

3.1 Solving Linear Equations

Equation –

Solution (solution set)–

Linear equation

$$ax + b = c$$

a, b, and c are called _____, while x is the _____.

Addition Principal of Equality

If the same algebraic expression is added to both sides of an equation, the new equation has the same solutions as the original equation. Symbolically, if A, B and C are algebraic expressions, then the equations

$$A = B \text{ and } A + C = B + C \text{ have the same solutions.}$$

Multiplication (Division) Property of Equality:

If both sides of an equation are multiplied by (or divided by) the same nonzero constant, the new equation has the same solutions as the original equation. Symbolically, if A and B are algebraic expressions and C is any nonzero constant, then the equations

$$a = b$$

$$\text{and } ac = bc \text{ where } c \neq 0$$

$$\text{and } \frac{a}{c} = \frac{b}{c} \text{ where } c \neq 0$$

have the same solutions. We say that the equations are equivalent.

***What is the objective when solving linear equations?**

Steps for Solving Equations

1.

2.

3.

*Every linear equation has _____ solution!

Examples: Solve.

a) $\frac{1}{3} + x = \frac{2}{5}$

b) $7x - 5 - 6x = 13 + 4$

c) $0.7 + t = 3.09$

d) $5x = 20$

e) $1.1x + 0.2x = 12.2 - 3.1$

f) $-3.3m + 2m = 2.8$

g) $\frac{7h}{6} = -14$

Problem Solving – Steps for Solving Applications

1. Understand the problem. For example,
 - a. _____ the problem carefully, maybe several times.
 - b. Understand all the words.
 - c. If it helps, restate the problem _____.
 - d. Be sure that there is enough information.

2. Devise a plan. For example,
 - a. Guess, estimate, or make a list of possibilities.
 - b. Draw a _____ or diagram.
 - c. Represent the unknown quantity with a _____ and form an _____

3. Carry out the plan. For example,
 - a. Try all the possibilities you have listed.
 - b. Study your picture or diagram for insight into the solution.
 - c. _____ any equation that you may have set up.

4. Look back over the results. For example,
 - a. Can you see an easier way to solve the problem?
 - b. Does your solution actually work? Does it _____ in terms of the wording of the problem? Is it _____?
 - c. If there is an equation, check your answer in the equation.

*In this section you will find that many applications can be solved by “reasoning” and there is nothing wrong with this approach. However, keep in mind that the algebraic techniques you are learning are important and also involve reasoning that will prove very useful in solving more complicated problems in later sections.

Examples:

a) The perimeter, P , of a triangle is equal to the sum of the lengths of the sides a , b , and c .
($P = a + b + c$) One side of a triangle is 11.5 inches long. A second side is 8.75 inches long.
If the perimeter is 24 inches, find the length of the third side.

b) The volume of a rectangular box of cereal is the product of its length, width, and height.
($V = lwh$) Find the width of a cereal box with volume 1260 cm^3 if its length is 14 cm and its height is 20 cm.

c) The profit, P , is equal to the revenue, R , minus the cost, C . ($P = R - C$) Find the revenue (income) of a company that shows a profit of \$3.2 million and costs of \$1.8 million.

d) The distance traveled, d , is equal to the product of the rate, r , and the time t . ($d = rt$)
How long will a truck driver take to travel 350 miles if he averages 50 mph?

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