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Maharashtra State Board 11th Commerce Maths Solutions Chapter 1 Sets and Relations Ex 1.1

Question 1.
Describe the following sets in Roster form:
(i) {x / x is a letter of the word 'MARRIAGE'}
(ii) {x / x is an integer, $-12 < x < 92$}
(iii) {x / x = 2n, n ∈ N}
Solution:
(i) Let A = {x / x is a letter of the word 'MARRIAGE'}
∴ A = {M, A, R, I, G, E}

(ii) Let B = {x / x is an integer, $-12 < x < 92$}
∴ B = {0, 1, 2, 3, 4}

(iii) Let C = {x / x = 2n, n ∈ N}
∴ C = {2, 4, 6, 8, ...}

Question 2.
Describe the following sets in Set-Builder form:
(i) {0}
(ii) {0, ±1, ±2, ±3}
(iii) $\{12,25,310,417,526,637,750\}$
Solution:
(i) Let A = {0}
0 is a whole number but it is not a natural number.
∴ A = {x / x ∈ W, x ∉ N}

(ii) Let B = {0, ±1, ±2, ±3}
B is the set of elements which belongs to Z from -3 to 3.
∴ B = {x / x ∈ Z, -3 ≤ x ≤ 3}

(iii) Let C = $\{12,25,310,417,526,637,750\}$
∴ C = {x / x = nn^2+1, n ∈ N, n ≤ 7}

Question 3.
If A = {x / $6x^2$ + x – 15 = 0}, B = {x / $2x^2$ – 5x – 3 = 0}, C = {x / $2x^2$ – x – 3 = 0}, then find (i) (A ∪ B ∪ C) (ii) (A ∩ B ∩ C)
Solution:
A = {x / $6x^2$ + x – 15 = o}
∴ $6x^2$ + x – 15 = 0
∴ $6x^2$ + 10x – 9x – 15 = 0
∴ 2x(3x + 5) – 3(3x + 5) = 0
∴ (3x + 5) (2x – 3) = 0
∴ 3x + 5 = 0 or 2x – 3 = 0
∴ x = -53 or x = 32
∴ A = $\{-53,32\}$

B = {x / $2x^2$ – 5x – 3 = 0}
∴ $2x^2$ – 5x – 3 = 0
∴ $2x^2$ – 6x + x – 3 = 0
∴ 2x(x – 3) + 1(x – 3) = 0
∴ (x – 3)(2x + 1) = 0
∴ x – 3 = 0 or 2x + 1 = 0
∴ x = 3 or x = -12
∴ B = {-12, 3}

C = {x / $2x^2$ – x – 3 = 0}
∴ $2x^2$ – x – 3 = 0
∴ $2x^2$ – 3x + 2x – 3 = 0
∴ x(2x – 3) + 1(2x – 3) = 0
∴ (2x – 3) (x + 1) = 0
∴ 2x – 3 = 0 or x + 1 = 0
∴ x = 32 or x = -1
∴ C = {-1, 32}

(i) A ∪ B ∪ C = {−53,32}∪{-12,3}∪{−1,32} = {-53,−1,-12,32,3}

(ii) A ∩ B ∩ C = { }

Question 4.
If A, B, C are the sets for the letters in the words 'college', 'marriage' and 'luggage' respectively, then verify that [A – (B ∪ C)] = [(A – B) ∩ (A – C)].
Solution:
A = {c, o, l, g, e}
B = {m, a, r, i, g, e}
C = {l, u, g, a, e}
B ∪ C = {m, a, r, i, g, e, l, u}
A – (B ∪ C) = {c, o}
A – B = {c, o, l}
A – C = {c, o}
∴ [(A – B) ∩ (A – C)] = {c, o} = A – (B ∪ C)
∴ [A – (B ∪ C)] = [(A – B) ∩ (A – C)]

Question 5.
If A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C = {4, 5, 6, 7, 8} and universal set X = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, then verify the following:
(i) A ∪ (B ∩ C) = (A ∪ B) ∩ (A ∪ C)
(ii) A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C)
(iii) (A ∪ B)′ = A′ ∩ B′
(iv) (A ∩ B)′ = A′ ∪ B′
(v) A = (A ∩ B) ∪ (A ∩ B′)
(vi) B = (A ∩ B) ∪ (A′ ∩ B)
(vii) n(A ∪ B) = n(A) + n(B) – n(A ∩ B)
Solution:
A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C = {4, 5, 6, 7, 8}, X = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
(i) B ∩ C = {4, 5, 6}
∴ A ∪ (B ∩ C) = {1, 2, 3, 4, 5, 6} ……(i)
A ∪ B = {1, 2, 3, 4, 5, 6}
A ∪ C = {1, 2, 3, 4, 5, 6, 7, 8}
∴ (A ∪ B) ∩ (A ∪ C) = {1, 2, 3, 4, 5, 6} ……(ii)
From (i) and (ii), we get
A ∪ (B ∩ C) = (A ∪ B) ∩ (A ∪ C)

(ii) B ∪ C = {3, 4, 5, 6, 7, 8}
∴ A ∩ (B ∪ C) = {3, 4} …..(i)
A ∩ B = {3, 4}
A ∩ C = {4}
∴ (A ∩ B) ∪ (A ∩ C) = {3, 4} …..(ii)
From (i) and (ii), we get
A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C)

(iii) A ∪ B = {1, 2, 3, 4, 5, 6}
∴ (A ∪ B)′ = {7, 8, 9, 10} …….(i)
A′ = {5, 6, 7, 8, 9, 10}, B′ = {1, 2, 7, 8, 9, 10}
∴ A′ ∩ B′ = {7, 8, 9, 10} ……(ii)
From (i) and (ii), we get
(A ∪ B)′ = A′ ∩ B′

(iv) A ∩ B = {3, 4}
∴ (A ∩ B)′ = {1, 2, 5, 6, 7, 8, 9, 10} ……(i)
A′ = {5, 6, 7, 8, 9, 10}
B′ = {1, 2, 7, 8, 9, 10}
∴ A′ ∪ B′ = {1, 2, 5, 6, 7, 8, 9, 10} ……(ii)
From (i) and (ii), we get
(A ∩ B)′ = A′ ∪ B′

(v) A = {1, 2, 3, 4} …..(i)
A ∩ B = {3, 4}
B′ = {1, 2, 7, 8, 9, 10}
A ∩ B′ = {1, 2}
∴ (A ∩ B) ∪ (A ∩ B′) = {1, 2, 3, 4} ……(ii)
From (i) and (ii), we get
A = (A ∩ B) ∪ (A ∩ B′)

(vi) B = {3, 4, 5, 6} .....(i)
A ∩ B = {3, 4}
A′ = {5, 6, 7, 8, 9, 10}
A′ ∩ B = {5, 6}
∴ (A ∩ B) ∪ (A′ ∩ B) = {3, 4, 5, 6} .....(ii)
From (i) and (ii), we get
B = (A ∩ B) ∪ (A′ ∩ B)

(vii) A = {1, 2, 3, 4}, B = {3, 4, 5, 6},
A ∩ B = {3, 4}, A ∪ B = {1, 2, 3, 4, 5, 6}
∴ n(A) = 4, n(B) = 4,
n(A ∩ B) = 2,
n(A ∪ B) = 6 .....(i)
∴ n(A) + n(B) – n(A ∩ B) = 4 + 4 – 2
∴ n(A) + n(B) – n(A ∩ B) = 6 .....(ii)
From (i) and (ii), we get
n(A ∪ B) = n(A) + n(B) – n(A ∩ B)

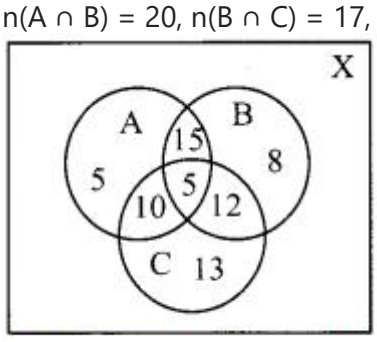
Question 6.
If A and B are subsets of the universal set X and n(X) = 50, n(A) = 35, n(B) = 20, n(A′ ∩ B′) = 5, find
(i) n(A ∪ B)
(ii) n(A ∩ B)
(iii) n(A′ ∩ B)
(iv) n(A ∩ B′)
Solution:
n(X) = 50, n(A) = 35, n(B) = 20, n(A′ ∩ B′) = 5
(i) n(A ∪ B) = n(X) – [n(A ∪ B)′]
= n(X) – n(A′ ∩ B′)
= 50 – 5
= 45

(ii) n(A ∩ B) = n(A) + n(B) – n(A ∪ B)
= 35 + 20 – 45
= 10

(iii) n(A′ ∩ B) = n(B) – n(A ∩ B)
= 20 – 10
= 10

(iv) n(A ∩ B′) = n(A) – n(A ∩ B)
= 35 – 10
= 25

Question 7.
Out of 200 students, 35 students failed in MHT-CET, 40 in AIEEE and 40 in IIT entrance, 20 failed in MHT-CET and AIEEE, 17 in AIEEE and IIT entrance, 15 in MHT-CET and IIT entrance, and 5 failed in all three examinations. Find how many students
(i) did not fail in any examination.
(ii) failed in AIEEE or IIT entrance.
Solution:
Let A = set of students who failed in MHT-CET
B = set of students who failed in AIEEE
C = set of students who failed in IIT entrance
X = set of all students
∴ n(X) = 200, n(A) = 35, n(B) = 40, n(C) = 40,
n(A ∩ B) = 20, n(B ∩ C) = 17, n(A ∩ C) = 15, n(A ∩ B ∩ C) = 5

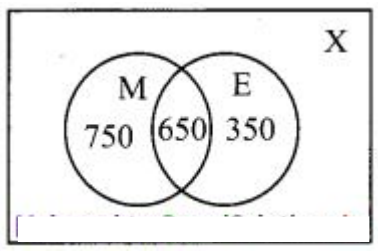


(i) n(A ∪ B ∪ C) = n(A) + n(B) + n(C) – n(A ∩ B) – n(B ∩ C) – n(A ∩ C) + n(A ∩ B ∩ C)
= 35 + 40 + 40 – 20 – 17 – 15 + 5
= 68
∴ No. of students who did not fail in any exam = n(X) – n(A ∪ B ∪ C)

= 200 – 68
= 132

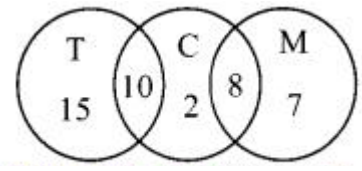
(ii) No. of students who failed in AIEEE or IIT entrance = n(B ∪ C)
= n(B) + n(C) – n(B ∩ C)
= 40 + 40 – 17
= 63

Question 8.
From amongst 2000 literate individuals of a town, 70% read Marathi newspapers, 50% read English newspapers and 32.5% read both Marathi and English newspapers. Find the number of individuals who read
(i) at least one of the newspapers.
(ii) neither Marathi nor English newspaper.
(iii) only one of the newspapers.
Solution:
Let M = set of individuals who read Marathi newspapers
E = set of individuals who read English newspapers
X = set of all literate individuals
∴ n(X) = 2000,
n(M) = $\frac{70}{100}$ × 2000 = 1400
n(E) = $\frac{50}{100}$ × 2000 = 1000
n(M ∩ E) = $\frac{32.5}{100}$ × 2000 = 650
n(M ∪ E) = n(M) + n(E) – n(M ∩ E)
= 1400 + 1000 – 650
= 1750



(i) No. of individuals who read at least one of the newspapers = n(M ∪ E) = 1750.
(ii) No. of individuals who read neither Marathi nor English newspaper = n(M′ ∩ E′)
= n(M ∪ E)′
= n(X) – n(M ∪ E)
= 2000 – 1750
= 250
(iii) No. of individuals who read only one of the newspapers = n(M ∩ E′) + n(M′ ∩ E)
= n(M ∪ E) – n(M ∩ E)
= 1750 – 650
= 1100

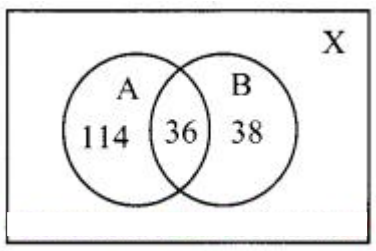
Question 9.
In a hostel, 25 students take tea, 20 students take coffee, 15 students take milk, 10 students take both tea and coffee, 8 students take both milk and coffee. None of them take tea and milk both and everyone takes atleast one beverage, find the number of students in the hostel.
Solution:
Let T = set of students who take tea
C = set of students who take coffee
M = set of students who take milk
∴ n(T) = 25, n(C) = 20, n(M) = 15,
n(T ∩ C) = 10, n(M ∩ C) = 8, n(T ∩ M) = 0, n(T ∩ M ∩ C) = 0



∴ Number of students in the hostel = n(T ∪ C ∪ M)
= n(T) + n(C) + n(M) – n(T ∩ C) – n(M ∩ C) – n(T ∩ M) + n(T ∩ M ∩ C)
= 25 + 20 + 15 – 10 – 8 – 0 + 0
= 42

Question 10.
There are 260 persons with skin disorders. If 150 had been exposed to the chemical A, 74 to the chemical B, and 36 to both chemicals A and B, find the number of persons exposed to
(i) Chemical A but not Chemical B
(ii) Chemical B but not Chemical A
(iii) Chemical A or Chemical B.

Solution:
Let A = set of persons exposed to chemical A
B = set of persons exposed to chemical B
X = set of all persons
∴ n(X) = 260, n(A) = 150, n(B) = 74, n(A ∩ B) = 36



(i) No. of persons exposed to chemical A but not to chemical B = n(A ∩ B′)
= n(A) – n(A ∩ B)
= 150 – 36
= 114

(ii) No. of persons exposed to chemical B but not to chemical A = n(A′ ∩ B)
= n(B) – n(A ∩ B)
= 74 – 36
= 38

(iii) No. of persons exposed to chemical A or chemical B = n(A ∪ B)
= n(A) + n(B) – n(A ∩ B)
= 150 + 74 – 36
= 188

Question 11.
If A = {1, 2, 3}, write the set of all possible subsets of A.
Solution:
A = {1, 2, 3}
∴ { }, {1}, {2}, {3}, {1, 2}, {2, 3}, {1, 3} and {1, 2, 3} are all the possible subsets of A.

Question 12.
Write the following intervals in set-builder form:
(i) (-3, 0)
(ii) [6, 12]
(iii) (6, 12)
(iv) (-23, 5)
Solution:
(i) (-3, 0) = {x / x ∈ R, -3 < x < 0}
(ii) [6, 12] = {x / x ∈ R, 6 ≤ x ≤ 12}
(iii) (6, 12) = {x / x ∈ R, 6 < x < 12}
(iv) (-23, 5) = {x / x ∈ R, -23 < x < 5}

Maharashtra State Board 11th Commerce Maths Solutions Chapter 1 Sets and Relations Ex 1.2

Question 1.
If (x – 1, y + 4) = (1, 2), find the values of x and y.
Solution:
(x – 1, y + 4) = (1, 2)
By the definition of equality of ordered pairs, we have

x – 1 = 1 and y + 4 = 2
∴ x = 2 and y = -2

Question 2.
If $(x+13, y3-1)=(13, 32)$, find x and y.
Solution:
$(x+13, y3-1)=(13, 32)$
By the definition of equality of ordered pairs, we have
$x+13=13$ and $y3-1=32$
$x=13-13$ and $y3=32+1=52$
x = 0 and y = 152

Question 3.
If A = {a, b, c}, B = {x, y}, find A × B, B × A, A × A, B × B.
Solution:
A = {a, b, c}, B = {x, y}
A × B = {(a, x), (a, y), (b, x), (b, y), (c, x), (c, y)}
B × A = {(x, a), (x, b), (x, c), (y, a), (y, b), (y, c)}
A × A = {(a, a), (a, b), (a, c), (b, a), (b, b), (b, c), (c, a), (c, b), (c, c)}
B × B = {(x, x), (x, y), (y, x), (y, y)}

Question 4.
If P = {1, 2, 3} and Q = {6, 4}, find the sets P × Q and Q × P.
Solution:
P = {1, 2, 3}, Q = {6, 4}
P × Q = {(1, 6), (1, 4), (2, 6), (2, 4), (3, 6), (3, 4)}
Q × P = {(6, 1), (6, 2), (6, 3), (4, 1), (4, 2), (4, 3)}

Question 5.
Let A = {1, 2, 3, 4}, B = {4, 5, 6}, C = {5, 6}. Find
(i) A × (B ∩ C)
(ii) (A × B) ∩ (A × C)
(iii) A × (B ∪ C)
(iv) (A × B) ∪ (A × C)
Solution:
A= {1, 2, 3, 4}, B = {4, 5, 6}, C = {5, 6}
(i) B ∩ C = {5, 6}
∴ A × (B ∩ C) = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)}

(ii) A × B = {(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 4), (4, 5), (4, 6)}
A × C = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)}
∴ (A × B) ∩ (A × C) = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)}

(iii) B ∪ C = {4, 5, 6}
∴ A × (B ∪ C) = {(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 4), (4, 5), (4, 6)}

(iv) A × B = {(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 4), (4, 5), (4, 6)}
A × C = {(1, 5), (1, 6), (2, 5), (2, 6), (3, 5), (3, 6), (4, 5), (4, 6)}
∴ (A × B) ∪ (A × C) = {(1, 4), (1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 4), (3, 5), (3, 6), (4, 4), (4, 5), (4, 6)}

Question 6.
Express {(x, y) / $x^2 + y^2 = 100$, where x, y ∈ W} as a set of ordered pairs.
Solution:
{(x, y) / $x^2 + y^2 = 100$, where x, y ∈ W}
We have, $x^2 + y^2 = 100$
When x = 0 and y = 10,
$x^2 + y^2 = 0^2 + 10^2 = 100$
When x = 6 andy = 8,
$x^2 + y^2 = 6^2 + 8^2 = 100$
When x = 8 and y = 6,
$x^2 + y^2 = 8^2 + 6^2 = 100$
When x = 10 and y = 0,
$x^2 + y^2 = 10^2 + 0^2 = 100$
∴ Set of ordered pairs = {(0, 10), (6, 8), (8, 6), (10, 0)}

Question 7.
Write the domain and range of the following relations.
(i) {(a, b) / a ∈ N, a < 6 and b = 4}

(ii) {(a, b) / a, b ∈ N, a + b = 12}
(iii) {(2, 4), (2, 5), (2, 6), (2, 7)}
Solution:
(i) Let R_1 = {(a, b)/ a ∈ N, a < 6 and b = 4}
Set of values of 'a' are domain and set of values of 'b' are range.
a ∈ N and a < 6
∴ a = 1, 2, 3, 4, 5 and b = 4
Domain (R_1) = {1, 2, 3, 4, 5}
Range (R_1) = {4}

(ii) Let R_2 = {(a, b)/a, b ∈ N and a + b = 12}
Now, a, b ∈ N and a + b = 12
When a = 1, b = 11
When a = 2, b = 10
When a = 3, b = 9
When a = 4, b = 8
When a = 5, b = 7
When a = 6, b = 6
When a = 7, b = 5
When a = 8, b = 4
When a = 9, b = 3
When a = 10, b = 2
When a = 11, b = 1
∴ Domain (R_2) = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
Range (R_2) = {11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1}

(iii) Let R_3 = {(2, 4), (2, 5), (2, 6), (2, 7)}
Domain (R_3) = {2}
Range (R_3) = {4, 5, 6, 7}

Question 8.
Let A = {6, 8} and B = {1, 3, 5}.
Let R = {(a, b) / a ∈ A, b ∈ B, a – b is an even number}.
Show that R is an empty relation from A to B.
Solution:
A= {6, 8}, B = {1, 3, 5}
R = {(a, b)/ a ∈ A, b ∈ B, a – b is an even number}
a ∈ A
∴ a = 6, 8
b ∈ B
∴ b = 1, 3, 5
When a = 6 and b = 1, a – b = 5 which is odd
When a = 6 and b = 3, a – b = 3 which is odd
When a = 6 and b = 5, a – b = 1 which is odd
When a = 8 and b = 1, a – b = 7 which is odd
When a = 8 and b = 3, a – b = 5 which is odd
When a = 8 and b = 5, a – b = 3 which is odd
Thus, no set of values of a and b gives a – b even.
∴ R is an empty relation from A to B.

Question 9.
Write the relation in the Roster form and hence find its domain and range.
(i) R_1 = {(a, a_2) / a is a prime number less than 15}
(ii) R_2 = {(a, $1a$) / 0 < a ≤ 5, a ∈ N}
Solution:
(i) R_1 = {(a, a_2) / a is a prime number less than 15}
∴ a = 2, 3, 5, 7, 11, 13
∴ a2 = 4, 9, 25, 49, 121, 169
∴ R_1 = {(2, 4), (3, 9), (5, 25), (7, 49), (11, 121), (13, 169)}
∴ Domain (R_1) = {a/a is a prime number less than 15} = {2, 3, 5, 7, 11, 13}
Range (R_1) = {a_2/a is a prime number less than 15} = {4, 9, 25, 49, 121, 169}

(ii) $R_2 = \left\{\left(a, \frac{1}{a}\right) / 0 < a \leq 5, a \in N\right\}$

$\therefore$ $a = 1, 2, 3, 4, 5$

$\therefore$ $\frac{1}{a} = 1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

$\therefore$ $R_2 = \left\{(1, 1), \left(2, \frac{1}{2}\right), \left(3, \frac{1}{3}\right), \left(4, \frac{1}{4}\right), \left(5, \frac{1}{5}\right)\right\}$

$\therefore$ Domain $(R_2) = \{a / 0 < a \leq 5, a \in N\}$

$= \{1, 2, 3, 4, 5\}$

Range $(R_2) = \left\{\frac{1}{a} / 0 < a \leq 5, a \in N\right\}$

$= \left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\right\}$

Question 10.
R = {(a, b) / b = a + 1, a ∈ Z, 0 < a < 5}. Find the range of R.
Solution:
R = {(a, b) / b = a + 1, a ∈ Z, 0 < a < 5}
∴ a = 1, 2, 3, 4
∴ b = 2, 3, 4, 5
∴ Range (R) = {2, 3, 4, 5}

Question 11.
Find the following relations as sets of ordered pairs.
(i) {(x, y) / y = 3x, x ∈ {1, 2, 3}, y ∈ {3, 6, 9, 12}}
(ii) {(x,y) / y > x + 1, x ∈ {1, 2} and y ∈ {2, 4, 6}}
(iii) {(x, y) / x + y = 3, x, y ∈ {0, 1, 2, 3}}
Solution:
(i) {(x, y) / y = 3x, x ∈ {1, 2, 3}, y ∈ {3, 6, 9, 12}}
Here y = 3x
When x = 1, y = 3(1) = 3
When x = 2, y = 3(2) = 6
When x = 3, y = 3(3) = 9
∴ Ordered pairs are {(1, 3), (2, 6), (3, 9)}

(ii) {(x, y) / y > x + 1, x ∈ {1, 2} and y ∈ {2, 4, 6}}
Here, y > x + 1
When x = 1 and y = 2, 2 ≯ 1 + 1
When x = 1 and y = 4, 4 > 1 + 1
When x = 1 and y = 6, 6 > 1 + 1
When x = 2 and y = 2, 2 ≯ 2 + 1
When x = 2 and y = 4, 4 > 2 + 1
When x = 2 and y = 6, 6 > 2 + 1
∴ Ordered pairs are {(1, 4), (1, 6), (2, 4), (2, 6)}

(iii) {(x, y) / x + y = 3, x, y ∈ {0, 1, 2, 3}}
Here, x + y = 3
When x = 0, y = 3
When x = 1, y = 2
When x = 2, y = 1
When x = 3, y = 0
∴ Ordered pairs are {(0, 3), (1, 2), (2, 1), (3, 0)}

Maharashtra State Board 11th Commerce Maths Solutions Chapter 1 Sets and Relations Miscellaneous Exercise 1

Question 1.
Write the following sets in set builder form:
(i) {10, 20, 30, 40, 50}
(ii) {a, e, i, o, u}
(iii) {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}
Solution:
(i) Let A = {10, 20, 30, 40, 50}
∴ A = {x / x = 10n, n ∈ N and n ≤ 5}

(ii) Let B = {a, e, i, o, u}
∴ B = {x / x is a vowel of English alphabets}

(iii) Let C = {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}
∴ C = {x / x represents days of a week}

Question 2.
If U = {x / x ∈ N, 1 ≤ x ≤ 12}, A = {1, 4, 7, 10}, B = {2, 4, 6, 7, 11}, C = {3, 5, 8, 9, 12}.
Write the sets
(i) A ∪ B
(ii) B ∩ C
(iii) A – B
(iv) B – C
(v) A ∪ B ∪ C
(vi) A ∩ (B ∪ C)
Solution:
U = {x / x ∈ N, 1 ≤ x ≤ 12} = {1, 2, 3, …., 12}
A = {1, 4, 7, 10}, B = {2, 4, 6, 7, 11}, C = {3, 5, 8, 9, 12}
(i) A ∪ B = {1, 2, 4, 6, 7, 10, 11}

(ii) B ∩ C = { }

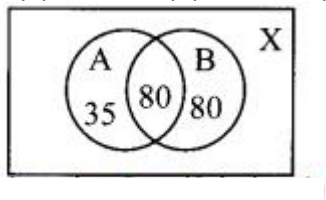
(iii) A – B = {1, 10}

(iv) B – C = {2, 4, 6, 7, 11}

(v) A ∪ B ∪ C = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}

(vi) B ∪ C = {2, 3, 4, 5, 6, 7, 8, 9, 11, 12}
∴ A ∩ (B ∪ C) = {4, 7}

Question 3.
In a survey of 425 students in a school, it was found that 115 drink apple juice, 160 drink orange juice, and 80 drink both apple as well as orange juice. How many drinks neither apple juice nor orange juice?
Solution:
Let A = set of students who drink apple juice
B = set of students who drink orange juice
X = set of all students
∴ n(X) = 425, n(A) = 115, n(B) = 160, n(A ∩ B) = 80



No. of students who neither drink apple juice nor orange juice

$n(A' \cap B') = n(A \cup B)'$
$= n(X) – n(A \cup B)$
$= 425 – [n(A) + n(B) – n(A \cap B)]$
$= 425 – (115 + 160 – 80)$
$= 230$

Question 4.
In a school, there are 20 teachers who teach Mathematics or Physics. of these, 12 teach Mathematics and 4 teach both Physics and Mathematics. How many teachers teach Physics?
Solution:
Let A = set of teachers who teach Mathematics
B = set of teachers who teach Physics
$n(A \cup B) = 20$, $n(A) = 12$, $n(A \cap B) = 4$