

3.3

Cool As A Cucumber or Hot Like A Tamale!

Literal Equations in Standard Form 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 TERM

- literal equation

Converting between degrees Celsius and degrees Fahrenheit is knowledge that you might need, especially if you travel or live outside of the United States. The formula $C = \frac{5}{9}(F - 32)$ can seem confusing and difficult to remember, especially if you don't understand where the numbers are coming from. So what is so special about $\frac{5}{9}$? Why is -32 so important to the formula?

The freezing point of water on the Fahrenheit scale is 32° . The freezing point for water on the Celsius scale is 0° . This 32 degree difference is why -32 is used in the formula. As for the fraction $\frac{5}{9}$, the difference between the freezing point of water and the boiling point of water in degrees Celsius is 100° . That same difference in degrees Fahrenheit is equal to 180° . This means the scales rise at different rates. This change in rates of $\frac{100}{180}$ can be simplified to $\frac{5}{9}$. Of course, when you convert the formula to solve for Fahrenheit, these numbers change slightly, but you should still be able to understand where they come from.

Want to make this formula even easier? The decimal form of $\frac{5}{9}$ is equivalent to about 0.56, which is just about half. Subtract the degrees Fahrenheit by 30 and then divide that difference by 2. It's not exact, but it should give you a pretty close estimate. You should still be able to tell whether you should wear a winter coat or a tank top!

PROBLEM 1 Is It Hot in Here?

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?

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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?



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?



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



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



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.

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

8. Carlos and Mikala do not like working with fractions. They rewrite their equation so that it does not have fractions. Their work is shown.

Carlos	Mikala
$F = \frac{9}{5}C + 32$	$C = \frac{5}{9}(F - 32)$
$(5)F = 5\left(\frac{9}{5}C + 32\right)$	$(9)C = (9)\left(\frac{5}{9}(F - 32)\right)$
$5F = 9C + 160$	$9C = 5(F - 32)$
$5F - 9C = 160$	$9C = 5F - 160$
	$9C - 5F = -160$

Carlos and Mikala got two different equations. Who is correct?

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9. In the original equations, the coefficients $\frac{9}{5}$ and $\frac{5}{9}$ as well as the constant 32 had meaning based on temperature. What do the coefficients, 9 and 5 and the constant 160 represent in Carlos's and Mikala's equations?

PROBLEM 2 Good Form!

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

1. $6x + 5y = 20$

a. slope-intercept form:

b. x -intercept:

c. y -intercept:

d. slope:

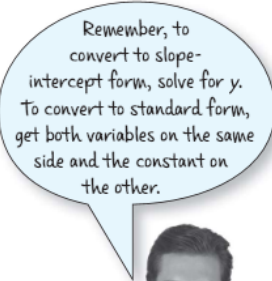
2. $y = -\frac{2}{3}x + 10$

a. standard form:

b. x -intercept:

c. y -intercept:

d. slope:



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3. $Ax + By = C$

a. slope-intercept form:

b. x-intercept:

c. y-intercept:

d. slope:

34. If you want to determine the y-intercept of an equation, which form is more efficient?
Explain your reasoning.5. If you want to determine the x-intercept of an equation, which form is more efficient?
Explain your reasoning.6. If you wanted to graph an equation on your calculator, which form is more efficient?
Explain your reasoning.

PROBLEM 3 Other Ways to Write Familiar Formulas



Convert each literal equation to solve for the given variable.

1. Think Inside the Box is manufacturing new boxes for You Pack 'Em, We Ship 'Em (YPEWSE). YPEWSE told Think Inside the Box that the boxes must have a specific volume and area. However, YPEWSE did not specify a height for the boxes.
 - a. Write a literal equation to calculate the volume of a box.

 - b. Convert the volume formula to solve for height.

2. The volume of an ice cream cone is the measure of how much ice cream a cone can hold. An ice cream cone company wants to make an ice cream cone with a larger radius that still holds the same amount of ice cream.
 - a. Write an equation to calculate the volume of a cone.

 - b. Convert the equation to solve for the radius.

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- c. YPEWSE specified the volume of the box must be 450 in^3 and the area of the base must be 75 in^2 . Use your formula to determine the height of the new boxes.

3. Future value is the value of a sum of money at a specific date due to interest. The formula $A = P(1 + rt)$ is used to determine future value. The variable A is the future value, P is the principal, r is the interest rate, and t is the time.
- A bank wants to know the interest rate of a customer's account who earned a certain amount of future value.
- a. Convert the equation to solve for rate.

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- b. Jillian deposited \$5000 in an account 10 years ago after her college graduation. The money she deposited now has a value of \$15,000. Determine the interest rate of Jillian's account.



Be prepared to share your solutions and methods.