

## The Algebra Tutor

### Lesson #3

#### Addition & Multiplication Property of Equality

In this lesson the techniques of algebra are extended to include the multiplication and addition properties in the same equation. Students will be introduced to solving for a variable requiring the additive inverse concept and multiplicative inverse in several different applications including word problems. Examples of word problems will include integer problems, age and rate.

#### PRACTICE PROBLEMS

- $5x - 7 = 3x + 2$
- $\frac{2}{5}x + 3 = \frac{1}{5}x - 7$
- $\frac{5}{8}x + x = 13$
- Find 6.5% of 80
- Find three consecutive odd integers whose sum is 93.
- Two sides of a triangle have the same length. The third side is 2 cm longer. If the perimeter of the triangle is 20 cm., find the lengths of the sides.
- $\frac{x}{4} + 9 = 6$
- $8 = 4.1n - 24.8$
- $13 - 8x = 5x + 2$
- $\frac{1}{2}b + 6 = \frac{1}{3}b$
- $8 + 10x = 5x + 11$
- One season Johnny Wilson scored 9 more runs than twice the number of runs he batted in. He scored 117 runs that season. How many runs did he bat in?
- Marie has 6 more than twice as many birds as when she started to raise birds. She now has 98 birds. How many did she have when she started?
- Twice a number increased by 4 times the number is 840. Find the number.
- The length of a rectangle is twice its width. The perimeter is 39 ft. Find the length and width.

#### Answers:

- $(x = 4 \frac{1}{2})$ , 2.  $(x = -50)$ , 3.  $(x = 8)$
- $(x = 5.2)$ , 5.  $(29, 31, 33)$ , 6.  $(6, 6, 8 \text{ cm})$
- $(x = -12)$ , 8.  $(n = 8)$ , 9.  $(x = \frac{11}{13})$
- $(b = -36)$ , 11.  $(x = \frac{3}{5})$
- $(54 \text{ runs})$ , 13.  $(46 \text{ birds})$ , 14.  $(140)$
- $(\text{Width is } 6.5 \text{ ft and the length is } 13 \text{ ft.})$

## STUDENT VOCABULARY

**Like Terms:** Terms that contain the same variables raised to the same power.

**Variable:** A term used in a mathematical equation to represent an unknown number.

**Reciprocal:** A reciprocal of a number is its multiplicative inverse. The product of a number and its reciprocal always equals 1. e.g.  $\frac{1}{2} * \frac{2}{1} = 1$ ,  $(\frac{3}{2}) (\frac{2}{3}) = 1$ .

**Mixed Fraction:** A number which has both a whole number and fraction. e.g.  $3\frac{1}{2}$ ,  $4\frac{3}{5}$ .

**Improper Fraction:** A number containing a numerator larger than the denominator. e.g.  $\frac{5}{3}$ ,  $\frac{15}{11}$ .

**Coefficient:** The number part of an algebraic term. In the term  $3x$ , 3 is the coefficient.

**Positive Number:** A number greater than zero.

**Negative Number:** A number less than zero.

**Integer:** A whole number that can be either positive or negative.

**Product:** The result of multiplication e.g.  $5 * 2 = 10$ . 10 is the product.

**Perimeter:** The sum of the lengths of all the sides of a polygon.

**Polygon:** A figure having three or more sides.

## QUESTIONS FOR THOUGHT AND FURTHER STUDY

1. In the equation  $3x + 4 = 2$ , what operation must be done first?
2. If the coefficient is a whole number what is the easiest way to solve for the variable?
3. If the word "decreased by" is used in a word problem, what operation should be used?
4. To solve for the variable if the coefficient is negative what method should be used?
5. Why is it necessary to combine the like terms on both sides?

6. Explain the difference in set-up between problems involving consecutive integers and consecutive even/odd integers.

Answers:

1. ( $\neq 4$  must be added to both sides).
2. (Divide both sides of the equation by the coefficient).
3. (Subtraction).
4. (Divide both sides of the equation by the negative coefficient).
5. (The equation should be simplified before solving for the variable).
6. (Consecutive integers are labeled by  $x$ ,  $x + 1$ ,  $x + 2$ ,: in spacing of one unit; consecutive even/odd integers are labeled by  $x$ ,  $x + 2$ ,  $x + 4$ ,: in spacing of two units).

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