

1.2 Explain – Solving Multi-Step Equations - Notes

Essential Question: How can you use multi-step equations to solve real-life problems?

Main Ideas/ Questions	Notes/Examples
<p><b>What You Will Learn</b></p>	<ul style="list-style-type: none"> <li>To solve multi-step linear equations using inverse operations.</li> <li>To use multi-step linear equations to solve real-life problems.</li> </ul>
<p><b>What you already know...</b></p>	<p><b>Solving Equations using Inverses:</b> Addition/Subtraction Multiplication/Division</p> <p><b>**Always do the same thing to both sides of the equation, but only once on each side.**</b></p> <p><b>Solution:</b> A solution makes the equation true.</p> <p><b>Practice:</b> Decide if the following values are solutions to the given equations by substituting the value in for the variable.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1. <math>3x = 12, x = 4</math> YES/NO</p> <p><math>3(4) = 12</math> <math>12 = 12 \checkmark</math></p> </div> <div style="text-align: center;"> <p>2. <math>x - 3 = 10, x = 7</math> YES/NO</p> <p><math>(7) - 3 = 10</math> <math>4 \neq 10</math></p> </div> </div>
<p><b>Steps to Solve Equations</b></p> <p><b>Step 1:</b> Use the distributive property to remove any grouping symbols.</p> <p><b>Step 2:</b> Simplify the expression on each side of the equation.</p> <p><b>Step 3:</b> Collect the variables on one side of the equation and the constant terms on the other side.</p> <p><b>Step 4:</b> Isolate the variable (add/subtract then multiply/divide).</p>	
<p><b>Practice:</b> Solve each equation using inverses. Show all work.</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>3. <math>3x + 4 = 19</math></p> <math display="block">\begin{array}{r} 3x + 4 = 19 \\ -4 \quad -4 \\ \hline 3x = 15 \\ \frac{3x}{3} = \frac{15}{3} \\ \hline x = 5 \end{array}</math> </div> <div style="width: 45%;"> <p>4. Check your solution to #3</p> <math display="block">\begin{array}{r} 3x + 4 = 19 \\ 3(5) + 4 = 19 \\ 15 + 4 = 19 \\ 19 = 19 \checkmark \end{array}</math> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> <p>5. <math>5z - 13 = -3</math></p> <math display="block">\begin{array}{r} 5z - 13 = -3 \\ +13 \quad +13 \\ \hline 5z = 10 \\ \frac{5z}{5} = \frac{10}{5} \\ \hline z = 2 \end{array}</math> </div> <div style="width: 45%;"> <p>6. Check your solution to #5.</p> <math display="block">\begin{array}{r} 5z - 13 = -3 \\ 5(2) - 13 = -3 \\ 10 - 13 = -3 \\ -3 = -3 \checkmark \end{array}</math> </div> </div>	

## 1.2 Explain - Solving Multi-Step Equations - Notes

$$7. 17 = z - (-9)$$

$$+(-9) +(-9)$$

$$\boxed{8 = z}$$

$$8. \frac{f}{4} - 5 = -9$$

$$+5 +5$$

$$\frac{f}{4} = -4$$

$$(4) \frac{f}{4} = -4(4)$$

$$f = -16$$

$$9. \frac{q+(-5)}{3} = 8$$

$$9 + (-5) = 24$$

$$-(-5) -(-5)$$

$$q = 29$$

$$10. 5x + 3x = 28$$

$$\boxed{8x} = 28$$

$$\frac{8x}{8} = \frac{28}{8}$$

$$x = \frac{7}{2}$$

$$11. 12x + 4 + 2x = 39$$

$$\boxed{14x} + 4 = 39$$

$$-4 -4$$

$$14x = 35$$

$$\frac{14x}{14} = \frac{35}{14}$$

$$x = \frac{5}{2}$$

$$12. 3(z+7) = 21$$

$$\boxed{3z} + 21 = 21$$

$$-21 -21$$

$$3z = 0$$

$$\frac{3z}{3} = \frac{0}{3}$$

$$z = 0$$

$$13. -4(z-12) = 42$$

$$\boxed{-4z} + 48 = 42$$

$$-48 -48$$

$$-4z = -6$$

$$\frac{-4z}{-4} = \frac{-6}{-4}$$

$$z = \frac{3}{2}$$

$$14. 33 = 12r - 3(9-r)$$

$$33 = 12r - 27 + 3r$$

$$33 = 15r - 27$$

$$+27 +27$$

$$60 = 15r$$

$$\frac{60}{15} = \frac{15r}{15}$$

$$4 = r$$

$$15. 7 + 3(2g-6) = -29$$

$$7 + 6g - 18 = -29$$

$$\boxed{6g} - 11 = -29$$

$$+11 +11$$

$$6g = -18$$

$$\frac{6g}{6} = \frac{-18}{6}$$

$$g = -3$$

16. Your school's drama club charges \$4 per person for admission to a play. The club borrowed \$400 to pay for costumes and props. After paying back the loan, the club has a profit of \$100. **Total**

a. Write an equation. Let  $x$  represent the number of people who attended the play.

$$4x - 400 = 100$$

b. How many people attended the play?

125 people

$$\boxed{4x} - 400 = 100$$

$$+400 +400$$

$$4x = 500$$

$$\frac{4x}{4} = \frac{500}{4}$$

$$x = 125$$

17. You have 96 feet of fencing to enclose a rectangular pen for your dog. To provide sufficient running space for your dog to exercise, the pen should be three times as long as it is wide. Find the dimensions of the pen.

width =  $w$   
length =  $3w$

$$w + w + 3w + 3w = 96$$

$$8w = 96$$

$$\frac{8w}{8} = \frac{96}{8}$$

$$w = 12$$

$$\text{width} = 12$$

$$\text{length} = 3(12) = 36$$

Application

## 1.2 Solving Multi-Step Equations

Name: \_\_\_\_\_

### Assignment

Class: \_\_\_\_\_ Calc#: \_\_\_\_\_

Video Notes: [https://www.youtube.com/watch?v=\\_iIiDt6LJzw](https://www.youtube.com/watch?v=_iIiDt6LJzw)

**Goal:** To get the variable by itself

**Step 1:** Simplify each side of the equation

Distribute & Combine Like Terms (on left side and on right side of equal sign)

**Step 2:** Solve the Equation

Box variable, Cancel what's beside it, Cancel what's inside box

[If your problem has a fraction, you can multiply EVERYTHING by the LCD 1<sup>st</sup>]



1.  $2x + 3x = 5$

2.  $10x - 3x = 20 + 1$

3.  $15 = 2x - 7$

4.  $3x + 2(x + 5) = 0$

5.  $2(x - 4) = 2$

6.  $\frac{1}{3}(x + 6) = 1$

7.  $2 + \frac{a}{-4} = -1$

8.  $\frac{1}{4}(m - 16) = 7$

Given the following equation, find the missing value for x and/or y.

9.  $2x + y = 2$

10.  $-3x + y = 1$

(3, ?)  $y =$  \_\_\_\_\_

(?, 2)  $x =$  \_\_\_\_\_

(-2, ?)  $y =$  \_\_\_\_\_

(?, -5)  $x =$  \_\_\_\_\_

## 1.2 Solving Multi-Step Equations

### Assignment

Name: \_\_\_\_\_

Class: \_\_\_\_\_ Calc#: \_\_\_\_\_

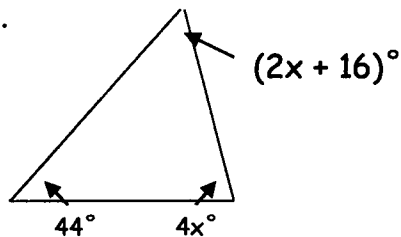
Use an equation to solve each problem.

11. Suppose you want to solve the equation  $-3m + 4 + 5m = -6$ . What would you do as your first step?

12. The MacNeils rented a moving truck for \$49.95 plus \$.30 per mile. Before returning the truck, they filled the tank with gasoline, which cost \$18.32. The total cost was \$95.87. Find the number of miles the truck was driven.

Number of miles \_\_\_\_\_

13. Find the value of  $x$ . The sum of the measures of the angles of a triangle is  $180^\circ$ .



14. Jared needs to solve the equation  $\frac{2x-3}{3} = 2$ . What should he do first?

- a) Multiply both sides of the equation by 2.
- b) Multiply both sides of the equation by 3.
- c) Subtract 2 from both sides of the equation.
- d) Cancel the 3 in the numerator with the 3 in the denominator.

15. Simplify the algebraic expression  $-a(2b - 3c) - 3a(b + c)$ .

- a)  $ab$
- b)  $-5ab$
- c)  $ab - 6ac$
- d)  $-5ab - 6ac$

16. The dimensions of a rectangle are represented by  $3x - 10$  and  $5x + 4$ . Write an expression in simplest form that represents the perimeter.

Perimeter = \_\_\_\_\_