**2.5 Linear Inequalities and Interval Notation**

**linear inequality** – any inequality that can be written in one of the following forms:

$Ax+B>0$, $Ax+B\geq 0$, $Ax+B<0$, $Ax+B\leq 0$, $Ax+B\ne 0$

*Examples:* $x>2$*,* $2x\geq 6$*,* $x+1<4$*,* $\frac{3}{2}x-3\leq 0$*,* $x\ne 1$

**To solve an inequality** means to find .......................................... satisfying the inequality.

The set of such values is called .............................................. .

**Solution sets** can be graphed on a number line and recorded in **interval notation**, as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **inequality** | **graph**  | **set-builder notation** | **interval notation** |
| $$2x\geq 6$$ |  3 | $$\left\{x\geq 3\right\}$$ | $$\left[3,\infty )\right.$$ |
| $$-x>1$$ |  $ -$1 |  | $$\left(-\infty ,-1\right)$$ |
|  |  5 |  |  |
|  |  |  | $$\left(-\infty ,\left.-4\right]\right.$$ |
| $$x\geq x$$ |  |  |  |
|  |  | $$\left\{x\ne 3\right\}$$ |  |

*Recall:* Solve inequalities the same way as equations, except when **multiplying or** **dividing by a negative** number, **reverse** the inequality sign.

*Example 1:* Solve, graph, and state your answer in interval notation.

a) $2\left(6-x\right)<6x+1$ b) $\frac{1}{3}\left(2x+5\right)-6\geq -\frac{1}{4}\left(12x-8\right)$

**Simultaneous Inequalities:**

To state that ***x*** is between two numbers, say between 2 and 3, we write $2<x<3 $.

This really means that $2<x$ **and** $x<3$.

To solve simultaneous inequalities, apply the needed operations to **all three parts** of the inequality.

*Example 2:* Solve.

a) $2\leq 1-3x<5$ b) $-1<\frac{2x+5}{4}\leq 3$

*Example 3:* Write appropriate inequality and solve.

a) Double a number increased by 1 is between 2 and 8.

b) If 5 is subtracted from a number, then the result is at least 7.

*Example 4:* After a serious automobile accident, most insurance companies will replace the damaged car with a new one if repair costs exceed 80% of the “blue-book” value of the car. John’s car recently sustained $9200 worth of damage but was not replaced. What can we say about the blue-book value of his car?

*Example 5:*

Toni can be paid in one of two ways:

*Plan A:* A salary of $400 per month plus a commission of 8% of gross sales;

*Plan B:* A salary of $610 per month plus a commission of 5% of gross sales.

For what amount of gross sales should Toni select plan A?