## Section 4.2 The Addition Property of Equality

**1. Definition of Solution:** A solution for an equation is a number that when used in place of the variable makes the equation a true statement.

Example 1: Check to see if the number to the right of each of the following equations is a solution for the equation.

*a*. $3x+5=14$ ; 3

*b*. 4x+3=7; 1

*c*. $4x+5=2x-1$ ; $-6$

**2. Addition Property of Equality:** Let A, B, and C represent algebraic expressions.

**If A = B**
**then A + C = B + C**

Adding the same quantity to both sides of an equation never changes the solution for the equation. Because subtraction is defined as the addition of the opposite, this property can be extended to subtraction.

**If A = B**
**then A − C = B − C**

We use the addition property of equals to solve equations. When solving an equation, we want to end up with an expression of the form

x = a number

If the side of the equation that contains the x has a number that is subtracted from the x, we can add that number from both sides of the equation to get the x by itself.

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If the side of the equation that contains the x has a number that is added to the x, we can subtract that number from both sides of the equation to get the x by itself.

Example 2: Solve each of the following.

a. $x + 3 = 15$

b. $a + 9 = -12$

c. $x - 7 = -8$

d. $x - 6 = 1$

**3. Simplifying Before You Solve:** Always simplify equations fully before you start solving them. Look for similar terms that can be combined and operations that can be carried out using the distributive property.

Example 3: Solve each of the following. Simplify fully before you begin to solve.

*a.* $5a + 6 - 4a = 4$

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*b*. $4(2a-1)-7a=9-5$

**4. Solving Equations That Involve Fractions:** Some equations involve fractions. You may use the rules for adding or subtracting fractions along with the Addition Property of Equality to solve these equations. Some equations have answers that are fractions. Leave those answers as fractions in lowest form.

Example 4: Solve the given equations.

*a*. $a-\frac{3}{4}=\frac{7}{8}$

*b*. $x-\frac{3}{5}=-\frac{5}{8}$

*c*. $a+2=\frac{7}{8}$

**5. Using Equations to Solve Applied Problems:** To solve applied problems:

- Identify the unknown and represent it with a variable. Write a statement or draw a diagram that tells what quantity the variable stands for.
- Write the equation that models the problem.
- Substitute in known values
- Solve the equation.
- Write your answer in English words.

If the equation does not involve a geometry formula for perimeter, area or volume, you may combine the second and third steps, writing the equation and substituting in the known values in one step.

Example 5: Solve the given applied problems.

a. Two angles are complementary. One angle is $34^\circ$. Find the other angle.

| | |
|---|---|
| Let x be the unknown angle. | (Identify the unknown.) |
| $x + 34^\circ = 90^\circ$ | (Write the equation substituting in the known value) |
| $x + 34^\circ - 34^\circ = 90^\circ - 34^\circ$ | (Solve the equation) |
| $x = 56^\circ$ | |
| The missing angle is $56^\circ$. | (Write your answer in English words.) |

b. Two angles are supplementary. One angle is $108^\circ$. Find the other angle.

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Practice Problems: Solve each equation. Show all steps.

*a*. $x - 6 = -8$

*b*. $2 - 6 = a - 1$

*c*. $7a - 6 - 6a = -3 + 1$

*d*. $\text{a}+\frac{1}{4} = -\frac{3}{4}$

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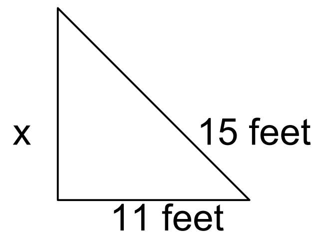
e. Find the value for x given that the perimeter is 30 feet.




Answers to Practice Problems:

a. {–2}
b. {–3}
c. {4}
d. {–1}
e. {4 ft.}

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