

# Mathematics IX - Standard

Strictly as per the Reduced (Prioritised) Syllabus released on 13th August, 2021 (G.O.(Ms).No126)

Salient Features :

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- Common Quarterly Exam 2019 and Common Half yearly Exam 2019 are incorporated in the appropriate sections.
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It gives me great pride and pleasure in bringing to you **Sura's Mathematics Guide** for **9**<sup>th</sup> **Standard**.

This guide encompasses all the requirements of the students to comprehend the text and the evaluation of the textbook.

In order to learn effectively, I advise students to learn the subject section-wise and practice the exercises given. It will be a teaching companion to teachers and a learning companion to students.

Though these salient features are available in this Guide, I cannot negate the indispensable role of the teachers in assisting the student to understand the subject thoroughly.

I sincerely believe this guide satisfies the needs of the students and bolsters the teaching methodologies of the teachers.

I pray the almighty to bless the students for consummate success in their examinations.

Subash Raj, B.E., M.S. - Publisher Sura Publications

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# Set Language

# **1.1 Introduction**

In our daily life, we often deal with collection of objects like books, stamps, coins, etc. Set language is a mathematical way of representing a collection of objects.

#### **1.2** Set :

- (i) A set is a well defined collection of objects.
- (ii) The objects of a set are called its members or elements. For example,
  - 1. The collection of all books in a District Central Library.
  - 2. The collection of all colours in a rainbow.

#### **1.3 Representation of a Set :**

The collection of odd numbers can be described in many ways:

- (1) "The set of odd numbers" is a fine description, we understand it well.
- (2) It can be written as  $\{1, 3, 5, ...\}$  and you know what I mean.
- (3) Also, it can be said as the collection of all numbers x where x is an odd number.

#### **1.3.1 Descriptive Form :**

In descriptive form, a set is described in words.

#### For Example,

- (i) The set of all vowels in English alphabets.
- (ii) The set of whole numbers.

#### **1.3.2** Set Builder Form or Rule Form :

In set builder form, all the elements are described by a rule. **For example,** 

- (i)  $A = \{x : x \text{ is a vowel in English alphabets}\}$
- (ii)  $B = \{x \mid x \text{ is a whole number}\}$

#### **1.3.3** Roster Form or Tabular Form

A set can be described by listing all the elements of the set.

#### For example,

- (i)  $A = \{a, e, i, o, u\}$
- (ii)  $B = \{0, 1, 2, 3, ...\}$



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# **Exercise 1.1**

1.	Which	of the	following	are sets?
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- (i) The Collection of prime numbers upto 100.
- (ii) The Collection of rich people in India.
- (iii) The Collection of all rivers in India.
- (iv) The Collection of good Hockey players.
- **Sol.** (i)  $A = \{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97\}$

As the collection of prime numbers upto 100 is known and can be counted (well defined). Hence this is a set.

- (ii) The collection of rich people in India. Rich people has no definition. Hence, it is not a set.
- (iii) A = {Cauvery, Sindhu, Ganga, ......} Hence, it is a set.
- (iv) The collection of good hockey players is not a well defied collection because the criteria for determining a hockey player's talent may vary from person to person.

Hence, this collection is not a set.

2. List the set of letters of the following words in Roster form.

- (i) INDIA (ii) PARALLELOGRAM
- (iii) MISSISSIPPI (iv) CZECHOSLOVAKIA
- **Sol.** (i)  $A = \{I, N, D, A\}$ 
  - (ii)  $B = \{P, A, R, L, E, O, G, M\}$
  - (iii)  $C = \{M, I, S, P\}$
  - (iv)  $D = \{C, Z, E, H, O, S, L, V, A, K, I\}.$
- 3. Consider the following sets  $A = \{0, 3, 5, 8\}$   $B = \{2, 4, 6, 10\}$   $C = \{12, 14, 18, 20\}$ 
  - (a) State whether True or false.
  - (i)  $18 \in C$  (ii)  $6 \notin A$  (iii)  $14 \notin C$  (iv)  $10 \in B$  (v)  $5 \in B$  (vi)  $0 \in B$
  - (b) Fill in the blanks?
  - (i)  $3 \in$  \_\_\_\_ (ii)  $14 \in$  \_\_\_\_ (iii) 18 \_\_\_ B (iv) 4 \_\_\_\_ B

**Sol.** (a) (i) True

(b) (i) A (ii) C

- (ii) True (iii) False (iv) True (v) False C (iii)  $\notin$  (iv)  $\in$
- 4. **Represent the following sets in Roster form.** 
  - (i) A = The set of all even natural numbers less than 20. [QY-2019]

(ii) 
$$\mathbf{B} = \{y : y = \frac{1}{2n}, n \in \mathbb{N}, n \le 5\}$$

- (iii)  $C = \{x : x \text{ is perfect cube, } 27 < x < 216\}$
- (iv)  $D = \{x : x \in \mathbb{Z}, -5 < x \le 2\}$

(vi) False.

Sol. (1) 
$$A = \{2, 4, 6, 8, 10, 12, 14, 16, 18\}$$
  
(ii)  $N = \{1, 2, 3, 4, 5\}$   
if,  $n = 1, y = \frac{1}{2n} = \frac{1}{2 \times 1} = \frac{1}{2}$   
 $n = 2, y = \frac{1}{2 \times 2} = \frac{1}{4}$   
 $n = 3, y = \frac{1}{2 \times 3} = \frac{1}{6}$   
 $n = 4, y = \frac{1}{2 \times 4} = \frac{1}{8}$   
 $n = 5, y = \frac{1}{2 \times 5} = \frac{1}{10}$   
 $\therefore B = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}\right\}$   
(iii)  $C = \{64, 125\}$ 

- (11) C (01, 125)
- (iv)  $D = \{-4, -3, -2, -1, 0, 1, 2\}$

5. Represent the following sets in set builder form.

(i) B = The set of all Cricket players in India who scored double centuries in One Day Internationals.

(ii) 
$$C = \left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \dots\right\}.$$

(iii) **D** = The set of all tamil months in a year.

(iv) E = The set of an odd Whole numbers less than 9.

**Sol.** (i)  $B = \{x : x \text{ is an Indian player who scored double centuries in One Day Internationals}\}$ 

(ii) 
$$C = \{x : x = \frac{n}{n+1}, n \in \mathbb{N}\}$$

- (iii)  $D = \{x : x \text{ is a tamil month in a year}\}$
- (iv)  $E = \{x : x \text{ is an odd number}, x \in \mathbb{W}, x < 9, \text{ where W is the set of whole numbers}\}.$

#### 6. Represent the following sets in descriptive form.

- (i) **P** = { January, June, July}
- (ii)  $Q = \{7,11,13,17,19,23,29\}$
- (iii)  $R = \{x : x \in \mathbb{N}, x < 5\}$

#### (iv) $S = \{x : x \text{ is an consonant in English alphabets}\}$

- **Sol.** (i) P is the set of English Months begining with J.
  - (ii) Q is the set of all prime numbers between 5 and 31.
  - (iii) R is the set of all natural numbers less than 5.
  - (iv) S is the set of all English consonants.

<b>1.4</b>	Types of sets			
}	1.4.1	Empty Set or Null Set :		
{		A set consisting of no element is called the empty set or null set or void set.		
}		For example,		
}		A={ $x : x$ is an odd integer and divisible by 2}		
{		$\therefore A=\{\} \text{ or } \emptyset$		
}	1.4.2	Singleton Set :		
}		A set which has only one element is called a singleton set.		
}		For example,		
}	1.1.0	$A = \{x : 3 < x < 5, x \in \mathbb{N}\}$		
{	1.4.3	Finite Set :		
}		A set with finite number of elements is called a finite set.		
}		The set of family members		
{		<ol> <li>The set of indoor/outdoor games you play.</li> </ol>		
}	1 4 4	2. The set of indoor/outdoor games you play.		
{	1.7.7	A set which is not finite is called an infinite set		
}		For example.		
}		(i) {5.10.15} (ii) The set of all points on a line.		
{	1.4.5	Equivalent Sets :		
}		Two finite sets A and B are said to be equivalent if they contain the same number		
{		of elements. It is written as $A \approx B$ .		
}		If A and B are equivalent sets, then $n(A) = n(B)$ .		
}	1.4.6	Equal Sets :		
{		Two sets are said to be equal if they contain exactly the same elements, otherwise		
}		they are said to be unequal.		
{		In other words, two sets A and B are said to be equal, If (i) $avery element of A is also an element of P$		
}		(i) every element of B is also an element of B (ii) every element of B is also an element of A		
}	147	Subset ·		
}	1.1./	Let A and B be two sets. If every element of A is also an element of B then		
}		A is called a subset of B. We write $A \subseteq B$ .		
}	1.4.8	Proper Subset :		
}		Let A and B be two sets. If A is a subset of B and $A\neq B$ , then A is called a proper		
{		subset of B and we write $A \subset B$ .		
		For example,		
	140	If $A = \{1,2,5\}$ and $B = \{1,2,3,4,5\}$ then A is a proper subset of B i.e. $A \subset B$ .		
	1.4.9	<b>Power set :</b> The set of all subsets of A is said to be the newer set of the set A and is denoted as		
}		P(A) $P(A)$		
{		For example.		
}		Let $A = \{-3, 4\}$		
{		The subsets of A are, $\emptyset$ , $\{-3\}$ , $\{4\}$ , $\{-3, 4\}$		
}		Then the power set of A is $P(A) = \{\emptyset, \{-3\}, \{4\}, \{-3, 4\}\}$		

# Exercise 1.2

- **1.** Find the cardinal number of the following sets.
  - (i)  $\mathbf{M} = \{p, q, r, s, t, u\}$
  - (ii)  $P = \{x : x = 3n + 2, n \in W \text{ and } x < 15\}$
  - (iii)  $\mathbf{Q} = \{y : y = \frac{4}{3n}, n \in \mathbb{N} \text{ and } 2 < n \le 5\}$
  - (iv)  $\mathbf{R} = \{x : x \text{ is an integers}, x \in \mathbb{Z} \text{ and } -5 \le x < 5\}$
  - (v) S = The set of all leap years between 1882 and 1906.

#### **Sol.** (i) n(M) = 6

(ii) W = {0, 1, 2, 3, .....} if n = 0, x = 3(0) + 2 = 2if n = 1, x = 3(1) + 2 = 5if n = 2, x = 3(2) + 2 = 8if n = 3, x = 3(3) + 2 = 11if n = 4, x = 3(4) + 2 = 14 $\therefore P = \{2, 5, 8, 11, 14\}$ 

(iii) N = {1, 2, 3, 4, .....}  

$$n \in \{3, 4, 5\}$$
  
if  $n = 3$ ,  $y = \frac{4}{3(3)} = \frac{4}{9}$   
if  $n = 4$ ,  $y = \frac{4}{3(4)} = \frac{4}{12}$   
if  $n = 5$ ,  $y = \frac{4}{3(5)} = \frac{4}{15}$   
 $Q = \left\{\frac{4}{9}, \frac{4}{12}, \frac{4}{15}\right\}$   
 $n(Q) = 3$ 

(iv)  $x \in z$ R = {-5, -4, -3, -2, -1, 0, 1, 2, 3, 4}

$$n(R) = 10.$$

- (v) S = {1884, 1888, 1892, 1896, 1904}
   n (S) = 5.
- Identify the following sets as finite or infinite.
  - (i) **X** = The set of all districts in Tamilnadu.
  - (ii) Y = The set of all straight lines passing through a point.
  - (iii)  $A = \{ x : x \in \mathbb{Z} \text{ and } x < 5 \}$
  - (iv)  $B = \{x : x^2 5x + 6 = 0, x \in \mathbb{N}\}\$

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**Sol.** (i) Finite set (ii) Infinite set (iii)  $A = \{ \dots, -2, -1, 0, 1, 2, 3, 4 \}$  : Infinite set (iv)  $x^2 - 5x + 6 = 0$ (x-3)(x-2) = 0 $B = \{3, 2\}$  : Finite set. Which of the following sets are equivalent or unequal or equal sets? 3. A = The set of vowels in the English alphabets. (i) B = The set of all letters in the word "VOWEL" (ii)  $C = \{2, 3, 4, 5\}$ D = {  $x : x \in \mathbb{W}, 1 < x < 5$  } (iii)  $X = A = \{x : x \text{ is a letter in the word "LIFE"}\}$  $Y = \{F, I, L, E\}$ (iv) G = {x : x is a prime number and 3 < x < 23} H = {x : x is a divisor of 18} **Sol.** (i)  $A = \{a, e, i, o, u\}$  $B = \{V, O, W, E, L\}$ The sets A and B contain the same number of elements. : Equivalent sets (ii)  $C = \{2, 3, 4, 5\}$  $D = \{2, 3, 4\}$ : Unequal sets (iii)  $X = \{L, I, F, E\}$  $Y = \{F, I, L, E\}$ The sets X and Y contain the exactly the same elements.  $\therefore$  Equal sets. (iv)  $G = \{5, 7, 11, 13, 17, 19\}$  $H = \{1, 2, 3, 6, 9, 18\}$  : Equivalent sets. 4. Identify the following sets as null set or singleton set. (i)  $A = \{x : x \in \mathbb{N}, 1 \le x \le 2\}$ (ii) B = The set of all even natural numbers which are not divisible by 2. (iii)  $C = \{0\}.$ (iv) D = The set of all triangles having four sides.**Sol.** (i)  $A = \{\}$  : There is no element in between 1 and 2 in Natural numbers. Null set (ii)  $B = \{\}$  All even natural numbers are divisible by 2.  $\therefore$  B is Null set (iii)  $C = \{0\}$  :: Singleton set (iv)  $D = \{\}$  :: No triangle has four sides. ... D is a Null set. 5. State which pairs of sets are disjoint or overlapping? (i)  $A = \{f, i, a, s\}$  and  $B = \{a, n, f, h, s\}$ (ii)  $C = \{x : x \text{ is a prime number}, x > 2\}$  and  $D = \{x : x \text{ is an even prime number}\}$ (iii)  $E=\{x : x \text{ is a factor of } 24\}$  and  $F=\{x : x \text{ is a multiple of } 3, x < 30\}$  $A = \{f, i, a, s\}$ Sol. (i)  $B = \{a, n, f, h, s\}$  $A \cap B = \{f, i, a, s\} \cap \{a, n, f, h, s\} = \{f, a, s\}$ Since  $A \cap B \neq \phi$ , A and B are overlapping sets.

	(ii) $C = \{3, 5, 7, 11, \dots\}$		
	$D = \{2\}$		
	$C \cap D = \{3, 5, 7, 11, \dots\} \cap \{2\} = \{ \}$		
	Since $C \cap D = \emptyset$ , C and D are disjoint sets.		
	(iii) $E = \{1, 2, 3, 4, 6, 8, 12, 24\}$		
	$F = \{3, 6, 9, 12, 15, 18, 21, 24, 27\}$		
	$E \cap F = \{1, 2, 3, 4, 6, 8, 12, 24\} \cap \{3, 6, 9, 12, 15, 18, 21, 24, 27\}$		
	$= \{3, 6, 12, 24\}$		
	Since $E \cap F \neq \phi$ , E and F are overlapping sets.		
6.	If $S = \{square, rectangle, circle, rhombus, triangle\}$ , list the elements of the following subset of S.		
	(i) The set of shapes which have 4 equal sides.		
	(ii) The set of shapes which have radius.		
	(iii) The set of shapes in which the sum of all interior angles is 180°		
	(iv) The set of shapes which have 5 sides.		
Sol.	(i) {Square, Rhombus} (ii) {Circle}		
	(iii) {Triangle} (iv) Null set.		
7.	If $A=\{a,\{a,b\}\}$ , write all the subsets of A.		
Sol.	A = $\{a, \{a, b\}\}$ subsets of A are $\{\} \{a\}, \{a, b\}, \{a, \{a, b\}\}$ .		
8.	Write down the power set of the following sets.		
	(i) $A = \{a, b\}$ (ii) $B = \{1, 2, 3\}$ (iii) $D = \{p, q, r, s\}$ (iv) $E = \emptyset$		
Sol.	(i) The subsets of A are $\emptyset$ , $\{a\}$ , $\{b\}$ , $\{a, b\}$		
	The power set of A		
	$P(A) = \{\emptyset, \{a\}, \{b\}, \{a, b\}\}\$		
	(ii) The subsets of B are $\phi$ , {1}, {2}, {3}, {1, 2}, {2, 3}, {1, 3}, {1, 2, 3}		
	The power set of B $P(D) = (D - D) = (D - D) = (D - D) = (D - D)$		
	$P(B) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 2, 3\}\}$ (iii) The subset of D are $\emptyset$ (n) (a) (r) (s) (n a) (n r) (n s) (a r) (a s)		
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	The power set of D		
	$P(D) = \{\emptyset, \{p\}, \{q\}, \{r\}, \{s\}, \{p, q\}, \{p, r\}, \{p, s\}, \{q, r\}, \{q, s\}, \{r, s$		
	${p, q, r}, {q, r, s}, {p, r, s}, {p, q, s}, {p, q, r, s}$		
	(iv) The power set of E		
	$P(E) = \{ \}.$		
9.	Find the number of subsets and the number of proper subsets of the following sets.		
	(i) W={red,blue,yellow} (ii) X ={ $x^2 : x \in \mathbb{N}, x^2 \le 100$ }.		
Sol.	(i) Given $W = \{red, blue, yellow\}$		
	Then $n(W) = 3$		
	The number of subsets $= n[P(W)] = 2^3 = 8$		
	The number of proper subsets = $n[P(W)] - 1 = 2^3 - 1 = 8 - 1 = 7$		

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8 Sura's O Mathematics - 9th Std O Chapter 1 O Set Language (ii) Given X =  $\{1, 2, 3, \dots\}$  $X^2 = \{1, 4, 9, 16, 25, 36, 49, 64, 81, 100\}$ n(X) = 10The Number of subsets =  $n[P(X)] = 2^{10} = 1024$ The Number of proper subsets =  $n[P(X)]-1 = 2^{10} - 1 = 1024 - 1 = 1023$ . (i) If n(A) = 4, find n[P(A)]. [QY-2019] (ii) If n(A) = 0, find n[P(A)]. 10. (iii) If n[P(A)] = 256, find n(A). **Sol.** (i) n(A) = 4 $n[P(A)] = 2^n = 2^4 = 16$ (ii) n(A) = 0 $n[P(A)] = 2^0 = 1$ n[P(A)] = 256(iii) 2 256 2 || 28 2 64 2 32 2 |16 2 18 24 2 2 1 n[P(A)] = $2^{8}$  $\therefore n(A) =$ 8. **Exercise 1.7 MULTIPLE CHOICE QUESTIONS:** 1. Which of the following is correct? (1)  $\{7\} \in \{1,2,3,4,5,6,7,8,9,10\}$ (2)  $7 \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ (3)  $7 \notin \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ (4)  $\{7\} \not\subseteq \{1,2,3,4,5,6,7,8,9,10\}$ [Ans. (2)  $7 \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ ] 2. The set  $P = \{x \mid x \in \mathbb{Z}, -1 \le x \le 1\}$  is a (1) Singleton set (2) Power set (3) Null set (4) Subset **Hint** :  $P = \{0\}$ [Ans. (1) Singleton set] 3. If  $U = \{x \mid x \in \mathbb{N}, x < 10\}$  and  $A = \{x \mid x \in \mathbb{N}, 2 \le x < 6\}$  then (A')' is  $(1) \{1,6,7,8,9\}$ (b)  $\{1,2,3,4\}$  (c)  $\{2,3,4,5\}$ (d)  $\{ \}$ **Hint**:  $(A') = A = \{2, 3, 4, 5\}$ [Ans. (3) {2,3,4,5}] If  $B \subset A$  then  $n(A \cap B)$  is 4. (1) n(A - B)(3) n(B - A)(2) *n*(B) (4) n(A)**Hint**:  $B \subseteq A \Rightarrow A \cap B = B$ [Ans. (2) *n*(B)]

5.	If $A = \{x, y, z\}$ then	the number of no	on-empty subsets of A is	[HY-2019]
	(1) 8	(2) 5	(3) 6	(4) 7
	Hint: Number	of non-empty subs	ets = 2 - 1 = 8 - 1 = 7	[Ans. (4) 7]
6.	Which of the follo	wing is correct ?		
	(1) $\emptyset \subseteq \{a, b\}$	(2) $\emptyset \in \{a,$	$b\}$ (3) $\{a\} \in \{a, b\}$	$(4)  a \subseteq \{a, b\}$
	<b>Hint :</b> Empty se	et is an improper su	ıbset	$[Ans. (1) \varnothing \subseteq \{a, b\}]$
7.	If $A \cup B = A \cap B$ , th	en		
	(1) $A \neq B$	(2)  A = B	$(4)  \mathbf{A} \subset \mathbf{B}$	$(4)  \mathbf{B} \subset \mathbf{A}$
				[Ans. (2) A = B]
8.	If $B - A$ is $B$ , the	n A∩B is		[QY-2019] 🔅
	(1) A	(2) B	(3) U	(4) Ø
0	<b>Hint:</b> $B - A = H$	$B \Rightarrow A and B are d$	isjoint sets.	[Ans. (4) $\varnothing$ ]
9.	(1) S	nt diagram $n[P(x)]$		$A \xrightarrow{B} U$
	(1) 8 (3) 32	(2) 10 (4) 64		$50 \begin{pmatrix} 30 \\ 85 \end{pmatrix} \begin{pmatrix} 30 \\ 20 \end{pmatrix} \begin{pmatrix} 90 \\ 70 \end{pmatrix}$
	<b>Hint:</b> $A \Delta B =$	{ 60, 85, 75, 90, 70	)}	75 20 70 65
	$\Rightarrow n(A \Delta)$	$(\mathbf{B}) = 5$	,	
	$\Rightarrow n(\mathbf{P})$	$(A \Delta B)) = 2^5 = 32$		[ <b>Ans. (3)</b> 32]
10.	If $n(\mathbf{A}) = 10$ and $n(\mathbf{A})$	(B) = 15, then the	minimum and maximum	number of elements in A $\cap$ B
	(1) (10,15)	(2) (15,10)	(3) (10,0)	$(4)  (0,10) \\ [Ans. (4) (0,10)]$
11	Let $\mathbf{A} = \{\emptyset\}$ and	$\mathbf{R} = \mathbf{P}(\mathbf{A})$ then $\mathbf{A}$	$\cap \mathbf{B}$ is	
		$(2)  (\alpha)$		(4) $(0)$
	$(1) \{ \emptyset, \{\emptyset\} \}$	$(2) \{\emptyset\}$	$(3) \otimes$	(4) {0}
	<b>Hint</b> : $P(A) = \{ g \in A \}$	Ø{Ø}}		[Ans. (2) {Ø}]
12.	In a class of 50 bo boys play both ga	ys, 35 boys play mes is	Carom and 20 boys play	Chess then the number of <i>[HY-2019]</i>
	(1) 5	(2) 30	(3) 15	(4) 10
	<b>Hint</b> : $n(A \cup B)$	$= n(\mathbf{A}) + n(\mathbf{B}) - n(\mathbf{A})$	$(A \cap B) \Longrightarrow 50 = 35 + 20 - n(A \cap B)$	$(A \cap B) \Longrightarrow n(A \cap B) = 5$
				[Ans. (1) 5]
13.	If U = $\{x : x \in \mathbb{N} \}$ and	nd $x < 10$ }, A ={1,	2, 3, 5, 8} and B = {2, 5, 6	, 7, 9}, then <i>n</i> [(A∪B)′] is
	(1) 1	(2) 2	(3) 4	(4) 8
	Hint: $U =$ A = B = $A \cup B =$ $(A \cup B)' =$	$\{1, 2, 3, 4, 5, 6, 7, \\\{1, 2, 3, 5, 8\}\\\{2, 5, 6, 7, 9\}\\\{1, 2, 3, 5, 6, 7, 8, \\\{4\}, \}$	, 8, 9} , 9}	
	$n (A \cup B)' =$	1		[Ans. (1) 1]

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[HY-2019] 🔅 14. For any three sets P, Q and R,  $P-(Q \cap R)$  is (1)  $P = (Q \cup R)$ (2)  $(P \cap Q) - R$ (3)  $(P - O) \cup (P - R)$ (4)  $(P-Q) \cap (P-R)$ **Hint**:  $P - (Q \cap R) = (P - Q) \cup (P - R)$ [Ans. (3)  $(P - Q) \cup (P - R)$ ] Which of the following is true? 15. (1)  $A-B = A \cap B$ (2) A - B = B - A $(4) \quad (A \cap B)' = A' \cup B'$ (3)  $(A \cup B)' = A' \cup B'$ **Hint**: (1)  $(A-B) = A \cap B$ х A - B = B - A(2)х  $(3) \qquad (A \cup B)' = A' \cup B'$ x  $(A \cap B)' = A' \cup B' \quad \checkmark$ (4) [Ans. (4)  $(A \cap B)' = A' \cup B'$ ] If  $n(A \cup B \cup C) = 100$ , n(A) = 4x, n(B) = 6x, n(C) = 5x,  $n(A \cap B) = 20$ ,  $n(B \cap C) = 15$ , 16.  $n(A \cap C)=25$  and  $n(A \cap B \cap C)=10$ , then the value of x is (3) 25 (4) 30 (1) 10 (2) 15 Hint :  $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$ 100 = 4x + 6x + 5x - 20 - 15 - 25 + 10100 = 15x - 60 + 10100 = 15x - 50 $\therefore 15x = 100 + 50 = 150$ x = 10[Ans. (1) 10] 17. For any three sets A, B and C,  $(A - B) \cap (B - C)$  is equal to *[OY-2019]* (3) C only (1) A only (2) B only (4) \$ **Hint**:  $(A - B) \cap (B - C)$  is equal to  $\phi$ [Ans. (4) **\operatorname{4}**] 18. If J = Set of three sided shapes, K = Set of shapes with two equal sides and L = Set of shapes with right angle, then  $J \cap K \cap L$  is (1) Set of isoceles triangles (2) Set of equilateral triangles (3) Set of isoceles right triangles (4) Set of right angled triangles  $J = \{ \bigtriangleup, \bigstar, \smile \}$ Hint:  $\mathbf{K} = \{ \underbrace{\mathbf{k}} \}$  $L = \{ f \} \}$ [Ans. (3) Set of isoceles right triangles] The shaded region in the Venn diagram is 19. (1)  $Z - (X \cup Y)$  $(2)(X \cup Y) \cap Z$ (3)  $Z - (X \cap Y)$ (4)  $Z \cup (X \cap Y)$ **Hint**:  $Z - (X \cap Y)$ [Ans. (3)  $Z - (X \cap Y)$ ]

20. In a city, 40% people like only one fruit, 35% people like only two fruits, 20% people like all the three fruits. How many percentage of people do not like any one of the above three fruits?







#### Activity - 1

1. Discuss and give as many examples of collections from your daily life situations, which are sets and which are not sets.

#### Sol. Which are sets

(i) Collection of pen

- (ii) Collection of dolls
- (iii) Collection of books (
- (iv) Collection of red flower etc.

#### Which are not sets

- (i) Collection of good students in a class.
- (ii) Collection of beautiful flowers in a garden etc.

#### Activity - 2

#### Write the following sets in respective forms.

Sol.	S. No	<b>Descriptive Form</b>	Set Builder Form	<b>Roster Form</b>
	1	The set of all natural numbers less than 10	A = { x : x is a natural number less than 10}	A = {1, 2, 3, 4, 5, 6, 7, 8, 9}
	2	The set of all positive integers which are multiples of 3	$\{x : x \text{ is a multiple of } 3, x \in \mathbb{N}\}$	{3, 6, 9, 12,18}
	3	The set of all natural even numbers. Less than 12	$\mathbb{N} = \{x : x \text{ is a natural even} $ number, $x < 12\}$	{2,4,6,8,10}
	4	The set of all days in a week.	X = {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}	$X = \{x : x \text{ is a day in a week}\}$
	5	The set of all Integers	$\mathbf{A} = \{x : x \text{ is an on Integer}\}\$	{3,-2,-1,0,1,2,3}

# **Government Exam Questions**

2 Marks

#### 1. Write the set of letters of the following words in Roster form : [HY-2019] (i) ASSESSMENT (ii) PRINCIPAL Sol. (i) ASSESSMENT (ii) PRINCIPAL $X = \{A, S, E, M, N, T\}$ $Y = \{P, R, I, N, C, A, L\}$ 2. Find the number of subsets and number of proper subsets of a set $X = \{a, b, c, x, y, z\}$ . Sol. Given X = $\{a, b, c, x, y, z\}$ . $\otimes$ Then, n(X) = 6The number of subsets = $n[P(X)] = 2^6 = 64$ The number of proper subsets = $n[P(X)] - 1 = 2^6 - 1 = 64 - 1 = 63$ 3. If $A = \{a, b, c, d, e\}$ and $B = \{a, e, i, o, u\}$ find $A \cap B$ .

**Sol.**  $A \cap B = \{a, b, c, d, e\} \cap \{a, e, i, o, u\} = \{a, e\}$ 

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