SOLVING INEQUALITIES

To **solve an inequality in one variable,** first change it to an equation and solve. Place the solution, called a "boundary point," on a number line. This point separates the number line into two regions. The boundary point is included in (≥ or ≤ shown by a solid dot) or excluded from (> or < shown by an open dot) the solution depending on the inequality sign. Next, choose a number from each region and check if it is true or false in the original inequality. If it is true, then every number in that region is a solution to the inequality. If it is false, then no number in that region is a solution to the inequality. See the Math Notes box on page 386.

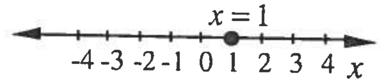
Example 1

Solve $3x-(x+2)\geq 0$

Change to an equation and solve.

$$3x-(x+2)=0$$
$$3x-x-2=0$$
$$+2 \quad +2$$
$$2x=2$$
$$x=1$$

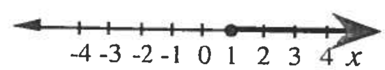
Place the solution (boundary point) on the number line. Because $x=1$ is also a solution to the inequality ($\geq$), we use a solid dot.



Test a number from each side of the boundary point in the original inequality.

Test $x=0$	Test $x=3$
$3\cdot 0-(0+2)\geq 0$	$3\cdot 3-(3+2)\geq 0$
$-2\geq 0$	$4\geq 0$
False	True

The solution is: $x\geq 1$.



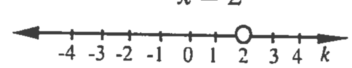
Example 2

Solve: $-x+6>x+2$

Change to an equation and solve.

$$-x+6=x+2$$
$$-x \quad -6 \quad -x \quad -6$$
$$-2x=-4$$
$$x=2$$

Place the solution (boundary point) on the number line. Because the original problem is a strict inequality (>), $x=2$ is not a solution, so we use an open dot.



Test a number from each side of the boundary point in the original inequality.

Test $x=0$	Test $x=4$
$-0+6>0+2$	$-4+6>4+2$
$6>2$	$2>6$
True	False

The solution is: $x<2$.

Solving Inequalities Notes

A linear inequality is similar to an equation but differs in the fact that while an equation has one solution that will make the equation true, an inequality has many solutions that are true. The solution of an inequality can be represented algebraically and graphically. The graph of a linear inequality with one variable is the set of point on a number line that represent all solutions of that inequality.

Less Than	$<$	**Open circle**
Less than or equal to	$\leq$	**Closed circle**
Greater than	$>$	**Open circle**
Greater than or equal to	$\geq$	**Closed circle**

When graphing the solution to an inequality on a number line the use of open and closed circles indicates whether or not the value is included in the solution set. An **open circle** indicates the value is not included in the solution. A **closed circle** indicates that the value is included in the solution.

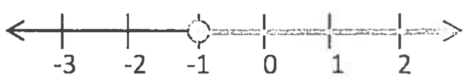
Solving & Graphing

Ex1) $2x + 5 \geq 3$

$\quad -5 \quad -5$

$2x \geq -2$

$x \geq -1$



Ex2) $-2 > n - 4$

$\quad +4 \quad +4$

$2 > n$

$n < 2$

*When the variable is on the right of the inequality, read the solution from the variable OR switch the solution around so the variable is on the left of the inequality

Multiplying & Dividing by a Negative

Ex3) $-2x - 5 < 7$

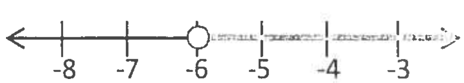
$\quad +5 \quad +5$

$-2x < 12$

$\dfrac{-2x}{-2} < \dfrac{12}{-2}$

NOTE: The sign switched!

$x > -6$



Ex4) $-3 \geq -2x - 1$

$\quad +1 \quad +1$

$-2 \geq -2x$

$\dfrac{-2}{-2} \geq \dfrac{-2x}{-2}$

$1 \leq x$ OR $x \geq 1$