INEQUALITIES

Inequalities make comparisons between two numbers or expressions and contain the following symbols

< > ≤ ≥

Check that you:

- **understand the symbols**

  < less than ≤ less than or equal to

  > more than ≥ more than or equal to

- **solve linear equations**

e.g. $3x - 7 = 17$ $\quad$ $5(x + 3) = 35$

$3x = 24$ $\quad$ $5x + 15 = 35$

$x = 8$ $\quad$ $5x = 20$

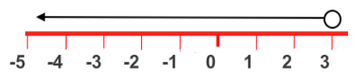
$x = 4$

- **draw straight line graphs knowing the equation of the line**

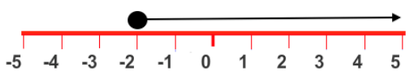
Representing inequalities on a number line

● A filed in circle is used if the sign includes 'equal to'

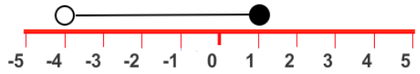
○ An empty circle is used if the sign does not include 'equal to'.



$x < 3$



$x \geq -2$



$-4 < x \leq 1$

Solving inequalities The method for solving inequalities is the same method for solving equations. The only difference is the use of the symbols <, ≤, > and ≥ and not the symbol =.

Simple linear inequalities

e.g. Solve $7x + 3 \leq 38$

-3 from both sides $\quad 7x \leq 35$

÷7 on both sides $\quad x \leq 5$

Double inequalities

e.g. Solve $-8 \leq 3x - 2 < 19$

+ 2 to all parts $\quad -6 \leq 3x < 21$

÷3 for all parts $\quad -2 \leq x < 7$

Inequalities with brackets

e.g. Solve $4(x - 5) \geq 24$

expand the brackets $\quad 4x - 20 \geq 24$

+20 to both sides $\quad 4x \geq 44$

÷4 on both sides $\quad x \geq 11$

Inequalities with unknowns on both sides

e.g. Solve $10x + 3 < 8x - 19$

$-8x$ from both sides $\quad 2x + 3 < -19$

-3 from both sides $\quad 2x < -22$

÷2 on both sides $\quad x < -11$

Inequalities with unknowns and brackets on both sides

e.g. a) Solve $6(x - 4) > 3(x + 7)$

expand the brackets $\quad 6x - 24 > 3x + 21$

$-3x$ from both sides $\quad 3x - 24 > 21$

+24 to both sides $\quad 3x > 45$

÷3 on both sides $\quad x > 15$

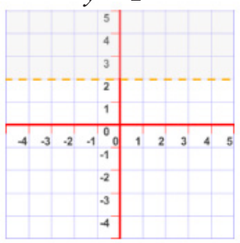
Be prepared to show your answer on a number line or to give the lowest/highest whole number that is true for the inequality.

Graphs of inequalities Representing an inequality on a graph is very similar to representing an equation on a graph. We plot a straight line but then we shade the region which satisfies the inequality.

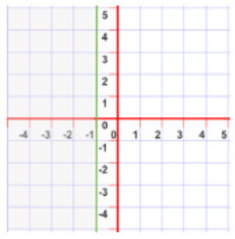
- A dashed line is used for an inequality containing < and >
- A solid line is used for an inequality containing ≤ and ≥

Shading the correct region Some examples are given below

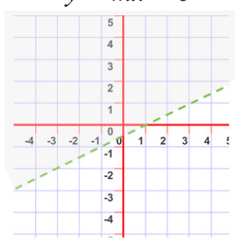
$y > 2$



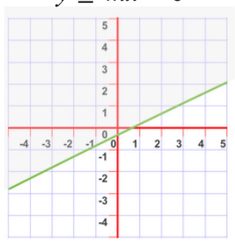
$x \leq -1$



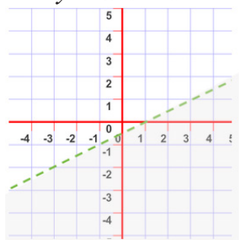
$y > mx + c$



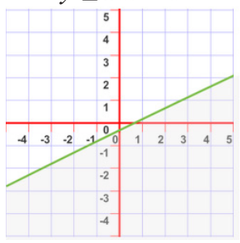
$y \geq mx + c$



$y < mx + c$



$y \leq mx + c$

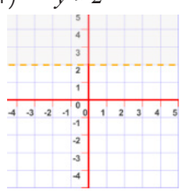


E.g 1) Draw the region which satisfies the inequalities

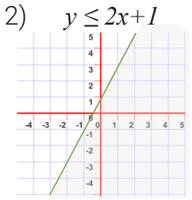
$y > 2$ and

$y \leq 2x + 1$

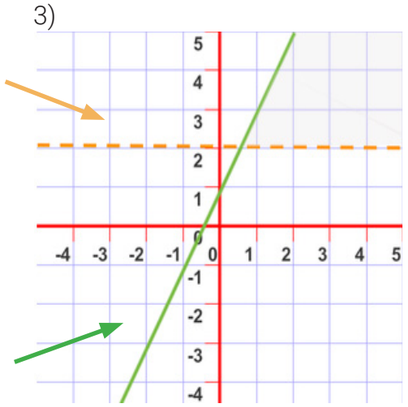
1) $y > 2$



2) $y \leq 2x + 1$



3)



1) Draw the line $y = 2$ using a dashed line and consider the region that satisfies $y > 2$ (above the line).

2) Draw the line $y = 2x + 1$ using a solid line and consider the region that satisfies $y \leq 2x + 1$ (below the line).

3) Shade in the region which satisfies **both** inequalities.

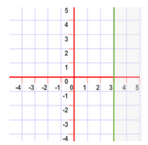
E.g 2) Draw the region which satisfies the inequalities

$x \geq 3$

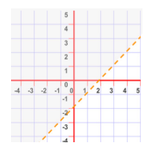
$y > x - 2$ and

$y \leq 3x + 2$

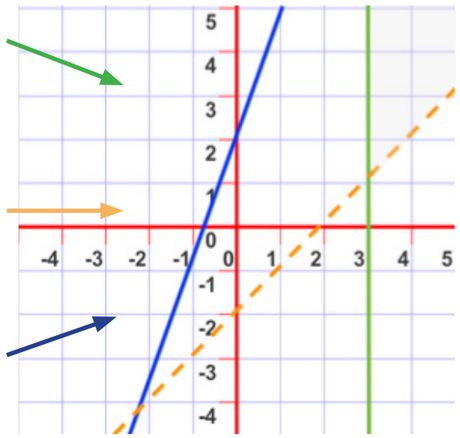
$x \geq 3$



$y > x - 2$



$y \leq 3x + 2$



1) Draw the line $x = 3$ using a solid line and consider the region that satisfies $x \geq 3$ (to the right of the line).

2) Draw the line $y = x - 2$ using a dashed line and consider the region that satisfies $y > x - 2$ (above the line).

3) Draw the line $y = 3x + 2$ using a solid line and consider the region that satisfies $y \leq 3x + 2$ (below the line).

4) Shade in the region which satisfies **all three** inequalities.

Be prepared to rearrange the equation of the line being used if it's not in the form $y = mx + c$.

Check that you have shaded the correct region by choosing a point within that region and seeing if the coordinates satisfy (are true for) all of the inequalities.