1. Set

Extra Question

Que. 1) Write the following sets in listing method or roster method (1 mark each)

1) {x/x is square root of 64}

Ans : A = {8,-8}

2) {z/z is a letter of the word 'statistic'}

Ans : B = {s, t, a, i, c}

3) D is set of months of Gregorian year having 31 days.

Ans : D = {January, March, May, July, August. October, December}

4) A={x/x∈W, x ∉N}

Ans : A = {0}

5) C ={x/x is an ocean of the world}

Ans : C = {Arctic ocean, Atlantic ocean, Indian ocean pacific ocean, southern ocean}

6) A= { $5, 5^2, 5^3, 5^4, \ldots$ }

Ans : A = {z/z =5^n, n ∈ N}

7) T = {1, 3, 7, 21}

Ans : T ={x/x is factor of 21}

8) A = {3, 6, 9, 12, 15, 18, 21}

Ans : A ={x/x = 3n , n ∈ N, $n \leq 7$}

9) D = {51, 53, 55, 57, 59}

Ans : A ={x/x ∈ N, x is an odd integer and 50<x < 60}

10) S = {2, 3, 5}

Ans : S ={y/y is a prime number which is a divisor of 30}

Q.2) Write the following symbolic statements in words. (1 mark each)

11) $\frac{5}{6}$ ∈ Q

Ans : $\frac{5}{6}$ is an element of set Q

Q.12) -3 ∉ N

Ans : -3 is not an element of set N

Q.13) A = { R/R is even number}

Ans : R is the element of set A such that x is even number.

Q.14) A = { x/x is whole number but not a natural number}

Ans :   N = 1, 2, 3 ………… (natural numbers)

       W = 0, 1, 2, 3, …… (Whole numbers)

     ∴ A = { 0}

     Set A contains only one element.

     ∴ Set A is a singleton set.

Q.15) B = { y/y is a natural number, $30 < z < 36$}

Ans : ∴ B = { 31, 32, 33, 34, 35}

    Set B contains only 5 elements are limited and countable.

    ∴ Set B is finite set.

Q.16) C = { z/z is a natural number less than 1}

Ans : ∴ C = { } or C = φ

    (∵ N = 1, 2, 3 ……… natural numbers)

    In set C, there is not a single element

    ∴ Set C is empty set.

Q.17) B = {y/y < -1, y is an integer}

Ans : B = { ....., -4, -3, -2}

The number of elements in B are unlimited and uncountable.

∴ B is an infinite set.

➢ Decide which of the following are equal sets and which are not? Justify your answer. (3 marks each)

Q.18) A = { x/6x – 1 = 11}

B = { x/x is a prime number but not odd}

Ans : given , A = { x/6x – 1 = 11}

Here 6x – 1 = 11

∴ 6x = 11 + 1

∴ 6x = 12

∴ x = $\frac{12}{6}$

∴ x = 2

∴ A = {2}

Now, B = {x/x is prime number but not odd}

∴ B = {2} …… [2 is a even prime number]

Here, A and B are equal sets.

∴ A = B

Q.19) S = { z/z ∈N, 5 ≤ z ≤ 10}

T = { x/x is an odd natural number, x< 9}

U = {y/y is an even natural number, y < 10}

Ans : given,

S = {z/z∈N, 5 ≤ z ≤ 10}

∴ S = {5, 6, 7, 8, 9, 10}

T = {x/x is an odd natural number, x< 9}

∴ T = { 1, 3, 5, 7 }

and U = {y/y is an even natural number, y < 10}

∴ U = { 2, 4, 6, 8}

All the elements in set S, T and U are not equal.

Therefore, set S, T and U are not equal set.

∴ S ≠ T ≠ U

Q.20) P = { x/x is set of odd prime numbers less than 10}

Q = { x/x is an odd natural number, x< 9}

U = {y/y is number, $y^2 = 81$}

R = {z/z=3n, n∈ $N, n \leq 5$}

S = {t/t *is odd number*, $2 < x < 9$}

Ans : given,

P = { x/x is set of odd prime numbers less than 10}

∴ P = { 3, 5, 7}

Q = { y/y is number, $y^2 = 81$}

∴ Q = {-9,9}

R = {z/z = 3n, n ∈ N, n ≤ 5 }

∴ R = { 3, 6, 9, 12, 15}

S = { t/t is odd number, 2 < x < 9}

∴ S = { 3, 5, 7}

In a set P, Q, R and S,

All the elements in set P and set S are equal. Therefore, set P and set S are equal set.

∴ P = S

Q.21) Take the set of natural numbers from 1 to 30 as universal set and show sets A and B using Venn diagram.

(i) A = { x/x ∈ N, x prime number}

(ii) B = {y/y ∈ N, y is a composite number}

Ans : (i) A = { x/x ∈N, x is a prime number}

∴ A = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29}

(ii) B = { y/y ∈ N, y is a composite number}

∴ B = { 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30}

U = natural numbers between 1 to 30

∴ U = { 1, 2, 3, 4, 5, 6, 7, …… 30}

Venn diagram :
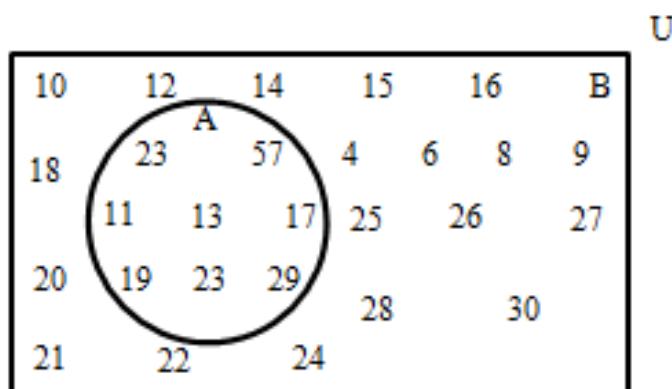
Q.22) show the following set and subset using Venn diagram. (3 marks each)

A = { x/x = 2^n, n < 5, n ∈ N }

B = { 2, 4}

C = {x/x is an even natural number x ≤ 16}.

Ans : A = { x/x = 2^n, n < 5, n ∈N }

∴ A = { 2, 4 , 8, 16, 32 }

B = { 2, 4}

C = {x/x is an even natural number x ≤ 16}.

∴ C = { 2, 4, 6, 8, 10, 12, 14, 16}

Diagram
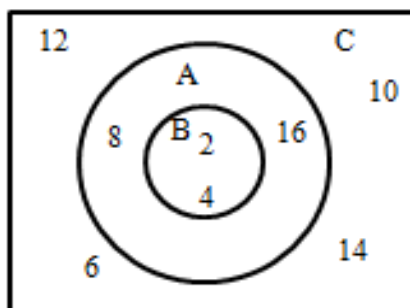
Q.23) If R = {s, t}, write all possible subset of R. (3 marks each)

Ans :   Ø, , {s}, {t}, {s, t}

∵ Every set is subset of itself and empty set is a subset of every set.

Q.24) E = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20}

F = { 4, 8, 12, 16, 20}

G = { 2, 2^2, 2^3 2^4 }

H = { 4^1, 4^2 }

Which of the above sets are subsets of others?

Ans : given,

E = { 2, 4, 6, 8, 10, 12, 14, 16, 18, 20}

F = { 4, 8, 12, 16, 20}

G = { 2, 2^2, 2^3 2^4 }

∴ G = {2, 4, 8, 16}

H = { 4^1, 4^2 }

∴ H = { 4, 16}

From set E, F, G, H,

The following sets are subsets of each other

∴ F ⊆ E, G ⊆ E, H ⊆ E, H ⊆ F, H ⊆ G.

Q.25) U = {x/x ∈ N and 4 ≤ x ≤ 24}

A = { y/y∈ N and 6 ≤ y ≤ 16 }

B = { z/z ∈ N and 18 ≤ z ≤ 24}

C = {m/m ∈ N and 6 < m < 11}

Write A', B' and C'

Ans : U = {x/x ∈ N and 4 ≤ x ≤ 24}

∴ U = { 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}

A = { y/y∈ N and 6 ≤ y ≤ 16 }

A = { 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16,}

∴ A' = { 17, 18, 19, 20, 21, 22, 23, 24}

B = { z/z ∈ N and 18 ≤ z ≤ 24}

∴ B = { 18, 19, 20, 21, 22, 23, 24}

∴ B' = { 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17}

C = {m/m ∈ N and 6 < m < 11}

∴ C = { 7, 8, 9, 10}

∴ C' = { 6, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}

Q.26) Let all the students of a class be an universal set. If 20% students play kho-kho is represented by set A, then write the complement of set A. (3 marks)

Ans : Let, U = Set all students in a class (100%)

A = 20% students play kho-kho

Complement of set A that means A′

∴ A′ = 100 – 20

= 80

∴ A′ = 80% students who do not play kho-kho.

Q.27) Which set of numbers could be the universal set for the sets given below? (3 marks)

A = Set of multiples of 4

B = Set of multiples of 10

C = set of multiples of 6

Ans : first we write the given sets in roster form,

A = { 4, 8, 12, 16, ...}

B = { 10, 20, 30, 40, ...}

C = { 6, 12, 18, 24,..........}

We know that,

W = { 0, 1, 2, 3, 4, ...}

N = { 1, 2, 3, 4, ...}

And I = { .... -2, -1, 0, 1, 2, ...}

∴ for the given three sets A, B, and C we can take natural numbers (N) or whole numbers (W) or Integers (I) as universal set.

Q.28) S is the set of all residents in Satara.

M is the set of all residents in Maharashtra.

A is the set of all residents in Aurangabad.

B is the set of all residents in India.

U is the set of all residents in Uttar Pradesh. (4 marks)

i) Write the subset relation between the sets.

ii) Which set can be the Universal set for above sets?

Ans : i) a) All residents of Satara are residents of India.

$\therefore S \subseteq B$

b) All residents of Satara are residents of Maharashtra.

$\therefore S \subseteq M$

c) All residents of Aurangabad are residents of India.

$\therefore A \subseteq B$

d) All residents of Aurangabad are residents of Maharashtra.

$\therefore A \subseteq M$

e) All residents of Uttar Pradesh are residents of India.

$\therefore U \subseteq B$

f) All residents of Maharashtra are residents of India.

$\therefore M \subseteq B$

ii) Satara, Aurangabad, Uttar-pradesh, Maharashtra is all elements of India.

$\therefore$ Set B can be the Universal set for above sets.

29) A = { 1, 4, 9, 10, 11}, B = { 9, 10, 11, 12}, C = {9, 10}, D = {1, 8}, then which of the following statements are true and which ones are false? (4 marks each)

i) A⊆B, ii) B⊆C, iii) C⊆B , iv) D ⊆ A

Ans : Given,

A = { 1, 4, 9, 10, 11}

B = { 9, 10, 11, 12}

C = {9, 10}

D = {1, 8}

i) A⊆B

This statement is a false.

ii) B⊆C

This statement is a false.

iii) C⊆B

This Statement is a true.

iv) D ⊆ A

This statement is a true.

Q. Write the following sets of intersection of two sets.

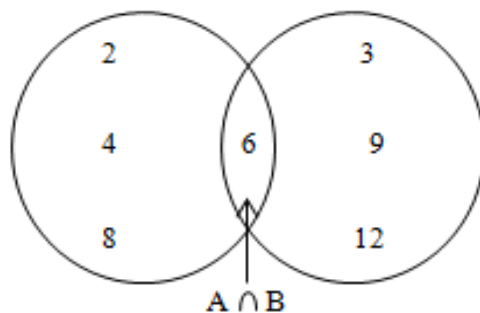30) If A = { 2, 4, 6, 8}, B = { 3, 6, 9, 12} then A∩B = ? Draw Venn diagram. (3 marks)

Ans : Given, A = { 2, 4, 6, 8}

B = { 3, 6, 9, 12}

∴ A∩B = {6}

{∵ The element 6 is common in set A and B}

Venn Diagram:

31) X = { x/x is prime number between 60 and 90}

X = [   ]

Y = [   ]

Y = { 71, 73, 75, 77, 79, 81, 83, 85, 87, 89 }

Then X ∩ Y = [   ]

Complete the above activity Represent the inter-section of two sets by Venn diagram. (3marks)

Ans : X = { x/x is prime number between 60 and 90}

X = [{61, 67, 71, 73, 79}]

Y = [{ y/y is an odd number between 70 and 90}]

Y = { 71, 73, 75, 77, 79, 81, 83, 85, 87, 89}

Then X ∩Y = [{71, 73, 79 }]

Venn diagram : -
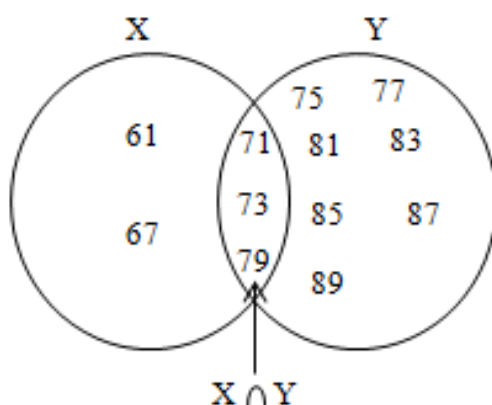
32) S = {a, b, c, d, e, f}, T = { c, d, e, f)

Then S∩T = [ ]

But T = [ ]

∴ S∩T = T

Here set T is the subset of S

∴ If [ ]   Then   [ ]

Similarly, if S ∩ T = T   [ ]   then T ⊆ S

Complete the above activity. (4 marks)

Ans : S = { a, b, c, d, e, f }

T = { c. d, e, f}

then S ∩ T = [{c, d, e, f }]   But T = [{c, d, e, f }]

∴ S ∩ T = T

Here set T is the subset of S

∴ If [T ⊆ S] then [S ∩ T = T]

Similarly, S ∩ T = [T]   then T⊆S.

33) In the following Venn diagram, Write the following sets of intersection of two sets,
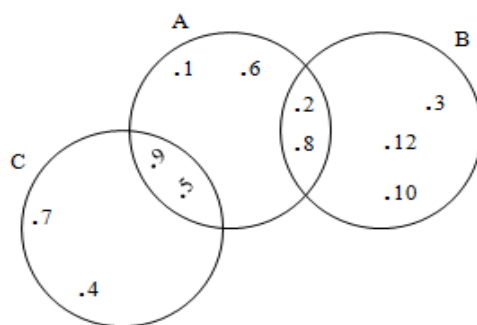
Ans : In the above Venn diagram, 2 and 8 are two elements common in set A and set B.

∴ A ∩ B = { 2, 8 }

9 and 5 are two elements common in set A and set C

∴ A ∩ C = { 5, 9 }
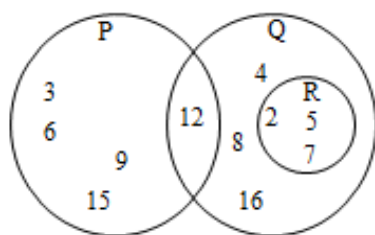
But set B and set C have no common element

Hence B and C are disjoint sets.

B∩C={ } or B∩C = ∅

34) Observe the P, Q, R given by, Venn diagrams and write which of these are disjoint sets. (3 marks)
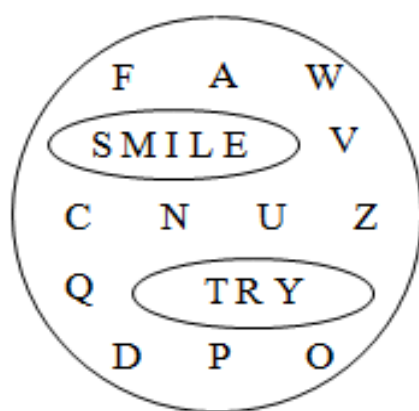

Ans : Here P = { 3, 6, 9, 12, 15}, Q = { 4, 8, 12, 16}
          R = { 2, 5, 7}

Set P and set R have no common element. Hence P and R are disjoint sets.

35) Let the set of English alphabets be the Universal set. The letters of the word 'SMILE' is one set can we say that these are two disjoint sets? Observe that intersection of these two set is empty show Venn diagram. (3 marks)

Ans :

$A = \{ S, M, I, L, E\}$

$B = \{ T, R, Y\}$

Set A and set B have no common element

∴ A and B are disjoint sets.

∴ A∩B = ∅

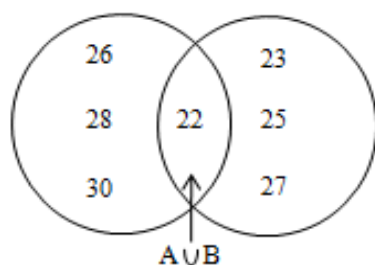Set A and set B have no common element. Therefore, intersection of these two set is empty.

36) A = { 22, 26, 28, 30} and B = { 22, 23, 25, 27}

Then A∪B =? Show Venn diagram (3 marks each)

Ans : A = {22, 26, 28, 30}

B = { 22, 23, 25, 27}

∴ A∪B = {22, 23, 25, 26, 27, 28, 30}

A∪B

37) X = {x/x is an integer, x ≤ -5}

X = [   ]

Y = [   ]

Y = {0, 1, 2, 3, 4, 5}

Then X∪Y = [   ]

Complete the above activity. (3marks)

Ans : X = {x/x is an integer, x ≤ -5}

X = {-5, -4, -3, -2, -1}

Y = {y/y is a whole number, x ≤5}

Y = { 0, 1, 2, 3, 4, 5}

Then X∪Y = {-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5}

38)

A = [   ]

B = [   ]

∴ A∪B = [   ]

Set A and A∪B have the same elements. Hence if B⊆A
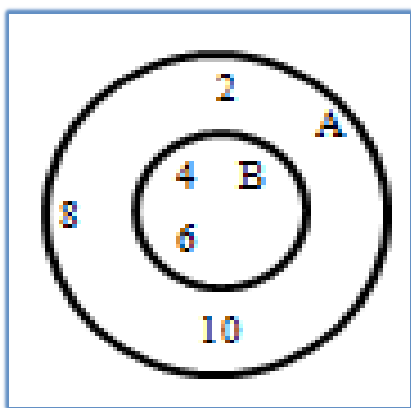
then [   ]

Ans : A = {2, 4, 6, 8, 10}

B = {4, 6}

∴ A∪B = { 2, 4, 6, 8, 10 }

Set A and A∪B have the same elements. Hence if

B ⊆ A then A∪B=A

39) In the following Venn diagram, write the following sets of union of two sets. (3 marks)
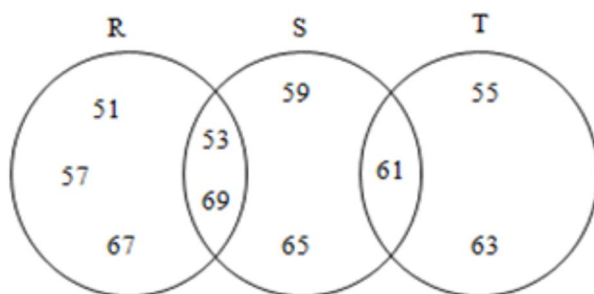
Ans :

R∪S = set of elements of set R and set S together.

∴ R∪S = { 51, 57, 67, 69, 59, 65, 61}

S∪T = Set of elements of set S and set T together.

∴ S∪T= { 59, 53, 69, 65, 61, 55, 63}
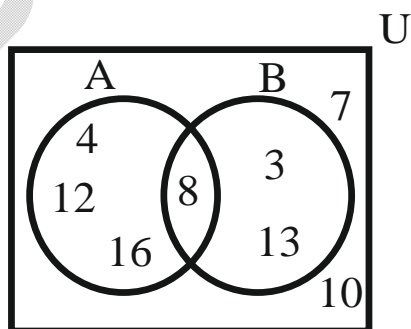
R∪T = Set of elements of set R and set T together

∴ R∪T = { 51, 57, 63, 69, 67, 53, 55, 61}

40) Observe the given Venn diagram. Write the following sets in listing method. (4 marks)

i) U ii) A iii) B iv) A∪B v) A∩ B

Ans : i) U = { 4, 8, 12, 16, 3, 13, 7, 10}

ii) A = { 4, 8, 12, 16}

iii) B = { 3, 8, 13}

iv) A∪B = { 3, 4, 8, 12, 13, 16}

v) A∩B = {8}

41) Universal set is all numbers between 20 to 35. A is set of prime numbers between 21 to 35 and B is another set of odd numbers between 20 to 30. Then find i) U ii) A iii) B iv) A∪B v) A∩B . Show Venn diagram. (4 marks)

Ans : i) U = All numbers between 20 to 35

∴ U = { 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35}

ii) A = prime numbers between 21 to 35

∴ A = { 23, 29, 31}

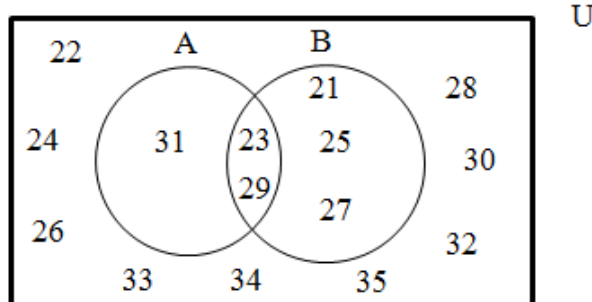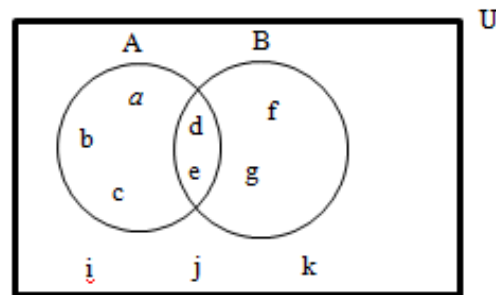iii) B = odd numbers between 20 to 30.

∴ B = { 21, 23, 25, 27, 29}

iv) A∪B = { 21, 23, 25, 27, 29, 31}

v) A∩B = {23, 29}

42) Observe the given Venn diagram. Write the following sets in listing method. (4 marks)

i) U ii) A' iii) B' iv) (A∩B)' v) (A∩B)'

Ans : i) U = {a, b, c, d, e, f, g, h, i, j, k}

A = { a, b, c, d, e}

ii) A' = {f, g, h, i, j, k}

B = { f, g, h, d, e}

iii) B' = {a, b, c, i, j, k}

A∪B = { a, b, c, d, e, f, g, h}

iv) (A∪B)' = {i, j, k}

A∩B = {d, e}

v) (A∩B)' = { a, b, c, f, g, h, i, j, k}

43) If U = {2, 3, 5, 7, 11, 13, 17, 19, 23} and A = {2} B = { 3, 5, 7} then write A' and B' by Venn diagram. (4 marks)

Ans : U = { 2, 3, 5, 7, 11, 13, 17, 19, 23 }

A = { 2 }

∴ A' = { 3, 5, 7, 11, 13, 17, 19, 23 }

B = { 3, 5, 7 }

∴ B' = { 2, 11, 13, 17, 19, 23 }

Venn diagram :
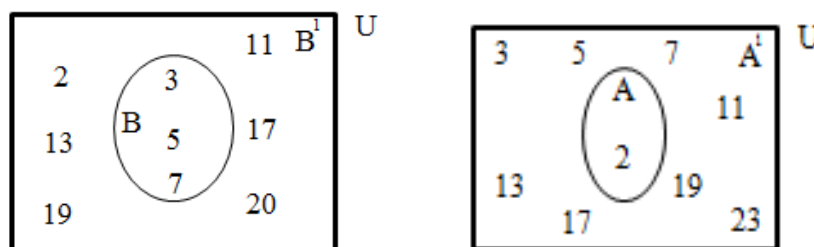
44) A = { 10, 20, 30, 40 }, B = { 20, 40, 60, 80, 100 } then n(A∪B) = n (A) + n (B) - n (A∩B) verify the above rule. (3 marks)

Ans : Given A = { 10, 20, 30, 40 }

In set A, there are 10, 20, 30, 40 i.e. 4 elements.

∴ n(A) = 4 ………………….. (1)

B = { 20, 40, 60, 80, 100 }

In set B, there are 20, 40, 60, 80, 100 i.e. 5 elements.

∴ n(B) = 5 ………………….. (2)

Now

(A∪B) = { 10, 20, 30, 40, 60, 80, 100 }

∴ n (A∪B) = 7 …………………….... (3)

Similarly, (A∩B) = { 20, 40 }

∴ n (A∩B) = 2 …………………….... (4)

Therefore,

∴ n (A∪B) = n (A) + n (B) - n (A∩B)

7   =   4   +   5   -   2   ... (from 1, 2, 3, 4)

7   =   9   -   2

7   =   7

∴ Left hand side = Right hand side.

∴ n (A∪B) = n (A) + n (B) - n (A∩B).

45) If n (A) = 17, n (B) = 23, n (A∩B) = 2 then find (A∪B) (3 marks)

Ans : Given , n (A) = 17,   n (B) = 23,   n (A∩B) = 2,

n (A∪B) = ?

∴ n (A∪B) = n (A) + n (B) - n (A∩B).

n (A∪B) = 17 + 23 - 2

n (A∪B) = 40 - 2

∴ n (A∪B) = 38.

46) If n (S∪T) = 29, n (S) = 15, n (S∩T) = 12 then find

n (T) = ? (3 marks)

Ans : we know that,

n (S∪T) = 29,   n (S) = 15,   n (S∩T) = 12,   n (T) = ?

n (S ∪ T) = n (S)+ n (T)- n (S∩T)

∴ 29 = 15 + n (T) - 12

∴ 29 = 15 - 12 + n (T)

∴ 29 = 3 + n (T)

∴ 29 - 3 = n (T)

∴ n(T) = 26.

47) If n(A) = 27, n (B) = 33, n (A∪B) = 48 then find

(A∩B) (3 marks)

Ans : Given, n (A) = 27, n (B) = 33, n (A∪B) = 48,

n (A∩B) = ?

we know that,

n (A∪B) = n (A) + n (B) - n (A∩B)

$48 = 27 + 33 - n\ (A \cap B)$

$48 = 60 - n\ (A \cap B)$

$\therefore n\ (A \cap B) = 60 - 48$

$\therefore n\ (A \cap B) = 12.$

48) In a competitive exam 60 students passed in maths. 70 students passed in Marathi. 50 students passed in both the subjects. None of them fail in both the, subjects. Find number of students who passed at least in one of the subjects?   (4 marks)

Ans : Let A be the set of students who passed in Maths.

$\therefore n\ (A) = 60.$

Let B be the set of students who passed in Marathi

$\therefore n\ (B) = 70.$

50 students passed in both subjects

$\therefore n\ (A \cap B) = 50$

The number of students who passed in at least in one of the subject $= n\ (A \cap B) = ?$

$n\ (A \cup B) = n\ (A) + n\ (B) - n\ (A \cap B)$

$n\ (A \cup B) = 60 + 70 - 50$

n (A∪B) = 130 - 50

n (A∪B) = 80

49) In a school hostel there are 200 students. Out of which 120 students drink coffee, 100 students drink tea. All the students drink at least one out of tea or coffee. Find the number of students who take tea and coffee both.   (4 marks)

Ans : Let P = set of students drinking coffee.

   Q = set of students drinking tea.

Set of students drinking at least one out of tea or coffee.

 ∴ n (P ∪ Q) = 200.

Set of students drinking both tea and coffee.

∴ n (P ∩ Q) = ?

We know that,

n (P ∪ Q) = n (P) + n (Q) - n (P ∩ Q)

∴ 200 = 120 + 100 - n (P ∩ Q)

∴ 200 = 220 - n (P ∩ Q)

∴ n (P ∩ Q) = 220 - 200

∴ n (P ∩ Q) = 20

∴ number of students who take tea and coffee both = 20

50) In a class of 50 students, 35 like physics, 30 like Mathematics and 3 like none of any subject. How many like both the subject? How many like physics only? (4 marks)

Ans : Total students in a class = 50.

Let A = set of students like physics.

$\therefore$ n (A) = 35

Let B = set of students like mathematics.

$\therefore$ n (B) = 30

Set of students like both physics and mathematics i.e.

n (A∪B) = ?

3 students like neither Physics nor Mathematics …….. (Given)

Set of students like at least one out of Physics or Mathematics.

$\therefore$ n (A∪B) = 50

We know that,

n (A∪B) = n (A) + n (B) - n (A ∩ B)

$\therefore$ 50 = 35 + 30 - n (A ∩ B)

$\therefore$ 50 = 65 - n (A ∩ B)

∴ n (A ∩ B) = 65 - 50

∴ n (A ∩ B) = 15

3 students like neither Physics nor Mathematics …………………………………………… (Given)

∴ 15 + 3 = 18

Similarly, set of students like physics = 35

∴ 35-18 = 17

Hence, 18 students like both subjects and 17 students like only physics.

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