Solve Two-Step Equations Involving Inverse Properties of Subtraction and Division

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1.4 Solve Two-Step Equations Involving Inverse Properties of Subtraction and Division

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[Figure 1]

Brandon and Felicia sold rolls of wrapping paper for a school fundraiser. Brandon sold 3 less than half the number of rolls that Felicia sold. Brandon sold a total of 9 rolls of wrapping paper.

Write an algebraic equation to represent w, Remember that w is the number of rolls of wrap the number of rolls of wrapping paper that Felicia sold. Then, find the number of rolls of wrapping paper that Felicia sold.

In this concept, you will solve equations involving inverse properties of subtraction and division.

Inverse Properties of Subtracting and Dividing

To solve a two-step equation, you will need to use more than one inverse operation. You begin solving two-step equations by isolating the variable.

For example, solve for z.

$$\frac{z}{6} - 7 = 3$$

Your first step should be to use inverse operations to get the term that includes a variable, $\frac{z}{6}$, by itself on one side of the equal sign. In the equation, 7 is subtracted from $\frac{z}{6}$. So, you can use the inverse of subtraction—addition. Therefore, add 7 to both sides of the equation.

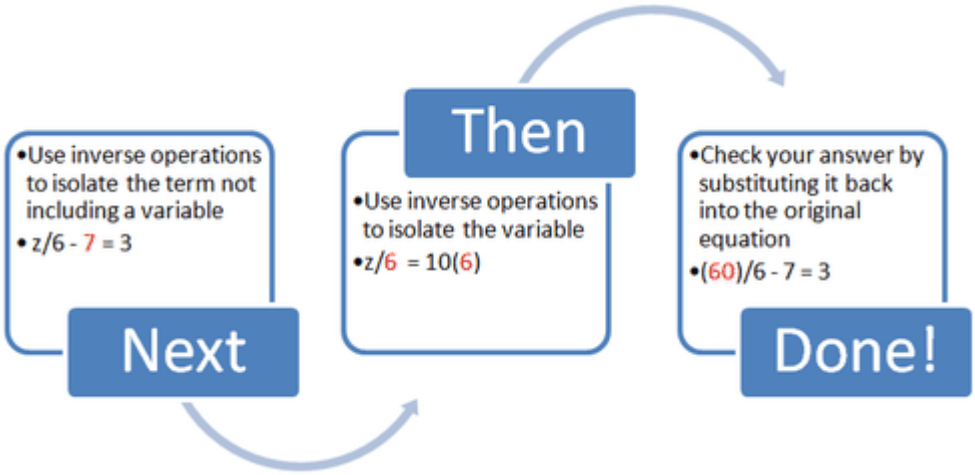
$$\begin{aligned} \frac{z}{6} - 7 &= 3 \\ \frac{z}{6} - 7 + 7 &= 3 + 7 \\ \frac{z}{6} &= 10 \end{aligned}$$

Next, you can use inverse operations to isolate z. Since z is divided by 6, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{z}{6} &= 10 \\ \frac{z}{6} \times 6 &= 10 \times 6 \\ z &= 60 \end{aligned}$$

The answer is 60.

Let's review your steps to solving this two-step equation.



[Figure 2]

Examples

Example 1

Earlier, you were given a problem about Brandon and Felicia's fundraising.

Brandon sold 3 less than half of Felicia's total, which was 9 rolls of wrap.

First, use the key words from the question to help you translate the problem into an equation. Remember that w is the number of rolls of wrap.

$$\begin{array}{c} \text{Brand on sold 3 less than half the number that Felicia sold.} \\ \downarrow \qquad\qquad \downarrow \\ -3 \qquad\qquad \frac{w}{2} \end{array}$$

So the equation is $\frac{w}{2} - 3 = 9$.

Next, use the inverse of subtraction—addition to isolate the variable.

$$\begin{aligned} \frac{w}{2} - 3 &= 9 \\ \frac{w}{2} - 3 + 3 &= 9 + 3 \\ \frac{w}{2} &= 12 \end{aligned}$$

Then, you can use inverse operations to isolate w. Since w is divided by 2, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{w}{2} &= 12 \\ \frac{w}{2} \times 2 &= 12 \times 2 \\ w &= 24 \end{aligned}$$

The answer is 24.

Felicia sold 24 rolls of wrapping paper.

Example 2

$\frac{x}{6} - 9 = 8$

First, use the inverse of subtraction—addition to isolate the variable.

$$\begin{aligned} \frac{x}{6} - 9 &= 8 \\ \frac{x}{6} - 9 + 9 &= 8 + 9 \\ \frac{x}{6} &= 17 \end{aligned}$$

Next, you can use inverse operations to isolate x. Since x is divided by 6, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{x}{6} &= 17 \\ \frac{x}{6} \times 6 &= 17 \times 6 \\ x &= 102 \end{aligned}$$

The answer is 102.

Example 3

$$\frac{x}{3} - 8 = 9$$

First, use the inverse of subtraction—addition to isolate the variable.

$$\begin{aligned} \frac{x}{3} - 8 &= 9 \\ \frac{x}{3} - 8 + 8 &= 9 + 8 \\ \frac{x}{3} &= 17 \end{aligned}$$

Next, you can use inverse operations to isolate x. Since x is divided by 3, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{x}{3} &= 17 \\ \frac{x}{3} \times 3 &= 17 \times 3 \\ x &= 51 \end{aligned}$$

The answer is 51.

Example 4

$\frac{y}{7} - 2 = 13$

First, use the inverse of subtraction—addition to isolate the variable.

$$\begin{aligned} \frac{y}{7} - 2 &= 13 \\ \frac{y}{7} - 2 + 2 &= 13 + 2 \\ \frac{y}{7} &= 15 \end{aligned}$$

Next, you can use inverse operations to isolate y. Since y is divided by 73, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{y}{7} &= 15 \\ \frac{y}{7} \times 7 &= 15 \times 7 \\ y &= 105 \end{aligned}$$

The answer is 105.

Example 5

$\frac{a}{7} - 2 = 12$

First, use the inverse of subtraction—addition to isolate the variable.

$$\begin{aligned} \frac{a}{7} - 2 &= 12 \\ \frac{a}{7} - 2 + 2 &= 12 + 2 \\ \frac{a}{7} &= 14 \end{aligned}$$

Next, you can use inverse operations to isolate a. Since a is divided by 7, you can use the inverse of division – multiplication.

$$\begin{aligned} \frac{a}{7} &= 14 \\ \frac{a}{7} \times 7 &= 14 \times 7 \\ a &= 98 \end{aligned}$$

The answer is 98.

Review

Solve each two-step equation that has division and subtraction in it.

1. $\frac{x}{5} - 4 = 8$
2. $\frac{y}{6} - 3 = 8$
3. $\frac{x}{7} - 7 = 10$
4. $\frac{x}{8} - 4 = 12$
5. $\frac{y}{7} - 5 = 11$
6. $\frac{x}{4} - 10 = 12$
7. $\frac{y}{4} - 8 = 2$
8. $\frac{x}{3} - 12 = 9$
9. $\frac{a}{5} - 3 = 11$
10. $\frac{b}{4} - 1 = 15$
11. $\frac{x}{2} - 8 = 4$
12. $\frac{a}{7} - 4 = 9$
13. $\frac{b}{4} - 7 = 3$
14. $\frac{x}{8} - 1 = 12$
15. $\frac{y}{6} - 8 = 5$
16. $\frac{x}{2} - 15 = 12$

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

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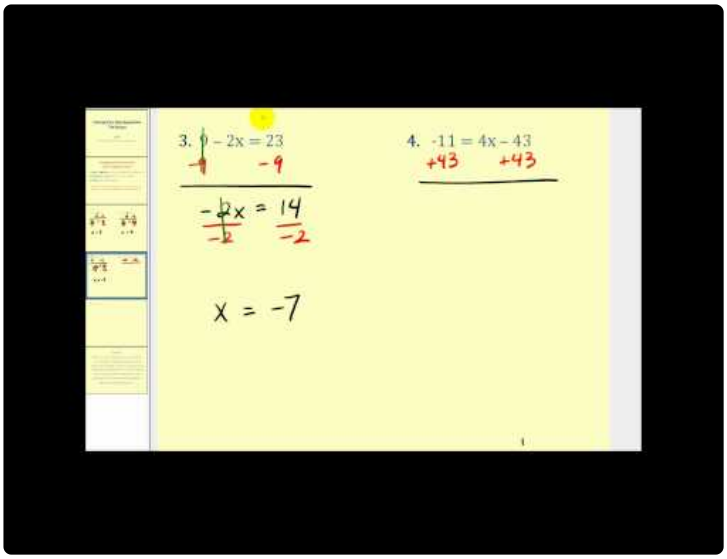

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