

Simultaneous Equations A

1 (a) $2(x - 1) - 4(x + 2) = 3(x + 5) + (x - 1)$

Eliminate the brackets to give $2x - 2 - 4x - 8 = 3x + 15 + x - 1$.

Simplify each side to give $-2x - 10 = 4x + 14$.

Add $2x - 14$ to both sides of the equation to give $-24 = 6x$ so that $x = -4$.

(b) $\frac{x-1}{2} - \frac{x+1}{2} = 5 - \frac{x+2}{4}$

Multiply throughout by 4 to give $2(x - 1) - 2(x + 1) = 20 - x - 2$.

Simplify to give $-4 = 18 - x$, therefore $x = 22$.

(c) $\frac{3}{x+2} - \frac{5}{x} = -\frac{2}{x-1}$

Multiply throughout by $x(x+2)(x-1)$ to give $3x(x-1) - 5(x+2)(x-1) = -2x(x+2)$.

Eliminate the brackets to give $3x^2 - 3x - 5x^2 - 5x + 10 = -2x^2 - 4x$.

Simplify to give $-2x^2 - 8x + 10 = -2x^2 - 4x$.

Add $2x^2$ to both sides to give $-8x + 10 = -4x$. Add $8x$ to both sides of the equation to give $10 = 4x$ so that $x = \frac{5}{2}$.

(a) $x - y = 2$ [1]

$2x + 3y = 9$ [2] Multiply [1] by -2

$-2x + 2y = -4$ Add [2] to give $5y = 5$ so that $y = 1$.

Substitution in [1] gives $x = 3$

(b) $4x + 2y = 10$ [1]

$3x - 5y = 1$ [2] Subtract $4x$ from both sides of [1] and then divide by 2 to give: $y = 5 - 2x$.

Substitute this expression for y in [2] to give $3x - 5(5 - 2x) = 1$.

Simplify to give $13x - 25 = 1$ so that $x = 2$ and $y = 5 - 4 = 1$.

- 3** $x + y + z = 6$ [1]
 $2x - y + 3z = 9$ [2]
 $x + 2y - 3z = -4$ [3] Add [1] and [3] and subtract [2] to give
 $(2x + 3y - 2z) - (2x - y + 3z) = (6 - 4) - 9$. That is
 $4y - 5z = -7$ [4] Subtract [1] from [3] to give
 $y - 4z = -10$ [5] Multiply this by 4 to give
 $4y - 16z = -40$ [6] Subtract [6] from [4] to give $11z = 33$ so that
 $z = 3$.
Substitute this value in [5] to give $y = -10 + 12 = 2$
so from [1], $x = 6 - 3 - 2 = 1$.
- 4** $2(x + 2y) - 3(x + 2z) - 4(y - 2z) = -1$ [1]
 $3(2x - y) + 2(3y - 4z) - 5(3x - 2z) = -7$ [2]
 $-(x - y) + (x - z) + (y + z) = -2$ [3] Eliminate the brackets to give
 $-x + 2z = -1$ [4]
 $-9x + 3y + 2z = -7$ [5]
 $2y = -2$ [6] Thus $y = -1$. Substituting this value in
[5] gives
 $-9x + 2z = -4$
Subtracting [4] gives $-8x = -3$ so that
 $x = \frac{3}{8}$. Substitution in [4] gives $z = -\frac{5}{16}$.

Simultaneous Equations B

- 1** (a) $x = -2$ (b) $x = 2$ (c) $x = -3$ **2** $x = 1, y = -1$ **3** $x = 1, y = 3, z = 5$