Question 1.

Let A = {1, 2, 3, 7} and B = {3, 0, -1, 7}, which of the following are relation from A to B?

(i) R_1 = {(2,1), (7,1)}

(ii) R_2 = {(-1,1)}

(iii) R_3 = {(2,-1), (7, 7), (1,3)}

(iv) R_4 = {(7, -1), (0, 3), (3, 3), (0, 7)}

Answer:

A = {1,2,3,7} B = {3,0,-1, 7}

A × B = {1,2,3} × {3, 0,-1, 7}

A × B = {(1,3) (1,0) (1,-1) (1,7) (2,3) (2, 0)
(2, -1) (2, 7) (3, 3) (3,0) (3,-1)
(3, 7) (7, 3) (7, 0) (7,-1) (7, 7)}

(i) R_1 = {(2, 1)} (7, 1)
It is not a relation, there is no element of (2, 1) and (7, 1) in A × B

(ii) R_2 = {(-1),1)}
It is not a relation, there is no element of
(-1, 1) in A × B

(iii) R_3 = {(2,-1) (7, 7) (1,3)}
Yes, It is a relation

(iv) R_4 = {(7,-1) (0,3) (3, 3) (0,7)}
It is not a relation, there is no element of (0, 3) and (0, 7) in A × B

Question 2.

Let A = {1, 2, 3, 4,…,45} and R be the relation defined as "is square of " on A. Write R as a subset of A × A. Also, find the domain and range of R.

Solution:

A = {1, 2, 3, 4, . . . 45}, A × A = {(1, 1), (2, 2) ….. (45, 45)}

R – is square of'

R = {(1, 1), (2, 4), (3, 9), (4, 16), (5, 25), (6, 36)}

R ⊂ (A × A)

Domain of R = {1, 2, 3, 4, 5, 6}

Range of R = {1, 4, 9, 16, 25, 36}

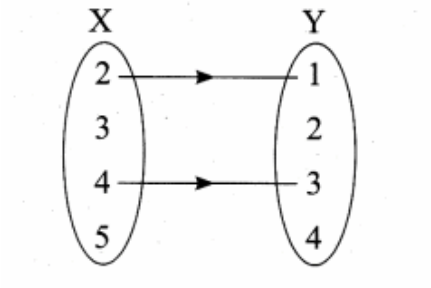
Question 3.

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

Answer:
x = {0, 1, 2, 3, 4, 5}
y = x + 3
when x = 0 ⇒ y = 0 + 3 = 3
when x = 1 ⇒ y = 1 + 3 = 4
when x = 2 ⇒ y = 2 + 3 = 5
when x = 3 ⇒ y = 3 + 3 = 6
when x = 4 ⇒ y = 4 + 3 = 7
when x = 5 y = 5 + 3 = 8
R = {(0, 3) (1,4) (2, 5) (3, 6) (4, 7) (5, 8)}
Domain = {0, 1, 2, 3, 4, 5}
Range = {3, 4, 5, 6, 7, 8}

Question 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 ∈ {2, 3, 4, 5}, y ∈ {1, 2, 3, 4}
(ii) {(x, y) | y = x + 3, x, y are natural numbers < 10}
Answer:
(i) x = {2, 3, 4, 5} y = {1, 2, 3, 4}
x = 2y
wheny y = 1 ⇒ x = 2 × 1 = 2
when y = 2 ⇒ x = 2 × 2 = 4
when y = 3 ⇒ r = 2 × 3 = 6
when y = 4 ⇒ x = 2 × 4 = 8

(a) Arrow diagram



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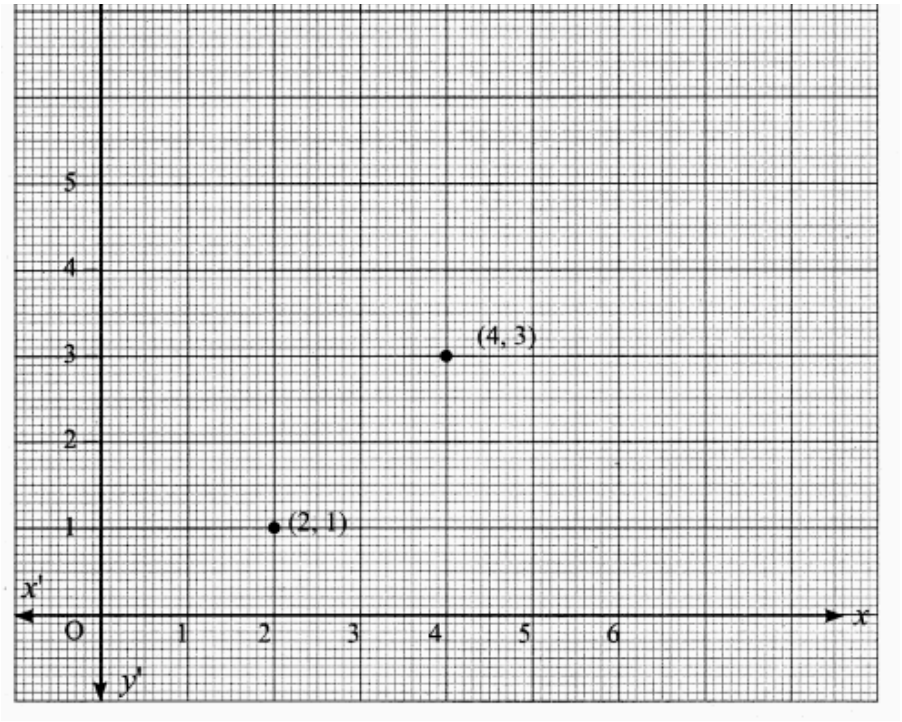
(b) Graph



(c) Roster form R = {(2, 1) (4, 3)}

(ii) x = {1, 2, 3, 4, 5, 6, 7, 8, 9}
y = {1,2, 3, 4, 5, 6, 7, 8,9}
y = x + 3
when x = 1 ⇒ y = 1 + 3 = 4
when x = 2 ⇒ y = 2 + 3 = 5
when x = 3 ⇒ y = 3 + 3 = 6
when x = 4 ⇒ y = 4 + 3 = 7
when x = 5 ⇒ y = 5 + 3 = 8
when x = 6 ⇒ y = 6 + 3 = 9
when x = 7 ⇒ y = 7 + 3 = 10
when x = 8 ⇒ y = 8 + 3 = 11
when x = 9 ⇒ y = 9 + 3 = 12

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

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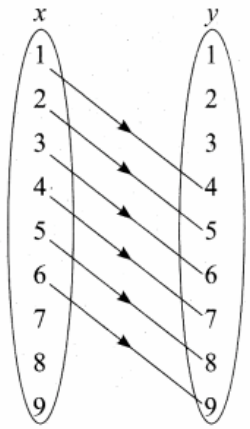
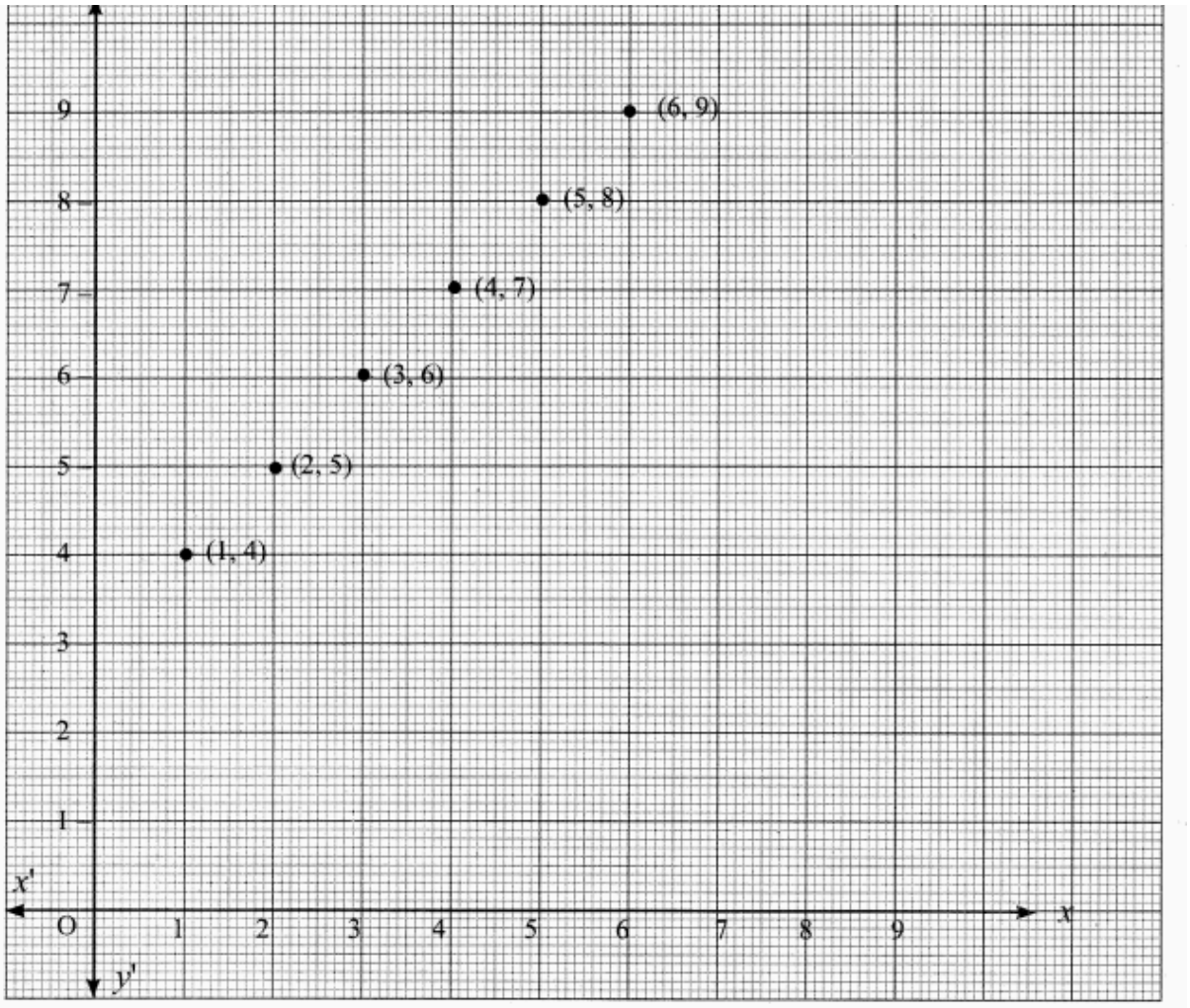
(a) Arrow diagram



(b) Graph



(c) Roster form: R = {(1, 4) (2, 5) (3, 6) (4, 7) (5, 8) (6, 9)}

Question 5.

A company has four categories of employees 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 the categories 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 xRy, where x is the salary given to person y, express the relation R through an ordered pair and an arrow diagram.

Answer:

Assistants $\longrightarrow A_1, A_2, A_3, A_4, A_5$

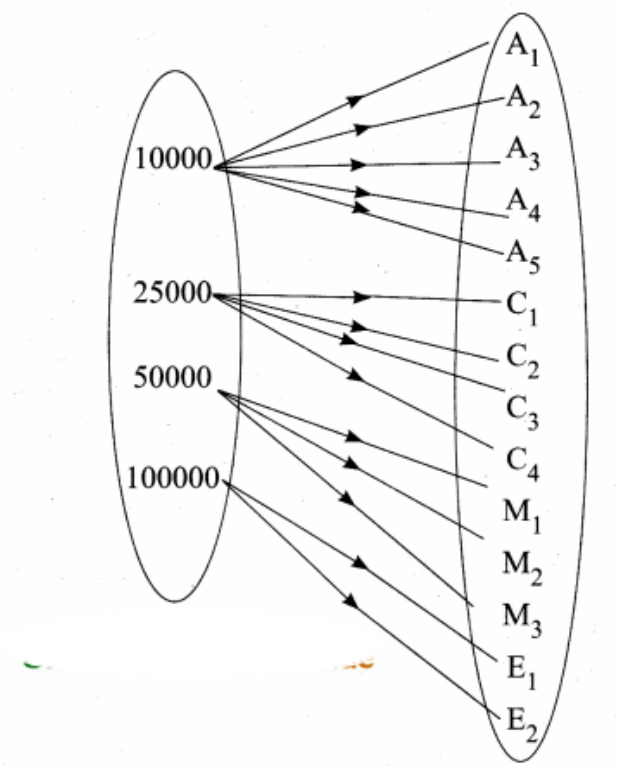
Clerks $\longrightarrow C_1, C_2, C_3, C_4$

Managers $\longrightarrow M_1, M_2, M_3$

Executive officers $\longrightarrow E_1, E_2$

R = {00000, A_1) (10000, A_2) (10000, A_3) (10000, A_4) (10000, A_5)
(25000, C_1) (25000, C_2) (25000, C_3) (25000, C_4)
(50000, M_1) (50000, M_2) (50000, M_3) (100000, E_1) (100000, E_2)}

(a) Arrow diagram



Functions Definition

A relation f between two non – empty sets X and Y is called a function from X to Y if for each $x \in X$ there exists only one $Y \in Y$ such that $(x, y) \in f$

$f = \{(x, y) / \text{for all } x \in X, y \in f\}$

Note: The range of a function is a subset of its co-domain