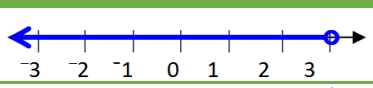
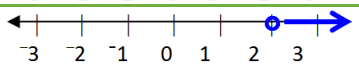
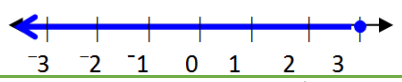
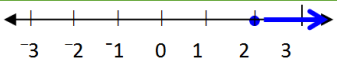
# Solving Inequalities Using Addition or Subtraction

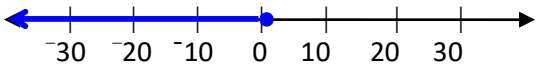
An **inequality** is a statement formed by placing an inequality symbol between two expressions. For example, $y + 5 \leq -6$ is an inequality.

The **solution of an inequality** with a variable is the set of all numbers that produce true statements when substituted for the variable. You can show the solution of an inequality by graphing the inequality on a number line. When you graph an inequality of the form $x > a$ or $x < a$, use an open circle at $a$. When you graph an inequality of the form $x \geq a$ or $x \leq a$, use a closed circle at $a$.

| Inequality | Words | Graph |
|---|---|---|
| $x < 3$ | All numbers less than 3 |  |
| $y > 2$ | All numbers greater than 2 |  |
| $z \leq 3$ | All numbers less than or equal to 3 |  |
| $n \geq 2$ | All numbers greater than or equal to 2. |  |

The freezing point of water is 0°C. At temperatures at or below the freezing point, water is a solid (ice). Write an inequality that gives the temperatures at which water is a solid. Then graph the inequality. Let $t$ represent the temperature of water. Water is a solid at temperatures less than or equal to 0°C.

The inequality is $t \leq 0$. The graph is shown below.



**Solving Inequalities** You can use the following properties to find solutions of inequalities involving addition and subtraction. Using these properties, you can write equivalent inequalities. **Equivalent inequalities** are inequalities that have the same solution.

**Addition and Subtraction Properties of Inequality**

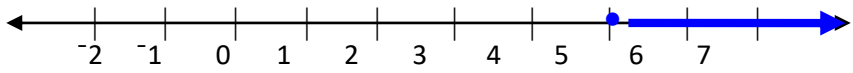
**Words:** Adding or subtracting the same number on each side of an inequality produces an equivalent inequality.

**Algebra:** If $a < b$, then $a + c < b + c$ and $a - c < b - c$.
If $a > b$, then $a + c > b + c$ and $a - c > b - c$.

Example 1: **Solve $m + 5 \geq 10$. Graph and check your solution.**

| | |
|---|---|
| $m + 5 \geq 10$ | Write original inequality. |
| $m + 5 - 5 \geq 10 - 5$ | Subtract 5 from each side. |
| $m \geq 5$ | Simplify. |

The solution is $m \geq 5$.




**Check** Choose any number greater than or equal to 5.

Substitute the number into the original inequality.

| | |
|---|---|
| $m + 5 \geq 10$ | Write original inequality. |
| $8 + 5 \geq 10$ | Substitute 8 for $m$. |
| $13 \geq 10$ √ | Solution checks. |