SIMULTANEOUS EQUATIONS

Note Title

We need to find a value for x and a value for y which make <u>both</u> equations true.

- Make the number of 'x's, or the number of 'y's, equal by MULTIPLYING one or both equations as appropriate
- If the signs in front of these numbers are the SAME, SUBTRACT the equations; if the signs are OPPOSITE, ADD the equations.
- When you have found the value of one letter, SUBSTITUTE it back into the first equation to find the second letter
- You can CHECK your answer using the second equation.

<u>Examples</u>

①

$$2x + 3y = 16 \quad (1)$$
$$2x - y = 8 \quad (2)$$

Number of 'x's is the same, so no need for any multiplying
Signs of 'x's are the same so <u>subtract</u> the equations

① − ②

$$4y = 8$$
$$\underline{y = 2}$$

Substitute in ①:

$$2x + 6 = 16$$
$$(-6) \quad (-6)$$
$$2x = 10$$
$$\underline{x = 5}$$

(2)

$3x - y = 11$ (1)

$4x + 3y = 6$ (2)

To make the number of 'y's the same, multiply equation (1) by 3

(1) × 3 $\quad 9x - 3y = 33$

(2) $\quad 4x + 3y = 6$

Signs of the 'y's are OPPOSITE, so ADD the equations

(1) + (2) $\quad 13x = 39$

$x = 13$

Substitute in (1) $\quad 9 - y = 11$

$(-9) \quad (-9)$

$-y = 2$

$(\times -1) \quad (\times -1)$

$y = -2$

(3)

$5x - 3y = 19$ (1)

$3x - 2y = 12$ (2)

To make the number of 'y's the same, make them both −6

(1) × 2 $\quad 10x - 6y = 38$

(2) × 3 $\quad 9x - 6y = 36$

Signs of the 'y's are the same, so subtract

(1) − (2) $\quad x = 2$

Substitute in (1):

$10 - 3y = 19$

$(-10) \quad (-10)$

$-3y = 9$

$(\div -3) \quad (\div -3)$

$y = -3$