Linear Simultaneous Equations

There are two main ways to solve simultaneous equations.

Elimination

$$3x + 2y = 9$$
$$5x - 2y = -1$$

Add the two equations together to eliminate y

$$8x = 8$$
$$x = 1$$

Now we have a value for x we can put it into one of the original equations to find y

$$3 \times 1 + 2y = 9$$
$$3 + 2y = 9$$
$$2y = 6$$
$$y = 3$$

Substitution

$$y + 3x = 5$$
$$2y + 7x = 11$$

Rearrange the first equation in terms of y and then substitute into the second equation

$$2(5 - 3x) + 7x = 11$$
$$10 - 6x + 7x = 11$$
$$x = 1$$

Now we have a value for x we can put it into one of the original equations to find y

$$y + 3 \times 1 = 5$$
$$y + 3 = 5$$
$$y = 2$$

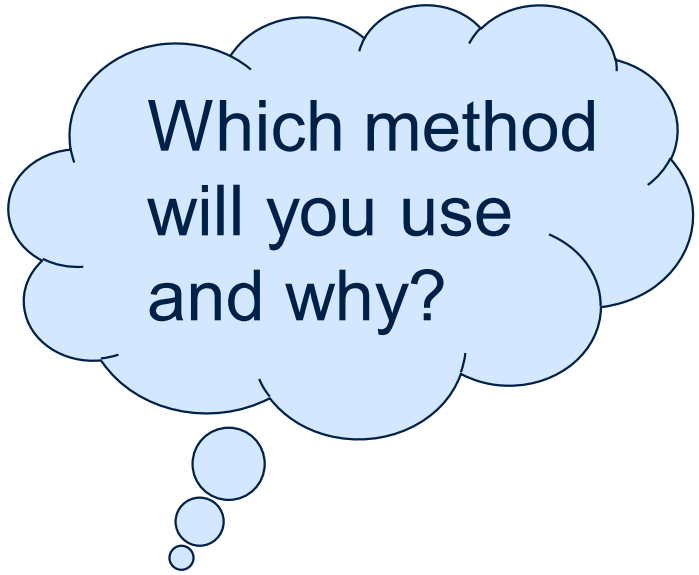
Which method is best and when?

Simultaneous Equations

Solve the following:

1. $2x + y = 7$
   $2x - y = 1$

2. $3x + 2y = 7$
   $3x + 5y = 4$



3. $y = 4x + 3$
   $3x + 2y = 28$

4. $4x + 3y = -4$
   $6x - 2y = 7$

Simultaneous Equations

Solutions on the next slide….

Simultaneous Equations Solutions

1. $2x + y = 7$
   $2x - y = 1$

→ Eliminate the y terms by adding the two equations

$4x = 8$

$x = 2$

Sub $x = 2$ into either equation to find y

$2 \times 2 + y = 7$

$y = 3$

2. $3x + 2y = 7$
   $3x + 5y = 4$

→ Eliminate the x terms by subtracting the second equation from the first

$-3y = 3$

$y = -1$

Sub $y = -1$ into either equation to find y

$3x + 2 \times -1 = 7$

$x = 3$

You can always check your answer is correct by substituting into the other equation and check it works in that one too

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Simultaneous Equations Solutions

3. $y = 4x + 3$
$3x + 2y = 28$

Subsitute the first equation into the second

$3x + 2(4x + 3) = 28$

$11x + 6 = 28$

$x = 2$

Sub $x = 2$ into either equation to find y

$y = 4 \times 2 + 3$

$y = 11$

4. $4x + 3y = -4$ $\times 2$
$6x - 2y = 7$ $\times 3$

Eliminate the y terms by adding the equations together

$26x = 13$

$x = \frac{1}{2}$

Subs $x = \frac{1}{2}$ into either equation to find x

$4 \times \frac{1}{2} + 3y = -4$

$y = -2$

You can always check your answer is correct by substituting into the other equation and check it works in that one too

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