Functions - Lesson 1

Introduction to Functions - Values of Linear Functions

LI

- Know what a Function is.
- Know what a Linear Function is.
- Work out values of a linear function without a calculator.

SC

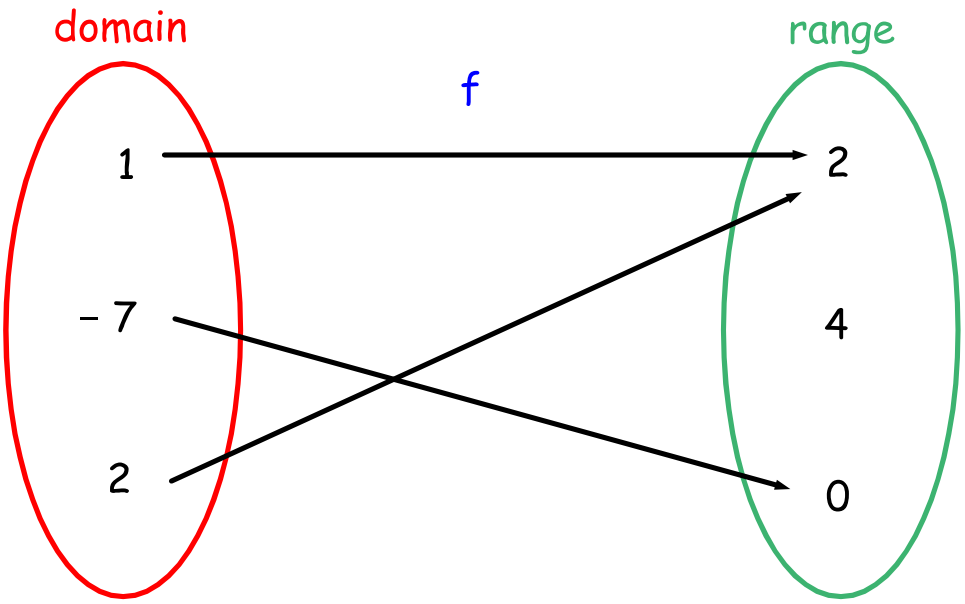
- Substitution.

Jan 10-12:11

A function is a relation between a set of allowed inputs (domain) and a set of allowed outputs (range);
for each input, there is exactly one output

Example 1

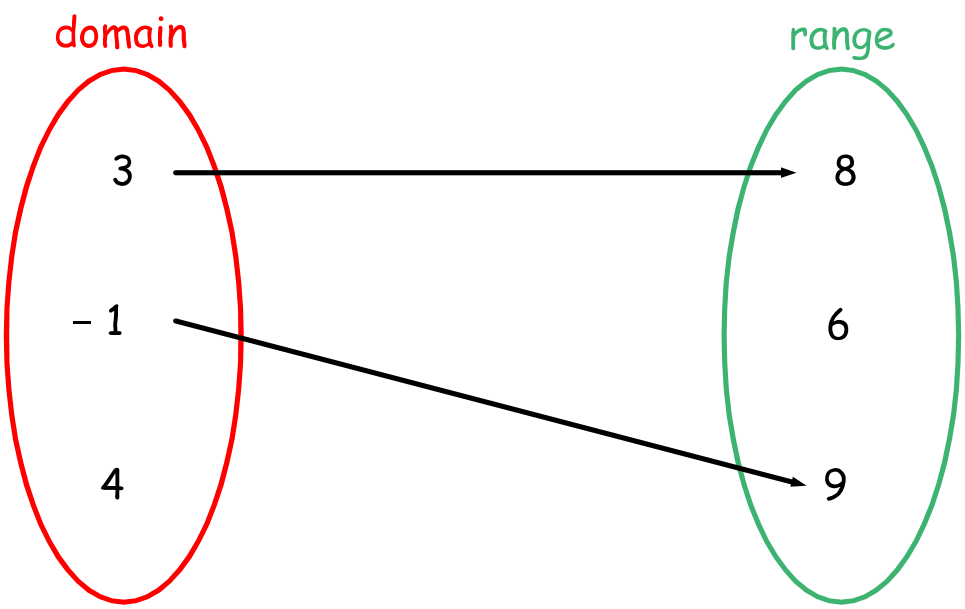
Is this a function ?



Yes, as every input has exactly one output

Example 2

Is this a function ?



No, as not every input has an output (4 goes nowhere)

Not all functions have an equation; we will study those functions that do have an equation

A linear function is one of the form :

$$f(x) = ax + b$$

(a and b are any numbers)

Example 3

If $f(x) = 2x + 3$, calculate :

(a) $f(1)$.

(b) $f(-3)$.

(a) $f(x) = 2x + 3$

$\therefore \quad f(1) = 2(1) + 3$

$\Rightarrow \quad f(1) = 2 + 3$

$\Rightarrow \quad \boxed{f(1) = 5}$

(b) $f(x) = 2x + 3$

$\therefore \quad f(-3) = 2(-3) + 3$

$\Rightarrow \quad f(-3) = -6 + 3$

$\Rightarrow \quad \boxed{f(-3) = -3}$

Jan 19-10:07

Example 4

If $p(x) = -4x + 2$, calculate :

(a) $p(-3)$.

(b) $p(0)$.

(a) $p(x) = -4x + 2$

$\therefore \quad p(-3) = -4(-3) + 2$

$\Rightarrow \quad p(-3) = 12 + 2$

$\Rightarrow \quad \boxed{p(-3) = 14}$

(b) $p(x) = -4x + 2$

$\therefore \quad p(0) = -4(0) + 2$

$\Rightarrow \quad p(0) = 0 + 2$

$\Rightarrow \quad \boxed{p(0) = 2}$

Jan 19-10:11

Example 5

If $h(x) = \frac{1}{2}x - 1$, calculate :

(a) $h(10)$.

(b) $h(-8)$.

(a) $h(x) = \frac{1}{2}x - 1$

$\therefore \quad h(10) = \frac{1}{2}(10) - 1$

$\Rightarrow \quad h(10) = 5 - 1$

$\Rightarrow \quad \boxed{h(10) = 4}$

(b) $h(x) = \frac{1}{2}x - 1$

$\therefore \quad h(-8) = \frac{1}{2}(-8) - 1$

$\Rightarrow \quad h(-8) = -4 - 1$

$\Rightarrow \quad \boxed{h(-8) = -5}$

Questions
1) $f(x) = 2x + 1$; $f(1)$, $f(3)$, $f(-3)$
2) $g(x) = 3x - 5$; $g(7)$, $g(-1)$, $g(9)$
3) $h(x) = 8x + 13$; $h(0)$, $h(4)$, $h(-2)$
4) $b(x) = -2x + 5$; $b(6)$, $b(-10)$, $b(11)$
5) $m(x) = -3x - 4$; $m(1)$, $m(2)$, $m(3)$
6) $w(x) = 90x + 1$; $w(2)$, $w(3)$, $w(4)$
7) $A(x) = \frac{1}{2}x + 11$; $A(6)$, $A(12)$, $A(-30)$
8) $Q(x) = -\frac{1}{2}x - 50$; $Q(8)$, $Q(50)$, $Q(90)$
9) $c(x) = \frac{3}{4}x - 17$; $c(8)$, $c(12)$, $c(16)$
10) $N(x) = \frac{3}{4}x + 78$; $N(16)$, $N(64)$, $N(400)$
11) $j(x) = -56x + 27$; $j(4)$, $j(2)$, $j(-1)$
12) $T(x) = -\frac{3}{4}x - 49$; $T(8)$, $T(12)$, $T(-8)$

Answers
1) $f(x) = 2x + 1$; $f(1)$, $f(3)$, $f(-3)$ 3, 7, −5
2) $g(x) = 3x - 5$; $g(7)$, $g(-1)$, $g(9)$ 16, −8, 22
3) $h(x) = 8x + 13$; $h(0)$, $h(4)$, $h(-2)$ 13, 45, −3
4) $b(x) = -2x + 5$; $b(6)$, $b(-10)$, $b(11)$ −7, 25, −17
5) $m(x) = -3x - 4$; $m(1)$, $m(2)$, $m(3)$ −7, −10, −13
6) $w(x) = 90x + 1$; $w(2)$, $w(3)$, $w(4)$ 181, 271, 361
7) $A(x) = \frac{1}{2}x + 11$; $A(6)$, $A(12)$, $A(-30)$ 14, 17, −4
8) $Q(x) = -\frac{1}{2}x - 50$; $Q(8)$, $Q(50)$, $Q(90)$ −54, −75, −95
9) $c(x) = \frac{3}{4}x - 17$; $c(8)$, $c(12)$, $c(16)$ −11, −8, −5
10) $N(x) = \frac{3}{4}x + 78$; $N(16)$, $N(64)$, $N(400)$ 90, 126, 378
11) $j(x) = -56x + 27$; $j(4)$, $j(2)$, $j(-1)$ −197, −85, 83
12) $T(x) = -\frac{3}{4}x - 49$; $T(8)$, $T(12)$, $T(-8)$ −58, −55, −55