Names: _____ _____ _____

**Activity #3: Compound Equations (Solutions)** **College Algebra**

1. Find all solutions of the following inequality.

$$|2x - 7| + 13 \leq 16$$

**Solution:** First, solve for the absolute value expression by subtracting 13 from both sides.

$$|2x - 7| \leq 3.$$

This is an absolute value inequality of the form "absolute value less than", so we can now rewrite as a compound inequality as follows.

$$2x - 7 \leq 3 \quad \text{AND} \quad 2x - 7 \geq -3.$$

Solving each of these for $x$, we have

$$2 \leq x \quad \text{AND} \quad x \leq 5.$$

In interval notation, the solution is $\boxed{[2, 5]}$.

2. Find all solutions of the following inequality.

$$|2x + 4| + 8 \geq 26$$

**Solution:** First, solve for the absolute value expression by subtracting 8 from both sides.

$$|2x + 4| \geq 18.$$

This is an absolute value inequality of the form "absolute value greater than", so we can now rewrite as a compound inequality as follows.

$$2x + 4 \geq 18 \quad \text{OR} \quad 2x + 4 \leq -18.$$

Solving each of these for $x$, we have

$$x \leq -11 \quad \text{OR} \quad 7 \leq x.$$

In interval notation, the solution is $\boxed{(-\infty, -11] \cup [7, \infty)}$.

3. Find all solutions of the following inequality.

$$2|5x + 4| + 14 < 28$$

**Solution:** First, solve for the absolute value expression by subtracting 14 from both sides and then dividing by 2.

$$|5x + 4| < 7.$$

This is an absolute value inequality of the form "absolute value less than", so we can now rewrite as a compound inequality as follows.

$$5x + 4 < 7 \quad \text{AND} \quad 5x + 4 > -7.$$

Solving each of these for $x$, we have

$$-11/5 \leq x \quad \text{AND} \quad x \leq 3/5.$$

In interval notation, the solution is $\boxed{(-11/5, 3/5)}$.

4. Find all solutions of the following inequality.

$$2|5x - 1| + 11 > 30$$

**Solution:** First, solve for the absolute value expression by subtracting 11 from both sides and then dividing by 2.

$$|5x - 1| > 19/2.$$

This is an absolute value inequality of the form "absolute value greater than", so we can now rewrite as a compound inequality as follows.

$$5x - 1 > 19/2 \quad \text{OR} \quad 5x - 1 < -19/2.$$

Solving each of these for $x$, we have

$$x < -17/10 \quad \text{OR} \quad 21/10 < x.$$

In interval notation, the solution is $\boxed{(-\infty, -17/10) \cup (21/10, \infty)}$.

5. Find all solutions of the following inequality.

$$|-5x + 1| + 15 \leq 21$$

**Solution:** First, solve for the absolute value expression by subtracting 15 from both sides.

$$|-5x + 1| \leq 6.$$

This is an absolute value inequality of the form "absolute value less than", so we can now rewrite as a compound inequality as follows.

$$-5x + 1 \leq 6 \quad \text{AND} \quad -5x + 1 \geq -6.$$

Solving each of these for $x$, we have

$$7/5 \geq x \quad \text{AND} \quad x \geq -1.$$

(Remember to change the direction of the inequality when dividing by -5!) In interval notation, the solution is $\boxed{[-1, 7/5]}$.

6. Find all solutions of the following inequality.

$$|-2x + 8| + 9 \geq 23$$

**Solution:** First, solve for the absolute value expression by subtracting 9 from both sides.

$$|-2x + 8| \geq 14.$$

This is an absolute value inequality of the form "absolute value greater than", so we can now rewrite as a compound inequality as follows.

$$-2x + 8 \geq 14 \quad \text{OR} \quad -2x + 8 \leq -14.$$

Solving each of these for $x$, we have

$$x \geq 11 \quad \text{OR} \quad -3 \geq x.$$

(Remember to change the direction of the inequality when dividing by -2!) In interval notation, the solution is $\boxed{(-\infty, -3] \cup [11, \infty)}$.