

Get out your book and turn to page 129. Solve the equation below to warm up!

Classwork - Writing Two Step Equations

WARM UP. Solve

$$3(2x - 4) - 4(x + 6) = -40$$

$$6x - 12 - 4x - 24 = -40$$

$$\begin{array}{r} 2x - 36 = -40 \\ + 36 \quad + 36 \\ \hline \end{array}$$

$$\begin{array}{r} 2x = -4 \\ \div 2 \quad \div 2 \\ \hline \end{array}$$

$$x = -2$$



Real-World Link

Robotics You want to attend a two-week robotic day camp that costs \$700. Your parents will pay the deposit of \$400 if you pay the rest in weekly payments of \$15. Use the questions below to help you find the number of weeks you will need to make payments.

1. Complete the table below. How much is paid after 2, 3, and 4 weeks?

Payments	Amount Paid
0	$400 + 15(0) = 400$
1	$400 + 15(1) = 415$
2	$400 + 15(2) = 430$
3	
4	

2. It will take a long time to solve the problem with a table. Instead, write and solve an equation to find the number of payments p you will need to make.

3. How many payments will you make?
4. Suppose you received \$75 in birthday money that you want to use towards the camp. Write and solve an equation to find the number of payments p you will need to make. _____



$$\begin{array}{r} 400 + 15w = 700 \\ -400 \qquad \qquad -400 \\ \hline \end{array}$$

$$\begin{array}{r} 15w = 300 \\ \underline{15} \qquad \underline{15} \end{array}$$

$w = 20$ payments

Translate Sentences into Equations

There are three steps to writing a two-step equation.

Words	Describe the situation. Use only the most important words.
	
Variable	Define a variable to represent the unknown quantity.
	
Equation	Translate your verbal model into an algebraic equation.



You know how to write verbal sentences as one-step equations. Some verbal sentences translate into two-step equations.

Examples





Translate each sentence into an equation.

1. Eight less than three times a number is -23 .

Words	Eight less than three times a number is -23 .
	
Variable	Let n represent the number.
	
Equation	$3n - 8 = -23$

2. Thirteen is 7 more than one-fifth of a number.

Words	Thirteen is 7 more than one-fifth of a number.
	
Variable	Let n represent the number.
	
Equation	$13 = \frac{1}{5}n + 7$

Got it? Do these problems to find out.

- Fifteen equals three more than six times a number.
- Ten increased by the quotient of a number and 6 is 5.
- The difference between 12 and $\frac{2}{3}$ of a number is 18.

$$A) 15 = 3 + 6n$$

$$B) 10 + \frac{n}{6} = 5 \quad \text{OR} \quad n \div 6 + 10 = 5$$

$$C) 12 - \frac{2}{3}n = 18 \quad \text{OR} \quad -\frac{2}{3}n + 12 = 18$$



Examples



3. You buy 3 books that each cost the same amount and a magazine, all for \$55.99. You know that the magazine costs \$1.99. How much does each book cost?

Words

Three books and a magazine cost \$55.99.



Variable

Let b represent the cost of one book.



Equation

$$3b + 1.99 = 55.99$$

$$3b + 1.99 = 55.99$$

Write the equation.

$$\underline{- 1.99 = - 1.99}$$

Subtraction Property of Equality

$$3b = 54.00$$

Simplify.

$$\frac{3b}{3} = \frac{54.00}{3}$$

Division Property of Equality

$$b = 18$$

Simplify.

So, the books each cost \$18.

4. A personal trainer buys a weight bench for \$500 and w weights for \$24.99 each. The total cost of the purchase is \$849.86. How many weights were purchased?

Words

Bench plus \$24.99 per weight equals \$849.86



Variable

Let w represent the number of weights.



Equation

$$500 + 24.99 \cdot w = 849.86$$

$$500 + 24.99w = 849.86$$

Write the equation.

$$\underline{- 500 = - 500}$$

Subtraction Property of Equality

$$24.99w = 349.86$$

Simplify.

$$\frac{24.99w}{24.99} = \frac{349.86}{24.99}$$

Division Property of Equality

$$w = 14$$

Simplify.

So, 14 weights were purchased.

Got it? Do this problem to find out.

- d. The current temperature is 54°F . It is expected to rise 2.5°F each hour. In how many hours will the temperature be 84°F ?

$$\begin{array}{r} 54 + 2.5h = 84 \\ -54 \qquad \qquad -54 \\ \hline \end{array}$$

$$\begin{array}{r} 2.5h = 30 \\ \hline 2.5 \qquad \qquad 2.5 \end{array}$$

$$h = 12 \text{ hours}$$



Example



5. Your and your friend's lunch cost \$19. Your lunch cost \$3 more than your friend's. How much was your friend's lunch?

Words	Your friend's lunch plus your lunch equals \$19.
Variable	Let f represent the cost of your friend's lunch.
Equation	$f + f + 3 = 19$

Your friend

you

$f + f + 3 = 19$	Write the equation.
$2f + 3 = 19$	$f + f = 2f$
<u>$- 3 = - 3$</u>	Subtraction Property of Equality
$2f = 16$	Simplify.
$\frac{2f}{2} = \frac{16}{2}$	Division Property of Equality
$f = 8$	Simplify.

Your friend spent \$8.

$f + (f + 3) = 19$

$2f + 3 = 19$

Guided Practice

Translate each sentence into an equation. (Examples 1 and 2)

1. One more than three times a number is 7. _____
2. Seven less than one-fourth of a number is -1 . _____
3. The quotient of a number and 5, less 10, is 3. _____
4. You already owe \$4.32 in overdue rental fees and are returning a movie that is 4 days late. Now you owe \$6.48. Define a variable. Then write and solve an equation to find the daily fine for an overdue movie. (Examples 3–5)

$$f = \text{daily fine}$$

$$4.32 + 4f = 6.48$$