intercept Form

LEARNING GOALS

In this lesson, you will:

- Recognize and use literal equations.
- Convert literal equations to highlight a specific variable.
- Convert between standard and slope-intercept form.
- Recognize the value of standard and slope-intercept form.

KEY TERMS

- literal equation

Literal equations are equations in which the variables represent specific measures. You most often see literal equations when you study formulas. These literal equations can be manipulated in order to allow you to solve for one specific variable.

A common literal equation is the formula for converting degrees Fahrenheit to degrees Celsius.

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

1. The normal temperature for the human body is 98.6°F. What temperature is that in degrees Celsius?

$$C = \frac{5}{9}(98.6 - 32)$$

$$C = \frac{5}{9}(66.6)$$

$$C = 37°C$$

2. The coldest temperature ever recorded on Earth was in Antarctica in 1983. The temperature recorded was −126.8°F. What is this temperature in degrees Celsius?

$$C = \frac{5}{9}(-126.8 - 32)$$

$$C = \frac{5}{9}(-158.8)$$

$$C = -88.22°C$$

3. The directions on a box of cake batter tells you to bake your cake at 177°C. What is this temperature in degrees Fahrenheit?

Solve for "F".

$$177 = \frac{5}{9}(F - 32)$$

Replace "C" with 177

$$\frac{9}{5} \cdot 177 = \frac{9}{5} \cdot \frac{5}{9}(F - 32)$$

Multiply both sides by $\frac{9}{5}$

$$318.6 = F - 32$$

Simplify. Add 32 to both sides

$$350.6°F = F \quad \text{or} \quad F = 350.6°F$$

4. Is there a more efficient way to determine degrees Fahrenheit than the method you used in Question 3?

Yes. You could solve "F" first.

5. Convert the given formula to determine degrees Fahrenheit. Show and explain your work.

$$C = \frac{5}{9}(F - 32)$$ ⟵ Just rearrange this formula so "F" is by itself!

$$\frac{9}{5} \cdot C = \frac{9}{5} \cdot \frac{5}{9}(F - 32)$$ Multiply both sides by $\frac{9}{5}$

$$\frac{9}{5}C = F - 32$$ Simplify. Add 32 to both sides

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

6. The hottest temperature ever recorded on Earth occurred in Africa in 1922. It was recorded as 57.8°C. Use your formula to determine this temperature in degrees Fahrenheit.

$$F = \frac{9}{5}(57.8) + 32$$
$$F = 104.04 + 32$$
$$F = 136.04°F$$

7. Dry ice melts at −78°C. At what temperature in degrees Fahrenheit does dry ice melt?

$$F = \frac{9}{5}(-78) + 32$$
$$F = -140.4 + 32$$
$$F = -108.4°F$$

Convert each given equation to the form indicated.
Then, identify the x-intercept, y-intercept, and the slope.
Show your work for each.

Remember, to convert to slope-intercept form, solve for y. To convert to standard form, get both variables on the same side and the constant on the other.

1. $6x + 5y = 20$

a. slope-intercept form:

$$6x + 5y = 20$$
$$5y = -6x + 20$$
$$\frac{5y}{5} = \frac{-6x}{5} + \frac{20}{5}$$
$$y = -\frac{6}{5}x + 4$$

Slope-intercept form:
$y = mx + b$
Get "y" by itself!

b. x-intercept:

$$6x + 5y = 20$$
$$6x + 5(0) = 20$$
$$6x = 20$$
$$x = \frac{20}{6} = \frac{10}{3}$$

c. y-intercept:

$$y = 4$$

d. slope:

$$m = -\frac{6}{5}$$

2. $y = -\frac{2}{3}x + 10$

   a. standard form:

$$y = -\frac{2}{3}x + 10$$

$$(3)y = 3\left(-\frac{2}{3}x + 10\right)$$

$$3y = -2x + 30$$

$$2x + 3y = 30$$

   b. x-intercept:

$$2x + 3y = 30$$

$$2x + 3(0) = 30$$

$$2x = 30$$

$$x = 15$$

   c. y-intercept:

$$y = 10$$

   d. slope:

$$m = -\frac{2}{3}$$

> **Standard form:**
> $Ax + By = C$
> Get "x" and "y"
> on the same side!

3. $Ax + By = C$

   a. slope-intercept form:

$$Ax + By = C$$

$$By = -Ax + C$$

$$\frac{By}{B} = \frac{-Ax}{B} + \frac{C}{B}$$

$$y = -\frac{A}{B}x + \frac{C}{B}$$

   b. x-intercept:

$$Ax + By = C$$

$$Ax + B(0) = C$$

$$\frac{Ax}{A} = \frac{C}{A}$$

$$x = \frac{C}{A}$$

   c. y-intercept:

$$y = \frac{C}{B}$$

   d. slope:

$$m = -\frac{A}{B}$$

4. If you want to determine the **y-intercept** of an equation, which form is more efficient? Explain your reasoning.
Slope-intercept form because the y-intercept (or *b*) is given.

5. If you want to determine the **x-intercept** of an equation, which form is more efficient? Explain your reasoning.
Either one. In both equations, you have to let y = 0 and solve for x.

6. If you wanted to graph an equation, which form is more efficient? Explain your reasoning.
Standard form because it is easy to find the x- and y-intercepts. If you use a graphing calculator like DESMOS, you can use either equation.