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**ENROLLMENT ID:**

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**ASSIGNMENT No. 01**

**SETS**

## Assignment

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1) Which of the following are well-defined sets?

- (a) All the colors in the rainbow.
- (b) All the points that lie on a straight line.
- (c) All the honest members in the family.
- (d) All the consonants of the English alphabet.
- (e) All the tall boys of the school.
- (f) All the efficient doctors of the ~~honest~~ hospital.
- (g) All the hardworking teachers in a school.
- (h) All the prime numbers less than 100.
- (i) All the letters in the word GEOMETRY

2) Let  $A = \{a, b, c, d, e, f\}$ . Insert the appropriate symbol  $\in$  or  $\notin$  in the blank space.

- (a)  $d \underline{\quad} A$
- (b)  $y \underline{\quad} A$
- (c)  $m \underline{\quad} A$
- (d)  $a \underline{\quad} A$
- (e)  $e \underline{\quad} A$
- (f)  $n \underline{\quad} A$

3) Write the following sets in the builder form.

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

~~Soln~~  $A = \{n : n \text{ is even and } n \leq 8\}$

(b.)  $B = \{3, 6, 9, 12, 15\}$

~~Soln~~  $B = \{n : n = 3n, n \in \mathbb{N}, n \leq 5\}$

(c)  $C = \{1, 4, 9, 16, 25\}$

~~Soln~~  $C = \{n : n = n^2, n \leq 5, n \in \mathbb{N}\}$

d

$$(d) D = \{1, 3, 5, \dots\}$$

Soln  $D = \{n : n \text{ is odd number}\}$

line

$$(e) E = \{4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, \dots, 52\}$$

Soln  $E = \{n : n \text{ is even and } n \leq 52\}$

tel.

$$(f) F = \{-10, \dots, -3, -2, -1, 0, 1, 2, \dots, 5\}$$

Soln  $F = \{n : -10 \leq n \leq 5\}$

4.) Write the following sets in the roster form.

$$(a) A = \{n : n \in \mathbb{W}, n \leq 5\}$$

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

$$(b) B = \{n : n \in \mathbb{I}, -3 < n < 3\}$$

Soln  $B = \{-2, -1, 0, 1, 2\}$

$$(c) C = \{n : n \text{ is divisible by } 12\}$$

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

$$(d) D = \{n : n = 3p, p \in \mathbb{W}, p \leq 3\}$$

Soln  $D = \{0, 3, 6, 9\}$

$$(e) E = \{n : n = a^2, a \in \mathbb{N}, 2 < a < 7\}$$

Soln  $E = \{16, 25, 36\}$

$$(f) F = \{n : n = n/(n+1), n \in \mathbb{N} \text{ and } n < 4\}$$

Soln  $F = \{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}\}$

$$(g) G = \{n : n \in \mathbb{N}, 3n-2 < 5\}$$

Soln  $G = \{1, 4\}$

5.b(e)

(h)  $J_2 = \{n : n \in \mathbb{N}, n^2 < 16\}$

Sol<sup>n</sup>  $J_2 = \{1, 4, 9\}$

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(i)  $K_2 = \{n : n \text{ is a prime number which is a divisor of } 42\}$

Sol<sup>n</sup>  $K_2 = \{7\}$

(j)  $H_2 = \{n : n \text{ is a 2-digit natural number such that the sum of the digits is } 5\}$

Sol<sup>n</sup>  $H_2 = \{14, 23, 32, 41\}$

5.) Which of the following are the examples of an empty set?

(a.) The set of even natural numbers divisible by 3.

(b.) The set of all prime numbers divisible by 2.

(c.)  $\{n : n \in \mathbb{N}, 5 \leq n < 6\}$

(d.) The set of odd natural numbers divisible by 2.

(e.)  $B = \{0\}$

(f.)  $C = \{\}$

(g.)  $D_2 = \{n : n \in \mathbb{N}, n^2 = 1\}$

(h.)  $E_2 = \{n : n \in \mathbb{N}, 3n+1=2\}$

(i.)  $P_2 = \{n : n \text{ is a prime number, } 54 < n < 58\}$

(j.)  $\varnothing = \{n : n = 2n+3, n \in \mathbb{N}, n \leq 5\}$

6.) From the sets given below, identify the equal sets.

(a.)

$$A_2 = \{3, 5, 9, 11\} = P_2 = \{9, 3, 5, 11\}$$

$$B_2 = \{8, 9, 1, 13\} = Q_2 = T_2 = \{1, 8, 9, 13\}$$

$$C = \{-3, 3\} = M = \{3, -3\}$$

$$D = \{s, t, m\} = Q = \{m, s, t\}$$

$$P = \{9, 2, 5, 11\}$$

$$X = \{a, o, z, p\} = R = \{o, p, a, z\}$$

7.) Are the following pairs of sets equal?

(a)  $A = \{2\}$        $B = \{n : n \in \mathbb{N}, n \text{ is an even prime number}\}$

(b)  $P = \{1, 4, 9\}$        $Q = \{n : n = n^2, n \in \mathbb{N}, n < 3\}$

(c)  $X = \{n : n \in \mathbb{W}, n < 5\}$        $Y = \{n : n \in \mathbb{N}, n < 5\}$

(d)  $M = \{a, b, c, d\}$        $N = \{P, Q, R, S\}$

(e)  $D = \{n : n \text{ is a multiple of } 30\}$        $E = \{n : n \text{ is a factor of } 10\}$

8.) Which of the following are equivalent sets?

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

(b)  $P = \{9, 8, m\}$        $Q = \{b, g, l, 2\}$

(c)  $X = \{n : n \text{ is a prime number less than } 10\}$

(d)  $y = \{n : n \in \mathbb{N}, n \leq 4\}$

(d)  $C = \text{The set of vowel in the English alphabet}$

(d)  $D = \text{The set of consonants in the English alphabet.}$

g.) Find the cardinal number of the following sets.

(a)  $A = \{n : n \in \mathbb{I}, 2 \leq n \leq 7\}$

(b)  $B = \{n : n \in \mathbb{N}, x = n^2, n < 3\}$

(c) The set of months in a year.

(d)  $C = \{n : n \in \mathbb{Z}^+, n < 100\}$

(e)  $D = \{n : n = n^3, n \in \mathbb{W}, n < 5\}$

(f) The set of letter in the word MALAYALAN

(a)  $A = \{3, 4, 5, 6\}$

The given set has 4 elements

Hence,

$$\underline{n(A) = 4}$$

(b)  $B = \{1, 4\}$

The given set has 2 elements

Hence,

$$\underline{n(B) = 2}$$

(c) Let the set of month be  $X$

So, Set 'X' contains 12 elements.

Hence,

$$\underline{n(X) = 12}$$

(d) ~~o~~  $C = \{n : n \in \mathbb{Z}^+, n < 100\}$

The given set has 99 elements

Hence,

$$\underline{n(C) = 99}$$

(e)  $D = \{n^2 : n \in \mathbb{Z}^+\}$

$$D = \{1, 4, 9, 16, 25, 36, 49, 64\}$$

The given set has 8 elements

Hence,

$$\underline{n(D) = 8}$$

(f) The set of letters

MALAYALAM

$\Rightarrow$  MALY

This set contains 4 elements

$$\underline{n(MALAYALM), 4}$$

Q. State whether true or false:

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

$\Rightarrow$  True

(ii) Sets  $\{4, 9, 6, 2\}$  and  $\{6, 2, 4, 9\}$  are not same

$\Rightarrow$  False

(iii) Sets  $\{0, 1, 3, 9, 4\}$  and  $\{4, 0, 1, 3, 9\}$  are same.

$\Rightarrow$  True

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

$\Rightarrow$  False.

(v)  $\{2, 3, 3, 4, 4\} = \{2, 3, 4\}$

$\Rightarrow$  True

(vi) Sets  $\{5, 4\}$  and  $\{5, 4, 4, 5\}$  are not same

$\Rightarrow$  False

(vii) Sets  $\{8, 3\}$  and  $\{3, 3, 8\}$  are same.

$\Rightarrow$  True

(viii)  $\{n \mid n \text{ is a vowel in the word 'EQUATION'}\} = \{n \mid n \text{ is a vowel in the word 'EDUCATION'}\}$

$\Rightarrow$  False True

~~EQUATION = A E EUAIO = FAUIO~~

(ix) Collection of vowels used in the word "ALLAHABAD" forms a set.

$\Rightarrow$  True  $\square$

(x) If  $X$  is the set of letters in the word 'ROOM'; then  $X = \{r, o, m\}$ .

$\Rightarrow$  True False True

(xi) If  $M$  is the set of letters in word 'KOLKATA';  
then  $M = \{k, o, l, a, t\}$

$\Rightarrow$  True

2) Write the set containing,

(i) first six counting numbers.

$\Rightarrow \{1, 2, 3, 4, 5, 6\}$

(ii) first six counting numbers

$\Rightarrow \{\text{Acute Angle, Right Angle, Obtuse Angle}\}$

(iii) Name of any three Prime Ministers of India.

$\Rightarrow \{\text{Narendra Modi, Manmohan Singh, Indira Gandhi}\}$

(iv) Three types of Triangle

$\Rightarrow \{\text{Equilateral } \Delta, \text{ Isosceles } \Delta, \text{ Right-Angle } \Delta\}$

(v) Last six consonants of English Alphabet

$\Rightarrow \{\text{f, v, w, n, y, z}\}$

(vi) First four vowels of English Alphabet.

$\Rightarrow \{\text{a, e, i, o}\}$

3) Write each of the following sets in the shortest possible way:

(i)  $\{2, 7, 7, 2, 3, 7, 8\}$

Soln  $\{2, 3, 7, 8\}$

(ii)  $\{10+5, 20+5, 30+5, 40+5, 37+32\}$

Soln  $\{5, 5, 5, 5, 5\}$   
 $\{5\}$

(iii)  $\{2+8, 3+7, 4+6, 5+5, 6+4, 7+3\}$

Soln  $\{10, 10, 10, 10, 10, 10\}$   
 $\{10\}$

(iv)

4.(a) Write the members (elements) of each set given below :

(i)  $\{3, 8, 5, 15, 12, 7\}$

Soln 3, 8, 5, 15, 12 and 7

(ii)  $\{c, m, n, o, s\}$

Soln c, m, n, o and s.

(v) (b.) Write the sets whose elements are :

(i) 2, 4, 8, 16, 64 and 128

$\{2, 4, 8, 16, 64, 128\}$

(ii) 3, 5, 15, 45, 75 and 90

$\{3, 5, 15, 45, 75, 90\}$

5) (i) Write the set of letters used in the word 'GOOGLE'.

$$\Rightarrow \{G, O, G, L, E\}$$

(ii) Write the set of vowels used in the word 'BENGAL'.

$$\Rightarrow \{B, E, N, G, A, L\}$$

(iii) Write the set of consonants used in the word 'HONG-KONG'

$$\Rightarrow \{H, O, N, G, K\}$$

$\xrightarrow{x} \quad \xrightarrow{x} \quad \xrightarrow{x} \quad \xrightarrow{x} \quad \xrightarrow{x}$

1.) Write down the union and intersection of the following pairs of sets:

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

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

Sol<sup>n</sup>

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

$$A \cap B = \{1, 3, 5\}$$

(ii)  $X = \{a, b, c, d, e\}$

$$Y = \{c, e, f, g\}$$

Sol<sup>n</sup>

$$X \cup Y = \{a, b, c, d, e, f, g\}$$

$$X \cap Y = \{c, e\}$$

(iii) P, {n : n is a multiple of 2 between 9 and 21}

Q, {n : n is a multiple of 3 between 10 and 20}

$$P = \{10, 12, 14, 16, 18, 20\}$$

$$Q = \{12, 15, 18, 1\}$$

$$P \cup Q = \{10, 12, 14, 15, 16, 18, 20\}$$

$$P \cap Q = \{12, 18\}$$

(iv) M: {Letters in the word 'COMPUTER'}

N: {Letters in the word 'CALCULATOR'}

~~SOL~~ M: {C, O, M, P, U, T, E, R}

N: {C, A, L, U, T, O, R}

$$M \cup N = \{C, O, M, P, U, T, E, R, A, L, O\}$$

$$M \cap N = \{C, O, U, T, R\}$$

2) Let A: {Set of natural numbers less than 8}

B: {Even natural numbers less than 12}

C: {Multiples of 3 between 5 and 15}

and D: {Multiples of 4 greater than 6 and less than 20};

Find: A: {1, 2, 3, 4, 5, 6, 7}

~~ii) B \ C~~ B: {2, 4, 6, 8, 10}

C: {6, 9, 12}

D: {8, 12, 16}

Find.

(i) B \ C: {2, 4, 6, 8, 9, 10, 12}

(ii) A \ D: {1, 2, 3, 4, 5, 6, 7, 8, 12, 16}

(iii) C \ D: {6, 8, 9, 12, 16}

(iv) A \ C: {6}

(v) (B \ C) \ A: { } {2, 4, 6, 8, 9, 10, 12}

: {1, 2, 3, 4, 5, 6, 7}

(vi) (A \ C) \ (B \ D): {6} \ {6} = {6}

(vii) (B \ D) \ (C \ A): {2, 4, 6, 8, 10, 12, 16} \ {1, 2, 3, 4, 5, 6, 7, 9, 12}

: {2, 4, 6, 12}

1) If  $A = \{5, 7, 8, 9\}$ ,  $B = \{3, 4, 5, 6\}$   
and  $C = \{2, 4, 6, 8, 10\}$ ;

(i)  $n(A) + n(B)$

$$\Rightarrow 4 + 4$$

$$\Rightarrow \underline{8}$$

(ii)  $n(A \cup B)$

$$\Rightarrow n(\{3, 4, 5, 6, 7, 8, 9\})$$

$$\Rightarrow \underline{7}$$

(iii)  $n(A \cap B)$

$$\Rightarrow n(\{5\})$$

$$\Rightarrow \underline{1}$$

(iv)  $n(A \cup B) + n(A \cap B)$

$$\Rightarrow 7 + 1$$

$$\Rightarrow \underline{8}$$

(v)  $n(B \cup C)$

$$\Rightarrow n(\{2, 3, 4, 5, 6, 8, 10\})$$

$$\Rightarrow \underline{7}$$

(vi)  $n(B) + n(C) - n(B \cap C)$

$$\Rightarrow 4 + 5 - 2$$

$$\Rightarrow \underline{7}$$

(vii) Is  $n(A) + n(B) = n(A \cup B) + n(A \cap B)$ ?

$$\begin{array}{rcl} \Rightarrow 4 + 4 & = & 7 + 1 \\ & & \underline{\underline{8 = 8}} \end{array}$$

Yes, it's True

(viii) Is  $n(B \cup C) = n(B) + n(C) - n(B \cap C)$ ?

$$\Rightarrow 7 = 4 + 5 - 2$$

$$\Rightarrow 7 = 7$$

Yes, the given statement is True.

2.) State, whether each of the following is true or false. In case, it is false, write the correct Answer.

(i) If  $A = \{0\}$ , then  $n(A) = 0$

$\Rightarrow$  False

$$n(A) = 1$$

(ii)  $n(\emptyset) = 1$

$\Rightarrow$  False ;  $n(\emptyset) = 0$

(iii) If  $T = \{a, t, a, h, b, d, h\}$ ;  $n(T) = 5$

$\Rightarrow$  True

(iv) If  $B = \{1, 5, 51, 15, 5, 1\}$ ; then,  $n(B) = 6$

$\Rightarrow$  False

$$n(B) = 4$$

3.) Find the cardinal number of the following sets:

(i)  $\{\}$

$$n = 0$$

(iii)  $\{3, 7, 11, 15\}$

$$n = 4$$

(ii)  $\{0\}$

$$n = 1$$

(iv)  $\{3, 3, 3, 4, 4, 5\}$

$$n = 3$$

(vi)  $\{n : n \text{ is a letter in the word 'STATICS'}\}$   
 $\Rightarrow 5$

(vii)  $\{n : n \text{ is an odd whole number less than } 12\}$   
 $\Rightarrow \{1, 3, 5, 7, 9, 11\}$   
 $\Rightarrow 6$

(viii)  $\{n : n \in \mathbb{N} \text{ and } n^2 < 50\}$   
 $\Rightarrow \{1, 2, 3, 4, 5, 6, 7\}$   
 $\Rightarrow 7$

(ix)  $\{n : n \text{ is a factor of } 12\}$   
 $\Rightarrow \{1, 2, 3, 4, 6, 12\}$   
 $\Rightarrow 6$

4.) If  $O = \{\text{odd numbers less than } 12\}$  and  $E = \{\text{even numbers between } 7 \text{ and } 17\}$ , show that :

$$\begin{aligned} n(O) - n(E) &= 1 \\ \text{So, } O &= \{1, 3, 5, 7, 9, 11\} \\ E &= \{8, 10, 12, 14, 16\} \end{aligned}$$

Now,

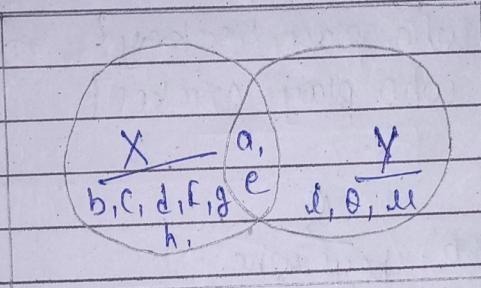
$$\begin{aligned} n(O) &= 6 & n(E) &= 5 \\ \text{A/q } n(O) - n(E) &= 1 \\ 6 - 5 &= 1 \\ 1 &= 1 \end{aligned}$$

proved

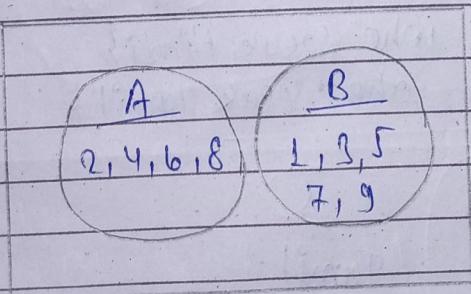
### Venn - Diagram

I) Show by Venn diagrams the relationship between the following.

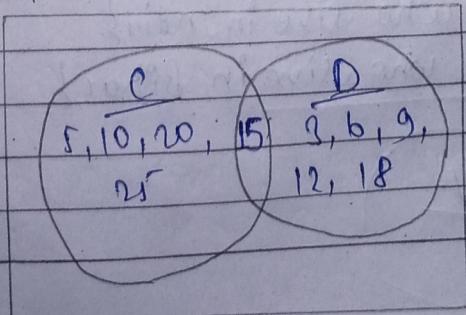
- (i)  $U = \{ \text{letters of English alphabet up to 'h'} \}$ ;  
 $Y = \{ \text{all the vowels of English alphabet} \}$   
 $U = \{ a, b, c, d, e, f, g, h \}$   
 $Y = \{ a, e, i, o, u \}$



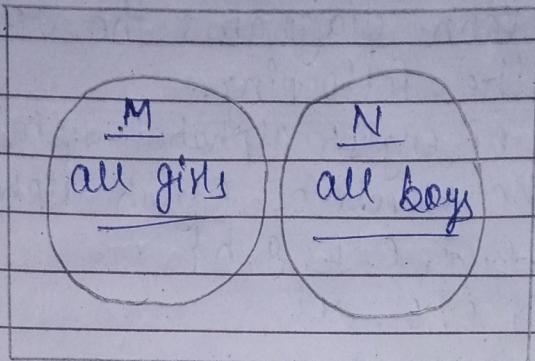
- (ii)  $A = \{ 2, 4, 6, 8 \}$   
 $B = \{ 1, 3, 5, 7, 9 \}$



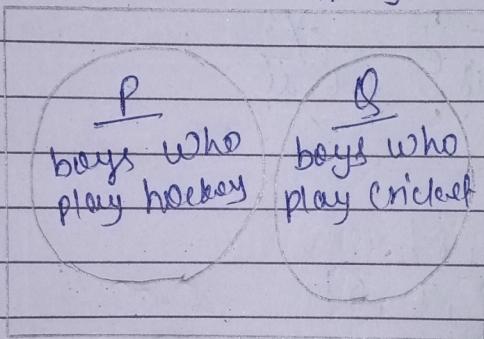
- (iii)  $C = \{ 5, 10, 15, 20, 25 \}$   
 $D = \{ 3, 6, 9, 12, 18, 18 \}$



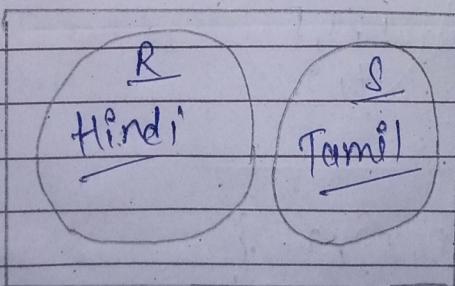
(iv)  $M_2 \{ \text{all girls of your school} \}$   
 $N_2 \{ \text{all boys of " } u \}$



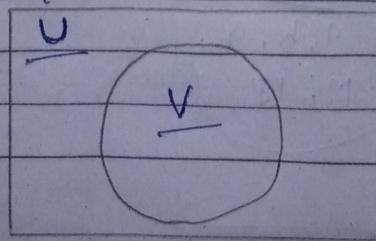
(v)  $P_2 \{ \text{boys who play hockey} \}$   
 $Q_2 \{ \text{boys who play cricket} \}$



(vi)  $R_2 \{ \text{people who speak Hindi} \}$   
 $S_2 \{ \text{people who speak Tamil} \}$

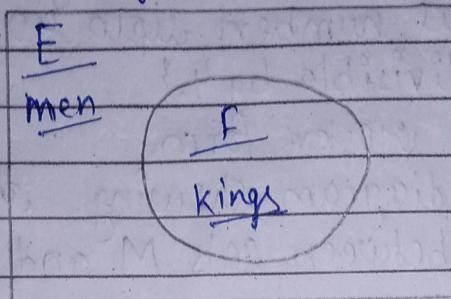


(vii)  $U_2 \{ \text{people who live in India} \}$   
 $V_2 \{ \text{people who live in Bihar} \}$



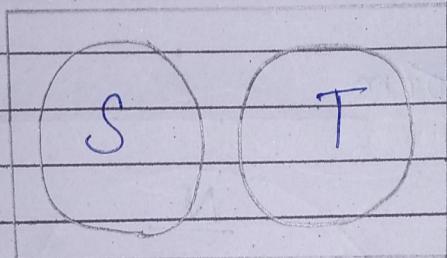
(viii)  $E = \{\text{men}\}$

$F = \{\text{kings}\}$



(ix)  $S = \{\text{all animals}\}$ ;

$T = \{\text{people who wear shirts}\}$



(x)

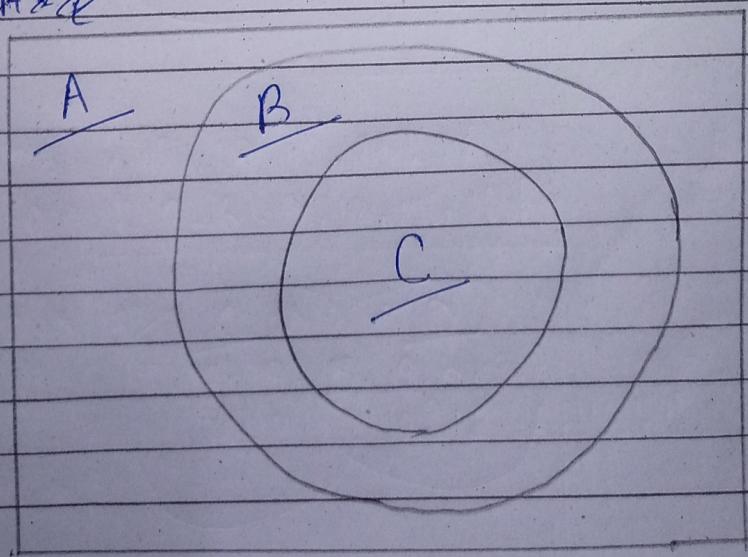
2) If: A = Set of natural numbers,

B = Set of prime numbers and

C = Set of even prime numbers.

Draw Venn diagram.

Sol<sup>n</sup> ~~A & C~~



3.) Let  $M = \{\text{Natural numbers between } 10 \text{ and } 40; \text{ each divisible by } 3\}$

$N = \{\text{Natural numbers upto } 40; \text{ each divisible by } 4\}$

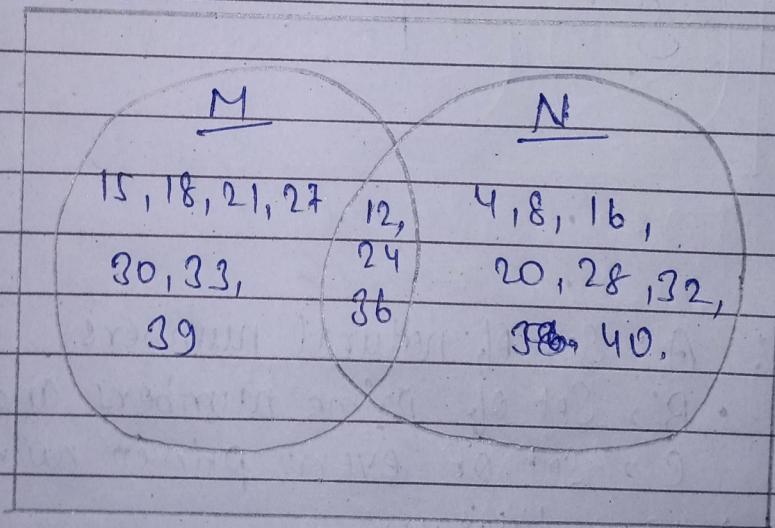
(i) Write each in roster form.

(ii) Draw a Venn-diagram showing the relationship between sets  $M$  and set  $N$ .

Sol<sup>M</sup>, (i)  $M = \{12, 15, 18, 21, 24, 27, 30, 33, 36, 39\}$   
 $N = \{4, 8, 12, 16, 20, 24, 28, 32, 36, 40\}$

(ii) In Roster form

(iii)



The End....

Thanking You :)

