14 - Equations and Inequalities

Solving simultaneous equations

Co-effecient Elimination

1. Look to see which (x or y) has the same coefficient

If they do not have the same co-efficient, multiply/divide the equation accordingly to get the same

2. Eliminate x or y by - or + everything in the 2 equations
3. Solve to find one value
4. Substitute x or y into the equation to find the other value

1. $3x + 2y = 18$
   $-2x - y = 5$
   x2
2. $3x + 2y = 18$
   $+ \quad 4x - 2y = 10$
   $7x = 28$ $\quad 28 \div 7$
3. $x = 4$
4. $3(4) + 2y = 18$
   $2y = 6$
   $y = 3$

Substitution

1. Re-arrange formula to create a formula for the value (y or x) that has the same co-efficient
2. Substitute this new formula into the equation, replacing y/x
3. Solve to find the other value
4. Substitute into the original equation to find 1st value

1. $6x + y = 15$
   $4x + y = 11$
   $y = 15 - 6x$
2. $6x + (15 - 6x) = 15$
   $4x + (15 - 6x) = 11$
3. $x = 2$
4. $6(2) + y = 15$ $\quad y = 3$
   $4(2) + y = 11$

Inequalities

e.g. $x^2 - 49$

1. Move to one side — $x^2 - 49 > 0$
2. Factorise — $(x + 7)(x - 7) > 0$
3. Locate B and S (Biggest and Smallest) — $B = 7, S = -7$
4. Because $> 0 \longrightarrow x > B, x < S$ — $x > 7, x < -7$

$< 0 \longrightarrow S < x < B$ (1 equation)

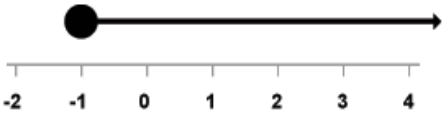
$> 0 \longrightarrow x > B, \; x < S$ (2 separate answers)

- When you multiply by a **negative** number, you must **flip** the inequality

e.g. $3 < 9 \quad x{-3}$
$= \quad -9 > -27$

$=$ — equal to
$<$ — less than
$>$ — more than
$\approx$ — approx

$\leq$ — less than or equal to
$\geq$ — more than or equal to
$\neq$ — not equal to



Symbol	Meaning	Closed or Open Circle
<	Less Than	Open ○
>	Greater Than	Open ○
≤	Less Than or Equal to	Closed ●
≥	Greater Than or Equal to	Closed ●

Plotting Inequalities

- Use cover up method to plot line

**When using cover up, x and y must be on the same side of the equation. One must be replaced with 0 to create a new equation and co-ordinates of (0,y) and (x,0)*

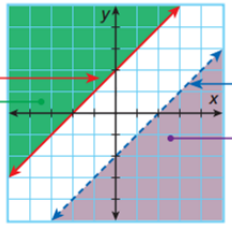
- Use random co-ordinates to work out the area to shade, by applying them into the inequality

e.g. (2,2) into $y \leq 2x + 1$

(2,2) — $2 \leq 4 + 1$

When the inequality is written as $y \leq$ or $y \geq$, the points on the boundary line are solutions of the inequality, and the line is **solid**.

When the inequality is written as $y <$ or $y >$, the points on the boundary line are not solutions of the inequality, and the line is **dashed**.



When the inequality is written as $y >$ or $y \geq$, the points **above** the boundary line are solutions of the inequality.

When the inequality is written as $y <$ or $y \leq$, the points **below** the boundary line are solutions of the inequality.