Funtions

A function is just an input output machine.

Patterns n^{th} term rule. $T_n = 2n+1$ common diff

$T_1 = 2(1)+1 = 3$ ↘ 2

$T_2 = 2(2)+1 = 5$ ↘ 2 Linear patter

$T_3 = 2(3)+1 = 7$ ↘ 2

Funtion will be written as $f(x) = 2x+1$

$y = 2x+1$

Funtion notation $f(x)$

y

x value is the input and y will be the out put

↓ input ↓ output.

$f(x) = 2x + 1$

$f(1) = 3$

when x is 1 y is 3.

$f(1) = 2(1) + 1$

$= 2 + 1$

$= 3$

3 5 7

+2 +2 slope.

$f(2) = 2(2) + 1$

$4 + 1$

$= 5$

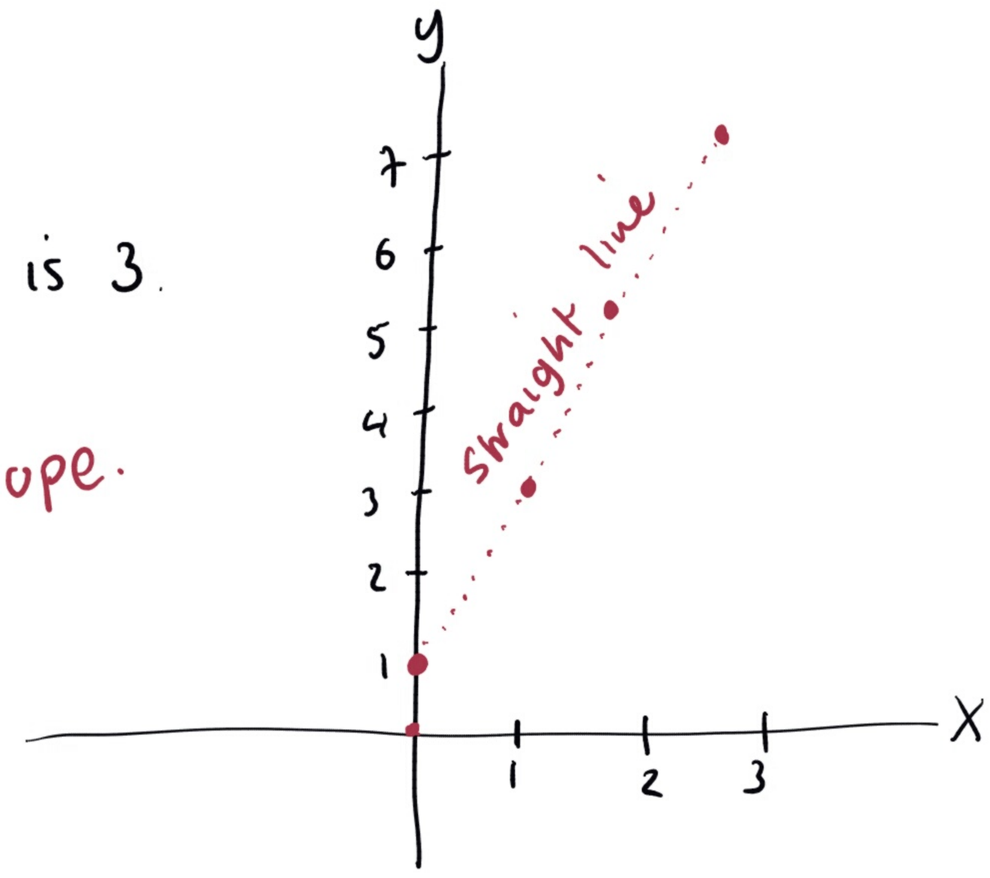
$f(2) = 5$

$f(3) = 2(3) + 1$

$6 + 1$

$= 7$

$f(3) = 7$



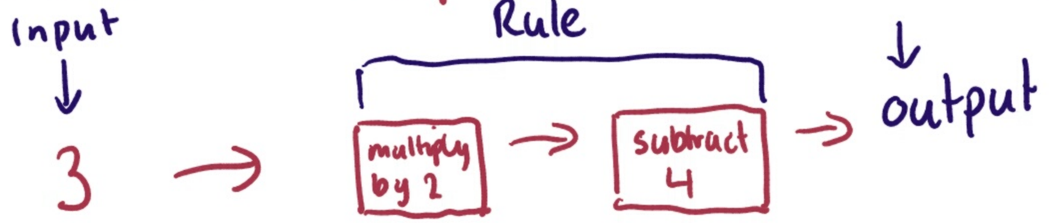
$f(0) = 2(0) + 1$

$f(0) = 1$

C/W
Pg 455
Q1,(11)
Q2 +3

Input values	Outputs values	(x, y)
x values	y values	point
Domain	Range.	couple.

Eg Find the output of the following



$f(x) \rightarrow 2x - 4 =$

$f(3) \rightarrow 2(3) - 4 = 2$

$f(7) \rightarrow 2(7) - 4 = 10$

$f(8) \rightarrow 2(8) - 4 = 12$

Point, couple

$f(3) = 2$ (x, y) $(3, 2)$

$f(7) = 10$ (x, y) $(7, 10)$

$f(8) = 12$ $(8, 12)$

Q1(ii) $f(x) = 2(x+4)$

$f(2) = 2((2)+4)$ $f(2)=12$ $(2,12)$

$2(6)$

$= 12$

$f(1) = 2((1)+4)$ $f(1)=10$ $(1,10)$

$2(5)$

$= 10$

$f(0) = 2((0)+4)$ $f(0)=8$ $(0,8)$

$2(4)$

$= 8$

Q2) x by 2

$f(x) = 2x + 4$

ii) $f(x)$
$y = 8x - 7$

iii) $f(x) = \frac{x}{4} - 3$

iv) $f(x) = 4(x + 3)$

Q3) $f(x) = 3x + 2$

$f(x) = 5x - 2$

$f(x) = \frac{x}{3} + 2$

$f(x) = 7(x + 2)$

Pg 456 Q4

Input x	Rule x^2+4	Output y	Couple (x,y)
-2	$(-2)^2+4$	8	$(-2,8)$
-1	$(-1)^2+4$	5	$(-1,5)$
0	$(0)^2+4$	4	$(0,4)$
1	$(1)^2+4$	5	$(1,5)$
2	$(2)^2+4$	8	$(2,8)$

Calculator

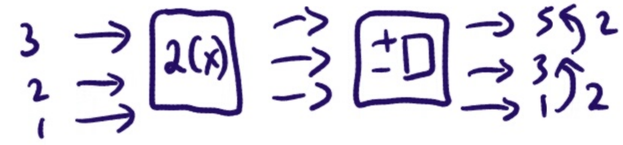
x	$f(x)$
-2	8
-1	5
0	4
1	5
2	8

4 ii)

Input x	Rule $3-2x$	Output y	Couple (x, y)
-3	$3-2(-3)$	9	$(-3, 9)$
-2	$3-2(-2)$	7	$(-2, 7)$
-1	$3-2(-1)$	5	$(-1, 5)$
0	$3-2(0)$	3	$(0, 3)$
1	$3-2(1)$	$+1$	$(1, 1)$
2	$3-2(2)$	-1	$(2, -1)$

input x	y $f(x)$
	output
-3	9
-2	7

Q5)



$2(3) \pm \square = 5$

$6 - 1 = 5$

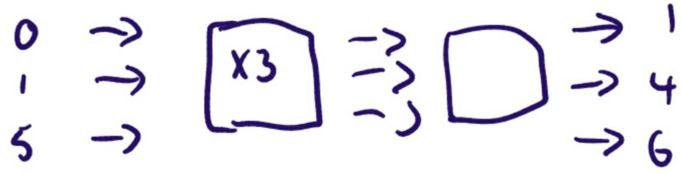
$2(2) \pm \square = 3$

$4 - 1 = 3$

Rule

$f(x) = 2x - 1$

Q5 ii)



$3(0) \pm \square = 1$

$+1 = +1$

$3(1) \pm \square = 4$

$3 + 1 = 4$

Rule

$f(x) = 3x + 1$

Q6) Input → Output = y.

x → [2x] = [+1] → 11
x → → 17
x → → 41

Make an equation.

$2x+1=11$ solve for x $\quad 2x+1=17$

$-1 \mid 2x=10 \mid -1$ $\quad -1 \mid 2x=16 \mid -1$

$\div 2 \mid x=5 \mid \div 2$ $\quad \mid x=8 \mid$

6ii)

x
x → [3x] → [-1] → 11, 23, 29
x

$3x-1=11$

$+1 \mid 3x=12 \mid +1$

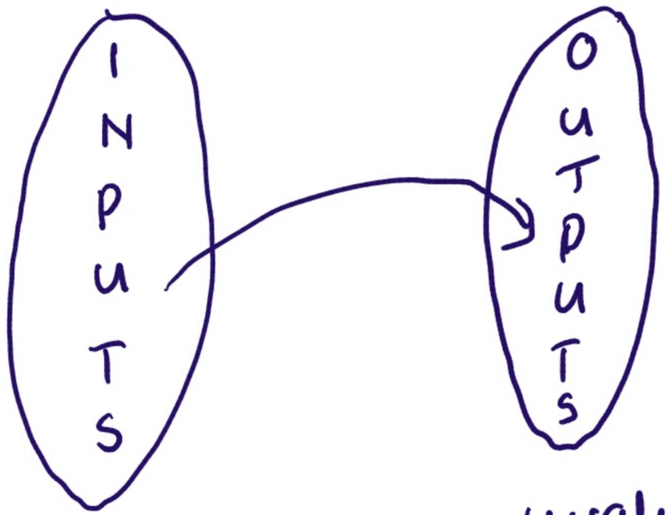
$x=4$

$3x-1=23$

$+1 \mid 3x=24 \mid +1$

$x=8$

Mapping Diagram



x values — y values

Domain — Range

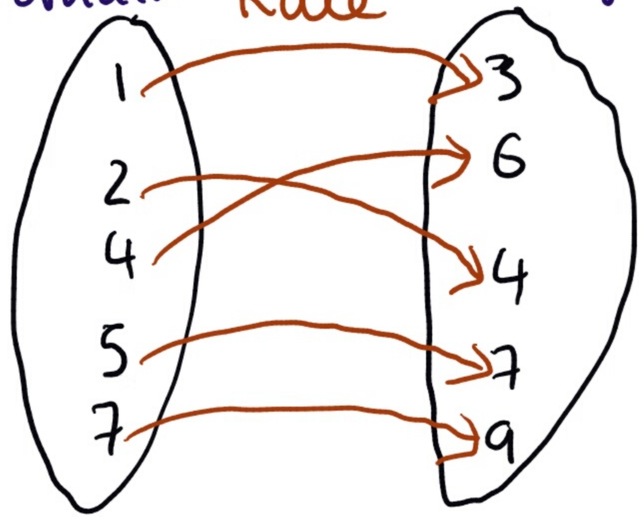
Couple (Domain, Range)

(x , y)

(input , output)

In a function, one input can only have one output.

Q7



Couples

(1,3)
(2,4)
(4,6)
(5,7)
(7,9)

Rule

$f(x) = x + 2$

$f(1) = (1) + 2$

$f1 = 3$

$f(2) = (2) + 2$

$f2 = 4$ ✓

(13)

$$2x + 4 = 8$$

$$-4 \quad 2x = 4 \quad -4$$

$$x = 2$$

$$2x + 4 = -8$$

$$-4 \quad 2x = -12 \quad -4$$

$$x = -6$$

HW pg 458 Q 14 + 15.

Q14 $f(x) \rightarrow 6x-2$

$\overset{x}{2}\ \overset{y}{a}$

$(2, a) \Rightarrow 6(2)-2$

$12-2=10$

$(2,10)$

$\overset{x}{-4}\ \overset{y}{b}$

$(-4, b) \Rightarrow 6(-4)-2$

$-24-2=-26$

$(-4,-26)$

$\overset{x}{c}\ \overset{y}{16}$

$(c, 16)$

$16 = 6x-2$

$+2 \mid 18 = 6x \mid +2$

$\div 6 \mid 3 = x \mid \div 6$

$(3,16)$

$\overset{x}{d}\ \overset{y}{-14}$

$(d, -14)$

$-14 = 6x-2$

$+2 \mid -12 = 6x \mid +2$

$\div 6 \mid -2 = x \mid \div 6$

$(-2,-14)$

1) $y = 2x - 4$

$2(3) - 4$

$6 - 4$

$= 2$

2) $y = 3x + 2$

$3(1) + 2$

$3 + 2 = 5$

3) $y = 3x + 1$

$3(1) + 1$

$3 + 1 = 4$

Operations with functions

Method

① If $f(x)$ is written with a value in the bracket i.e $f(1)$ replace the x value in the function with the value in the bracket

Eg1) If $f(x) = 2x - 3$, find $f(2)$

$f(2) = 2(2) - 3$

$4 - 3$

$f(2) = 1$

as a couple

$f(2) = 1$

$(2, 1)$

x y

find $f(1)$ $2(1) - 3$

$= -1$

$f(0)$ $2(0) - 3$

$= -3$

$f(-3)$ $2(-3) - 3$

$-6 - 3$

$= -9$

Method 2

When $f(x) =$ value, you will have to put the function equal to the given value and solve for x.

Eg 1) $f(x) = \underbrace{3x-2}_{y}$

Find $f(x) = 4$ given value.

$3x-2 = 4$

$+2 \mid 3x = 6 \mid +2$

$\div 3 \mid x = 2 \mid \div 3$

$f(2) = 4$

$(\overset{x}{2}, \overset{y}{4})$

Find $f(x) = 7$

$3x-2 = 7$

$+2 \mid 3x = 9 \mid +2$

$x = 3$

If $f(x) = 3x-2$ and $g(x) = \underbrace{2-4x}$

find $g(x) = -10$

$+2-4x = -10$

$-2 \mid -4x = -12 \mid \div 2$

$\div -4 \mid x = 3 \mid \div -4$

$g(3) = -10$

Q1) $g(x) = f(\overset{x}{4})$

$2-4x = 3(4)-2$

$2-4x = 10$

$-2 \mid -4x = 8 \mid -2$

$\div -4 \mid x = -2 \mid \div -4$

Pg 460 Q2+3

If $f(x) = 2x^2 - 1$ and $g(x) = x + 2$ are two functions

($2x^2 - 1$: quadratic ∪ shape; $x + 2$: linear)

find

① $f(x) = 3$

$2x^2 - 1 = 3$

Solve for x

$+1$ | $2x^2 = 4$

$\div 2$ | $x^2 = \pm 2$

$\sqrt{}$ | $x = \sqrt{2}$

$[(-2)^2 = 4]$

② $g(x) = f(3)$

$x + 2 = 2(3)^2 - 1$

$x + 2 = 17$

-2 | $x = 15$

③ $f(x) = g(x)$

$2x^2 - 1 = x + 2$

$-x$ | $2x^2 - x - 1 = 2$ | $-x$

-2 | $2x^2 - x - 3 = 0$ | -2

mult: $6x^2$, $6N = 6$, 2×3

$2x^2 + 2x - 3x - 3$

$2x(x+1) - 3(x+1) = 0$

$(2x - 3)(x + 1) = 0$

$2x = 3$, $x = 3/2$; $x = -1$

$$2x^2 - x - 3 = 0$$

$$(2x - 3)(x + 1) = 0$$

$$+2x \quad -3x \quad -1x$$

$2x - 3 = 0$ $\quad$ $x + 1 = 0$

$2x = 3$ $\quad$ $x = -1$

$x = 3/2$

When you have to put a function into another function

Eg1) $f(x) = 2x-3$ and $g(x) = x+5$ are two functions

① find $f(2)$

$2x-3$

$2(2)-3$

$4-3$

$f(2) = 1$

② $g(-2)$

$x+5$

$(-2)+5$

$= 3$

$g(-2) = 3$

③ $fg(2)$

put the g function into the x part of the f function

$f(x) = 2x-3$

$g(x) = x+5$

$2(x+5)-3$

$2x+10-3$

$2x+7$

$2(2)+7$

$4+7$

$= 11$

$fg(2) = 11$

④ $gf(-2)$

$f(x) = 2x - 3$ $g(x) = x + 5$

$gf(-2)$

put the f function into the x part of the g function

$f(x)$

$(2x - 3) + 5$

$2x - 3 + 5$

$2x + 2$

$gf(-2) = 2(-2) + 2$

$-4 + 2$

$= -2$

HW pg 461 Q14