MHF 4U

LINEAR INEQUALITIES

Algebraic ***inequalities*** replace "**=**" in an equation with either $\leq$, $\geq$, <, or >.

An equation such as $4x - 3 = -11$ becomes an inequality as follows: $4x - 3 > -11$.

A **linear inequality** is similar to a linear equation, that is, the **degree of the inequality is 1**.

To solve a linear **inequality** using algebra is similar to solving a linear **equation** with one exception***. If, in the process of solving the inequality, division (or multiplication) by a negative number is applied, the direction of the inequality symbol must change.***

The ***SOLUTION TO AN INEQUALITY*** is always in terms of the ***INDEPENDENT VARIABLE***.

EXAMPLES:

① **Solve** $\boldsymbol{4x - 3 > -11}$**.**

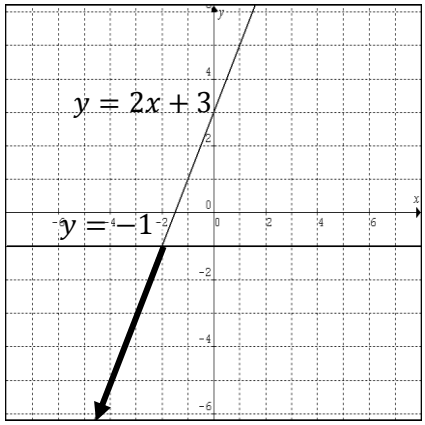
$4x > -11 + 3$
$x > -8/4$
$x > -2$
$x \in (-2, \infty)$

② **Solve** $\boldsymbol{3(3 - n) \geq 4(n - 3)}$

$9 - 3n \geq 4n - 12$
$-7n \geq -21$
$n \leq 3$
$x \in (-\infty, 3]$

The solution set to a linear inequality can be determined by **GRAPHING**.

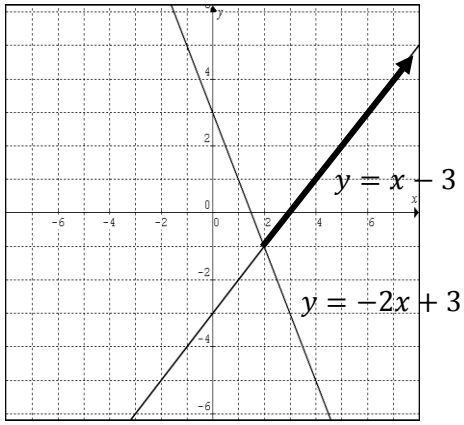
③ **Solve** $\boldsymbol{2x + 3 < -1}$ **by graph.**



Solution: $x \in (-\infty, -2)$

NOTE: round bracket due to **<**

④ **Solve** $\boldsymbol{x - 3 \geq -2x + 3}$ **by graph.**



Solution: $x \in [2, \infty)$

NOTE: square bracket due to **=**

SOLVING A DOUBLE INEQUALITY:

⑤ **Solve** $-\mathbf{4} < -2\boldsymbol{x} + \mathbf{6} < 2.$ ⟶ Apply opposite operations to both sides of the inequality.

$-4 - 6 < -2x < 2 - 6$

$-10 < -2x < -4$

$\frac{-10}{-2} > x > \frac{-4}{-2}$ ⟶ Notice symbols change direction due to division by a negative.

$5 > x > 2$

interval notation: _____

absolute value notation: _____

⑥ **Solve** $-\mathbf{2} \leq \mathbf{3}\boldsymbol{x} + \mathbf{4} \leq \mathbf{22}$

$-2 - 4 \leq 3x \leq 22 - 4$

$-6 \leq 3x \leq 18$

$-2 \leq x \leq 6$

interval notation: _____

absolute value notation: _____