Name _____   Date _____

Writing and Solving Linear Equations

For each of the following problems, write an equation and solve.

1. Given a right triangle, find the measures of all the angles if one angle is a right angle and the measure of the second angle is six less than seven times the measure of the third angle.

2. In a triangle, the measure of the first angle is six times a number. The measure of the second angle is nine less than the first angle. The measure of the third angle is three times the number more than the measure of the first angle. Determine the measure of each angle.

For each of the following problems, write an equation and solve.

1. The measure of one angle is thirteen less than five times the measure of another angle. The sum of the measures of the two angles is $140°$. Determine the measure of each angles.

2. An angle measures seventeen more than three times a number. Its supplement is three more than seven times the number. What is the measure of each angle?

3. The angles of a triangle are described as follows: $\angle A$ is the largest angle; its measure is twice the measure of $\angle B$. The measure of $\angle C$ is 2 less than half the measure of $\angle B$. Find the measures of the three angles.

4. A pair of corresponding angles are described as follows: The measure of one angle is five less than seven times a number, and the measure of the other angle is eight more than seven times the number. Are the angles congruent? Why or why not?

5. The measure of one angle is eleven more than four times a number. Another angle is twice the first angle's measure. The sum of the measures of the angles is $195°$. What is the measure of each angle?

6. Three angles are described as follows: $\angle B$ is half the size of $\angle A$. The measure of $\angle C$ is equal to one less than two times the measure of $\angle B$. The sum of $\angle A$ and $\angle B$ is $114°$. Can the three angles form a triangle? Why or why not?

For each of the following problems, write an equation and solve.

1. Given a right triangle, find the measures of all of the angles if one angle is a right angle and the measure of a second angle is six less than seven times the measure of the third angle.

    Let x represent the measure of the third angle. Then, $7x - 6$ can represent the measure of the second angle. The sum of the two angles in the right triangles will be $90°$.

    $$7x - 6 + x = 90$$
    $$8x - 6 = 90$$
    $$8x - 6 + 6 = 90 + 6$$
    $$8x = 96$$
    $$\frac{8}{8}x = \frac{96}{8}$$
    $$x = 12$$

    The measure of the third angle is $12°$, and the measure of the second angle is $7(12°) - 6° = 84° - 6° = 78°$. The measure of the third angle is $90°$.

2. In a triangle, the measure of the first angle is six times a number. The measure of the second angle is nine less than the first angle. The measure of the third angle is three times the number more than the measure of the first angle. Determine the measure of each angle.

    Let x be the number. Then, the measure of the first angles is $6x$, the measure of the second angle is $6x - 9$, and the measure of the third angle is $3x + 6x$. The sum of the measures of the angles in a triangle is $180°$.

    $$6x + 6x - 9 + 3x + 6x = 180$$
    $$21x - 9 = 180$$
    $$21x - 9 + 9 = 180 + 9$$
    $$21x = 189$$
    $$\frac{21}{21}x = \frac{189}{21}$$
    $$x = 9$$

    The measure of the first angle is $6(9°) = 54°$. The measure of the second angle is $54° - 9° = 45°$. The measure of the third angle is $54° + 3(9°) = 54° + 27° = 81°$.

Note to teacher: There are several ways to solve problems like these. For example, a student may let x be the measure of the first angle and write the measure of the other angles accordingly. Either way, make sure that students are defining their symbols and correctly using the properties of equality to solve.

Students practice writing and solving linear equations.

For each of the following problems, write an equation and solve.

1. The measure of one angle is thirteen less than five times the measure of another angle. The sum of the measures of the two angles is $140°$. Determine the measure of each angles.

    Let x be the measure of the one angle. Then, the measure of the other angle is $5x - 13$.

    $$x + 5x - 13 = 140$$
    $$6x - 13 = 140$$
    $$6x - 13 + 13 = 140 + 13$$
    $$6x = 153$$
    $$x = 25.5$$

    The measure of one angle is $25.5°$, and the measure of the other angle is $140° - 25.5° = 114.5°$.

2. An angle measures seventeen more than three times a number. Its supplement is three more than seven times the number. What is the measure of each angle?

    Let x be the number. Then, the measure of one angle is $3x + 17$. The measure of the other angle is $7x + 3$. Since the angles are supplementary, the sum of their measures will be 180.

    $$3x + 17 + 7x + 3 = 180$$
    $$10x + 20 = 180$$
    $$10x + 20 - 20 = 180 - 20$$
    $$10x = 160$$
    $$x = 16$$

    The measure of one angle is $3(16°) + 17° = 65°$. The measure of the other angle is $180° - 65° = 115°$.

3. The angles of a triangle are described as follows: $\angle A$ is the largest angle; its measure is twice the measure of $\angle B$. The measure of $\angle C$ is 2 less than half the measure of $\angle B$. Find the measures of the three angles.

    Let x be the measure of $\angle B$. Then, the measure of $\angle A = 2x$, and $\angle C = \frac{x}{2} - 2$. The sum of the measures of the angles must be $180°$.

    $$x + 2x + \frac{x}{2} - 2 = 180$$
    $$3x + \frac{x}{2} - 2 + 2 = 180 + 2$$
    $$3x + \frac{x}{2} = 182$$
    $$\frac{6x}{2} + \frac{x}{2} = 182$$
    $$\frac{7x}{2} = 182$$
    $$7x = 364$$
    $$x = 52$$

    The measures of the angles are as follows: $\angle A = 104°$, $\angle B = 52°$, and $\angle C = \frac{52°}{2} - 2° = 26° - 2° = 24°$.

4. A pair of corresponding angles are described as follows: The measure of one angle is five less than seven times a number, and the measure of the other angle is eight more than seven times the number. Are the angles congruent? Why or why not?

Let x be the number. Then, the measure of one angle is $7x - 5$, and the measure of the other angle is $7x + 8$. Assume they are congruent, which means their measures are equal.

$$7x - 5 = 7x + 8$$
$$7x - 7x - 5 = 7x - 7x + 8$$
$$-5 \neq 8$$

Since $-5 \neq 8$, the angles are not congruent.

5. The measure of one angle is eleven more than four times a number. Another angle is twice the first angle's measure. The sum of the measures of the angles is $195°$. What is the measure of each angle?

Let x be the number. The measure of one angle can be represented with $4x + 11$, and the other angle's measure can be represented as $2(4x + 11) = 8x + 22$.

$$4x + 11 + 8x + 22 = 195$$
$$12x + 33 = 195$$
$$12x + 33 - 33 = 195 - 33$$
$$12x = 162$$
$$x = 13.5$$

The measure of one angle is $4(13.5°) + 11° = 54° + 11° = 65°$, and the measure of the other angle is $130°$.

6. Three angles are described as follows: $\angle B$ is half the size of $\angle A$. The measure of $\angle C$ is equal to one less than two times the measure of $\angle B$. The sum of $\angle A$ and $\angle B$ is $114°$. Can the three angles form a triangle? Why or why not?

Let x represent the measure of $\angle A$. Then, the measure of $\angle B = \frac{x}{2}$, and the measure of $\angle C = 2\left(\frac{x}{2}\right) - 1 = x - 1$.

The sum of $\angle A + \angle B = 114$.

$$x + \frac{x}{2} = 114$$
$$\frac{3x}{2} = 114$$
$$3x = 228$$
$$x = 76$$

The measure of $\angle A = 76°$, $\angle B = \frac{76°}{2} = 38°$, and $\angle C = 75°$. The sum of the three angles is $76° + 38° + 75° = 189°$. Since the sum of the measures of the interior angles of a triangle must have a sum of $180°$, these angles do not form a triangle. The sum is too large.