

Simultaneous Equations

Example: $3x + 4y = -8$
 $-2x + 8y = 8$

Number the equations: $3x + 4y = -8$ (1) and decide which variable to eliminate
 $-2x + 8y = 8$ (2)

The aim is to make the coefficients of the variable to be eliminated equal in both equations

To eliminate y , multiply equation (1) by 2 and re-number the equation: $6x + 8y = -16$ (3)
 $-2x + 8y = 8$ (2)

Note that Equation 2 is unchanged because the coefficients of y are now the same in both equations.
 If they had not been the same, then Equation 2 would also have been multiplied

Check the signs of the variable to be eliminated

Same sign in both equations \Rightarrow subtract one equation from the other
 Different signs in each equation \Rightarrow add the equations together

Subtract (2) from (3): $8x = -24 \therefore x = -3$

Substitute in equation (1): $6(-3) + 8y = -16 \therefore 8y = 2 \therefore y = \frac{1}{4}$

Write the answer out in full, separately from the working: $x = -3, y = \frac{1}{4}$

Exercises

Solve the following pairs of equations, leaving non-integer answers as fractions

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|---|---|--|---|
| 1 $2x + y = 18$
$x - 2y = -1$ | 2 $x + 2y = 4$
$3x + 5y = 9$ | 3 $14x + 4y = -1$
$-3x + 5y = 9$ | 4 $7x + 3y = 5$
$5x - y = 2$ |
| 5 $17x + 9y = 20$
$5x - 2y = -22$ | 6 $2x + 3y = -5$
$3x - 5y = 21$ | 7 $2x - 7y = 57$
$-11x + 3y = 6$ | 8 $24x + 12y = -7$
$6x + 12y = 5$ |

Answers
 1. 7, 4 2. -2, 3 3. 4, 5 4. $\frac{2}{1}, \frac{2}{1}$ 5. -2, 6 6. -3, 2 7. -3, -9 8. $-\frac{2}{2}, \frac{3}{4}$