Math 9 Tripp

Name: ___________ KEY ____________

Chapter 3 – Equations

Test Date: ____

To do:

3.1 – Equations
- Complete Notes ○

3.2 – Variables
- Complete Notes ○

3.3 – Substitution
- Complete Notes ○

3.4 – Equation Solving
- Complete Notes ○
- Quiz 1 ○

3.5 – Two-Step Solving
- Complete Notes ○

3.6 – Solving with Fractions
- Complete Notes ○

3.7 – Solving with Brackets
- Complete Notes ○

3.8 – Solving Applied Problems
- Complete Notes ○
- Quiz 2 ○

Assignments
- Chapter Assignment ○

Write Unit Test ○

An equation is a mathematical sentence, containing the **equals** sign, in which the expression on the left-hand side of the sign is equal to the expression on the right-hand side.

$5 + 3 = 8$ $2^3 = 8$ $8 = 8$

$12 + 7 - 3 = 4 + 6 + 6$

$x - 10 = 22$ $a + 0.6 = 7.2$ $4y = 16$

Examples that are **not** equations:

$5 + 3$ $7 + 3 > 8$ $345, 122$

$18 \div 6$ $42 \times 2 + 3$

$x - 18$ $a + 7.2$ $4xy$

Math 9 **Lesson 3.2 - Variables** Tripp

We can use letters or symbols to represent a value that we don't know. This is called a **variable** because depending on the situation it may represent a different value, it varies. We use these in mathematical statements or expressions as a placeholder. For example:

$$\triangle + 2 = 5$$
$$7 - \square = 3$$
$$5 \times \bigcirc = 15$$

or

$$x + 2 = 5$$
$$7 - q = 3$$
$$5 \times b = 15$$

Vocab to consider:

With the example $6x + 5$

- The ***variable*** is… x
- The ***coefficient*** is… 6 (the number that multiplies by the variable)
- The ***constant*** is… 5 (the number that is by itself—no variable)

Math 9 **Lesson 3.3 - Substitution** Tripp

When you are asked to evaluate an expression, you replace the **variable** with a number value, then **evaluate** following BEDMAS, to get an answer.

Examples:

1. Find the value of $2x - 7$ when $x = 5$

If $x = 5$, then $2x - 7 = 2(5) - 7 = 10 - 7 = 3$

2. Find the value of $-abc^2$ when $a = -6$, $b = -3$, and $c = 2$

If $a = -6$, $b = -3$, and $c = 2$, then

$-abc^2 = -(-6)(-3)(2)^2 = -(-6)(-3)(4) = -72$

Math 9 **Lesson 3.4 – Equation Solving** Tripp

To solve an equation, we must try to get the unknown (variable) on one side of the equal sign, by itself. We can perform the opposite operations in order to do so, in the opposite order of BEDMAS. Don't forget to check your work!

Examples:

1. $x + 5 = 17$

Subtracting 5 from both sides, we get $x = 17 - 5 = x = 12$

Therefore, $x = 12$.

2. $5x = 20$

Dividing both sides by 5, we get $x = \frac{20}{5} = 4$

Therefore, $x = 4$.

3. $\frac{p}{-6} = 5$

Multiplying both sides by –6, we get $p = 5 \times (-6) = -30$

Therefore, $p = -30$.

Math 9 **Lesson 3.5 – Two-Step Solving** Tripp

To solve an equation, we must try to get the unknown (variable) on one side of the equal sign, by itself. We can perform the opposite operations in order to do so, in the opposite order of BEDMAS. Don't forget to check your work!

1. $-8x - 7 = 17$

Step 1: add 7 to both sides	$-8x - 7 + 7 = 17 + 7$
(Group like terms/simplify)	$-8x = 24$
Step 2: divide both sides by –8	$-\frac{8x}{-8} = \frac{24}{-8}$
(Simplify)	$x = -3$

2. $\frac{2}{3}x = 24$

Step 1: multiply both sides by 3	$\frac{2}{3}x \times 3 = 24 \times 3$
(Group like terms/simplify)	$2x = 72$
Step 2: divide both sides by 2	$\frac{2x}{2} = \frac{72}{2}$
(Simplify)	$x = 36$

3. $4 + \frac{x}{2} = 9$

Step 1: subtract 4 from both sides	$4 + \frac{x}{2} - 4 = 9 - 4$
(Group like terms/simplify)	$\frac{x}{2} = 5$
Step 2: multiply both sides by 2	$\frac{x}{2} \times 2 = 5 \times 2$
(Simplify)	$x = 10$

Math 9 **<u>Lesson 3.6 - Solving with Fractions</u>** Tripp

Suppose you have an expression like,

$$\mathbf{2(x+5)}$$

This means 2 multiplied by everything inside the brackets. In order to simplify expressions like this we will need to get rid of the brackets by applying the **distributive property** by multiplying onto everything inside the brackets.

$$\mathbf{2(x+5) = 2(x) + 2(5) = 2x + 10}$$

Examples:

1. $-3(x-4)$

$= (-3)(x) + (-3)(-4)$

$= -3x + 12$

2. $-2(x+\frac{1}{2})$

$= (-2)(x) + (-2)(\frac{1}{2})$

$= -2x - 1$

In order to solve equations with fractions, it is most effective to **"remove" or cancel out** the fractions from the equation using the distributive property!

$$4x - \frac{4}{5} = 8 \rightarrow 5\left(4x - \frac{4}{5}\right) = 5(8) \rightarrow 5(4x) - 5\left(\frac{4}{5}\right) = 40 \rightarrow 20x - 4 = 40 \rightarrow x = \frac{11}{5}$$

Examples:

1. $\frac{x}{9} + 2 = 7 \rightarrow 9\left(\frac{x}{9} + 2\right) = 9(7) \rightarrow 9\left(\frac{x}{9}\right) + 9(2) = 63 \rightarrow x + 18 = 63 \rightarrow x = 45$

2. $\frac{23}{6} + \frac{f}{3} = \frac{11}{8} \rightarrow 24\left(\frac{23}{6} + \frac{f}{3}\right) = 24\left(\frac{11}{8}\right) \rightarrow 24\left(\frac{23}{6}\right) + 24\left(\frac{f}{3}\right) = 33 \rightarrow$

$$92 + 8f = 33 \rightarrow 8f = 33 - 92 = -59 \rightarrow f = -\frac{59}{8}$$

3. $\frac{2x}{4} = \frac{15}{6} \rightarrow 12\left(\frac{2x}{4}\right) = 12\left(\frac{15}{6}\right) \rightarrow 6x = 30 \rightarrow x = \frac{30}{6} = 5$

Math 9 **<u>Lesson 3.7 – Solving with Brackets</u>** Tripp

We will need to simplify these equations before we can solve them. **Like terms** are expressions containing the same variables and exponents. We will need to combine **like terms** before solving.

Examples:

1. $6x - 9 - 2x = 19 \rightarrow 4x - 9 = 19 \rightarrow 4x = 28 \rightarrow x = 7$

2. $5x - 7 = 2x - 28 \rightarrow 5x - 2x = -28 + 7 \rightarrow 3x = -21 \rightarrow x = -7$

In these examples we will need to use the **distributive property** before solving the equations. We then should simplify each side, combine like terms, before applying the same operations to each side.

Examples:

1. $3(x - 1) = 15 \rightarrow (3)(x) + (3)(-1) = 15 \rightarrow 3x - 3 = 15 \rightarrow 3x = 18 \rightarrow x = 6$

2. $-2(x-3)=10 \rightarrow (-2)(x)+(-2)(-3)=10 \rightarrow -2x+6=10 \rightarrow -2x=4 \rightarrow x=-2$

3. $5(2x-3)=2(-2-3x)+5$

$(5)(2x)+(5)(-3)=(2)(-2)+(2)(-3x)+5$

$10x-15=-4-6x+5$

$16x=16$

$x=1$

Math 9 **Lesson 3.8 – Solving Applied** Tripp

Here are some tips to help you solve word problems involving linear equations:

- Read the question carefully and underline and interpret key words
- Define the variables you wish to use
- Translate the word problem into a mathematical statement
- Solve
- Verify into words of the problem
- Answer the question

Examples:

1. For her birthday, Brenda wanted to buy herself and her 5 friends a soft drink and a hamburger. She knows the soft drinks were $2.00 and total bill came to $30.00. How much did the hamburgers cost?

$2.00 per soft drink x 6 drinks (5 friends plus herself) = $12.00 for soft drinks

If the total bill was $30.00, then $30.00 – $12.00 = $18.00 accounted for the hamburgers.

Therefore, the hamburgers costed $18.00 in total, or $18.00/6 people = $3.00 each.

2. What number, when multiplied by 4, is 2 less than 10?

$$4x = 10 - 2$$

$$x = 2$$

3. Write out a real-world problem that could be represented by the following equation:

$$3x - 5 = 125$$

Answers may vary.