Solve Simultaneous Equations

Follow these steps…

1. Eliminate one of the variables.
2. Find the value of the remaining variable.
3. Substitute this value into any of the starting equations.
4. State the final answer, giving values for both variables, eg. x = 3, y = 4
5. Check answer by substituting the values into one of the original equations.

Solve:
3x + 3y = 27 (eq. 1)
3x − y = 3 (eq. 2)

Eliminate one variable – the 2 variables are x and y. Look for a variable that is the same in both equations (in this case, 4x appears in both). If we subtract (eq. 2) from (eq. 1)…

3x – 3x = 0
3y – (– y) = 3y + y = 4y
27 - 3 = 24

$$\begin{array}{rl} & 3x + 3y = 27 \\ - & \underline{3x - y = 3} \\ & 4y = 24 \end{array}$$

Find the value of the remaining variable

4y = 24 divide both sides by 4
y = 6

Substitute this value into any of the equations

3x − y = 3
3x − 6 = 3 Add 6 to both sides
3x = 9 Divide both sides by 4
x = 9/3 = 3

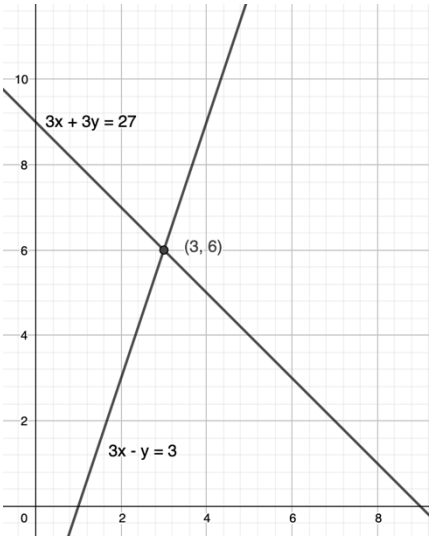
State the final answer, giving values for both variables

x = 3, y = 6

Check answer

3x + 3y = 27
3(3) + 3(6)
9 + 18 = 27 Answer is correct

If the 2 equations are graphed, the intersect of the lines also gives the x and y values (3,6).



Solve Simultaneous Equations

Follow along with this one…

Solve:
$6x + 4y = 16$ (1)
$6x + 15y = -6$ (2)

Take (2) from (1) to remove x:
$6x – 6x = 0$
$4y – 15y = – 11y$
$16 – (–6) = 22$

$-11y = 22$ Divide both sides by -11
$y = -2$

Substitute for y
$6x + 4y = 16$
$6x + 4(-2) = 16$
$6x - 8 = 16$ Add 8 to both sides
$6x = 24$ Divide both sides by 6
$x = 4$

$x = 4, y = -2$ Check: we'll use equation (2)…
$6x + 15y = -6$
$6(4) + 15(-2)$
$24 – 30 = -6$

What happens when the variables don't match?

$6x + 5y = 13$ (1)
$2x + 3y = 3$ (2)

These are equations – one side equals the other. We can alter them and if we perform the same operation to every term, the equation remains the same!

We could change the 2x in (2) to 6x if we multiply everything by 3…

$2x + 3y = 3$ becomes $6x + 9y = 9$ (3)

Now take (1) away from (3)

$6x + 9y = 9$
$\underline{6x + 5y = 13}$
$4y = –4$
$y = –1$ substitute into (2) $2x + 3(–1) = 3$
$2x – 3 = 3$ add 3 to both sides
$2x = 6$ divide both sides by 2
$x = 3$

Our answer is… $x = 3, y = –1$