

More on two-step equations

Please gather your clicker, your math notebook, and a pencil.

Get ready for the warm-up questions.



Solve: $x + 4 = -3$

Text in your answer now please.



Solve: $c - 5 = -1$

Text in your answer.

2-1

Solving Two-Step Equations

CONTENT STANDARDS

8.EE.7, 8.EE.7.b

What You'll Learn

To solve two-step equations and to use two-step equations to solve problems

Suppose you adopt a puppy from an animal shelter and buy 3 bags of dog food. The adoption fee is \$125 and you spend a total of \$154.97. How much does each bag of dog food cost?



Total cost \$154.97	
Adoption fee \$125	Bags $3b$

The model at the left shows that you can use the equation $125 + 3b = 154.97$ to represent the problem. This equation requires two steps to solve. Use the order of operations in reverse to choose the operation to undo first.

EXAMPLE Solving Using Subtraction and Division

$$\begin{aligned} \text{1 Solve } 125 + 3b &= 154.97. \\ 125 + 3b &= 154.97 \\ 125 - 125 + 3b &= 154.97 - 125 \quad \leftarrow \text{Subtract 125 from each side.} \\ 3b &= 29.97 \quad \leftarrow \text{Simplify.} \\ \frac{3b}{3} &= \frac{29.97}{3} \quad \leftarrow \text{Divide each side by 3.} \\ b &= 9.99 \quad \leftarrow \text{Simplify.} \end{aligned}$$

$$\begin{aligned} \text{Check } 125 + 3b &= 154.97 \\ 125 + 3(9.99) &\stackrel{?}{=} 154.97 \quad \leftarrow \text{Substitute 9.99 for } b. \end{aligned}$$

1 EXAMPLE Solve $4p + 27 = 61.48$.

$$\begin{aligned} 4p + 27 &= 61.48 \\ 4p + 27 - 27 &= 61.48 - 27 \quad \leftarrow \text{Subtract 27 from each side.} \\ 4p &= 34.48 \quad \leftarrow \text{Simplify.} \\ \frac{4p}{4} &= \frac{34.48}{4} \quad \leftarrow \text{Divide each side by 4.} \\ p &= 8.62 \quad \leftarrow \text{Simplify.} \end{aligned}$$

$$\begin{aligned} \text{Check } 4p + 27 &= 61.48 \\ 4(8.62) + 27 &\stackrel{?}{=} 61.48 \quad \leftarrow \text{Substitute 8.62 for } p. \\ 61.48 &= 61.48 \checkmark \quad \leftarrow \text{The solution checks.} \end{aligned}$$

1 Solving Using Subtraction and Division Solve $4p + 7 = -13$.

$$4p + 7 = -13$$

$$4p + 7 - \boxed{} = -13 - \boxed{} \leftarrow \text{Subtract 7 from each side.}$$

$$4p = \boxed{} \leftarrow \text{Simplify.}$$

$$\frac{4p}{\boxed{}} = \frac{-20}{\boxed{}} \leftarrow \text{Divide each side by 4.}$$

$$p = \boxed{} \leftarrow \text{Simplify.}$$

Check $4p + 7 = -13$

$$4(\boxed{}) + 7 \stackrel{?}{=} -13 \leftarrow \text{Substitute } -5 \text{ for } p.$$

$$\boxed{} = -13 \checkmark \leftarrow \text{The solution checks.}$$



Solve: $4g + 11.6 = -23.2$

(A) -8.7

(B) 2.9

(C) -2.9

(D) 8.7

2 EXAMPLE At a recent breakfast, four friends paid for their drinks and shared the cost of a bag of doughnuts. Joe's drink was \$1.75. He paid \$3.20 total for breakfast. What equation can be used to find the cost of the doughnuts? How much did the bag of doughnuts cost?

Words cost of Joe's drink plus (cost of bag of doughnuts \div 4) is \$3.20



Let d = the cost of a bag of doughnuts.

Equation 1.75 + $\frac{d}{4}$ = 3.20

The equation is $1.75 + \frac{d}{4} = 3.2$. You can solve the equation to find the cost.

$$1.75 + \frac{d}{4} = 3.2.$$

$$1.75 - 1.75 + \frac{d}{4} = 3.2 - 1.75 \leftarrow \text{Subtract 1.75 from each side.}$$

$$\frac{d}{4} = 1.45 \leftarrow \text{Simplify.}$$

$$(4)\frac{d}{4} = (4)1.45 \leftarrow \text{Multiply each side by 4.}$$

$$d = 5.8 \leftarrow \text{Simplify.}$$

The cost of a bag of doughnuts is \$5.80.

EXAMPLE Application: Sharing Costs

- 2 **Multiple Choice** Suppose you buy a slice of pizza for \$1.50. You also split the cost of renting a video with two friends. Your total cost is \$2.75. Which equation can you use to find the cost of renting the video?

- (A) $1.50 + v = 2.75$ (C) $1.50 + \frac{v}{3} = 2.75$
 (B) $1.50 + \frac{v}{2} = 2.75$ (D) $\frac{1.50 + v}{3} = 2.75$

Words cost of pizza plus (cost of video \div 3) is \$2.75

Let v = the cost of the video.

Equation $1.50 + \frac{v}{3} = 2.75$

The correct answer is C. You can solve the equation to find the cost.

$$1.50 + \frac{v}{3} = 2.75$$

$$1.50 - 1.50 + \frac{v}{3} = 2.75 - 1.50 \quad \leftarrow \text{Subtract } 1.50 \text{ from each side.}$$

$$\frac{v}{3} = 1.25 \quad \leftarrow \text{Simplify.}$$

$$(3)\frac{v}{3} = (3)1.25 \quad \leftarrow \text{Multiply each side by } 3.$$

$$v = 3.75 \quad \leftarrow \text{Simplify.}$$

The cost of renting the video is \$3.75.

- 2 **Sharing Costs** Six people at dinner shared equally a total bill of \$180. This total included a tip of \$30. Which equation can be used to find the amount of each person's share for dinner without the tip?

- A. $6s = 180$ B. $6s - 30 = 180$
 C. $6s + 30 = 180$ D. $6(s + 30) = 180$

Words each person's share for dinner times 6 plus tip is \$180

Let s = each person's share for dinner.

Equation $s \times 6 + 30 = 180$

The equation is $6s + 30 = 180$.

The correct answer is choice C.

You can solve the equation to find each person's share.

$$6s + 30 - 30 = 180 - 30 \quad \leftarrow \text{Subtract } 30 \text{ from each side.}$$

$$6s = 150 \quad \leftarrow \text{Simplify.}$$

$$\frac{6s}{6} = \frac{150}{6} \quad \leftarrow \text{Divide each side by } 6.$$

$$s = 25 \quad \leftarrow \text{Simplify.}$$

Each person's share for dinner without the tip is \$25.



To make a long-distance call, it costs \$0.50 per call and \$0.85 per minute. You make a long-distance call that costs \$3.90. Which of the following equations describes the length of the call and gives the correct amount of time of the call?

- (A) $0.85 + 0.5c = 3.90$, the call was 5 minutes
 (B) $0.5 + 0.85c = 3.90$, the call was 5 minutes
 (C) $0.85 + 0.5c = 390$, the call was 4 minutes
 (D) $0.5 + 0.85 = 3.90$, the call was 4 minutes

Power down your clickers and put them away.

You have an assignment worksheet, due tomorrow.

Name _____ Class _____ Date _____

Activity Lab 2-1

Solving Two-Step Equations

Solve each equation. There are three different solutions for y .

1. $3y - 9 = 30$

2. $-8.4 = 8y + 1.2$

3. $\frac{1}{2}(4y) = -12$

4. $6.4 = 4 - 2y$

5. $-12 = 6 + 3y$

6. $2y - 14 = 12$

7. Which pairs of equations have equivalent solutions?

____ and ____

____ and ____

____ and ____

8. Which equations have addition or subtraction as the first step in solving? _____

9. Which equations have multiplication or division as the first step in solving? _____

10. How do you determine which operation to perform first?
