

# 10-1 Solving Two-Step Equations

*Learn* to solve two-step equations.

## 10-1 Solving Two-Step Equations

Sometimes more than one inverse operation is needed to solve an equation. Before solving, ask yourself, “What is being done to the variable, and in what order?” Then work backward to undo the operations.

# Solving Algebra Equations

1. Write down the problem: Variable Side  $\equiv$  Answer Side
2. Clear out the equation by combining like terms by doing the opposite operation on both sides & cross out on variable side.
3. Notice operation on variable side- do the opposite operation on both sides= **inverse operation**, to **isolate the variable**.
4. On variable side, **perform operation** and **cross out**- either below or beside variable
5. Draw answer line
6. On variable side, drop down the variable
7. Solve
8. Check



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$$2x - 7 = 13$$

$$\begin{array}{r} +7 \quad +7 \\ \hline \end{array}$$

$$\underline{2x} = \underline{20}$$

$$\underline{2} \quad \underline{2}$$

$$x = 10$$

What is being done?

2 times x, minus 7 equals 13

To undo the equation...

Opposite of subtracting 7 is to add 7 to both sides.

Opposite of multiplying by 2 is to divide by 2 on both sides.

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## Additional Example 2A: Solving Two-Step Equations

**Solve.**

$$\text{A. } \frac{n}{3} + 7 = 22$$

*Think:* First the variable is **divided by 3**, and then **7 is added**. To isolate the variable, **subtract 7**, and then **multiply by 3**.

$$\frac{n}{3} + 7 = 22$$

$$\underline{-7} \quad \underline{-7}$$

$$\frac{n}{3} = 15$$

$$3 \cdot \frac{n}{3} = 3 \cdot 15$$

$$n = 45$$

*Subtract to undo addition.*

*Multiply to undo division.*

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## Additional Example 2A Continued

**Check**  $\frac{n}{3} + 7 = 22$

$$\frac{45}{3} + 7 \stackrel{?}{=} 22$$

*Substitute 45 into the original equation.*

$$15 + 7 \stackrel{?}{=} 22 \quad \checkmark$$

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## Additional Example 2C: Solving Two-Step Equations

$$c. \frac{y - 4}{3} = 9$$

*Think:* First 4 is subtracted from the variable, and then the result is divided by 3. To isolate the variable, multiply by 3, and then add 4.

$$\frac{y - 4}{3} = 9$$

$$3 \cdot \frac{y - 4}{3} = 3 \cdot 9 \quad \text{Multiply to undo division.}$$

$$y - 4 = 27$$

$$\underline{+ 4} \quad \underline{+ 4} \quad \text{Add to undo subtraction.}$$

$$y = 31$$

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## Try This: Example 2A

**Solve.**

$$\text{A. } \frac{n}{4} + 5 = 29$$

*Think:* First the variable is **divided by 4**, and then **5 is added**. To isolate the variable, **subtract 5**, and then **multiply by 4**.

$$\begin{array}{r} \frac{n}{4} + 5 = 29 \\ \underline{-5} \quad \underline{-5} \end{array}$$

*Subtract to undo addition.*

$$4 \cdot \frac{n}{4} = 4 \cdot 24$$

*Multiply to undo division.*

$$n = 96$$

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## Try This: Example 2A Continued

**Check**  $\frac{n}{4} + 5 = 29$

$$\frac{96}{4} + 5 \stackrel{?}{=} 29$$

*Substitute 96 into the original equation.*

$$24 + 5 \stackrel{?}{=} 29 \quad \checkmark$$

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## Try This: Example 2B

$$\mathbf{B. \ 4.8 = -2.3m + 0.2}$$

*Think:* First the variable is **multiplied by  $-2.3$** , and then  **$0.2$  is added**. To isolate the variable, **subtract  $0.2$** , and then **divide by  $-2.3$** .

$$4.8 = -2.3m + 0.2$$

$$\underline{-0.2}$$

$$\underline{-0.2}$$

*Subtract to undo addition.*

$$4.6 = -2.3m$$

$$\frac{4.6}{\underline{-2.3}} = \frac{-2.3m}{\underline{-2.3}}$$

*Divide to undo multiplication.*

$$-2 = m$$

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## Try This: Example 2C

$$c. \frac{y - 2}{4} = 8$$

*Think:* First 2 is subtracted from the variable, and then the result is divided by 4. To isolate the variable, multiply by 4, and then add 2.

$$\frac{y - 2}{4} = 8$$

$$4 \cdot \frac{y - 2}{4} = 4 \cdot 8 \quad \text{Multiply to undo division.}$$

$$y - 2 = 32$$

$$\underline{+ 2} \quad \underline{+ 2} \quad \text{Add to undo subtraction.}$$

$$y = 34$$

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## Lesson Quiz

**Solve.**

1.  $\frac{x}{-9} - 3 = 10$      $x = -117$

2.  $7y + 25 = -24$      $y = -7$

3.  $-8.3 = -3.5x + 13.4$      $x = 6.2$

4.  $\frac{y + 5}{11} = 3$      $y = 28$

5. The cost for a new cell phone plan is \$39 per month plus a one-time start-up fee of \$78. If you are charged \$1014, how many months will the contract last? **24 months**