Inequalities and you 1 Solutions NAME:

This worksheet will provide practice for solving and interpreting inequalities. We will first investigate the general rules for algebraically solving inequalities. We will then solve a few problems algebraically.

1. Show that if you multiply or divide an inequality by a **negative** number, you have to change the sign. (Hint: Perhaps you want to start with a true inequality like 7 > 2. Pick any negative number and multiply both sides of the inequality by it. Indicate where the sign must be changed. Also, do the same for division.)

$$7 > 2$$
$$-2*7 \overset{?}{\underset{?}{>}} -2*2$$
$$-14 \overset{?}{\underset{?}{>}} -4$$
$$-14 < -4$$

Notice the inequality became false when we multiplied or divided by a negative. So we switch the sign.

$$7 > 2$$
$$\frac{7}{-2} \overset{?}{\underset{?}{>}} \frac{2}{-2}$$
$$-3.5 \overset{?}{\underset{?}{>}} -1$$
$$-3.5 < -1$$

2. Show that if you multiply or divide an inequality by a **positive** number, you do **not** have to change the sign. (Hint: Perhaps you want to start with a true inequality like 7 > 2. Pick any positive number and multiply both sides of the inequality by it. Notice the sign does **not** need to be changed. Also, do the same for division.)

$$7 > 2$$
$$2*7 \overset{?}{\underset{?}{>}} 2*2$$
$$14 \overset{?}{\underset{?}{>}} 4$$
$$14 > 4$$

Notice the inequality remained true when we multiplied or divided by a positive. So we do not switch the sign.

$$7 > 2$$
$$\frac{7}{2} \overset{?}{\underset{?}{>}} \frac{2}{2}$$
$$3.5 \overset{?}{\underset{?}{>}} 1$$
$$3.5 > 1$$

3. Below is a possible solution to the inequality $-3(x+2) \le 8$. What, if anything, is wrong with it?

$$-3(x+2) \le 8$$
$$-3x - 6 \le 8$$
$$-3x \le 14$$
$$x \le -4.67$$

To get from the third line to the fourth, they divided by -3. They should have switched the sign. It should read $x \ge -4.67$.

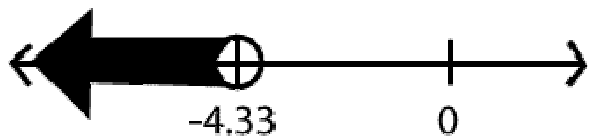
4. Solve the inequality below. Round to two decimal places where applicable. Write your solution in inequality notation, interval notation, and graph your solution on the real number line.

$-6x+4>30$

$$-6x+4>30$$
$$-6x>26$$
$$x<\frac{26}{-6}$$
$$x<-4.33$$

Switch the sign when we divide by -6.

Interval notation: $(-\infty, -4.33)$



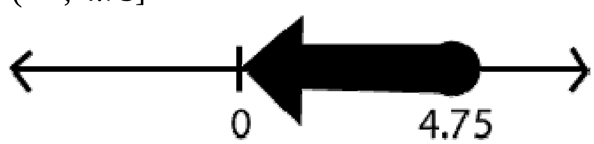
5. Solve the inequality below. Round to two decimal places where applicable. Write your solution in inequality notation, interval notation, and graph your solution on the real number line.

$2(4x-7)\le 24$

$$2(4x-7)\le 24$$
$$4x-7\le 12$$
$$4x\le 19$$
$$x\le 4.75$$

We did not divide or multiply by a negative. So we do not switch the sign.

Interval notation: $(-\infty, 4.75]$



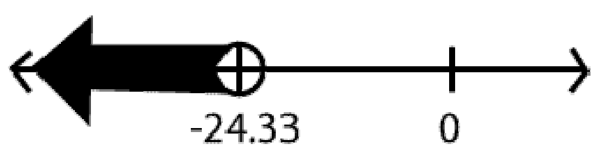
6. Solve the inequality below. Round to two decimal places where applicable. Write your solution in inequality notation, interval notation, and graph your solution on the real number line.

$-3x-9>64$

$$-3x-9>64$$
$$-3x>73$$
$$x<-24.33$$

Switch the sign when we divide by -3.

Interval notation: $(-\infty, -24.33)$



7. Solve the inequality below. Round to two decimal places where applicable. Write your solution in inequality notation, interval notation, and graph your solution on the real number line.

$$-4 \le \frac{3x+8}{2} < 10$$

(Hint: This is a double inequality. You can solve it by solving $-4 \le \frac{3x+8}{2}$ and $\frac{3x+8}{2} < 10$ and then combining the solutions. You will find the same operations are used in solving $-4 \le \frac{3x+8}{2} < 10$ as a double inequality.)

$-4 \le \frac{3x+8}{2} < 10$

$-8 \le 3x+8 < 20$

$-16 \le 3x < 12$

$-16/3 \le x < 12/3$

$-5.33 \le x < 4$

Interval notation: $[-5.33, 4)$

8. Solve the inequality below. Round to two decimal places where applicable. Write your solution in inequality notation, interval notation, and graph your solution on the real number line.

$\underline{0 > 6x+7 > -3}$

$0 > 6x+7 > -3$

$-7 > 6x > -10$

$-1.17 > x > -1.67$

$-1.67 < x < -1.17$

Interval notation: (-1.67, -1.17)

Here, I switched the inequality around so that the smaller number was first. This just helps me visualize the interval better. It is not necessary. It has nothing to do with division or multiplication by a negative. It's like writing 6 < 10 instead of 10 > 6.