

one unknown or two: isolate, rearrange, and always substitute back

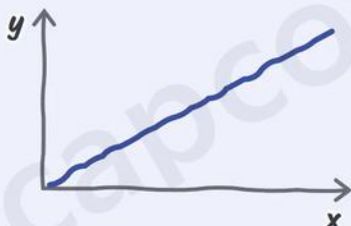
The four forms worth recognising

one variable, standard $ax + b = 0$

two variables, standard $Ax + By = C$

slope-intercept $y = mx + b$

point-slope, through (x_1, y_1) $y - y_1 = m(x - x_1)$



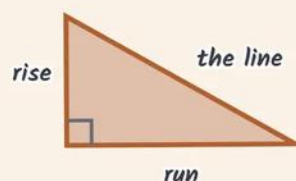
every linear equation in two variables draws one straight line: constant slope, no bend anywhere
linear means every variable sits to the first power and never multiplies another variable. An x^2 , an xy or an x in a denominator all disqualify it

Slope, three ways to get it

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

rise over run $m = \frac{\Delta y}{\Delta x}$

from $Ax + By = C$ $m = -\frac{A}{B}$, $b = \frac{C}{B}$



the slope triangle: rise over run, the vertical leg divided by the horizontal one. This one is drawn against a falling line, so its rise counts as negative
take both differences in the same order. If y_2 is on top, x_2 must be first underneath, or you get the negative of the true slope

Q. Solve $4(x - 3) + 5x = 2x + 9$.

① distribute the 4 across the bracket: $4x - 12 + 5x = 2x + 9$

② collect like terms on the left: $9x - 12 = 2x + 9$

③ move the x terms one way, the numbers the other: $9x - 2x = 9 + 12$

④ $7x = 21$, so divide both sides by 7

Answer $x = 3$

check it in the original line, not the tidied one:
 $4(3-3) + 5(3) = 15$ and $2(3) + 9 = 15$, so both sides agree

how many solutions does $ax + b = cx + d$ have

a is not equal to c

exactly one solution

the x terms do not cancel, so x lands on one number

$a = c$ but b is not equal to d

no solution

x cancels and leaves a false number statement

$a = c$ and $b = d$

infinitely many solutions

the two sides are literally the same expression

the same fork decides a two-variable pair: match coefficient to coefficient first, then check whether the constants agree too