Simultaneous Equations (1)

$3x + 4y = 29$ —(i)

$5x - 4y = -5$ —(ii)

Choose add because +4y add -4y makes zero

Get rid of the y terms as these are equal in absolute terms

∴ Add (i) + (ii)

$8x = 24$

$\therefore x = \frac{24}{8}$

$\therefore x = 3$

Remember: whatever you do to the right, do the same thing to the left. In this case divide both sides by 8.

Substitute in (i).

Try to avoid negative and fractions if you can.

$3x + 4y = 29$

$3(3) + 4y = 29$

$\therefore 4y = 29 - 9$

$= 20$

$\therefore y = \frac{20}{4}$

$= 5$

Rearrange the equation so that you get y on its own.

Check in (ii).

Always check in one of the original equations and NOT the same equation as you substituted in.

$5x - 4y = -5$

$5(3) - 4(5) = -5$

$15 - 20 = -5$ ✓

Try these:

① $4x + 3y = 67$

$6x - 3y = 63$

② $8x + 7y = 132$

$12x - 7y = -12$

Simultaneous Equations (2)

$8x + 4y = 72$ —(i)

$5x + 4y = 63$ —(ii)

Get rid of the y terms as these are equal.

Choose subtract because $+4y - (+4y) = 4y - 4y = 0$.

You are trying to isolate either x or y. In this case: y.

Subtract (i) − (ii)...

$3x = 9$

$\div 3$ ↓ $\div 3$

$x = 3$

Make sure you are left with positive numbers on this side if you can.

...Substitute into (i)

Try to avoid fractions and negative numbers if you can.

$8x + 4y = 72$

$8(3) + 4y = 72$

$\therefore 4y = 72 - 24$

$\therefore 4y = 48$

$\therefore y = 12$

Check in (ii)

$5x + 4y = 63$

$5(3) + 4(12) = 63$

$15 + 48 = 63$ ✓

Check in one of the original equations that you didn't use for substitution.

Try these:

③ $7x + 2y = 101$

$5x + 2y = 75$

④ $9x + 3y = 90$

$7x + 3y = 78$

Simultaneous Equations (3)

$3x - 5y = 42$ ——(i)

$9x + 7y = 258$ ——(ii)

9 is a multiple of 3 so multiply 3 × (i)

∴ Multiply (i) × 3

$9x - 15y = 126$ ——(iii)

Call this equation (iii) so you can refer to it

The 9x matches in equations (iii) and (ii). As they are both positive, you need to subtract

Subtract (ii) − (iii)

The number on the right > in equation (ii) than (iii).

$7y - (-15y) = 22y$

$\therefore 22y = 132$

$\therefore y = \frac{132}{22}$

$= 6.$

Substitute in (ii)

Choose one of your original equations into which to substitute

$9x + 7y = 258$

Rearrange your equation to get $x = \ldots$

$9x = 258 - 7(6)$

$= 216$

$\therefore x = \frac{216}{9}$

$= 24$

Check in (i)

$3x - 5y = 42$

$3(24) - 5(6) = 42$

$72 - 30 = 42$ ✓

Try these

① $5x + 7y = 159$

$15x - 9y = -33$

② $6x + 4y = 142$

$24x - 17y = -59$