

## Section 1.2 Solving Inequalities

For any two real numbers  $a$  and  $b$  there is exactly one of the following statements that is true.

$$a < b \quad a = b \quad a > b$$

Properties of inequality

1. Addition

$$\begin{array}{r} x - 4 < 6 \\ + 4 \quad + 4 \\ \hline x < 10 \end{array}$$

2. Subtraction.

$$\begin{array}{r} x + 2 > 7 \\ - 2 \quad - 2 \\ \hline x > 5 \end{array}$$

solve and graph the solution on a number line  
and write the solution is **Set Notation**.

$$x + 4 \leq 10$$

$$\{x \mid x \leq 6\} \quad \{x \mid x \leq 6\}$$

$$7x - 5 > 6x + 4$$

$$-6x \quad -6x$$

$$x - 5 > 4$$

$$\{x \mid x > 9\}$$

$$11x - 3 \geq 8x + 6$$

$$3x - 3 \geq 6$$

$$\frac{3x}{3} \geq \frac{9}{3}$$

$$\{x \mid x \geq 3\}$$

Investigate multiplication and division properties.

If you multiply the same number to both sides of the inequality is the inequality still true?

positive

$$2 \cdot 5 < 7 \cdot 2 \quad 2 \cdot 5 < 7 \cdot 2$$

$$10 < 14$$

negative

$$5 > 7 \quad 5 > 7 \cdot -2$$

$$-10 < -14$$

flip the sign

$$-10 > -14$$

### 3. Multiplication

If you multiply or divide by a negative number, then you need to flip the inequality sign.

### 4. Division

Solve, graph the solution and write in set notation.

$$\begin{aligned} -3x &< 9 \\ \frac{-3x}{-3} &< \frac{9}{-3} \\ \{x \mid x > -3\} \end{aligned}$$

$$\begin{aligned} \frac{x}{-4} &\geq 6 \cdot -4 \\ \{x \mid x \leq -24\} \end{aligned}$$

$$\begin{aligned} -5x + 2 &> 12 \\ -5x &> 10 \\ \frac{-5x}{-5} &> \frac{10}{-5} \\ \{x \mid x < -2\} \end{aligned}$$

$$\begin{aligned} 6 - 4x &\leq 2x - 16 \\ -6 - 6x &\leq -16 \\ -6 - 6x + 6 &\leq -16 + 6 \\ -6x &\leq -10 \\ \frac{-6x}{-6} &\leq \frac{-10}{-6} \\ \frac{1}{3} &\leq x \\ \{x \mid x \geq \frac{1}{3}\} \end{aligned}$$

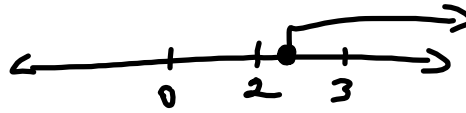
Solve

~~$$\frac{4x-3}{2} \geq 3 \cdot 2$$~~

$$4x - 3 \geq 6$$

$$\frac{4x}{4} \geq \frac{9}{4}$$

$$\{x \mid x \geq \frac{9}{4}\}$$



~~$$\frac{2}{3}x - \frac{1}{4} \leq \frac{1}{2}x + 3 \cdot 12$$~~

$$8x - 3 \leq 6x + 36$$

$$\frac{2}{2}x \leq \frac{39}{2} \quad \{x \mid x \leq \frac{39}{2}\}$$



$$4x - 5(x-3) > 3(x+1) - 4$$

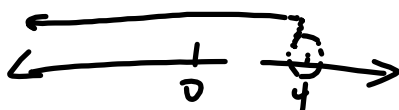
$$4x - 5x + 15 > 3x + 3 - 4$$

$$-x + 15 > 3x - 1$$

$$-3x - 4x + 15 > -15$$

$$\frac{-4x}{-4} > \frac{-16}{-4}$$

$$\{x \mid x < 4\}$$



$$x < 4$$

Writing inequalities algebraically from word problem.

1. Twelve less than the product of three and a number is less than 21.

$$3x - 12 < 21$$

2. The quotient of three times a number and 4 is at least -16.

$$\frac{3x}{4} \geq -16$$

3. The difference of 5 times a number and 6 is greater than the number.

$$5x - 6 > x$$

4. the quotient of the sum of 3 and a number and 6 is less than -2.

$$\frac{3+x}{6} < -2$$