

one rate, one starting value, and a graph that never changes its mind

### Function notation, stripped down

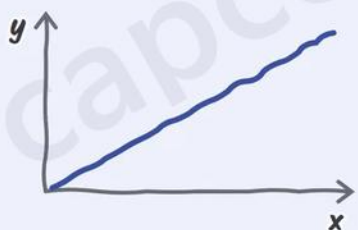
the shape of every linear function  $f(x) = mx + b$

$f(a)$  means put  $a$  in place of  $x$

slope from two outputs  $m = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$

one step along  $x$   $f(x+1) - f(x) = m$

$n$  steps along  $x$   $f(x+n) - f(x) = mn$



the graph of a linear function: one constant tilt, so the same run always buys the same rise

$f(x)$  is a label for the output, never  $f$  multiplied by  $x$ . The letter outside the bracket names the machine, the letter inside is what you feed it

Q. The function  $g$  is defined by  $g(x) = \frac{1}{2}x - 4$ . If  $g(k) = 6$ , what is  $k$ ?

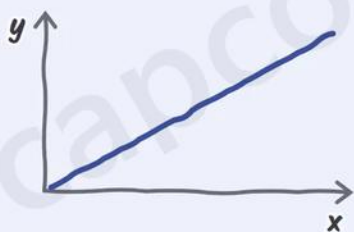
- ①  $g(k)$  means substitute  $k$  for  $x$ :  $\frac{1}{2}k - 4 = 6$
- ② add 4 to both sides:  $\frac{1}{2}k = 10$
- ③ multiply both sides by 2

Answer  $k = 20$

read the question twice:  $g(k) = 6$  gives you the output and asks for the input. Half the marks lost here are from solving the easier question instead

### Nonzero slope vs zero slope

$m$  is not 0



- the output changes at a steady rate
- the graph crosses the horizontal axis exactly once
- there is exactly one  $x$  with  $f(x) = 0$

$m = 0$



- $f(x) = b$  for every input, a constant function
- the graph is a flat horizontal line
- no  $x$  makes  $f(x) = 0$  unless  $b$  is already 0

both are still linear. Linear does not mean rising: a flat line has slope 0 and qualifies just as much