

CHAPTER
1Simultaneous
Linear Equations
and Graphs

1) Solving simultaneous equations

↳ Find the value(s) of the unknown. Eg: $x = \underline{\quad}$, $y = \underline{\quad}$

a) Graphical method

- Plot and draw the 2 linear equations
- The intersection point of the 2 lines will be the .

eg. Solve the simultaneous equations.

$$2y - 4 = x$$

$$y = -x + 3$$

$$2y - 4 = x$$

$$2y = x + 4$$

①

$$y = -x + 3$$

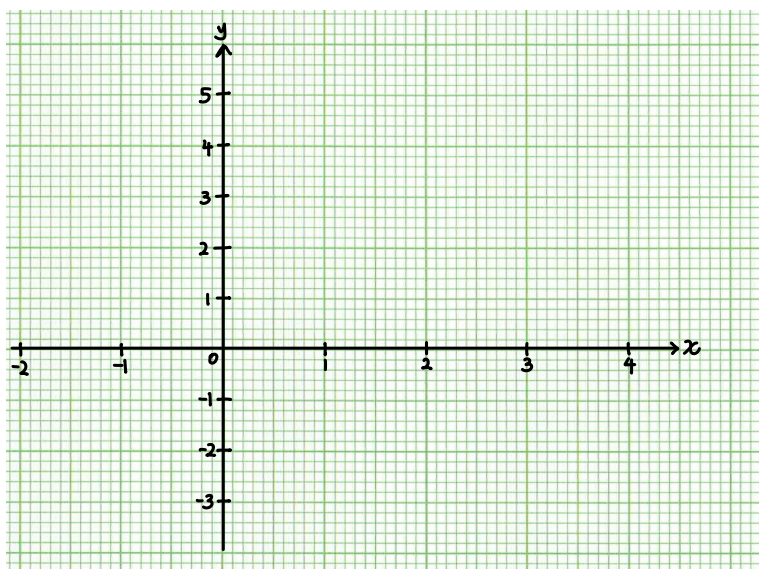
②

x			
y			

x			
y			

③

④



⑤ $\therefore$ The solution is and .

Steps

- For each equation, rewrite it into this form: $y = mx + c$. (Make y the subject)
- For each equation, create a table of x and y values. Choose 3 different x -values: a negative x , $x = 0$ and a positive x .
- Substitute the x -values into the equation to find the corresponding y -values.
- Plot the 2 lines on your graph paper.
- Find the point where the 2 lines meet. The x - and y -coordinates of this point will be the solution.

Recap
Sec 1
Chap 6

Equation of straight lines:

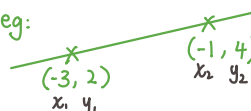
$$y = mx + c$$

Gradient

y-intercept

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

eg:



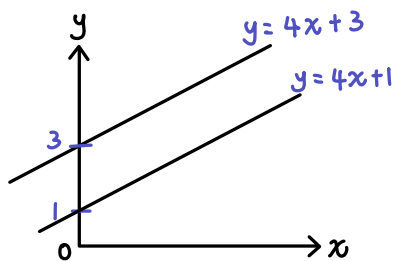
m =

- Where the line crosses y -axis.
- When $x = 0$

Graph	Gradient	Example equation
	$m = 0$	$y = c$
	undefined	$x = a$
	$m > 0$	
	$m < 0$	

3 Possible graphs of Simultaneous Equations

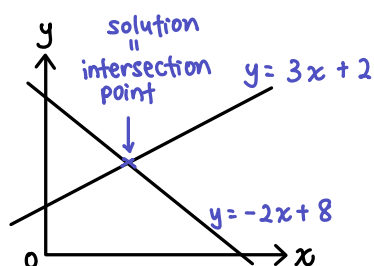
① No solution



The two lines are _____
and do not intersect.

The two lines have the
Same _____, $m =$ _____,
and different _____.

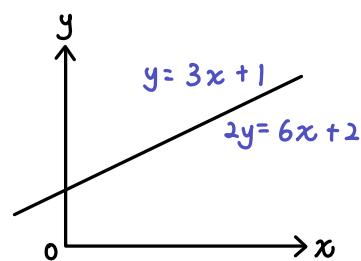
② 1 solution



The two lines intersect at
_____ point.

The two lines have different
_____.

③ Infinite number of solutions



The two lines _____ /
_____ each other completely.

The two lines have the same
_____ and _____
in which one equation is _____
the other.

b) Substitution method

eg. Solve the following pair of simultaneous equations.

$$\begin{aligned} 3x + 5y &= 11 \\ 2x - 4y &= 6 \end{aligned}$$

Steps

- ① Look for a variable with the lowest coefficient. In this example, it is '2x'.
- ② Make the chosen variable the subject. In this example, express x in terms of y . (i.e. $x = \boxed{}$)
- ③ Substitute into the unused equation (1).
- ④ Solve for y .
- ⑤ Substitute y value into (3) to find x .
- ⑥ Check your answers by substituting x and y values back into the original equations.

OR

menu $\rightarrow$ 5 $\rightarrow$ 1 $\rightarrow$ 2

c) Elimination method

eg 1. Solve the following pair of simultaneous equations.

$$\begin{aligned}9y + 2x &= 5 \\ 3x &= 13 + 7y\end{aligned}$$

Steps

- ① Compare equations (1) and (3).
Pick a variable and make its coefficient the same in both equations by finding the Lowest Common Multiple (LCM).
In e.g. 1, pick $2x$ and $3x \rightarrow$ LCM is _____.
- ② Ensure that the variable you want to eliminate is on the same side in both equations. In e.g. 2, to eliminate y , shift _____ to the _____.
- ③ Eliminate $6x$ by subtracting (4) from (3).
OR (3) from (4) in this example.
*Note: Sometimes we _____ to eliminate variable.
- ④ Solve for y .
- ⑤ Substitute y value into either (1) or (2) to find x .
- ⑥ Check your answers by substituting x and y values back into the original equations.

OR

menu $\rightarrow$ 5 $\rightarrow$ 1 $\rightarrow$ 2 $\rightarrow$ Key equations $\rightarrow$ "="

Before you key in your equations, ensure that they are in this form: $ax + by = c$

For example, for this question:

Key in (1) and (2). You will get $x = \underline{\hspace{2cm}}$, $y = \underline{\hspace{2cm}}$

eg 2. Solve the above question by eliminating 'y'.

eg 1. Solve the following pair of simultaneous equations.

$$\frac{3}{4}x - \frac{2}{5}y = 7$$

$$9 - \frac{1}{2}x = \frac{3}{5}y$$

TIP

If you have fractional coefficients,
multiply the entire equation
by the lowest common multiple
of all the denominators.

2) Problems in Real World Context

eg 1. The difference between two numbers is 8. When one-third of the first number is added to one-half of the second number, the result is 18. Given that the first number is greater than the second number, find the sum of the two numbers.

eg. 2 In the figure below, $AC = (4x - y) \text{ cm}$, $AB = (x + y) \text{ cm}$, $BC = 15 \text{ cm}$ and $DF = (2x + 3y) \text{ cm}$. The area of triangle ABC is 45 cm^2 . Given that $AC = DF$, form two equations and find the length of DF .

