Solving simultaneous equations

Simultaneous equations are where you have two unknowns (e.g. x, y) and two equations linking them.
You can solve them graphically, or algebraically (2 methods).

Method 1 – Elimination

1. Make a variable (x or y) have the same number in both equations by multiplying one or both (if necessary)
2. Add/subtract equations to eliminate one variable.
3. Substitute back into the simpler original equation to find the other.

Example 1

$$2x + 3y = 17 \ _____[1]$$
$$4x + 3y = 19 \ _____[2]$$

These have same number of y, so subtract: [1] – [2]   …………………………..

$$x =$$

substitute into (1)

………...…………………….

$$y = ………………………...$$

Example 2

$$7x – 2y = 17 \ _____[1]$$
$$6y = 5x – 3 \ \_\_\_\_\_[2]$$

multiply [1] by 3 to make $6y$:

$$21x – 6y = 51_____[1A]$$

add [2] and [1A] to cancel $6y$:

$$21x \quad = ………………..$$

$$16x \ = ………………..$$

$$x \ = ………………..$$

substitute into [1]:

…………………………….

…………………………….

Example 3

$$12x - 2y = 34 \underline{\hspace{2cm}}[1]$$
$$3y - 11x = -23 \underline{\hspace{2cm}}[2]$$

small number of y in both, so make them the same by:

[1] x 3 ....

[2] x 2 ....

add to eliminate y: ....

....

$x = $ ....

substitute in [1] ....

....

....

$y = $ ....

Method 2 – Substitution

1. Use when numbers are more complicated
2. From one equation find x in terms of y or y in terms of x.
3. Substitute into the other equation.

$$0.7x - 0.9y = 3.2 \underline{\hspace{2cm}}[1]$$
$$1.3y - 0.5x = 1.0 \underline{\hspace{2cm}}[2]$$

Simplest value is 0.5x, so rearrange [2] to get x:

....

$x = $ ....

substitute into [1]:

$y = $ ....

$x = $ ....

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