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Warm-Up | Solving Two-Step Equations

Lesson Question

Lesson Goals

Solve algebraic equations.

Recognize equation operations and their _____.

Use the properties of operations to _____ the variable.

Check the solution with substitution and estimation.

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Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

distributive property	the property stating that the product of a [ ] times a given quantity containing a sum or difference is equal to the sum of the [ ] of that factor times each addend from within the quantity
equation	a mathematical sentence equating two [ ]
inverse operation	operations that "undo" each other, such as addition and subtraction or [ ] and division
properties of equality	properties that allow you to perform the same operation to [ ] sides of an equation while maintaining equality

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Solving Two-Step Equations

PROCEDURE

To solve a two-step **equation**:

1. Use the addition or subtraction property of equality to isolate the variable term.
2. Use the multiplication or division property of equality to [ ] the variable.
3. Check the solution using [ ] or estimation.

Solve $11.85 = 2.1n + 4.5$ using **inverse operations** and the **properties of equality**.

$$11.85 = 2.1n + 4.5$$
$$-4.5 \qquad -4.5$$
$$\frac{7.35}{2.1} = \frac{2.1n}{\square}$$
$$\square = n$$

Check.

$$11.85 = 2.1(3.5) + 4.5$$
$$11.85 = \square + 4.5$$
$$11.85 = \square$$

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Steps to Solve a Two-Step Equation

Solve $\frac{x}{3} - \frac{1}{2} = 10$

1. Use the ☐ property of equality to isolate the variable

$$\frac{x}{3} - \frac{1}{2} = 10$$
$$+\frac{1}{2} \quad +\frac{1}{2}$$
$$\frac{x}{3} = \frac{21}{2}$$

2. Use the multiplication property of equality to isolate the variable.

$$(\square)\frac{x}{3} = (3)\left(\frac{21}{2}\right)$$
$$x = \frac{\square}{2}$$
$$= \square$$

3. Check the solution using substitution or estimation.

$$\frac{31.5}{3} - \frac{1}{2} = 10$$
$$\square - \frac{1}{2} = 10$$
$$\square = 10$$

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Equations with the Distributive Property

Solve the equation using the **distributive property**.

$$14.12 = \frac{1}{2}(3.6x - 12.8)$$

$$14.12 = \left(\square\right)(3.6x) - \left(\frac{1}{2}\right)\left(\square\right)$$

$$14.12 = 1.8x - \square$$

$$+6.4 \qquad +6.4$$

$$\square = 1.8x$$

$$\frac{20.52}{1.8} = \frac{1.8x}{1.8}$$

$$\square = x$$

Estimate to check the solution.

$$14.12 = 1.8x - 6.4 \rightarrow 14 = 2x - 6$$

$$+6 \qquad +6$$

$$20 = 2x$$

$$\square = x$$

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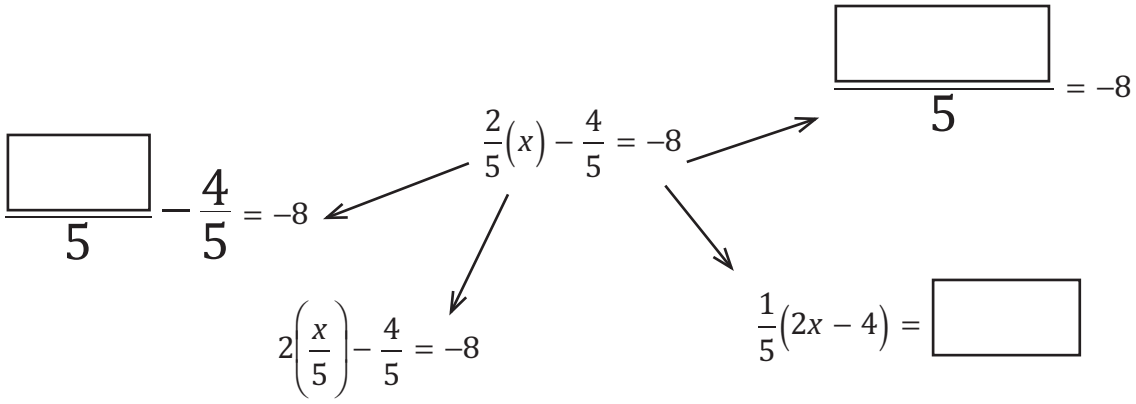
Equivalent Equations

What are the other ways to write this equation?



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Problem-Solving with Two-Step Equations

The clearance of the Golden Gate Bridge in San Francisco is 67 meters. This clearance is about 14.8 meters less than 2 times the clearance of the Brooklyn Bridge in New York City. What is the approximate clearance of the Brooklyn Bridge?

- Question

  $x =$ ☐ of the Brooklyn bridge

- Clues

  Clearance of Golden Gate ☐ m

  14.8 ☐ than $2x$

- Strategy
- Check

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- Question
  - x = clearance for Brooklyn Bridge
- Clues
  - Golden Gate clearance = 67; 14.8 less than 2 times
- Strategy

$$67 = \square - 14.8$$
$$+14.8 \qquad +14.8$$
$$\square = 2x$$
$$\frac{81.8}{2} = \frac{2x}{2}$$
$$x = \square$$

- Check

$$14.8 \rightarrow \square$$
$$67 = 2x - 15$$
$$+15 \qquad +15$$
$$\frac{82}{2} = \frac{2x}{2}$$
$$x = \square$$

41 is very close to 40.9, and so I can be reasonably sure that the x that I found earlier as the clearance for the Brooklyn Bridge is correct.

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Determining a Partial Cost

Cynthia is visiting the state fair. The cost of admittance is $17.50. This price includes a $5.20 concert ticket and the cost of three passes: one for the rides, one for the animal show, and one for the games. Each of the passes costs the same. What is the price of one pass?

- Question
  - p = price of ☐ pass
- Clues
  - cost is 17.50; ☐ ticket and 3 passes
- Strategy
  - Equation:

$$17.50 = 5.20 + \square$$
$$-5.20 \qquad -5.20$$
$$\frac{\square}{3} = \frac{3p}{3}$$
$$p = \square$$

The price of 1 pass is $4.10.

- Check

$$17.50 = 5.20 + 3(4.10)$$
$$17.50 = 5.20 + 12.30$$
$$17.50 = \square$$

Since, using substitution, I arrived at a true statement, I know the value I found for p is correct.

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Summary | Solving Two-Step Equations

Lesson Question

How can you solve a two-step equation?

Answer

2 Review: Key Concepts

To solve a two-step equation:

1. Use the addition or subtraction property of equality to _____ the variable term.
2. Use the multiplication or division property of _____ to isolate the variable.
3. Check the solution using _____ or estimation.

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Summary | Solving Two-Step Equations

Use this space to write any questions or thoughts about this lesson.

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