

Solving Two-Step Equations

Q. How do you solve a 2-step equation?

A. Use _____ or algorithms to solve 2-step equations. _____ the variable by _____ the same operation on both sides of the equation.

What operation will you use to solve

1. $5w = 150$ _____

2. $8p - 2 = 6$ _____

3. $\frac{1}{2}x + 5 = 15$ _____

4. $b - 3 = 13$ _____

Remember to isolate the variable. Then solve for the variable

$$3x + 12 = 24$$

$$\underline{\hspace{2cm}} \quad \underline{\hspace{2cm}}$$

$$3x = \underline{\hspace{2cm}}$$

1.) Isolate

Opposite of adding 12 is _____

2.) perform this to both sides

3.) Is variable / coefficient by itself on 1 side?

4.) What operation is being performed? _____

5.) What is the opposite operation? _____

6.) Perform operation to both sides.

LESSON
8-2

Solving Two-Step Equations

Reading Strategies: Analyze Information

An equation such as $-3x + 7 = -5$ is called a *two-step equation* because:

It takes two steps to form *the expression* $-3x + 7$.

It also takes two steps to solve *the equation* $-3x + 7 = -5$.

To form the expression $-3x + 7$ from x : Step 1. Multiply x by -3 .
Step 2. Add 7.

To solve the equation $-3x + 7 = -5$: Step A. Subtract 7 from both sides.
Step B. Divide both sides by -3 .

Look at the two pairs of steps. To find Step A and Step B, reverse the order of Step 1 and Step 2 and use inverse operations.

Before you solve each equation, list each pair of steps.

1. to form $-2x - 3$ from x : _____

to solve $-2x - 3 = -25$: _____

The solution to the equation $-2x - 3 = -25$ is: _____

2. to form $\frac{x+1}{3}$ from x : _____

to solve $\frac{x+1}{3} = -5$: _____

The solution to the equation $\frac{x+1}{3} = -5$ is: _____

3. to form $5 - 4x$ from x : _____

to solve $5 - 4x = 17$: _____

The solution to the equation $5 - 4x = 17$ is: _____

4. to form $\frac{1}{3}(x - 7)$ from x : _____

to solve $\frac{1}{3}(x - 7) = 1$: _____

The solution to the equation $\frac{1}{3}(x - 7) = 1$ is: _____

LESSON
8-2

Solving Two-Step Equations

Success for English Learners

Expression

$$\overbrace{5x - 3} = 32$$
 Equation

Expression

$$\overbrace{\frac{x + 12}{4}} = -3$$
 Equation

Problem 1

Steps to form the expression $5x - 3$:

1. Multiply a variable by 5.
2. Subtract 3.

Steps to solve the equation $5x - 3 = 32$:

- A. Add 3 to both sides: $5x = 35$
 B. Divide both sides by 5. $x = 7$

Problem 2

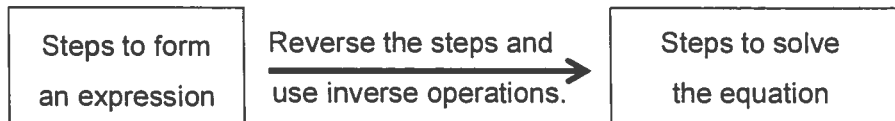
Steps to form the expression $\frac{x + 12}{4}$:

1. Add 12 to a variable.
2. Divide by 4.

Steps to solve the equation $\frac{x + 12}{4} = -3$:

- A. Multiply both sides by 4: $x + 12 = -12$
 B. Subtract 12 from both sides: $x = -24$

Here is the pattern:



Answer part a and part b for each equation.

1. $13x + 2 = 41$

a. List the steps to form $13x + 2$.

b. List the steps to solve $13x + 2 = 41$. Solve.

2. $\frac{x - 3}{5} = -1$

a. List the steps to form $\frac{x - 3}{5}$.

b. List the steps to solve $\frac{x - 3}{5} = -1$. Solve.

LESSON
8-2**Solving Two-Step Equations****Practice and Problem Solving: D**

Tell how to solve each two-step equation. Then solve it. The first one is done for you.

1. $5x + 3 = 33$

Subtract 3 from both sides; $5x = 30$. Then divide both sides by 5; $x = 6$.

2. $8y - 1 = 31$

3. $\frac{1}{2}z + 5 = 11$

4. $15 - 4t = 3$

5. $\frac{1}{3}(q + 3) = 5$

Solve. Check each answer.

6. $2m + 7 = 9$

7. $3p - 5 = 19$

Write an equation to represent the problem. Then solve the problem. The first one is done for you.

8. When 3 is subtracted from two times a number, the result is 17. What is the number?

$2n - 3 = 17; n = 10$

9. The sum of half a number and 5 is 9. What is the number?

10. The sum of 15 and two times a number is 29. What is the number?

LESSON
8-2 **Solving Two-Step Equations**
Practice and Problem Solving: A/B

Solve each equation. Cross out each number in the box that matches a solution.

- | | | | | | | | | | | | |
|-----|----|----|----|----|----|---|---|---|---|---|----|
| -18 | -8 | -6 | -4 | -3 | -2 | 2 | 3 | 4 | 6 | 8 | 18 |
|-----|----|----|----|----|----|---|---|---|---|---|----|

1. $5x + 8 = 23$

2. $-2p - 4 = 2$

3. $6a - 11 = 13$

4. $4n + 12 = 4$

5. $9g + 2 = 20$

6. $\frac{k}{6} + 8 = 5$

7. $\frac{s}{3} - 4 = 2$

8. $\frac{c}{2} + 5 = 1$

9. $9 + \frac{a}{6} = 8$

Solve. Check each answer.

10. $3v - 12 = 15$

11. $8 + 5x = -2$

12. $\frac{d}{4} - 9 = -3$

Write an equation to represent the problem. Then solve the equation.

13. Two years of local Internet service costs \$685, including the installation fee of \$85. What is the monthly fee?

14. The sum of two consecutive numbers is 73. What are the numbers?

Solving Two-Step Equations

Q. How do you solve a 2-step equation?

A. Use models or algorithms to solve 2-step equations. Isolate the variable by performing the same operation on both sides of the equation.

What operation will you use to solve

1. $5w = 150$ division
2. $8p - 2 = 6$ addition then division
3. $\frac{1}{2}x + 5 = 15$ subtraction then multiplication
4. $b - 3 = 13$ addition

Remember to isolate the variable. Then solve for the variable

$$\begin{array}{r} 3x + 12 = 24 \\ \underline{-12} \quad \underline{-12} \end{array}$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

- 1.) Isolate.
Opposite of adding 12
is -12
- 2.) perform this to both sides
- 3.) Is variable / coefficient
by itself on 1 side?
yes
- 4.) What operation is being
performed? multiplication
- 5.) What is the opposite operation?
division
- 6.) Perform operation to both
sides.

LESSON
8-2

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Reading Strategies: Analyze Information

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To form the expression $-3x + 7$ from x : Step 1. Multiply x by -3 .
Step 2. Add 7.

To solve the equation $-3x + 7 = -5$: Step A. Subtract 7 from both sides.
Step B. Divide both sides by -3 .

Look at the two pairs of steps. To find Step A and Step B, reverse the order of Step 1 and Step 2 and use inverse operations.

Before you solve each equation, list each pair of steps.

1. to form $-2x - 3$ from x : multiply by -2 ; subtract 3

to solve $-2x - 3 = -25$: $\begin{matrix} -2x = -22 & x = 11 \\ +3 & +3 \\ \hline -2 & -2 \end{matrix}$ add 3; divide by -2

The solution to the equation $-2x - 3 = -25$ is: $x = 11$

2. to form $\frac{x+1}{3}$ from x : add 1; divide by 3

to solve $\frac{x+1}{3} = -5$: multiply by 3; subtract 1

The solution to the equation $\frac{x+1}{3} = -5$ is: $x+1 = -15$ $x = -16$

3. to form $5 - 4x$ from x : multiply by -4 add 5

to solve $5 - 4x = 17$: $-4x = 12$ $x = -3$

The solution to the equation $5 - 4x = 17$ is: -3

4. to form $\frac{1}{3}(x - 7)$ from x : multiply by $\frac{1}{3}$ subtract 7

to solve $\frac{1}{3}(x - 7) = 1$: multiply by 3; add 7

The solution to the equation $\frac{1}{3}(x - 7) = 1$ is: $x = 10$

LESSON
8-2 **Solving Two-Step Equations**
Success for English Learners

Expression

$$\overbrace{5x - 3}^{\text{Expression}} = 32$$
 Equation

Expression

$$\frac{\overbrace{x + 12}^{\text{Expression}}}{4} = -3$$
 Equation

Problem 1

Steps to form the expression $5x - 3$:

1. Multiply a variable by 5.
2. Subtract 3.

Steps to solve the equation $5x - 3 = 32$:

- A. Add 3 to both sides: $5x = 35$
 B. Divide both sides by 5: $x = 7$

Problem 2

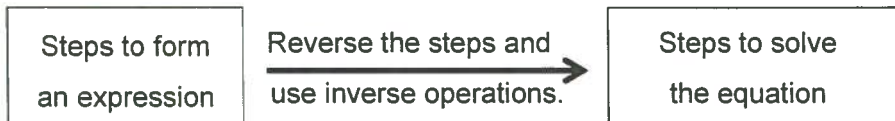
Steps to form the expression $\frac{x + 12}{4}$:

1. Add 12 to a variable.
2. Divide by 4.

Steps to solve the equation $\frac{x + 12}{4} = -3$:

- A. Multiply both sides by 4: $x + 12 = -12$
 B. Subtract 12 from both sides: $x = -24$

Here is the pattern:



Answer part a and part b for each equation.

1. $13x + 2 = 41$

- a. List the steps to form $13x + 2$.

multiply by 13
add 2

- b. List the steps to solve $13x + 2 = 41$. Solve.

$13x = 39$
 $x = 3$

2. $\frac{x - 3}{5} = -1$

- a. List the steps to form $\frac{x - 3}{5}$.

divide by 5
subtract 3

- b. List the steps to solve $\frac{x - 3}{5} = -1$. Solve.

$x - 3 = -5$
 $x = -2$

LESSON
8-2

Solving Two-Step Equations

Practice and Problem Solving: D

Tell how to solve each two-step equation. Then solve it. The first one is done for you.

1. $5x + 3 = 33$

Subtract 3 from both sides; $5x = 30$. Then divide both sides by 5; $x = 6$.

2. $8y - 1 = 31$

add both by 1; $8y = 32$; divide by 8; $y = 4$

3. $\frac{1}{2}z + 5 = 11$

subtract 5; $\frac{1}{2}z = 6$; multiply by 2; $z = 12$

~~multiply by 2; $z + 10 = 22$; subtract 10; $z = 12$~~

4. $15 - 4t = 3$

subtract 15; $-4t = -12$; divide by -4; $t = 3$

5. $\frac{1}{3}(q + 3) = 5$

multiply by 3; $q + 3 = 15$; subtract 3; $q = 12$

Solve. Check each answer.

6. $2m + 7 = 9$

$m = 1$

7. $3p - 5 = 19$

$p = 8$

Write an equation to represent the problem. Then solve the problem. The first one is done for you.

8. When 3 is subtracted from two times a number, the result is 17. What is the number?

$2n - 3 = 17$; $n = 10$

9. The sum of half a number and 5 is 9. What is the number?

$\frac{1}{2}x + 5 = 9$ $\frac{1}{2}x = 4$ $x = 8$

10. The sum of 15 and two times a number is 29. What is the number?

$2x + 15 = 29$
 $2x = 14$ $x = 7$