

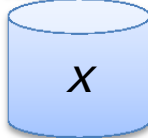


## Solving One-Variable Equations and Inequalities


Explore – Answer Key

**Directions:** For each problem situation below, write an equation you can use to solve the problem. Use cups and counters to solve the equation. Represent the solution on a number line and use substitution to verify your solution.


**Key**




= x



= 1



= 1



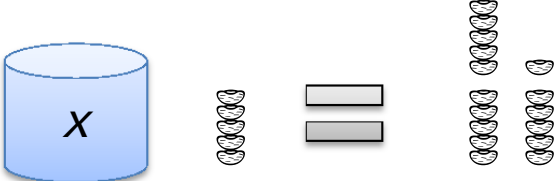
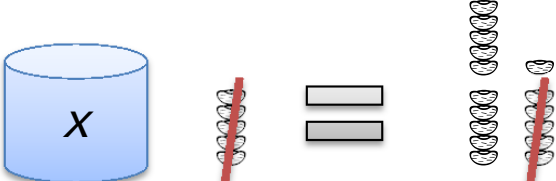
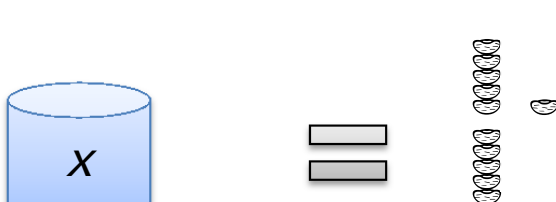
= -1

1. Alfred is 5 years younger than his sister. His sister is 16 years old. How old is Alfred?

a) Write the equation.

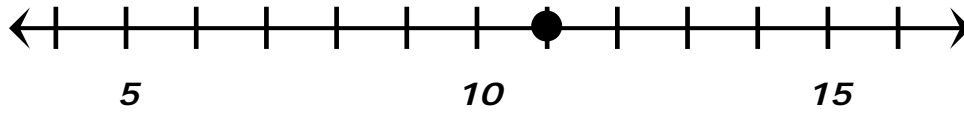
$$x + 5 = 16$$

b) Solve the equation using cups and counters. Sketch each step.

Model	Symbols
	$x + 5 = 16$
	$x + 5 - 5 = 16 - 5$
	$x = 11$



c) Represent the solution on a number line.



d) Use substitution to determine whether 9, 11, or 15 are solutions to the equation.

$$\begin{aligned} (9) + 5 &= 16 \\ 14 &\neq 16 \end{aligned}$$

**9 is not a solution.**

$$\begin{aligned} (11) + 5 &= 16 \\ 16 &= 16 \end{aligned}$$

**11 is a solution.**

$$\begin{aligned} (15) + 5 &= 16 \\ 20 &\neq 16 \end{aligned}$$

**15 is not a solution.**

2. A square has a perimeter of 20 meters. What is the side length,  $x$ , of the square?

a) Write the equation.

$$4x = 20$$

b) Solve the equation using cups and counters. Sketch each step.

Model	Symbols
	$4x = 20$
	$4x \div 4 = 20 \div 4$
	$x = 5$



c) Represent the solution on a number line.



d) Use substitution to determine whether 4, 5, or 6 are solutions to the equation.

$$4(4) = 20$$

$$16 \neq 20$$

$$4(5) = 20$$

$$20 = 20$$

$$4(6) = 20$$

$$24 \neq 20$$

**4 is not a solution.**

**5 is a solution.**

**6 is not a solution.**

3. There are  $x$  students in Mrs. Jackson's class. Mr. Holder's class has 22 students, which is 4 fewer than there are in Mrs. Jackson's class. How many students are in Mrs. Jackson's class?

a) Write the equation.

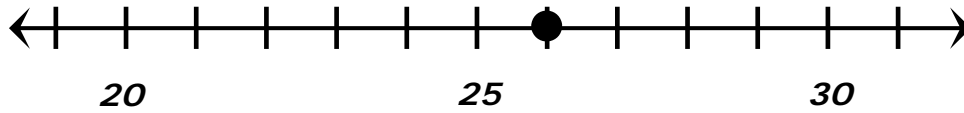
$$x - 4 = 22$$

b) Solve the equation using cups and two-color counters. Sketch each step.

Model	Symbols
	$x - 4 = 22$
	$x - 4 + 4 = 22 + 4$
	$x = 26$



c) Represent the solution on a number line.



d) Use substitution to determine whether 20, 26, or 28 are solutions to the equation.

$$\begin{aligned} (20) - 4 &= 22 \\ 16 &\neq 22 \end{aligned}$$

$$\begin{aligned} (26) - 4 &= 22 \\ 22 &= 22 \end{aligned}$$

$$\begin{aligned} (28) - 4 &= 22 \\ 24 &\neq 22 \end{aligned}$$

**20 is not a solution.**

**22 is a solution.**

**28 is not a solution.**

4. Amanda and two friends earned \$42 in a garage sale. They decided to share the money evenly. How much money,  $x$ , will each person receive?

a) Write the equation.

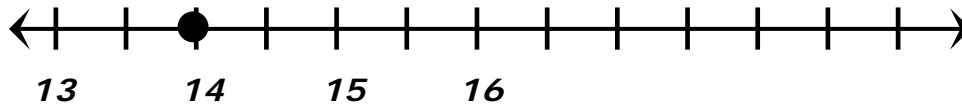
$$3x = 42$$

b) Solve the equation using cups and counters. Sketch each step.

Model	Symbols
	$3x = 42$
	$3x \div 3 = 42 \div 3$
	$x = 14$



c) Represent the solution on a number line.



d) Use substitution to determine whether 10, 12, or 14 are solutions to the equation.

$$\begin{aligned} 3(10) &= 42 \\ 30 &\neq 42 \end{aligned}$$

*10 is not a solution.*

$$\begin{aligned} 3(12) &= 42 \\ 36 &\neq 42 \end{aligned}$$

*12 is not a solution.*

$$\begin{aligned} 3(14) &= 42 \\ 42 &= 42 \end{aligned}$$

*14 is a solution.*

### Debriefing Questions

1. How did you use the model to represent each expression?  
*Let the cup represent  $x$ . For positive whole numbers, you can either use beans or yellow counters. For negative numbers, use red counters.*
2. For equations with a sum or difference, how did you determine the value of  $x$ ?  
*Remove beans from both sides of the equal sign or use add the same amount of two-color counters to both sides of the equal sign and remove zero pairs.*
3. For equations with a product, how did you determine the value of  $x$ ?  
*Divide the beans or counters among the number of cups until each cup has the same number of beans or counters.*



**Extra Practice:**

Write equations for the following problem situations and solve the equations.

1. The perimeter of a square is 48 centimeters. What is the side length of the square,  $s$ ?

$$4s = 48$$

$$s = 12 \text{ centimeters}$$

2. 6 containers of candy weigh 69 pounds. What is the weight,  $x$ , of each container of candy?

$$6x = 69$$

$$x = 11.5 \text{ pounds}$$

3. Juan caught a fish that weighed 7.5 pounds. Orlando also caught a fish. Both fish together weighed 17.3 pounds. What is the weight,  $x$ , of Orlando's fish?

$$7.5 + x = 17.3$$

$$x = 9.8 \text{ pounds}$$

4. Amy is 143 centimeters tall. Her best friend, Elizabeth, is 7 centimeters taller. What is Elizabeth's height,  $x$ ?

$$x - 143 = 7$$

$$x = 150 \text{ centimeters}$$

5. An angle has a measure of  $51.4^\circ$ . What is the measure of its complement,  $x$ ?

$$51.4 + x = 90$$

$$x = 38.6^\circ$$

6. The measures of two of the interior angles of a triangle are  $40^\circ$  and  $25^\circ$ . What is the measure,  $x$ , of the third interior angle?

$$65 + x = 180$$

$$x = 115^\circ$$

