

Practice Set 1.1 Algebra 9th Std Maths Part 1

Answers Chapter 1 Sets

Question 1.

Write the following sets in roster form.

- i. Set of even natural numbers
- ii. Set of even prime numbers from 1 to 50
- iii. Set of negative integers
- iv. Seven basic sounds of a sargam (sur)

Answer:

- i. $A = \{ 2, 4, 6, 8, \dots \}$
- ii. 2 is the only even prime number
 $\therefore B = \{ 2 \}$
- iii. $C = \{-1, -2, -3, \dots\}$
- iv. $D = \{\text{sa, re, ga, ma, pa, dha, ni}\}$

Question 2.

Write the following symbolic statements in words.

- i. $43 \in Q$
- ii. $-2 \notin N$
- iii. $P = \{p \mid p \text{ is an odd number}\}$

Answer:

- i. 43 is an element of set Q.
- ii. -2 is not an element of set N.
- iii. Set P is a set of all p's such that p is an odd number.

Question 3.

Write any two sets by listing method and by rule method.

Answer:

- i. A is a set of even natural numbers less than 10.

Listing method: $A = \{2, 4, 6, 8\}$

Rule method: $A = \{x \mid x = 2n, n \in N, n < 5\}$

- ii. B is a set of letters of the word 'SCIENCE'. Listing method : $B = \{S, C, I, E, N\}$

Rule method: $B = \{x \mid x \text{ is a letter of the word 'SCIENCE'}\}$

AllGuidesite –

- *Digvijay*
- *Arjun*

Question 4.

Write the following sets using listing method.

- i. All months in the Indian solar year.
- ii. Letters in the word 'COMPLEMENT'.
- iii. Set of human sensory organs.
- iv. Set of prime numbers from 1 to 20.
- v. Names of continents of the world.

Answer:

- i. $A = \{\text{Chaitra, Vaishakh, Jyestha, Aashadha, Shravana, Bhadrapada, Ashwina, Kartika, Margashirsha, Paush, Magha, Falguna}\}$
- ii. $X = \{C, O, M, P, L, E, N, T\}$
- iii. $Y = \{\text{Nose, Ears, Eyes, Tongue, Skin}\}$
- iv. $Z = \{2, 3, 5, 7, 11, 13, 17, 19\}$
- v. $E = \{\text{Asia, Africa, Europe, Australia, Antarctica, South America, North America}\}$

Question 5.

Write the following sets using rule method.

- i. $A = \{1, 4, 9, 16, 25, 36, 49, 64, 81, 100\}$
- ii. $B = \{6, 12, 18, 24, 30, 36, 42, 48\}$
- iii. $C = \{S, M, I, L, E\}$
- iv. $D = \{\text{Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}\}$
- v. $X = \{a, e, t\}$

Answer:

- i. $A = \{x \mid x = n^2, n \in \mathbb{N}, n < 10\}$
- ii. $B = \{x \mid x = 6n, n \in \mathbb{N}, n < 9\}$
- iii. $C = \{y \mid y \text{ is a letter of the word 'SMILE'}\}$ [Other possible words: 'SLIME', 'MILES', 'MISSILE' etc.]
- iv. $D = \{z \mid z \text{ is a day of the week}\}$
- v. $X = \{y \mid y \text{ is a letter of the word 'eat'}\}$
[Other possible words: 'tea' or 'ate']

Question 1.

Fill in the blanks given in the following table. (Textbook pg. no. 3)

- Digvijay
- Arjun

Answer:

Listing or Roster Method	Rule Method
$A = \{2, 4, 6, 8, 10, 12, 14\}$	$A = \{x \mid x \text{ is an even natural number less than } 15\}$
$B = \{4, 9, 16\}$	$B = \{x \mid x \text{ is a perfect square number between } 1 \text{ to } 20\}$
$C = \{a, e, i, o, u\}$	$C = \{x \mid x \text{ is a vowel of English alphabet}\}$
$D = \{\text{violet, indigo, blue, green, yellow, orange, red}\}$	$D = \{y \mid y \text{ is a colour in the rainbow}\}$
$P = \{-2, -1, 0, 1, 2\}$	$P = \{x \mid x \text{ is an integer and } -3 < x < 3\}$
$M = \{1, 8, 27, 64, 125, \dots\}$	$M = \{x \mid x \text{ is a cube of a positive integer}\}$

Practice Set 1.2 Algebra 9th Std Maths Part 1 Answers Chapter 1 Sets

Question 1.

Decide which of the following are equal sets and which are not ? Justify your answer.

$$A = \{x \mid 3x - 1 = 2\}$$

$$B = \{x \mid x \text{ is a natural number but } x \text{ is neither prime nor composite}\}$$

$$C = \{x \mid x \in \mathbb{N}, x < 2\}$$

Solution:

$$A = \{x \mid 3x - 1 = 2\}$$

$$\text{Here, } 3x - 1 = 2$$

$$\therefore 3x = 3$$

$$\therefore x = 1$$

$$\therefore A = \{1\} \dots (i)$$

AllGuidesite –

- Digvijay
- Arjun

$B = \{x \mid x \text{ is a natural number but } x \text{ is neither prime nor composite}\}$

1 is the only number which is neither prime nor composite,

$$\therefore x = 1$$

$$\therefore B = \{1\} \dots(\text{ii})$$

$C = \{x \mid x \in \mathbb{N}, x < 2\}$

1 is the only natural number less than 2.

$$\therefore x = 1$$

$$\therefore C = \{1\} \dots(\text{iii})$$

\therefore The element in sets A, B and C is identical. ... [From (i), (ii) and (iii)]

\therefore A, B and C are equal sets.

Question 2.

Decide whether set A and B are equal sets. Give reason for your answer.

A = Even prime numbers

$$B = \{x \mid 7x - 1 = 13\}$$

Solution:

A = Even prime numbers

Since 2 is the only even prime number,

$$\therefore A = \{2\} \dots(\text{i})$$

$$B = \{x \mid 7x - 1 = 13\}$$

$$\text{Here, } 7x - 1 = 13$$

$$\therefore 7x = 14$$

$$\therefore x = 2$$

$$\therefore B = \{2\} \dots(\text{ii})$$

\therefore The element in set A and B is identical. ... [From (i) and (ii)]

\therefore A and B are equal sets.

Question 3.

Which of the following are empty sets? Why?

i. $A = \{a \mid a \text{ is a natural number smaller than zero}\}$

ii. $B = \{x \mid x^2 = 0\}$

iii. $C = \{x \mid 5x - 2 = 0, x \in \mathbb{N}\}$

Solution:

i. $A = \{a \mid a \text{ is a natural number smaller than zero}\}$

Natural numbers begin from 1.

$$\therefore A = \{ \}$$

\therefore A is an empty set.

AllGuidesite –

- Digvijay
- Arjun

ii. $B = \{x \mid x^2 = 0\}$

Here, $x^2 = 0$

$\therefore x = 0$... [Taking square root on both sides]

$\therefore B = \{0\}$

$\therefore B$ is not an empty set.

iii. $C = \{x \mid 5x - 2 = 0, x \in \mathbb{N}\}$

Here, $5x - 2 = 0$

$\therefore 5x = 2$

$\therefore x = \frac{2}{5}$

Given, $x \in \mathbb{N}$

But, $x = \frac{2}{5}$ is not a natural number.

$\therefore C = \{\}$

$\therefore C$ is an empty set.

Question 4.

Write with reasons, which of the following sets are finite or infinite.

i. $A = \{x \mid x < 10, x \text{ is a natural number}\}$

ii. $B = \{y \mid y < -1, y \text{ is an integer}\}$

iii. $C = \text{Set of students of class 9 from your school.}$

iv. $\text{Set of people from your village.}$

v. $\text{Set of apparatus in laboratory}$

vi. $\text{Set of whole numbers}$

vii. $\text{Set of rational number}$

Solution:

i. $A = \{x \mid x < 10, x \text{ is a natural number}\}$

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

The number of elements in A are limited and can be counted.

$\therefore A$ is a finite set.

ii. $B = \{y \mid y < -1, y \text{ is an integer}\}$

$\therefore B = \{\dots, -4, -3, -2\}$

The number of elements in B are unlimited and uncountable.

$\therefore B$ is an infinite set.

iii. $C = \text{Set of students of class 9 from your school.}$

The number of students in a class is limited and can be counted.

$\therefore C$ is a finite set.

AllGuidesite –

- Digvijay
- Arjun

iv. Set of people from your village.

The number of people in a village is limited and can be counted.

∴ Given set is a finite set.

v. Set of apparatus in laboratory

The number of apparatus in the laboratory are limited and can be counted.

∴ Given set is a finite set.

vi. Set of whole numbers

The number of elements in the set of whole numbers are unlimited and uncountable.

∴ Given set is an infinite set.

vii. Set of rational number

The number of elements in the set of rational numbers are unlimited and uncountable.

∴ Given set is an infinite set.

Question 1.

If $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, 4\}$, then $A \neq B$ verify it. (Textbook pg. no. 6)

Answer:

Here, $4 \in B$ but $4 \notin A$

∴ A and B are not equal sets,

i.e. $A \neq B$

Question 2.

$A = \{x \mid x \text{ is prime number and } 10 < x < 20\}$ and $B = \{11, 13, 17, 19\}$. Here $A = B$. Verify. (Textbook pg. no. 6)

Answer:

$A = \{x \mid x \text{ is prime number and } 10 < x < 20\}$

∴ $A = \{11, 13, 17, 19\}$

$B = \{11, 13, 17, 19\}$

∴ All the elements in set A and B are identical.

∴ A and B are equal sets, i.e. $A = B$

Practice Set 1.3 Algebra 9th Std Maths Part 1

Answers Chapter 1 Sets

Question 1.

If $A = \{a, b, c, d, e\}$, $B = \{c, d, e, f\}$, $C = \{b, d\}$, $D = \{a, e\}$, then which of the following statements are true and which are false?

i. $C \subseteq B$

ii. $A \subseteq D$

iii. $D \subseteq B$

iv. $D \subseteq A$

v. $B \subseteq A$

vi. $C \subseteq A$

Ans:

i. $C = \{b, d\}$, $B = \{c, d, e, f\}$

$C \subseteq B$

False

Since, all the elements of C are not present in B.

ii. $A = \{a, b, c, d, e\}$, $D = \{a, e\}$

$A \subseteq D$

False

Since, all the elements of A are not present in D.

iii. $D = \{a, e\}$, $B = \{c, d, e, f\}$

$D \subseteq B$

False

Since, all the elements of D are not present in B.

iv. $D = \{a, e\}$, $A = \{a, b, c, d, e\}$

$D \subseteq A$

True

Since, all the elements of D are present in A.

v. $B = \{c, d, e, f\}$, $A = \{a, b, c, d, e\}$

$B \subseteq A$

AllGuidesite –

- Digvijay
- Arjun

False

Since, all the elements of B are not present in A.

vi. $C = \{b, d\}$, $A = \{a, b, c, d, e\}$

$C \subseteq A$

True

Since, all the elements of C are present in A.

Question 2.

Take the set of natural numbers from 1 to 20 as universal set and show set X and Y using Venn diagram. [2 Marks each]

i. $X = \{x \mid x \in \mathbb{N}, \text{ and } 7 < x < 15\}$

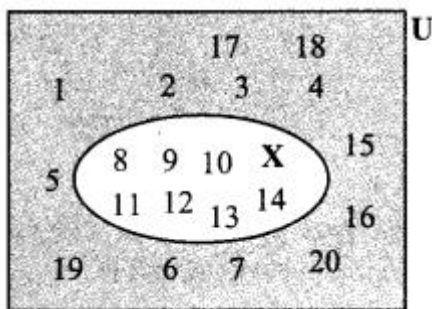
ii. $Y = \{y \mid y \in \mathbb{N}, y \text{ is a prime number from 1 to 20}\}$

Answer:

i. $U = \{1, 2, 3, 4, \dots, 18, 19, 20\}$

$x = \{x \mid x \in \mathbb{N}, \text{ and } 7 < x < 15\}$

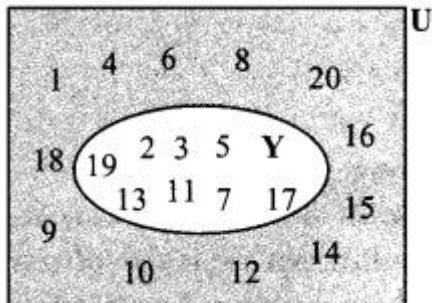
$\therefore x = \{8, 9, 10, 11, 12, 13, 14\}$



ii. $U = \{1, 2, 3, 4, \dots, 18, 19, 20\}$

$Y = \{y \mid y \in \mathbb{N}, y \text{ is a prime number from 1 to 20}\}$

$\therefore Y = \{2, 3, 5, 7, 11, 13, 17, 19\}$



Question 3.

$U = \{1, 2, 3, 7, 8, 9, 10, 11, 12\}$ $P = \{1, 3, 7, 10\}$, then

i. show the sets U, P and P' by Venn diagram.

AllGuidesite –

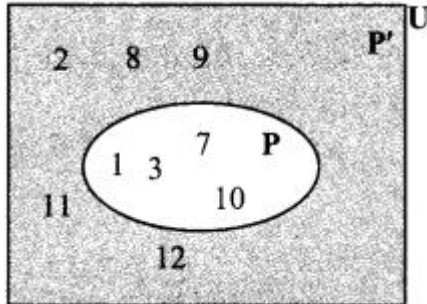
- Digvijay
- Arjun

ii. Verify $(P')' = P$

Solution:

i. Here, $U = \{1, 2, 3, 7, 8, 9, 10, 11, 12\}$ $P = \{1, 3, 7, 10\}$

$\therefore P' = \{2, 8, 9, 11, 12\}$



II. Here, $U = \{1, 2, 3, 7, 8, 9, 10, 11, 12\}$

$P = \{1, 3, 7, 10\}$ (i)

$\therefore P' = \{2, 8, 9, 11, 12\}$

Also, $(P')' = \{1, 3, 7, 10\}$... (ii)

$\therefore (P')' = P$... [From (i) and (ii)]

Question 4.

$A = \{1, 3, 2, 7\}$, then write any three subsets of A.

Solution:

Three subsets of A:

i. $B = \{3\}$

ii. $C = \{2, 1\}$

iii. $D = \{1, 2, 7\}$

[Note: The above problem has many solutions. Students may write solutions other than the ones given]

Question 5.

i. Write the subset relation between the sets.

P is the set of all residents in Pune.

M is the set of all residents in Madhya Pradesh.

I is the set of all residents in Indore.

B is the set of all residents in India.

H is the set of all residents in Maharashtra.

ii. Which set can be the universal set for above sets ?

Solution:

AllGuidesite –

- Digvijay
- Arjun

i.

a. The residents of Pune are residents of India.

$$\therefore P \subseteq B$$

b. The residents of Pune are residents of Maharashtra.

$$\therefore P \subseteq H$$

c. The residents of Madhya Pradesh are residents of India.

$$\therefore M \subseteq B$$

d. The residents of Indore are residents of India.

$$\therefore I \subseteq B$$

e. The residents of Indore are residents of Madhya Pradesh.

$$\therefore I \subseteq M$$

f. The residents of Maharashtra are residents of India.

$$\therefore H \subseteq B$$

ii. The residents of Pune, Madhya Pradesh, Indore and Maharashtra are all residents of India.

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

Question 6.

Which set of numbers could be the universal set for the sets given below?

i. A = set of multiples of 5,

B = set of multiples of 7,

C = set of multiples of 12

ii. P = set of integers which are multiples of 4.

T = set of all even square numbers.

Answer:

i. A = set of multiples of 5

$$\therefore A = \{5, 10, 15, \dots\}$$

B = set of multiples of 7

$$\therefore B = \{7, 14, 21, \dots\}$$

C = set of multiples of 12

$$\therefore C = \{12, 24, 36, \dots\}$$

Now, set of natural numbers, whole numbers, integers, rational numbers are as follows:

$$N = \{1, 2, 3, \dots\}, W = \{0, 1, 2, 3, \dots\}$$

$$I = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

$$Q = \{pq \mid p, q \in I, q \neq 0\}$$

AllGuidesite –

- Digvijay
- Arjun

Since, set A, B and C are the subsets of sets N, W, I and Q.

∴ For set A, B and C we can take any one of the set from N, W, I or Q as universal set.

ii. P = set of integers which are multiples of 4.

$$P = \{4, 8, 12, \dots\}$$

$$T = \text{set of all even square numbers } T = \{2^2, 4^2, 6^2, \dots\}$$

Since, set P and T are the subsets of sets N, W, I and Q.

∴ For set P and T we can take any one of the set from N, W, I or Q as universal set.

Question 7.

Let all the students of a class form a Universal set. Let set A be the students who secure 50% or more marks in Maths. Then write the complement of set A.

Answer:

Here, U = all the students of a class.

A = Students who secured 50% or more marks in Maths.

∴ A' = Students who secured less than 50% marks in Maths.

Question 1.

If A = {1, 3, 4, 7, 8}, then write all possible subsets of A.

$$\text{i. e. } P = \{1, 3\}, T = \{4, 7, 8\}, V = \{1, 4, 8\}, S = \{1, 4, 7, 8\}$$

In this way many subsets can be written. Write five more subsets of set A.

(Textbook pg. no, 8)

Answer:

$$B = \{ \},$$

$$E = \{4\},$$

$$C = \{1, 4\},$$

$$D = \{3, 4, 7\},$$

$$F = \{3, 4, 7, 8\}$$

Question 2.

Some sets are given below.

$$A = \{\dots, -4, -2, 0, 2, 4, 6, \dots\}$$

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

$$C = \{\dots, -12, -6, 0, 6, 12, 18, \dots\}$$

$$D = \{\dots, -8, -4, 0, 4, 8, \dots\}$$

$$I = \{\dots, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$$

AllGuidesite –

- Digvijay
- Arjun

Discuss and decide which of the following statements are true.

- a. A is a subset of sets B, C and D.
- b. B is a subset of all the sets which are given above. (Textbook pg. no. 9)

Solution:

- a. All elements of set A are not present in set B, C and D.

$$\therefore A \subseteq B,$$

$$\therefore A \subseteq C,$$

$$\therefore A \subseteq D$$

\therefore Statement (a) is false.

- b. All elements of set B are not present in set A, C and D.

$$\therefore B \subseteq A,$$

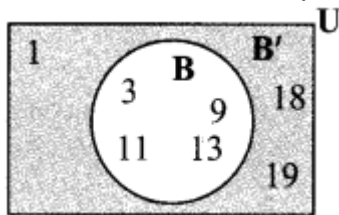
$$\therefore B \subseteq C,$$

$$\therefore B \subseteq D$$

\therefore Statement (b) is false.

Question 3.

Suppose $U = \{1, 3, 9, 11, 13, 18, 19\}$, and $B = \{3, 9, 11, 13\}$. Find $(B')'$ and draw the inference. (Textbook pg. no. 10)



Solution:

$$U = \{1, 3, 9, 11, 13, 18, 19\},$$

$$B = \{3, 9, 11, 13\} \dots (i)$$

$$\therefore B' = \{1, 18, 19\}$$

$$(B')' = \{3, 9, 11, 13\} \dots (ii)$$

$$\therefore (B')' = B \dots [\text{From (i) and (ii)}]$$

\therefore Complement of a complement is the given set itself.

Practice Set 1.4 Algebra 9th Std Maths Part 1

Answers Chapter 1 Sets

Question 1.

If $n(A) = 15$, $n(A \cup B) = 29$, $n(A \cap B) = 7$, then $n(B) = ?$

Solution:

Here, $n(A) = 15$, $n(A \cup B) = 29$, $n(A \cap B) = 7$

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

$$\therefore 29 = 15 + n(B) - 7$$

$$\therefore 29 - 15 + 7 = n(B)$$

$$\therefore n(B) = 21$$

Question 2.

In a hostel there are 125 students, out of which 80 drink tea, 60 drink coffee and 20 drink tea and coffee both. Find the number of students who do not drink tea or coffee.

Solution:

i. Let U be the set of students in the hostel, T be the set of students who drink tea and C be the set of students who drink coffee.

$$n(U) = 125, n(T) = 80, n(C) = 60,$$

$$\text{number of students who drink Tea and Coffee} = n(T \cap C) = 20$$

$$\text{ii. } n(T \cup C) = n(T) + n(C) - n(T \cap C)$$

$$= 80 + 60 - 20$$

$$\therefore n(T \cup C) = 120$$

\therefore 120 students drink tea or coffee

Also, there are 125 students in the hostel.

$$\text{iii. Number of students who do not drink tea or coffee} = n(U) - n(T \cup C)$$

$$= 125 - 120$$

$$= 5$$

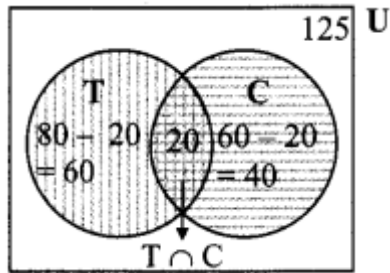
\therefore 5 students do not drink tea or coffee.

Alternate Method:

Let U be the set of students in the hostel, T be the set of students who drink tea and C be the set of students who drink coffee.

AllGuidesite –

- Digvijay
- Arjun



From Venn diagram,

Student who drinks tea or coffee = $n(T \cup C) = 60 + 20 + 40 = 120$

\therefore The number of students who do not drink tea or coffee = $n(U) - n(T \cup C)$
 $= 125 - 120 = 5$

\therefore 5 students do not drink tea or coffee.

Question 3.

In a competitive exam 50 students passed in English, 60 students passed in Mathematics and 40 students passed in both the subjects. None of them failed in both the subjects. Find the number of students who passed at least in one of the subjects ?

Solution:

Let U be the set of students who appeared for the exam,

E be the set of students who passed in English and

M be the set of students who passed in Maths.

$\therefore n(E) = 50, n(M) = 60,$

40 students passed in both the subjects

$\therefore n(M \cap E) = 40$

Since, none of the students failed in both subjects

\therefore Total students = $n(E \cup M)$

$= n(E) + n(M) - n(E \cap M)$

$= 50 + 60 - 40$

$= 70$

\therefore The number of students who passed at least in one of the subjects is 70.

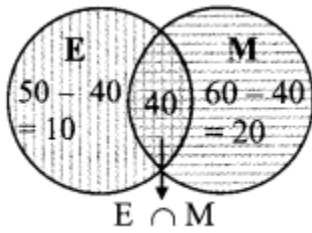
Alternate Method:

Let U be the set of students who appeared for the exam,

E be the set of students who passed in English and M be the set of students who passed in Maths.

AllGuidesite –

- Digvijay
- Arjun



Since, none of the students failed in both subjects

\therefore Total student = $n(E \cup M)$

$$= 10 + 40 + 20$$

$$= 70$$

\therefore The number of students who passed at least in one of the subjects is 70.

Question 4.

A survey was conducted to know the hobby of 220 students of class IX. Out of which 130 students informed about their hobby as 'rock climbing and 180 students informed about their hobby as sky watching. There are 110 students who follow both the hobbies. Then how many students do not have any of the two hobbies? How many of them follow the hobby of rock climbing only? How many students follow the hobby of sky watching only?

Solution:

i. Let U be the set of students of class IX,

R be the set of students who follow the hobby of rock climbing and

S be the set of students who follow the hobby of sky watching.

$$\therefore n(U) = 220, n(R) = 130, n(S) = 180,$$

110 students follow both the hobbies

$$\therefore n(R \cap S) = 110$$

$$\text{ii. } n(R \cup S) = n(R) + n(S) - n(R \cap S)$$

$$= 130 + 180 - 110$$

$$\therefore n(R \cup S) = 200$$

\therefore 200 students follow the hobby of rock climbing or sky watching.

iii. Total number of students = 220.

Number of students who do not follow the hobby of rock climbing or sky watching

$$= n(U) - n(R \cup S)$$

$$= 220 - 200$$

$$= 20$$

AllGuidesite –

- Digvijay
- Arjun

iv. Number of students who follow the hobby of rock climbing only

$$\begin{aligned} &= n(R) - n(R \cap S) \\ &= 130 - 110 \\ &= 20 \end{aligned}$$

v. Number of students who follow the hobby of sky watching only

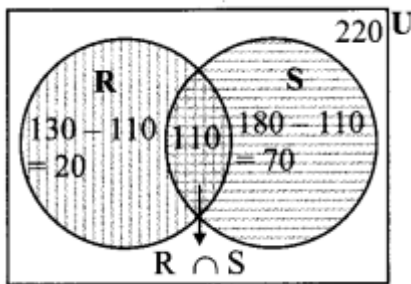
$$\begin{aligned} &= n(S) - n(R \cap S) \\ &= 180 - 110 \\ &= 70 \end{aligned}$$

Alternate Method:

Let U be the set of students of class IX,

R be the set of students who follow the hobby of rock climbing and

S be the set of students who follow the hobby of sky watching.



From the Venn diagram

i. Students who follow the hobby of rock climbing or sky watching

$$\begin{aligned} &= n(R \cup S) \\ &= 20 + 110 + 70 \\ &= 200 \end{aligned}$$

ii. Number of students who do not follow the hobby of rock climbing or sky watching

$$\begin{aligned} &= n(U) - n(R \cup S) \\ &= 220 - 200 \\ &= 20 \end{aligned}$$

iii. Number of students who follow the hobby of rock climbing only

$$\begin{aligned} &= n(R) - n(R \cap S) \\ &= 130 - 110 \\ &= 20 \end{aligned}$$

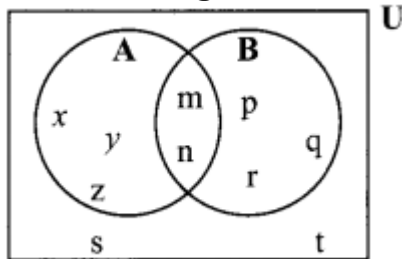
AllGuidesite –

- Digvijay
- Arjun

iv. Number of students who follow the hobby of sky watching only
 $= n(S) - n(R \cap S)$
 $= 180 - 110$
 $= 70$

Question 5.

Observe the given Venn diagram and write the following sets.



- i. A
- ii. B
- iii. $A \cup B$
- iv. U
- v. A'
- vi. B'
- vii. $(A \cup B)'$

Ans:

- i. $A = \{x, y, z, m, n\}$
- ii. $B = \{p, q, r, m, n\}$
- iii. $A \cup B = \{x, y, z, m, n, p, q, r\}$
- iv. $U = \{x, y, z, m, n, p, q, r, s, t\}$
- v. $A' = \{p, q, r, s, t\}$
- vi. $B' = \{x, y, z, s, t\}$
- vii. $(A \cup B)' = \{s, t\}$

Question 1.

Take different examples of sets and verify the above mentioned properties.
(Textbook pg.no. 12)

Solution:

- i. Let $A = \{3, 5\}$, $B = \{3, 5, 8, 9, 10\}$
 $A \cap B = B \cap A = \{3, 5\}$

- ii. Let $A = \{3, 5\}$, $B = \{3, 5, 8, 9, 10\}$

Since, all elements of set A are present in set B.

AllGuidesite –

- Digvijay
- Arjun

$$\therefore A \subseteq B$$

$$\text{Also, } A \cap B = \{3, 5\} = A$$

$$\therefore \text{If } A \subseteq B, \text{ then } A \cap B = A.$$

$$\text{iii. Let } A = \{2, 3, 8, 10\}, B = \{3, 8\}$$

$$A \cap B = \{3, 8\} = B$$

Also, all the elements of set B are present in set A

$$\therefore B \subseteq A$$

$$\therefore \text{If } A \cap B = B, \text{ then } B \subseteq A.$$

$$\text{iv. Let } A = \{2, 3, 8, 10\}, B = \{3, 8\}, A \cap B = \{3, 8\}$$

Since, all the elements of set $A \cap B$ are present in set A and B

$$A \cap B \subseteq A \text{ and } A \cap B \subseteq B$$

$$\text{v. Let } U = \{3, 4, 6, 8\}, A = \{6, 4\}$$

$$\therefore A' = \{3, 8\}$$

$$\therefore A \cap A' = \{\} = \varnothing$$

$$\text{vi. } A \cap \varnothing = \{\} = \varnothing$$

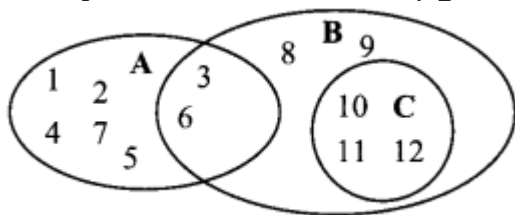
$$\text{vii. Let } A = \{6, 4\}$$

$$\therefore A \cap A = \{6, 4\}$$

$$\therefore A \cap A = A$$

Question 2.

Observe the set A, B, C given by Venn diagrams and write which of these are disjoint sets. (Textbook pg. no. 12)



Solution:

$$\text{Here, } A = \{1, 2, 3, 4, 5, 6, 7\}$$

$$B = \{3, 6, 8, 9, 10, 11, 12\}$$

$$C = \{10, 11, 12\}$$

$$\text{Now, } A \cap C = \varnothing$$

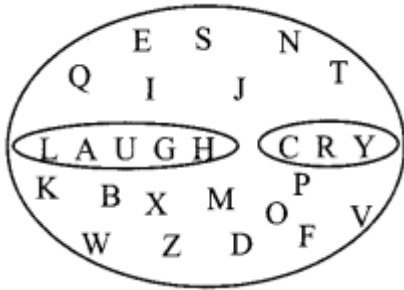
\therefore A and C are disjoint sets.

AllGuidesite –

- Digvijay
- Arjun

Question 3.

Let the set of English alphabets be the Universal set. The letters of the word 'LAUGH' is one set and the letter of the word 'CRY' is another set. Can we say that these are two disjoint sets? Observe that intersection of these two sets is empty. (Textbook pg. no. 13)



Solution:

Let $A = \{L, A, U, G, H\}$

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

Now, $A \cap B = \varnothing$

\therefore A and B are disjoint sets.

Question 4.

Fill in the blanks with elements of that set.

$U = \{1, 3, 5, 8, 9, 10, 11, 12, 13, 15\}$

$A = \{1, 11, 13\}$

$B = \{8, 5, 10, 11, 15\}$

$A' = \{ \}$

$B' = \{ \}$

$A \cap B = \{ \}$

$A' \cap B' = \{ \}$

$A \cup B = \{ \}$

$A' \cup B' = \{ \}$

$(A \cap B)' = \{ \}$

$(A \cup B)' = \{ \}$

Verify: $(A \cap B)' = A' \cup B'$, $(A \cup B)' = A' \cap B'$ (Textbook pg. no, 18)

Solution:

$U = \{1, 3, 5, 8, 9, 10, 11, 12, 13, 15\}$

$A = \{1, 11, 13\}$

$B = \{8, 5, 10, 11, 15\}$

$A' = \{3, 5, 8, 9, 10, 12, 15\}$

$B' = \{1, 3, 9, 12, 13\}$

$A \cap B = \{11\}$

AllGuidesite –

- Digvijay
- Arjun

$$A' \cap B' = \{3, 9, 12\} \dots (i)$$

$$A \cup B = \{1, 5, 8, 10, 11, 13, 15\}$$

$$A' \cup B' = \{1, 3, 5, 8, 9, 10, 12, 13, 15\} \dots (ii)$$

$$(A \cap B)' = \{1, 3, 5, 8, 9, 10, 12, 13, 15\} \dots (iii)$$

$$(A \cup B)' = \{3, 9, 12\} \dots (iv)$$

$$(A \cap B)' = A' \cup B' \dots [\text{From (ii) and (iii)}]$$

$$(A \cup B)' = A' \cap B' \dots [\text{From (i) and (iv)}]$$

Question 5.

$$A = \{1, 2, 3, 5, 7, 9, 11, 13\}$$

$$B = \{1, 2, 4, 6, 8, 12, 13\}$$

Verify the above rule for the given set A and set B. (Textbook pg. no. 14)

Solution:

$$A = \{1, 2, 3, 5, 7, 9, 11, 13\}$$

$$B = \{1, 2, 4, 6, 8, 12, 13\}$$

$$A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13\}$$

$$A \cap B = \{1, 2, 13\}$$

$$n(A) = 8, n(B) = 7,$$

$$n(A \cup B) = 12, n(A \cap B) = 3$$

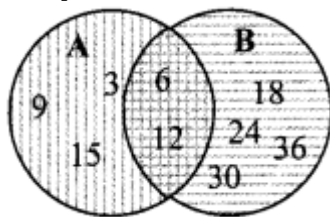
$$n(A \cap B) = 12 \dots (i)$$

$$n(A) + n(B) - n(A \cap B) = 8 + 7 - 3 = 12 \dots (ii)$$

$$\therefore n(A \cup B) = n(A) + n(B) - n(A \cap B) \dots [\text{From (i) and (ii)}]$$

Question 6.

Verify the above rule for the given Venn diagram. (Textbook pg. no. 14)



Solution:

$$n(A) = 5, n(B) = 6$$

$$n(A \cup B) = 9, n(A \cap B) = 2$$

$$\text{Now, } n(A \cup B) = 9 \dots (i)$$

$$n(A) + n(B) - n(A \cap B) = 5 + 6 - 2 = 9 \dots (ii)$$

$$\therefore n(A \cup B) = n(A) + n(B) - n(A \cap B) \dots [\text{From (i) and (ii)}]$$

Problem Set 1 Algebra 9th Std Maths Part 1

Answers Chapter 1 Sets

Question 1.

Choose the correct alternative answer for each of the following questions.

i. $M = \{1, 3, 5\}$, $N = \{2, 4, 6\}$, then $M \cap N = ?$

(A) $\{1, 2, 3, 4, 5, 6\}$

(B) $\{1, 3, 5\}$

(C) \varnothing

(D) $\{2, 4, 6\}$

Answer:

(C) \varnothing

ii. $P = \{x \mid x \text{ is an odd natural number, } 1 < x \leq 5\}$. How to write this set in roster form?

(A) $\{1, 3, 5\}$

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

(C) $\{1, 3\}$

(D) $\{3, 5\}$

Answer:

(D) $\{3, 5\}$

iii. $P = \{1, 2, \dots, 10\}$. What type of set is P ?

(A) Null set

(B) Infinite set

(C) Finite set

(D) None of these

Answer:

(C) Finite set

iv. $M \cup N = \{1, 2, 3, 4, 5, 6\}$ and $M = \{1, 2, 4\}$, then which of the following represent set N ?

(A) $\{1, 2, 3\}$

(B) $\{3, 4, 5, 6\}$

(C) $\{2, 5, 6\}$

(D) $\{4, 5, 6\}$

AllGuidesite –

- Digvijay
- Arjun

Answer:

(B) {3, 4, 5, 6}

v. If $P \subseteq M$, then which of the following set represent $P \cap (P \cup M)$?

- (A) P
- (B) M
- (C) $P \cup M$
- (D) $P' \cap M$

Answer:

(A) P

vi. Which of the following sets are empty sets?

- (A) Set of intersecting points of parallel lines.
- (B) Set of even prime numbers.
- (C) Month of an english calendar having less than 30 days.
- (D) $P = \{x \mid x \in I, -1 < x < 1\}$

Answer:

(A) Set of intersecting points of parallel lines.

Hints:

v. Here, $P \subseteq M$

$\therefore P \cup M = M$

$\therefore P \cap (P \cup M) = P \cap M$

$= P \dots [\because P \subseteq M]$

Question 2.

Find the correct option for the given question.

i. Which of the following collections is a set ?

- (A) Colors of the rainbow
- (B) Tall trees in the school campus.
- (C) Rich people in the village
- (D) Easy examples in the book

Answer:

(A) Colors of the rainbow

ii. Which of the following set represent $N \cap W$?

- (A) {1, 2, 3,...}
- (B) {0, 1, 2, 3,...}

AllGuidesite –

- Digvijay
- Arjun

(C) {0}

(D) { }

Answer:

(A) {1, 2, 3,....}

iii. $P = \{x \mid x \text{ is an odd natural number, } 1 < x < 5\}$. How to write this set in roster form?

(A) {1, 3, 5}

(B) {1, 2, 3, 4, 5}

(C) {1, 3}

(D) {3, 5}

Answer:

(B) {1, 2, 3, 4, 5}

iv. If $T = \{1, 2, 3, 4, 5\}$ and $M = \{3, 4, 7, 8\}$, then $T \cup M = ?$

(A) {1, 2, 3, 4, 5, 7}

(B) {1, 2, 3, 7, 8}

(C) {1, 2, 3, 4, 5, 7, 8}

(D) {3, 4}

Answer:

(C) {1, 2, 3, 4, 5, 7, 8}

Hints:

- i. The elements of options B, C and D cannot be definitely and clearly decided.
- ii. The common elements of N and W are 1 2, 3,....

Question 3.

Out of 100 persons in a group, 72 persons speak English and 43 persons speak French. Each one out of 100 persons speak at least one language. Then how many speak only English? How many speak only French ? How many of them speak English and French both?

Solution:

- i. Let U be the set of all the persons,
E be the set of persons who speak English and
F be the set of persons who speak French.

$$\therefore n(E) = 72, n(F) = 43$$

AllGuidesite –

- Digvijay
- Arjun

Since, each one out of 100 persons speak at least one language

$$\therefore n(U) = n(E \cup F) = 100,$$

$$\text{ii. } n(E \cup F) = n(E) + n(F) - n(E \cap F)$$

$$100 = 72 + 43 - n(E \cap F)$$

$$n(E \cap F) = 72 + 43 - 100$$

$$\therefore n(E \cap F) = 15$$

Number of people who speak English and French = 15

$$\text{iii. Number of people who speak only English} = n(E) - n(E \cap F)$$

$$= 72 - 15 = 57$$

iv. Number of

$$\text{people who speak only French} = n(F) - n(E \cap F)$$

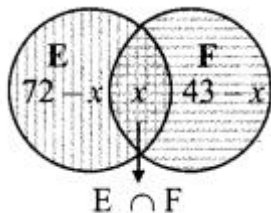
$$= 43 - 15 = 28$$

Alternate Method:

Let U be the set of all the persons,

E be the set of persons who speak English,

F be the set of persons who speak French and x people speak both the languages.



Since, each one out of 100 persons speak at least one language.

$$\therefore n(U) = n(E \cup F) = 100$$

$$\therefore 72 - x + x + 43 - x = 100$$

$$\therefore 115 - x = 100$$

$$\therefore x = 115 - 100 = 15.$$

Number of people who speak English and French = 15

Number of people who speak only English = $72 - x = 72 - 15 = 57$

Number of people who speak only French = $43 - x = 43 - 15 = 28$

Question 4.

70 trees were planted by Parth and 90 trees were planted by Pradnya on the occasion of Tree Plantation Week. Out of these 25 trees were planted

AllGuidesite –

- Digvijay
- Arjun

by both of them together. How many trees were planted by Parth or Pradnya?

Solution:

i. Let P be the trees planted by Parth and Q be the trees planted by Pradnya

$$\therefore n(P) = 70 \text{ and } n(Q) = 90$$

$$\text{Total number of trees planted by Parth and Pradnya} = n(P \cap Q) = 25$$

ii. Number of trees planted by Parth or Pradnya = $n(P \cup Q)$

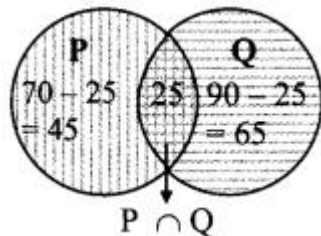
$$= n(P) + n(Q) - n(P \cap Q)$$

$$= 70 + 90 - 25 = 135$$

\therefore A total of 135 trees were planted by Parth or Pradnya.

Alternate Method:

Let P be the trees planted by Parth and Q be the trees planted by Pradnya



From Venn diagram

$$\therefore \text{Total trees planted by parth or pradnya} = n(P \cup Q)$$

$$= 45 + 25 + 65$$

$$= 135$$

A total of 135 trees were planted by Parth or Pradnya.

Question 5.

If $n(A) = 20$, $n(B) = 28$ and $n(A \cup B) = 36$, then $n(A \cap B) = ?$

Solution:

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

$$\therefore 36 = 20 + 28 - n(A \cap B)$$

$$\therefore n(A \cap B) = 20 + 28 - 36$$

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

Question 6.

In a class, 8 students out of 28 have a dog as their pet animal at home, 6 students have a cat as their pet animal, 10 students have dog and cat both, then how many students do not have dog or cat as their pet animal at home?

AllGuidesite –

- Digvijay
- Arjun

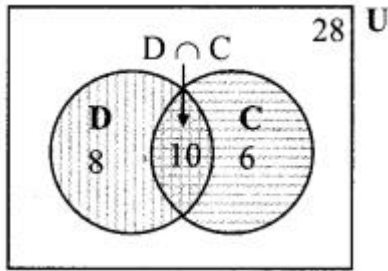
Solution:

i. Let U be the set of all the students, then $n(U) = 28$

Let D be the set of students who have dog as pet and C be the set of students who have cat as pet.

10 students have dog and cat as their pet animal

$$n(D \cap C) = 10$$



From venn diagram,

ii. Number of students who have cat or dog as pet

$$= n(D \cup C)$$

$$= 8 + 10 + 6$$

$$= 24$$

iii. Number of students who do not have dog or cat as pet = $n(U) - n(D \cup C)$

$$= 28 - 24$$

$$= 4$$

Question 7.

Represent the union of two sets by Venn diagram for each of the following.

i. $A = \{3, 4, 5, 7\}, B = \{1, 4, 8\}$ | Marks

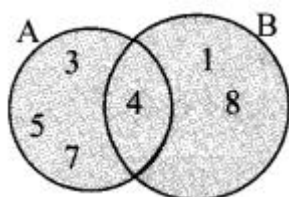
ii. $P = \{a, b, c, e, f\}, Q = \{l, m, n, e, b\}$ | Markj

iii. $X = \{x \mid x \text{ is a prime number between } 80 \text{ and } 100\}$

$Y = \{y \mid y \text{ is an odd number between } 90 \text{ and } 100\}$

Solution:

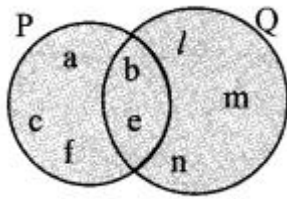
i. $A = \{3, 4, 5, 7\}, B = \{1, 4, 8\}$



AllGuidesite –

- Digvijay
- Arjun

ii. $P = \{a, b, c, e, f\}$, $Q = \{l, m, n, e, b\}$

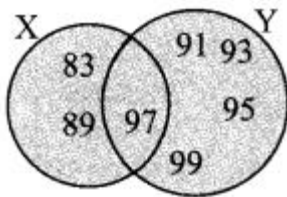


iii. $X = \{x \mid x \text{ is a prime number between } 80 \text{ and } 100\}$

$\therefore X = \{83, 89, 97\}$

$Y = \{y \mid y \text{ is an odd number between } 90 \text{ and } 100\}$

$\therefore Y = \{91, 93, 95, 97, 99\}$



Question 8.

Write the subset relations between the following sets.

X = set of all quadrilaterals.

Y = set of all rhombuses.

S = set of all squares.

T = set of all parallelograms.

V = set of all rectangles. [3 Marks]

Solution:

i. Rhombus, square, parallelogram and rectangle all are quadrilaterals.

$\therefore Y \subseteq X, S \subseteq X, T \subseteq X, V \subseteq X$

ii. Every square is a rhombus, parallelogram and rectangle.

$\therefore S \subseteq Y, S \subseteq T, S \subseteq V$

iii. Every rhombus and rectangle is a parallelogram.

$\therefore Y \subseteq T, V \subseteq T$

Question 9.

If M is any set, then write $M \cup \Phi$ and $M \cap \Phi$.

Solution:

Let $M = \{2, 3, 4, 8\}$ and $\Phi = \{ \}$

$\therefore M \cup \Phi = \{2, 3, 4, 8\}$

AllGuidesite –

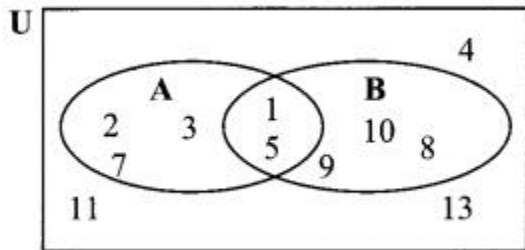
- Digvijay
- Arjun

$\therefore M \cup \Phi = M$ Also, $M \cap \Phi = \{ \}$

$\therefore M \cap \Phi = \emptyset$

Question 10.

Observe the Venn diagram and write the given sets U , A , B , $A \cup B$ and $A \cap B$.



$U = \{1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13\}$

$A = \{1, 2, 3, 5, 7\}$

$B = \{1, 5, 8, 9, 10\}$

$A \cup B = \{1, 2, 3, 5, 7, 8, 9, 10\}$

$A \cap B = \{1, 5\}$

Question 11.

If $n(A) = 7$, $n(B) = 13$, $n(A \cap B) = 4$, then $n(A \cup B) = ?$

Solution:

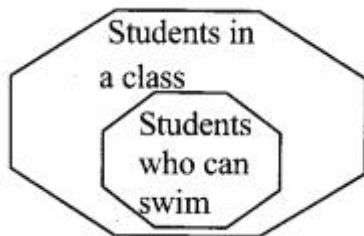
$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 7 + 13 - 4$

$n(A \cup B) = 16$

Question 1.

Set of students in a class and set of students in the same class who can swim, are shown by the Venn diagram.



Observe the diagram and draw Venn diagrams for the following subsets.

i. a. Set of students in a class

b. Set of students who can ride bicycles in the same class

AllGuidesite –

- Digvijay
- Arjun

ii. A set of fruits is given as follows.

$U = \{\text{guava, orange, mango, jackfruit, chickoo, jamun, custard apple, papaya, plum}\}$

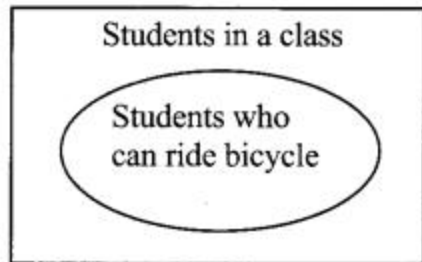
Show these subsets.

$A = \text{fruit with one seed}$

$B = \text{fruit with more than one seed. (Textbook pg. no. 8)}$

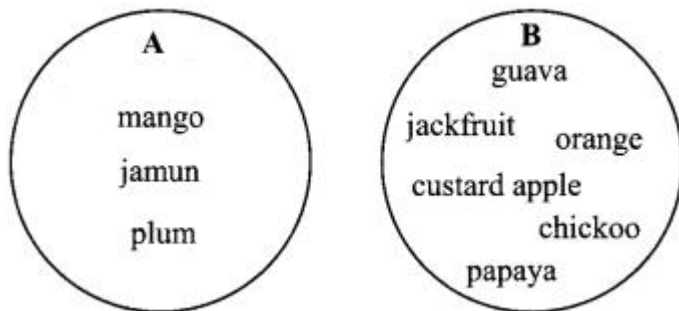
Solution:

i.



ii. $A = \{\text{mango, jamun, plum}\}$

$B = \{\text{guava, orange, jackfruit, chickoo, custard apple, papaya}\}$



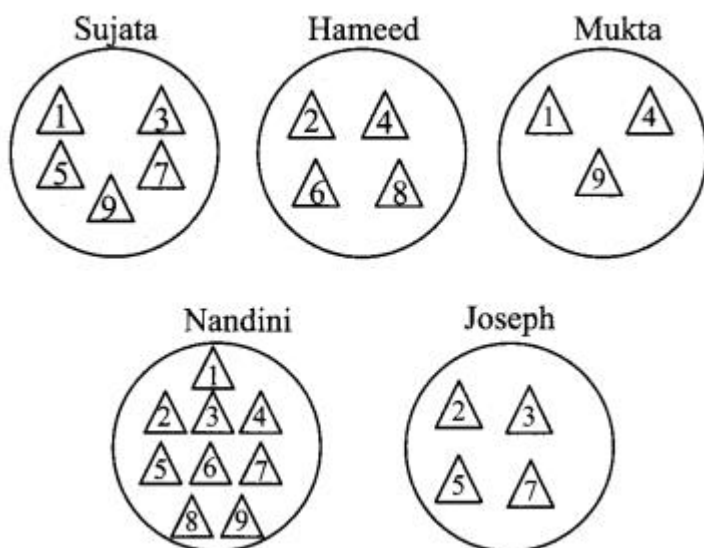
Question 2.

Every student should take 9 triangular sheets of paper and one plate.

Numbers from 1 to 9 should, be written on each triangle. Everyone should keep some numbered triangles in the plate. Now the triangles in each plate form a subset of the set of numbers from 1 to 9.

AllGuidesite –

- Digvijay
- Arjun



Look at the plates of Sujata, Hameed, Mukta, Nandini, Joseph with the numbered triangles. Guess the thinking behind selecting these numbers. Hence write the subsets in set builder form. (Textbook pg, no. 9)

Solution:

Sujata:

$$S = \{x \mid x = 2n - 1, n \in \mathbb{N}, x < 9\}$$

Hameed:

$$H = \{x \mid x = 2n, n \in \mathbb{N}, x < 9\}$$

Mukta:

$$M = \{x \mid x = n^2, n \in \mathbb{N}, x \leq 9\}$$

Nandini:

$$N = \{x \mid x \in \mathbb{N}, x \leq 9\}$$

Joseph:

$$J = \{x \mid x \text{ is a prime number between } 1 \text{ and } 9\}$$

Question 3.

Collect the following information from 20 families nearby your house.

- i. Number of families subscribing for Marathi Newspaper.
- ii. Number of families subscribing for English Newspaper.
- iii. Number of families subscribing for both English as well as Marathi Newspaper.

Show the collected information using Venn diagram. (Textbook pg.no. 18)

[Students should attempt the above activity on their own.]