

Chapter 1. Sets

Question-1

Which of the following are sets?

- (i) The collection of all months of a year beginning with letter J.
- (ii) The collection of most talented writers of India.
- (iii) A team of eleven best cricket batsmen of the world.
- (iv) The collection of all boys in your class.
- (v) The collection of all natural numbers less than 100.
- (vi) The collection of novels written by the river Prem Chand.
- (vii) The collection of all even integers.
- (viii) The collection of different problems in this chapter.
- (ix) A collection of most dangerous animals of the world.

Solution:

(i), (iv), (v), (vi), (vii) and (viii) are sets.

Question-2

$$A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

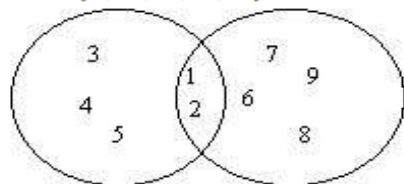
$A \cap B = \{1, 2\}$ and $A = \{1, 2, 3, 4, 5\}$ find the set B.

Solution:

$$A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$A \cap B = \{1, 2\} \text{ and}$$

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



$$\therefore B = \{1, 2, 6, 7, 8, 9\}$$

Question-3

If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, find the complements of the following sets:

(i) $A = \{2, 4, 6, 8\}$

(ii) $B = \{1, 3, 5, 7, 9\}$

(iii) $C = \{2, 3, 5, 7\}$

(iv) $\varnothing$

(v) U

Solution:

(i) $A' = \{1, 3, 5, 7, 9\}$

(ii) $B' = \{2, 4, 6, 8\}$

(iii) $C' = \{1, 4, 6, 8, 9\}$

(iv) $\varnothing' = U$

(v) $U' = \varnothing$

Question-4

Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

(i) $5 \underline{\hspace{1cm}} A$

(ii) $8 \underline{\hspace{1cm}} A$

(iii) $0 \underline{\hspace{1cm}} A$

(iv) $4 \underline{\hspace{1cm}} A$

(v) $2 \underline{\hspace{1cm}} A$

(vi) $10 \underline{\hspace{1cm}} A$

Solution:

(i) $5 \underline{\in} A$

(ii) $8 \underline{\notin} A$

(iii) $0 \underline{\notin} A$

(iv) $4 \underline{\in} A$

(v) $2 \underline{\in} A$

(vi) $10 \underline{\notin} A$



Question-5

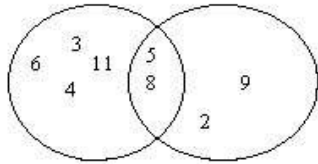
If $A \cup B = \{2, 3, 4, 5, 6, 8, 9, 11\}$, $A \cap B = \{5, 8\}$ and $B = \{2, 5, 8, 9\}$ find the set $A - B$

Solution:

$$A \cup B = \{2, 3, 4, 5, 6, 8, 9, 11\},$$

$$A \cap B = \{5, 8\}$$

$$B = \{2, 5, 8, 9\}$$



$$\therefore A = \{3, 4, 5, 6, 8, 11\}$$

$$\therefore A - B = \{3, 4, 6, 11\}$$

Question-6

If U is the set of all natural numbers and A' is the set of all composite numbers, what is A ?

Solution:

$$U = \{1, 2, 3, 4, 5, 6, \dots\}$$

$$A' = \{4, 6, \dots\}$$

$$\text{Then } A = \{1, 2, 3, 5, \dots\}$$

Question-7

Write the following sets in the roster form:

(i) $A = \{x : x \text{ is an integer and } -3 \leq x < 7\}$

(ii) $B = \{x : x \text{ is a natural number less than 6}\}$

(iii) $C = \{x : x \text{ is two digit natural number such that sum of its digits is 8}\}$

(iv) $D = \{x : x \text{ is a prime number which is a divisor of 60}\}$

(v) $E = \text{the set of all letters in the word TRIGONOMETRY}$

(vi) $F = \text{the set of all letters in the word SETS.}$

Solution:

(i) $A = \{-3, -2, -1, 0, 1, 2, 3, 4, 5, 6\}$

(ii) $B = \{1, 2, 3, 4, 5\}$

(iii) $C = \{17, 26, 35, 44, 53, 62, 71\}$

(iv) $D = \{2, 3, 5\}$

(v) $E = \{T, R, I, G, O, N, M, E, R, Y\}$



(vi) $F = \{S, E, T\}$

Question-8

If $A = \{p, q, r, s\}$ find $A \cap A$ and $A \cup A$.

Solution:

$$A = \{p, q, r, s\}$$

$$\therefore A \cap A = \{p, q, r, s\}$$

$$\therefore A \cup A = \{p, q, r, s\}$$

Question-9

Which of the following statements are true and which are false?

(i) $U' = \varnothing$

(ii) $\varnothing' = U$

(iii) For any two subsets, X and Y of U,

$$(X \cup Y)' = X' \cup Y'$$

(iv) For any two subsets, X and Y of U,

$$(X \cap Y)' = X' \cap Y'$$

(v) For any two subsets, S and T of U,

$$(S \cup T)' = S' \cap T'$$

(vi) For any two subsets S and T of U,

$$(S \cap T)' = S' \cup T'$$

Solution:

(i) True

(ii) True

(iii) False

(iv) False

(v) True

(vi) True

Question-10

If $A = \{x : x \text{ is a letter in the word, 'follow'}\}$ and

$B = \{x : x \text{ is a letter in the word, 'wolf'}\}$, show that $A = B$.

Solution:

Clearly, $A = \{f, o, l, w\}$ and $B = \{w, o, l, f\}$.

Since every element of A is in B and every element of B is in A, so $A = B$.

Question-11

Express the following sets by using the set builder method:

(i) $A = \{1, 3, 5, 7, 9\}$

(ii) $B = \{2, 4, 6, 8\}$

(iii) $C = \{-1, 1\}$

(iv) $D = \{1, 5, 10, 15, \dots\}$

(v) $E = \{14, 21, 28, 35, 42, \dots, 98\}$

Solution:

(i) $A = \{x : x \text{ is an odd natural number, } x \leq 9\}$

(ii) $B = \{x : x \text{ is an even natural number, } x \leq 8\}$

(iii) $C = \{x : x \text{ is an odd natural number and } |x| < 2\}$

(iv) $D = \{x : x \text{ is a natural number multiple of 5 and } x \geq 1\}$

(v) $E = \{x : x \text{ is a multiple of 7 and } 7 < x < 100\}$

Question-12

Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60° , what is A' ?

Solution:

U = The set of all triangles in a plane.

A = The set of all triangles with at least one angle different from 60° .

A' = The set of all equilateral triangles.



Question-13

List all the elements of the following sets:

- (i) $A = \{x : x \text{ is an odd natural number}\}$
- (ii) $B = \{x : x \text{ is an integer, } -1/2 < x < 9/2\}$
- (iii) $C = \{x : x \text{ is an integer, } x^2 \leq 4\}$
- (iv) $D = \{x : x \text{ is a letter in the word "LOYAL"}\}$
- (v) $E = \{x : x \text{ is a month of a year not having 31 days}\}$
- (vi) $F = \{x : x \text{ is a consonant in the English alphabet which precedes k}\}$

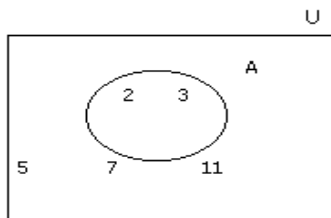
Solution:

- (i) $A = \{1, 3, 5, 7, 9, 11, 13, \dots\}$
- (ii) $B = \{0, 1, 2, 3, 4\}$
- (iii) $C = \{-2, -1, 1, 2\}$
- (iv) $D = \{L, O, Y, A\}$
- (v) $E = \{\text{February, April, June, September, November}\}$
- (vi) $F = \{b, c, d, f, g, h, j\}$

Question-14

Represent the following sets in a Venn diagram: $U = \{2, 3, 5, 7, 11\}$, $A = \{2, 3\}$

Solution:



Question-15

Match each of the sets on the left described in the roster form with the same set on the right described in set builder form:

- | | |
|---------------------------|--|
| (i) $\{1, 2, 3, 6\}$ | (a) $\{x : x \text{ is a prime number and a divisor of } 6\}$ |
| (ii) $\{2, 3\}$ | (b) $\{x : x \text{ is an odd natural number less than } 10\}$ |
| (iii) $\{H, A, Y, R, N\}$ | (c) $\{x : x \text{ is a natural number and divisor of } 6.\}$ |
| (iv) $\{1, 3, 5, 7, 9\}$ | (d) $\{x : x \text{ is a letter of the word 'HARYANA'}. \}$ |

Solution:

- | | |
|---------------------------|--|
| (i) $\{1, 2, 3, 6\}$ | (c) $\{x : x \text{ is a natural number and divisor of } 6.\}$ |
| (ii) $\{2, 3\}$ | (a) $\{x : x \text{ is a prime number and a divisor of } 6\}$ |
| (iii) $\{H, A, Y, R, N\}$ | (d) $\{x : x \text{ is a letter of the word 'HARYANA'}. \}$ |
| (iv) $\{1, 3, 5, 7, 9\}$ | (b) $\{x : x \text{ is an odd natural number less than } 10\}$ |

Question-16

Which of the following sets is finite or infinite?

- (i) The set of the months of a year.
- (ii) $\{1, 2, 3, \dots\}$
- (iii) $\{1, 2, 3, \dots, 99, 100\}$
- (iv) The set of positive integers greater than 100.
- (v) The set of prime numbers less than 99.

Solution:

- (i) Finite set
- (ii) Infinite set
- (iii) Finite set
- (iv) Infinite set
- (v) Finite set



Question-17

Represent the following sets in a Venn diagram:

$$U = \{x : x \text{ is a natural number and } 2 \leq x \leq 8.\}$$

$$A = \{x : x \in U \text{ and } x \text{ divides } 18\}$$

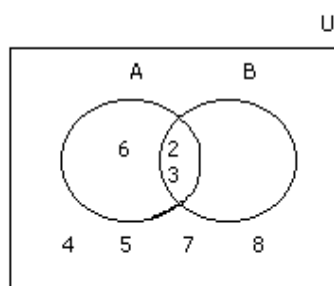
$$B = \{x : x \in U \text{ and } x \text{ is a prime divisor of } 18\}$$

Solution:

$$U = \{2, 3, 4, 5, 6, 7, 8\}$$

$$A = \{2, 3, 6\}$$

$$\text{and } B = \{2, 3\}$$



Question-18

Which of the following sets is finite or infinite?

- (i) The set of lines which are parallel to the x-axis.
- (ii) The set of letters in the English alphabet.
- (iii) The set of numbers which are multiples of 5.
- (iv) The set of animals living on earth.
- (v) The set of circles in plane passing through the origin.

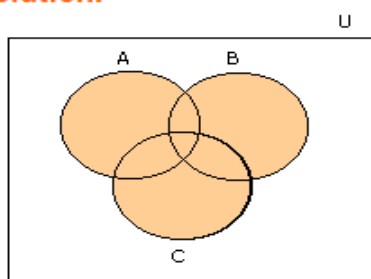
Solution:

- (i) Infinite set
- (ii) Finite set
- (iii) Infinite set
- (iv) Finite set
- (v) Infinite set

Question-19

If A, B and C are three subsets of the universal set U, draw a venn diagram showing $A \cup (B \cap C)$

Solution:



Question-20

Which of the following are examples of the null set?

- (i) Set of odd natural numbers divisible by 2.
- (ii) Set of even prime numbers.
- (iii) $\{x : x \text{ is a natural number, } x < 5 \text{ and simultaneously } x > 7\}$
- (iv) $\{y : y \text{ is a point common to any parallel lines}\}$

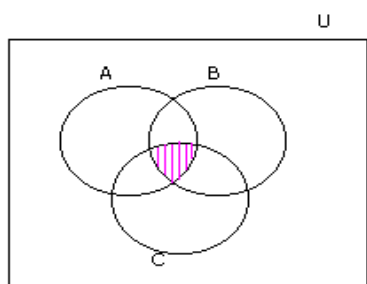
Solution:

- (i) Null set.
- (ii) It is not a null set because 2 is a even prime number.
- (iii) Null set.
- (iv) Null set.

Question-21

If A, B and C are three subsets of the universal set U, draw a venn diagram showing $(A \cap B) \cap C$.

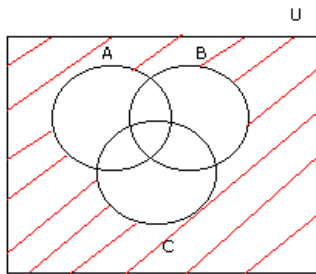
Solution:



Question-22

If A, B and C are three subsets of the universal set U, draw a venn diagram showing $[(A \cup B) \cup C]'$

Solution:



Question-23

In the following, state whether $A = B$ or not:

(i) $A = \{a, b, c, d\}$

$B = \{d, c, b, a\}$

(ii) $A = \{4, 8, 12, 16\}$

$B = \{8, 4, 16, 18\}$

(iii) $A = \{2, 4, 6, 8, 10\}$
less than 10}

$B = \{x : x \text{ is positive even integer less than } 10\}$

(iv) $A = \{x : x \text{ is a multiple of } 10\}$ $B = \{10, 15, 20, 25, 30, \dots\}$

Solution:

(i) $A = B$

(ii) $A \neq B$, because element 12 of set A is not present in set B and element 18 of set B is not present in set A.

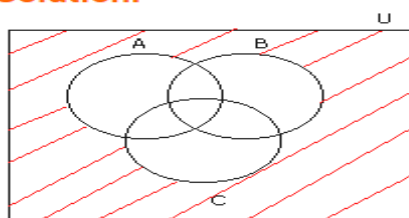
(iii) $A = B$

(iv) $A \neq B$, because set B consists of elements that are multiple of 5.

Question-24

If A, B and C are three subsets of the universal set U, draw a venn diagram showing $(A' \cap B') \cap C'$

Solution:



Question-25

Are the following pair of sets equal? Give reasons.

(i) $A = \{2, 3\}$

$B = \{x: x \text{ is a solution of } x^2 + 5x + 6 = 0\}$

(ii) $A = \{x: x \text{ is a letter in the word FOLLOW}\}$

$B = \{y: y \text{ is a letter in the word WOLF}\}$

Solution:

(i) $A = \{2, 3\}$

$B = \{x: x \text{ is a solution of } x^2 + 5x + 6 = 0\} = \{2, 3\}$

Therefore the above pair are equal sets.

(ii) $A = \{x: x \text{ is a letter in the word FOLLOW}\} = \{F, O, L, W\}$

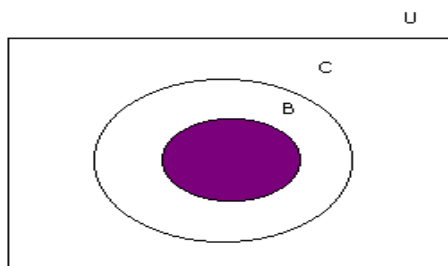
$B = \{y: y \text{ is a letter in the word WOLF}\} = \{W, O, L, F\}$

Therefore the above pair are equal sets.

Question-26

If A, B, and C are three subsets of the universal set U, draw Venn diagrams for the following: $B \cap C$, when $B \subset C$.

Solution:



Question-27

From the sets given below, select equal sets and equivalent sets

$A = \{0, a\}$

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

$C = \{4, 8, 12\}$

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

$E = \{1, 0\}$

$F = \{8, 4, 12\}$

$G = \{1, 5, 7, 11\}$

$H = \{a, b\}$

Solution:

Equal sets:

(i) $B = D$

(ii) $C = F$;

Equivalent sets:

(i) A, E, H ;

(ii) D, G ;

Question-28

Given that $A = \{6, 7, 8, 9, 10\}$ and $B = \{2, 3, 4, 5\}$. Write down all ordered pairs (a, b) such that a is divisible by b and hence write down the set of ordered pairs given the relation 'is a multiple of' from A and B .

Solution:

$A = \{6, 7, 8, 9, 10\}$ and $B = \{2, 3, 4, 5\}$

List of all ordered pairs : $(6, 2), (6, 3), (6, 4), (6, 5), (7, 2), (7, 3), (7, 4), (7, 5), (8, 2), (8, 3), (8, 4), (8, 5), (9, 2), (9, 3), (9, 4), (9, 5), (10, 2), (10, 3), (10, 4), (10, 5)$

The ordered pairs (a, b) such that a is divisible by b : $(6, 2), (6, 3), (8, 2), (8, 4), (9, 3), (10, 2), (10, 5)$

Question-29

Which of the following statements are true?

- (i) The set of all cats is contained in the set of all animals.
- (ii) The set of all isosceles triangles is contained in the set of all equilateral triangles.
- (iii) The set of all rectangles is contained in the set of all squares.
- (iv) The sets $A = \{1\}$ and $B = \{\{1\}\}$ are equal.
- (v) The sets $A = \{x : x \text{ is a letter in the word "TITLE"}\}$ and $B = \{x : x \text{ is a letter in the word "LITTLE"}\}$ are equal.

Solution:

- (i) True
- (ii) False
- (iii) False
- (iv) False
- (v) True

Question-30

Let R be the relation defined by 'divides' from $A = \{2, 3, 5\}$ to $B = \{6, 10, 12, 15\}$. Represent R (i) as a set of ordered pairs (ii) as a graph and (iii) by an arrow diagram.

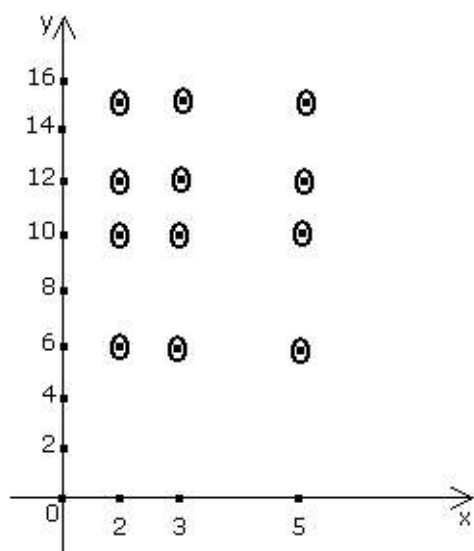
Solution:

$A = \{2, 3, 5\}$ to $B = \{6, 10, 12, 15\}$

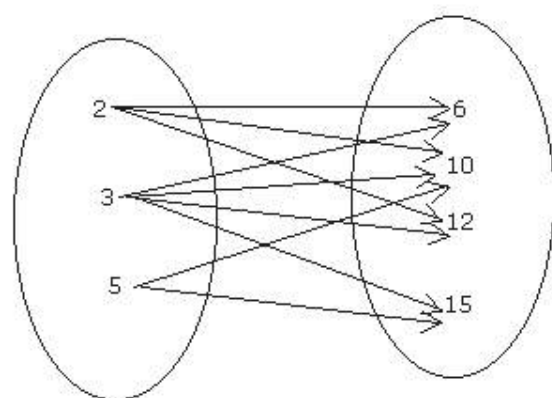
(i) $R = \{(2, 6), (2, 10), (2, 12), (2, 15), (3, 6), (3, 10), (3, 12), (3, 15), (5, 6), (5, 10), (5, 12), (5, 15)\}$



(ii)



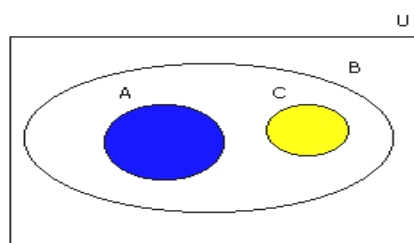
(iii)



Question-31

A and C are disjoint sets and both A and C are subsets of B, draw Venn diagrams for the following.

Solution:



Question-32

Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces:

(i) $\{2, 3, 4\} \dots\dots \{1, 2, 3, 4, 5\}$

(ii) $\{a, b, c\} \dots\dots \{b, c, d\}$

(iii) $\{x : x \text{ is a student of Class 9 of your school.}\} \dots\dots \{x : x \text{ is a student of your school}\}$

(iv) $\{x : x \text{ is a circle in the plane}\} \dots\dots \{x : x \text{ is a circle with radius 1}\}$

(v) $\{x : x \text{ is a triangle in the plane}\} \dots\dots \{x : x \text{ is a rectangle in the plane}\}$

(vi) $\{x : x \text{ is an equilateral triangle in the plane}\} \dots\dots \{x : x \text{ is a triangle in the plane}\}$

(vii) $\{x : x \text{ is an even natural number}\} \dots\dots \{x : x \text{ is an integer}\}$

Solution:

(i) $\{2, 3, 4\} \dots \subset \dots \{1, 2, 3, 4, 5\}$

(ii) $\{a, b, c\} \dots \not\subset \dots \{b, c, d\}$

(iii) $\{x : x \text{ is a student of Class 9 of your school.}\} \dots \subset \dots \{x : x \text{ is a student of your school.}\}$

(iv) $\{x : x \text{ is a circle in the plane.}\} \dots \not\subset \dots \{x : x \text{ is a circle with radius 1.}\}$

(v) $\{x : x \text{ is a triangle in the plane.}\} \dots \not\subset \dots \{x : x \text{ is a rectangle in the plane.}\}$

(vi) $\{x : x \text{ is an equilateral triangle in the plane.}\} \dots \subset \dots \{x : x \text{ is a triangle in the plane.}\}$

(vii) $\{x : x \text{ is an even natural number.}\} \dots \subset \dots \{x : x \text{ is an integer.}\}$



Question-33

If A and B are two sets such that A has 21 elements, B has 17 elements, and $A \cup B$ has 21 elements, how many elements does $A \cap B$ have?

Solution:

We have $n(A) = 12$

$$n(B) = 17$$

$$n(A \cup B) = 21$$

By using the formula,

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

$$\text{We have } 21 = 12 + 17 - n(A \cap B)$$

$$\therefore n(A \cap B) = 29 - 21$$

$$\therefore n(A \cap B) = 8$$

Question-34

If $P = \{2, 3, 4, 8, 9\}$ write down the sets of ordered pairs representing the relations (i) is a factor of (ii) is divisible by (iii) is a multiple of 2 on P.

Solution:

$$P = \{2, 3, 4, 8, 9\}$$

(i) The sets of ordered pairs representing "is a factor of" : $\{(2, 2), (2, 4), (2, 8), (3, 3), (3, 9), (4, 4), (4, 8), (8, 8), (9, 9)\}$

(ii) The sets of ordered pairs representing "is divisible by" : $\{(2, 2), (4, 2), (8, 2), (4, 4), (8, 4), (8, 8), (9, 3), (9, 9), (3, 3)\}$

(iii) The sets of ordered pairs representing "is a multiple of 2 on P" : $\{(2, 2), (4, 2), (8, 2)\}$

Question-35

Examine whether the following statements are true or false:

$$(i) \{a, b\} \not\subset \{b, c, a\}$$

$$(ii) \{a, e\} \subset \{x : x \text{ is a vowel in the English alphabet.}\}$$

$$(iii) \{1, 2, 3\} \subset \{1, 2, 3\}$$

$$(iv) \{a\} \subset \{a, b, c\}$$

$$(v) \{a\} \in \{a, b, c\}$$

$$(vi) \{x : x \text{ is an even natural number less than 6.}\} \subset \{x : x \text{ is a natural number which divides 36}\}$$

Solution:

(i) False, because elements a and b are present in that set.

(ii) True



(iii) True

(iv) True

(v) False

(vi) True

Question-36

Describe the relation R defined from A to B where $A = \{-1, 2, 3, 4\}$ to $B = \{-2, 4, 6\}$ by the set $R = \{(-1, -2), (2, 4), (3, 6)\}$.

Solution:

$A = \{-1, 2, 3, 4\}$ to $B = \{-2, 4, 6\}$

set $R = \{(-1, -2), (2, 4), (3, 6)\}$ is the relation "is half of"

Question-37

If A and B are disjoint sets, show that $n(A \cup B) = n(A) + n(B)$

Solution:

We know that, if A and B are disjoint sets then $n(A \cap B) = \varnothing$.

Hence, by using the formula $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

We have $n(A \cup B) = n(A) + n(B) - \varnothing$

$$\therefore n(A \cup B) = n(A) + n(B)$$

Example: Let $A = \{1, 2\}$ and $B = \{3, 4\}$,

then $A \cup B = \{1, 2, 3, 4\}$ and $A \cap B = \varnothing$

Now $n(A) = 2$, $n(B) = 2$, $n(A \cup B) = 4$ and $n(A \cap B) = \varnothing$

Hence, $n(A \cup B) = n(A) + n(B)$



Question-38

Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are false and why?

- (i) $\{3, 4\} \subset A$
- (ii) $\{3, 4\} \in A$
- (iii) $\{\{3, 4\}\} \subset A$
- (iv) $1 \in A$
- (v) $1 \subset A$
- (vi) $\{1, 2, 5\} \subset A$
- (vii) $\{1, 2, 5\} \in A$
- (viii) $\{1, 2, 3\} \subset A$
- (ix) $\varphi \in A$
- (x) $\{\varphi\} \subset A$

Solution:

- (i) False, $\{3, 4\}$ is an element not a set.
- (ii) True
- (iii) True
- (iv) True
- (v) False, 1 is an element not a set.
- (vi) True
- (vii) False, $\{1, 2, 5\}$ is a set not an element.
- (viii) False, 3 is an element of set contained in A.
- (ix) False, φ is not an element of A.
- (x) False, φ is not an element of A.

Question-39

Write the power set of $A = \{3, 6, 9\}$.

Solution:

$P(A) = \{\varphi, \{3\}, \{9\}, \{6\}, \{3, 6\}, \{3, 9\}, \{6, 9\}, \{3, 6, 9\}\}$.



Question-40

Describe the relation, domain and range if (i) $R = \{(1, 1), (8, 2), (27, 3), (64, 4)\}$ (ii) $R = \{(\text{Delhi, India}), (\text{Paris, France}), (\text{Karachi, Pakistan})\}$ (iii) $R = \{(4, -2), (9, -3), (1, 1), (4, 2), (1, -1), (9, 3)\}$

Solution:

(i) $R = \{(1, 1), (8, 2), (27, 3), (64, 4)\}$

R is the relation "is the cube of"

Domain = $\{1, 8, 27, 64\}$

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

(ii) $R = \{(\text{Delhi, India}), (\text{Paris, France}), (\text{Karachi, Pakistan})\}$

R is the relation "is the capital of"

Domain = $\{\text{Delhi, Paris, Karachi}\}$

Range = $\{\text{India, France, Pakistan}\}$

(iii) $R = \{(4, -2), (9, -3), (1, 1), (4, 2), (1, -1), (9, 3)\}$

R is the relation "is the square of"

Domain = $\{1, 4, 9\}$

Range = $\{-3, -2, -1, 2, 3\}$

Question-41

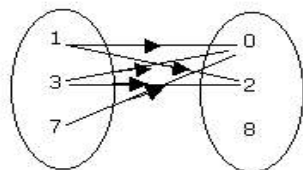
If $x \in \{1, 3, 7\}$, $y \in \{0, 2, 8\}$ and R is the relation such that $x + y < 8$, represent R (i) as a set of ordered pairs and (ii) by an arrow diagram.

Solution:

(i) $x \in \{1, 3, 7\}$, $y \in \{0, 2, 8\}$, R is such that $x + y < 8$.

The set of ordered pairs = $\{(1, 0), (1, 2), (3, 0), (3, 2), (7, 0)\}$

(ii)



Question-42

Which of the following sets are equal ?

$$A = \{x : x \in \mathbb{N}, x < 3\},$$

$$B = \{1, 2\},$$

$$C = \{3, 1\}$$

$$D = \{x : x \in \mathbb{N}, x \text{ is odd}, x < 5\},$$

$$E = \{1, 2, 1\},$$

$$F = \{1, 1,$$

3}

Solution:

$$A = \{1, 2\}, B = \{1, 2\}, C = \{3, 1\},$$

$$D = \{1, 3\}, E = \{1, 2, 1\}, F = \{1, 1, 3\}$$

A, B, E and C, D, F are equal sets.

Question-43

If A and B are two sets such that $A \cup B$ has 25 elements, A has 10 elements, and B has 37 elements, how many elements does $A \cap B$ have?

Solution:

$$n(A \cup B) = 25; n(A) = 10; n(B) = 37$$

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

$$\therefore 25 = 10 + 37 - n(A \cap B)$$

$$\Rightarrow n(A \cap B) = 12$$

$\therefore A \cap B$ has 12 elements.

Question-44

In a group of 52 persons, 16 drink tea but not coffee and 33 drink tea. Find :

- (i) how many drink tea and coffee both:
- (ii) how many drink coffee but not tea.

Solution:

Let A be the set of those persons who drink tea and let B be the set of those persons who drink coffee. Then,

$A \cap B$ = set of persons who drink both tea and coffee.

$A - B$ = set of persons who drink tea but not coffee.

$B - A$ = set of persons who drink coffee but not tea

$$\therefore n(A \cup B) = 52, n(A - B) = 16 \text{ and } n(A) = 33$$

$$\text{Now, } n(A - B) + n(A \cap B) = n(A)$$

$$\therefore n(A \cap B) = n(A) - n(A - B) = (33 - 16) = 17$$

Thus, 17 persons drink tea and coffee both.

$$\text{Now, } n(A) = 33, n(A \cup B) = 52 \text{ and } n(A \cap B) = 17$$

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

$$\therefore n(A) = 33, n(A \cup B) = 52 \text{ and } n(A \cap B) = 17.$$

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

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

$$\Rightarrow n(B) = (52 + 17 - 33) = 36$$

$$\text{Also, } n(B - A) + n(A \cap B) = n(B)$$

$$\Rightarrow n(B - A) = n(B) - n(A \cap B) = (36 - 17) = 19$$

$\therefore$ 19 persons drink coffee but not tea.

Question-45

Represent the relation R from $A = \{2, 4, 5, 7\}$ to $B = \{3, 5, 6, 8, 10\}$ by an arrow diagram given $a R b$ if $b = a + 1$ where $a \in A$ and $b \in B$.

Solution:

$A = \{2, 4, 5, 7\}$ to $B = \{3, 5, 6, 8, 10\}$

