3) A Relation R is given by the set $\{(x,y)/y = x+3, x \in \{0,1,2,3,4,5\}$ Determine its domain and range

$$R = \{(x,y)/y = x+3\}$$

$$x \in = \{0,1,2,3,4,5\}$$

$x = 0 \longrightarrow y = x+3 = 0+3 = 3$

$x = 1 \longrightarrow y = x+3 = 1+3 = 4$

$x = 2 \longrightarrow y = x+3 = 2+3 = 5$

$x = 3 \longrightarrow y = x+3 = 3+3 = 6$

$x = 4 \longrightarrow y = x+3 = 4+3 = 7$

$x = 5 \longrightarrow y = x+3 = 5+3 = 8$

Domain $R = \{0,1,2,3,4,5\}$

Range $R = \{3,4,5,6,7,8\}$

4) Represent each of the given relations by (a) an arrow diagram (b) a graph and (c) a set in roster form, wherever possible.

i) $\{(x,y)(x = 2y, x \in \{2,3,4,5\}, y \in \{0,1,2,3,4\}, \emptyset$.

i) $x, y \{x = 2y\}$

$x = 2$	$y = 1$
$x = 3$	$y = 2$
$x = 4$	$y = 3$
$x = 5$	$y = 4$

$x = 2y$

$y = \frac{x}{2}$

i) $x = 2$

$y = \frac{x}{2} = \frac{2}{2} = 1$

ii) $x = 3$

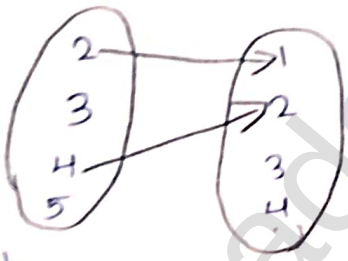
$y = x/2 = 3/2$

iii) $x = 4$

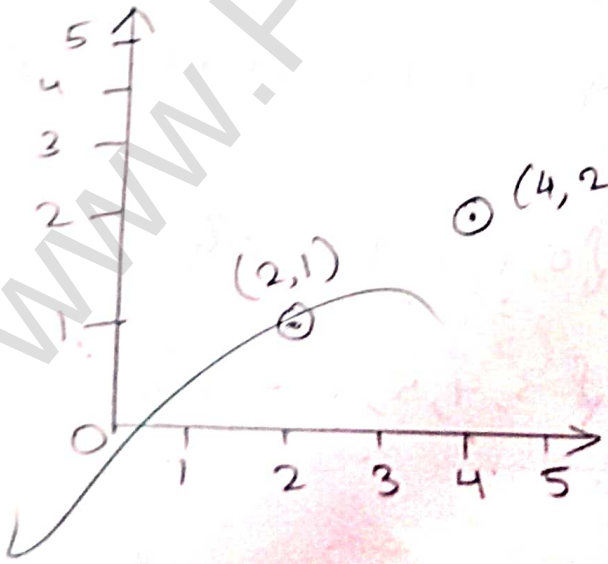
$y = x/2 = 4/2 = 2$

iv) $x = 5$

$y = \frac{x}{2} = 5/2$



Graph



Roaster $= \{(2,1)\ (4,2)\}$.

(x) ii) $\{(x,y) | y = x+3$ x, y are Natural numbers $< 10\}$

$x = \{1,2,3,4,5,6,7,8,9\}$

$y = x+3$ $x=1$ $y = 1+3 = 4$

$y = x+3$ $x=2$ $y = 2+3 = 5$

$y = x+3$ $x=3$ $y = 3+3 = 6$

$y = x+3$ $x=4$ $y = 4+3 = 7$

$y = x+3$ $x=5$ $y = 5+3 = 8$

$y = x+3$ $x=6$ $y = 6+3 = 9$

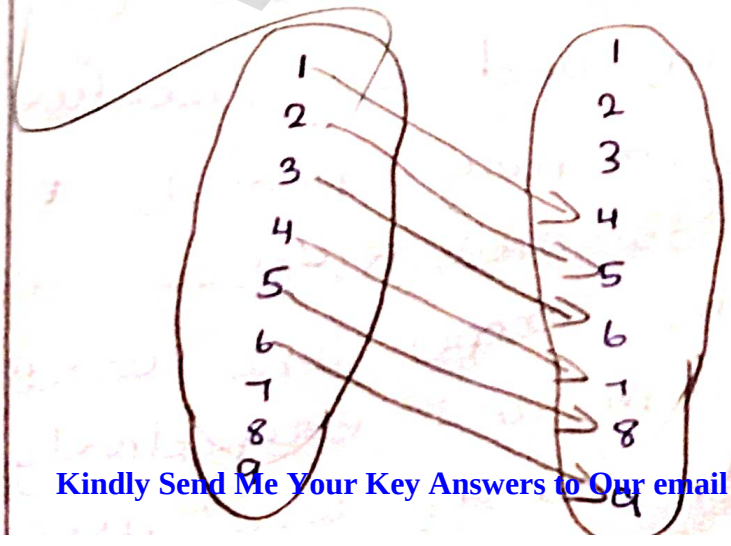
$y = x+3$ $x=7$ $y = 7+3 = 10$

$y = x+3$ $x=8$ $y = 8+3 = 11$

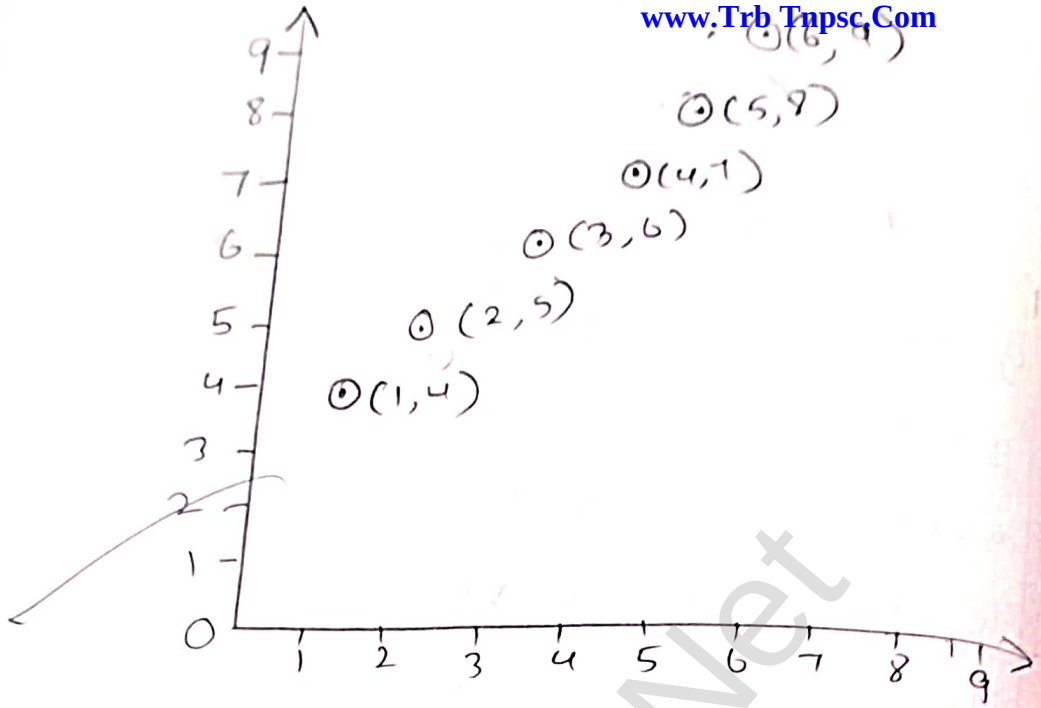
$y = x+3$ $x=9$ $y = 9+3 = 12$

$R = \{(1,4)\ (2,5)\ (3,6)\ (4,7)\ (5,8)\ (6,9)$
$(7,10)\ (8,11)\ (9,12)\}$

An arrow diagram



Graph



Roaster form

$R = \{(1,4)\ (2,5)\ (3,6)\ (4,7)\ (5,8)\ (6,9)\}$

5) A company has four categories of employes given by assistants (A) clerks (C) managers (M) and an executive officer (E). The company provide ₹10,000 ₹25,000, ₹50,000 and ₹1,00,000 as salaries to the people who work in Catogories A, C, M and E respectively If A_1, A_2, A_3, A_4 and A_5 were assistants,

C_1, C_2, C_3, C_4 were clerks; M_1, M_2, M_3 were managers and E_1, E_2 were executive officers and if the relation R is defined by x R y where x is the salary given to Person express the relation R through an ordered pair and an arrow diagram.

A ⟶ assistants

Salary

$A_1 \longrightarrow 10,000$

$A_2 \longrightarrow 10,000$

$A_3 \longrightarrow 10,000$

$A_4 \longrightarrow 10,000$

$A_5 \longrightarrow 10,000$

C ⟶ clerks

Salary

$C_1 \longrightarrow 25,000$

$C_2 \longrightarrow 25,000$

$C_3 \longrightarrow 25,000$

$C_4 \longrightarrow 25,000$

M ⟶ managers

Salary

$M_1 \longrightarrow 50,000$

$M_2 \longrightarrow 50,000$

$M_3 \longrightarrow 50,000$

E ⟶ Executive officer

Salary

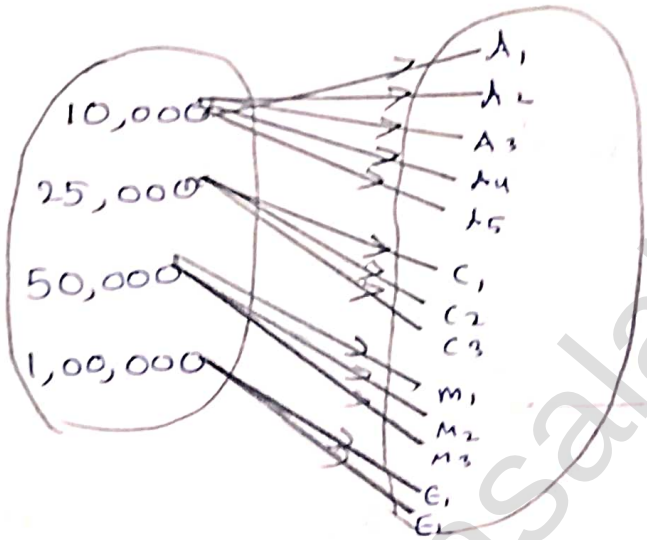
$E_1 \longrightarrow 100,000$

$E_2 \longrightarrow 100,000$

a)

$R = \{(10,000, A_1)\ (10,000, A_2)\ (10,000, A_3)$
$(10,000, A_4)\ (10,000, A_5)\ (50,000, C_1)$
$(50,000, C_2)\ (50,000, C_3)\ (50,000, C_4)$
$(1,00,000, E_1)\ (1,00,000, E_2)\}$

b)



Exercise 1.3

1) Let $f = \{(x,y) \mid x, y \in N \text{ and } y = 2x\}$ be a relation on N. Find the domain co-domain and range. Is this relation a function?

$f = \{x, y \mid x, y \in N \text{ and } y = 2x$

$x = 1 \longrightarrow y = 2x \Rightarrow y = 2(1) = 2$

$x = 2 \longrightarrow y = 2x \Rightarrow y = 2(2) = 4$

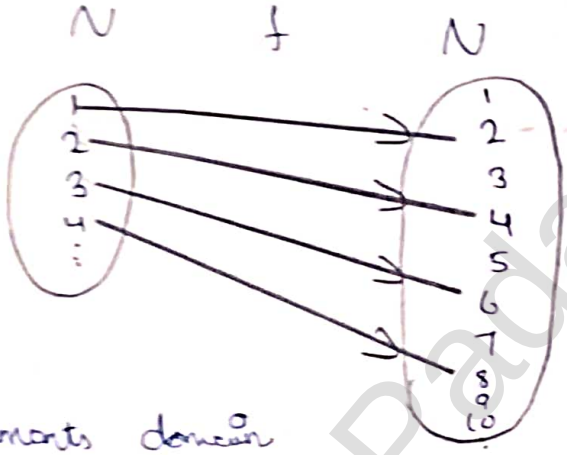
$x = 3 \longrightarrow y = 2x \Rightarrow y = 3(3) = 6$

$x = 4 \longrightarrow y = 2x \Rightarrow y = 4(4) = 8$

$R = \{(1,2)\ (2,4)\ (3,6)\ (4,8)\}$

Domain $= \{1, 2, 3, 4 \ldots\}$

Range $R = \{2, 4, 6, 8 \ldots\}$



A elements domain

2) Let $X = \{3, 4, 6, 8\}$ determine whether the $R = \{(x; f(x)) \mid x \in X, f(x) = x^2 + 1\}$ is a function from X to N?

$X = \{3, 4, 6, 8\}$

$R = \{x, f(x)\}\ \{x \in \quad f(x) = x^2 + 1\}$

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

$f(3) = (3)^2 + 1 = 9 + 1 = 10$

$f(4) = (4)^2 + 1 = 16 + 1 = 17$

$1^2 = 1 \quad 7^2 = 49$

$2^2 = 4 \quad 8^2 = 64$

$3^2 = 9 \quad 9^2 = 81$

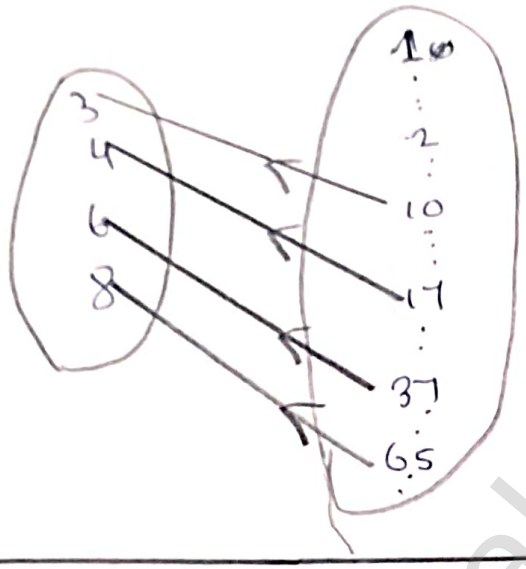
$4^2 = 16 \quad 10^2 = 100$

$5^2 = 25$

$f(6) = (6)^2 + 1 = 36 + 1 = 37$

$f(8) = (8)^2 + 1 = 64 + 1 = 65$

$R = \{(3,10), (4,17), (6,37), (8,65)\}$



Eg: 1.9

Given $f(x) = 2x - x^2$

find (i) $f(1)$ ii) $f(x+)$ (iii) $f(x) + f(1)$

i) $x = 1$

$f(x) = 2x - x^2$

i) $f(1)$

$f(x) = 2x - x^2$

$f(1) = 2(1) - (1)^2$

$= 2 - 1$

$= 1$

ii) $f(x+1)$

$f(x) = 2x - x^2$

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

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

$\boxed{(a+b)^2 = a^2 + b^2 + 2ab}$

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

(a = x, b = 1)

$= \boxed{x^2 + 1 + 2x}$

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

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

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

$\boxed{f(x+1) = -x^2 + 1}$ — (2)

iii) $f(x) + f(1)$

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

$= 2x - x^2 + 1$ — (3)

13/08/2021

$f(x) + f(1) \neq f(x+1)$

(2) $\neq$ (3)