

Inequalities are an algebraic expression describing a simple numerical relationship between the left and right hand sides of the *inequality symbol*.

- < Less than
- ≤ Less than or equal
- > Greater than
- ≥ Greater than or equal

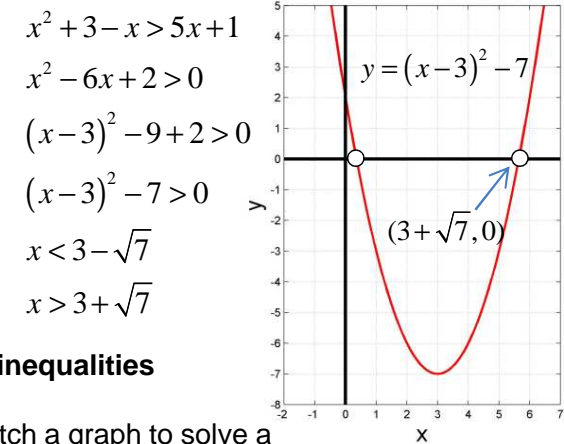
- $x^2 + x - 3 < 2x + 10$ Means the left hand side of the < symbol is LESS THAN the right hand side
- $x - 4 \leq 5x + 1$ Means the left hand side of the ≤ symbol is LESS THAN OR EQUAL TO the right hand side
- $x^2 + 3 - x > 5x + 1$ Means the left hand side of the > symbol is GREATER THAN the right hand side
- $x - 3 \geq 9x - 2$ Means the left hand side of the ≥ symbol is GREATER THAN OR EQUAL TO the right hand side

We can 'solve' an inequality in the same way as we can solve an *equation*, i.e. an algebraic expression connecting left and right sides with an = sign, by rearranging, factorizing etc...

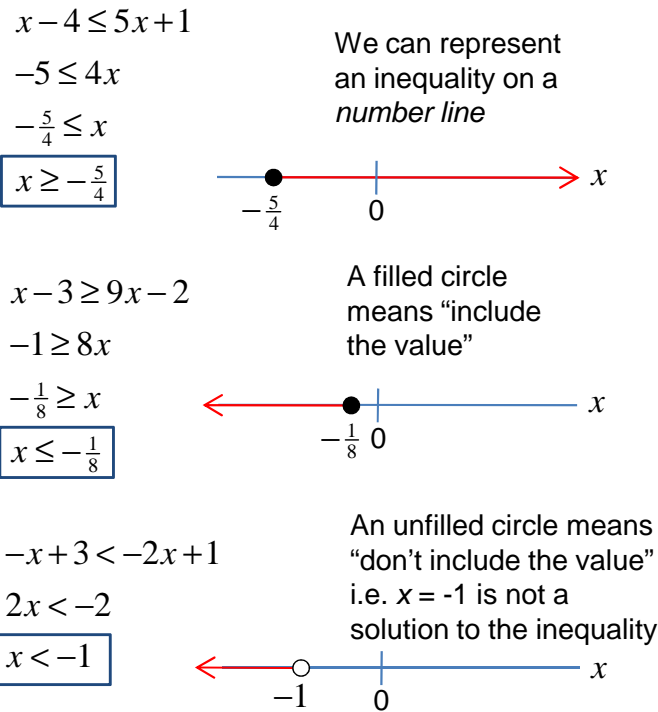
BUT WITH AN IMPORTANT DIFFERENCE: If you multiply both sides of an inequality by a negative, you reverse the direction of the inequality symbol.

$-12 < -4$ $-x + 3 < -2x + 1$

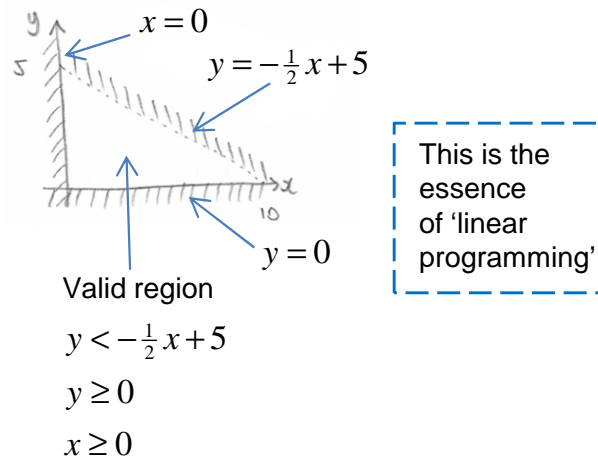
$12 > 4$ $x - 3 > 2x - 1$



Linear inequalities & number lines



Linear inequalities & graphs



Inequalities relating x and y can describe *regions* of a graph.

Shade the regions where the inequality is *invalid*.

A *dotted* line means *don't include the line* (i.e. > or <)
 A *solid* line means *include the line* in the valid region.

Quadratic inequalities

Always sketch a graph to solve a quadratic inequality.

