Sets, Number & Interval

~~Sets Groups of well defined things~~

100 soldiers

One hand + One leg + One eye

60 + 50 + 40 = 150

$100 \Rightarrow (l+E)+(H+E)+(l+H)+(L+H+E)$ ~~$= L+H+E$~~

$\Rightarrow$ ~~$L+E+H$~~

Sets - Set is a collection of well defined objects

eg. 1. Collection of all natural numbers
2. Collection of all rivers/lakes
3. Collection of all days in a week

Q verify weather the following are sets or not

1. Collection of all boys in a class - ~~yes~~ yes
2. collection of all handsome boys in a class - na
3. collection of most dangerous animals of world na
4. collection of all even integers yes

~~5. A, B, C, Z~~

~~6. ab,~~

Scanned with CamScanner

★ $A, B, C \ldots Z \Rightarrow$ set denotion

$a, b, c \ldots, 1, 2 \ldots \Rightarrow$ Elements

★ Element a belongs to set A

$\downarrow$

$a \in A$

$\downarrow$

belongs to

★ Element a not belongs to A

$\downarrow$

$a \notin A$

Q Set A is a collection of natural nos less than 7.

1. $5 \in A$ ✓
2. $8 \in A$ ✗
3. $0 \notin A$ ✓
4. $2 \in A$ ✓
5. $10 \notin A$ ✓

Methods to write a set

Roster or Tabular method

1. listing elements seperated by commas (,) and enclosing them in curly brackets.

   eg. $A = \{a, b, c \ldots z\}$

2. order does not matter here

   eg. $A = \{a, b, c\}$ and $A = \{b, a, c\}$ are same

Property or set builder form

1. Write down the property or rule which gives us elements of a set

   eg. $A = \{x : P(x)\}$

   Elements — Such that — Property

   $A = \{x :$ All Alphabets in english vocabulary $\}$

Scanned with CamScanner

Roster / Tabular	Property / builder form
3. Elements are not generally repeated here. eg. $A = \{S, C, H, O, O, L\}$ and $A = \{S, C, H, O, L\}$ are same, duplicates are not counted	$B = \{x : x$ is prime no. less than $10\}$ $C = \{x : x$ is a odd no. and $1 \leq x \leq 10\}$

Q convert in set builder form

1. $A = \{3, 6, 9, 12\}$

   $A = \{x : x$ is ~~divisible~~ multiple of 3 and $3 \geq x \leq 12\}$ or

   $A = \{x : x \in 3n$ and $n \in N, 1 \leq n \leq 4\}$

2. $B = \{2, 4, 8, 16, 32\}$

   ~~$B = \{x : x$ is a natural no. less than $6\}$~~

   ~~$B = \{2^x : x$ is a natural no. less than $6\}$~~

   $B = \{x : x$ is 2^n and n is a natural no. less than $6\}$

3. $C = \{2, 4, 6 \ldots\}$

   $C = \{x : x$ is even no. and $x \geq 2\}$

Q convert in roster / tabular form

1. $A = \{x : x$ is an integer and $-\frac{1}{2} < x < \frac{9}{2}\}$

   $A = \{0, 1, 2, 3, 4\}$

2. $B = \{x : x$ is a month of a year & not having 31 day$\}$

   $B = \{$February, April, June, September, November$\}$

3. $C = \{x : x$ is a consonant in english which proceeds $r\}$

   ~~$C = \{l, m, n, p, q, r, s, t, v, w, x, y, z\}$~~

   $C = \{b, c, d, f, g, h, j\}$

Scanned with CamScanner

Q let A be the set of Natural nos. and x, y be any two elements of A.

Then:-

a) $x-y \in A$ ✗

b) $x+y \in A$ ✓

c) $xy \in A$ ✓

d) $\frac{x}{y} \in A$ ✗

<u>Cardionality</u> :- (1) Number of <u>distinct elements</u> of a ~~set~~ <u>finite set.</u>

(2) It is denoted by $n(A)$ or $|A|$ for set A

eg. $A = \{a, b, c, d\}$ — 4

$B = \{1, 2, 3, 4, 4, 5\}$ — 5

$C = \{\ \}$ — 0

$|A| = 4$

$|B| = 5$

$|C| = 0$

Q Find Cardinality

1. $P = \{a, b, e, l, p\}$ $|5|$
2. $Q = \{a, a, b, d, d\}$ $|3|$
3. $C = \{a, \{c, d\}, k\}$ $|3|$
4. $D = \{a, \{\ \}, k\}$ $|3|$
5. $E = \{n, \{q, \{r, s\}\}, t\}$ $|3|$ $n(E) = 3$

(4)

Scanned with CamScanner

Practice Set

Q1. Set or not?

1.	collection of natural nos. between 2 & 20.	Yes ✓
2.	collection of ~~nos~~ nos. which satisfy $x^2 - 5x + 6 = 0$	Yes ✓
3.	" prime nos. between 2 & 100	Yes ✓
4.	" all intelligent women in Udaipur.	No ✓

Q2. Write in Tabular form:

1. $A = \{x : x \text{ is a } +ve \text{ prime} < 10\}$

$A = \{2, 3, 5, 7\}$ ✓

2. $B = \{x : x = 3\lambda,\ x \in I,\ 1 \leq \lambda \leq 3\}$

$B = \{3, 6, 9\}$ ✓

$x \in Q$

Rational

Q 3. Write in set builder form:

1. set of all rational nos.

$A = \{x : x \text{ is a rational number}\}$ ✓

2. $\{2, 5, 10, 17, 26, 37 \ldots\}$

~~$B = \{x : x \text{ is } 2+y,\ y \in N,\ 3 \leq y,\ y \text{ is a odd number}\}$~~

$B = \{x : x \text{ is } y^2+1,\ y \in N\}$ ✓

Scanned with CamScanner

Types of Sets

	Set name	Definition	Example
1	Null/ Void/Empty set	a) set having no elements. ~~b) card~~ b) $A = \{\ \}$ or $A = \phi$ (fi) c) cardinality $= 0$ d) $\phi \neq \{\phi\}$	$A = \{x : x \in N, x < 1\}$ $A = \{x : x \in W, x < 0\}$ $B = \{x : x \neq x\}$ C = set of all months having 32 days.
2	Singleton Set	a) set having only one element. b) cardinality $= 1$	A = set of all months having only 28 days. $B = \{1, 1, 1, 1\}$ $C = \{x : x \in W, x < 1\}$ $D = \{\phi\}$
3.	Finite set	a) set having a ~~fixed~~ finite no. of elements b) All Null & Singleton sets lie in finite set	A = set of having days of a week. $B = \{5, 7, 9\}$ C = set of all lakes in udaipur
4.	Infinite Set	a) set having infinite number of elements.	$A = \{1, 2, 3 \ldots\}$ $B = \{x : x$ is prime no $\}$

Scanned with CamScanner

Q Match the following:-

a. $A = \{x : x^2 = 4, x \text{ is odd}\}$

b. $B =$ set of all Men living presently in Udaipur

c. $C =$ set of all points on a line

d. Set of solutions of $x^2 - 16 = 0$

P) Null set

Q) Finite set

R) Infinite set

S) singleton

~~a - P, Q~~
~~b - Q~~
~~c - R~~
~~d - Q~~

a - P, Q
b - Q
c - R
d - Q

Q. In rule method, the null set is represented by

a) { }

b) ϕ

c) $\{x : x = x\}$

✓d $\{x : x \neq x\}$

A set having at least 1 element is called non-empty or non-void set.

Scanned with CamScanner

Equivalent Sets

1. Only Cardinal numbers are same.
   (Same Cardinality)
2. Elements can be same or different.
3. denoted by '≡' or '~'
4. eg. $A = \{1, 2, 3\}$
   $B = \{a, b, c\}$
   $C = \{m, n, o, p\}$
   $D = \{7, 8, 9\}$
   $A \equiv B \equiv D$

Equal Sets / Identical sets

1. Cardinal number and elements in sets are same.
2. Order of elements does not matter
3. denoted by '='
4. $Q = \{A, L, L, O, Y\}$
   $P = \{L, O, Y, A, L\}$
   $R = \{O, L, A, Y\}$
   $P = Q = R$

All equal sets are always equivalent.
But equivalent sets may need not be equal sets.

H.W.

1. D.Y.S - 1
   Q 4, 5, 13, 3
2. O-1
   Q 1, 2, 13, 14, 15, 16, 18
3. O-2
   Q 10, 11
4. O-3
   Q 10

DYS-1
Q 4. A-P, B-R, C-Q, D-S
Q 5. D-R, C-Q, B-S, A-P
Q 3. D) Q 13. all α
O-1
Q 1. B) Q 2. A) Q 13. C)
Q 14 C) Q 15 D) Q 16. D)
Q 18. A)
O-2
Q 10. B, C, D Q 11. A, C, D
O-3
Q 10. A-S, B-P, C-Q, D-R

Scanned with CamScanner

Subset

1. If every element of set-A is an element of set-B then, set-A is called <u>subset</u> of set-B and set-B is called <u>superset</u> of set-A.

eg. $J = \{R, L, C, G, P\}$

$A = \{G, P\}$

$B = \{R, G\}$

$C = \{R, L, G\}$

$D = \{R, L, G, C\}$

Sets A, B, C, D are subsets of set J & set J is a superset of sets A, B, C, D.

eg 2. Udaipur is a subset of Rajasthan

→ Subsets are denoted by '$\subseteq$'

eg. $A \subseteq B$
A is subset of B
B is superset of A

eg. $A = \{a\}$
subsets $= \{\ \}, \{a\}$
$= 2^1 = 2$

$B = \{a, b\}$
B subsets $= \{\ \}, \{a\}, \{b\}, \{a, b\}$
$= 2^2 = 4$

$C = \{a, b, c\}$
$C = \{\ \}, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}$
$= 2^3 = 8$

Formula $= 2^{\text{cardinality}}$

Scanned with CamScanner

☆ Equal sets are always subsets of each other

$L = \{a, b, b, c, c, c, a\}$

$M = \{a, b, c\}$

$M \subseteq L \qquad L \subseteq M$

Proper Subset

→ If set A is a sub set of set B and $A \neq B$ Then, A is a proper subset of B.

→ It is denoted by '$\subset$'

eg. $B = \{a, b\}$

$$\underbrace{\underbrace{\{\ \}, \{a\}, \{b\}}_{\text{Proper subsets of } B}, \{a, b\}}_{\text{subsets of } B}$$

eg 2. $T = \{$Munni, Chmeli, Sheela$\}$

Proper Subsets = { }, {Munni}, {Chameli}, {Sheela}, {Munni, Chameli}, {Munni, Sheela} {Chameli, Sheela}

Subsets = P. Subsets and {Munni, Chameli, Sheela}

☆ Every set is a subset of itself

☆ Empty set is a subset of every set

☆ If $n(A) = m$, (no. of elements in A)

Then Total no. of subsets of $A = 2^m$

no. of proper subsets of $A = 2^m - 1$

Scanned with CamScanner

Q1. Find total no. of subsets & Proper subsets

① $A = \{l, m\}$

$|A| = 2$

no. of subsets $= 2^{|A|}$

$= 2^2$

$\boxed{=4}$

no. of ~~so~~ proper subsets $= 2^{|A|} - 1$

$= 4 - 1$

$\boxed{=3}$

② $B = \{P, Q, R, S, T\}$

$|B| = 5$

no. of subsets $= 2^{|B|}$

$= 2^5$

$\boxed{= 32}$

no. of Proper subsets $= 32 - 1$

$\boxed{=31}$

Q2. two finite sets have m & n elements. The total no. of subsets of the first set is 48 more than the total no. of subsets of the second set. The value of m & n are?

a) 7, 6 b) 6, 3 ✓ c) 6, 4 d) 7, 4

$2^m + 48 = 2^n$

$\cancel{2^m - 2^n = -48}$

$\cancel{48 = 2^n - 2^m}$

$48 = 2^m - 2^n$

$2^n(2^{m-n} - 1) = 2^4 \times 3$

2^n

$2^n = 2^4$

$n = 4$

$2^{m-n} - 1 = 3$

$2^{m-4} = 4$

$2^{m-4} = 2^2$

$m - 4 = 2$

$\boxed{m = 6}$

Scanned with CamScanner

$2^n = 3$ $\qquad$ $2^{m-n} - 1 = 2^4$

$2^{m-n} = 2^4 + 1$

$2^n = 3$ $\qquad$ $2^{m-n} = 17$

(Reject)

Power Set

→ It is a set containing all the subsets of set A

→ It is denoted by $P(A)$

eg. $A = \{a, b\}$

Subsets $= \{\{\}, \{a\}, \{b\}, \{a, b\}\}$

$P(A) = \{\{\}, \{a\}, \{b\}, \{a, b\}\}$

eg2. $X = \{3, 7, 11\}$

$P(X) = \{\{\}, \{3\}, \{7\}, \{11\}, \{3, 7\}, \{3, 11\}, \{7, 11\}, \{7, 3, 11\}\}$

① $3 \in X$ ✓

② $\{3\} \in P(X)$ ✓

③ $\{3\} \subset X$ ✓

④ $7 \in X$ ✓

⑤ $\{7\} \in P(X)$ ✓

⑥ $\{7\} \subset X$ ✓

⑦ $\{3, 7\} \subset X$ ✓

⑧ $\{3, 7\} \in P(X)$ ✓

Scanned with CamScanner

Q $W = \{1, 2\}$

$P(W) = \{\{\}, \{1\}, \{2\}, \{1,2\}\}$

(A) $\{1\} \subset W$ ✓

(B) $\{1\} \subset P(W)$ ✗

(C) $\{1\} \in P(W)$ ✓

(D) $\{1,2\} \in P(W)$ ✓

(E) $\{1,2\} \subset P(W)$ ✗

(F) $\{1,2\} \subseteq W$ ✗

Q $Z = \{\{1\}, 3, \{1,5\}\}$

$P(Z) = \{\phi, \{\{1\}\}, \{3\}, \{\{1,5\}\}, \{\{1\}, 3\}, \{\{1\}, \{1,5\}\}, \{3, \{1,5\}\}, \{\{1\}, 3, \{1,5\}\}\}$

(A) $= \{\{1\}\} \in Z$ ✗

(B) $= \{\{1\}\} \subset Z$ ✓

(C) $3 \in Z$ ✓

(D) $\{1\} \in Z$ ✓

(E) $\{3\} \in Z$ ✗

(F) $\{3\} \subset Z$ ✓

Scanned with CamScanner

M.W. ~~04-04-~~
04-04-2024

DYS-1 (Q6, Q7, 8, 9, 11, 12)

DYS-2 (Q3)

DYS-3 (Q8, 10, 11; 12)

O-1 ~~(Q1, 2,~~ (Q17, 19)

O-2 (Q12)

Answers

DYS-1

Q6 - 8 Q7 - 2 Q8 - 7

Q9 - A iii I
B i II
C ii III
D iv IV

Q11 - 3 Q12 - 2

DYS-3

Q8 - D Q10 - D Q11 - B Q12 - B

O-1

Q17 - A Q19 - A

O-2

Q12 - A, B, C, D

Scanned with CamScanner

★ If set A is a empty set, then

P(A) has 1 element

eg $A = \{\ \}$ or ϕ

$P(A) = \{\{\ \}\}$ or $\{\phi\}$

1. Power set is always non-empty and its minimum value is 1.

Q Determine the power set of the following :-

① $A = \{a\}$

$P(A) = \{\phi, \{a\}\}$

② $B = \{\phi, \{\phi\}\}$

$P(A) = \{\phi, \{\phi\}, \{\{\phi\}\}, \{\phi, \{\phi\}\}\}$

Q2. Which of the following cannot be the number of elements in the power set of any finite set.

✓a) 26 b) 32 c) 8 D) 16

Q 3. write power set of $\{0\}$.

$P(\{0\}) = \{\phi, \{0\}\}$

Universal Set → A set contains all the elements occur in the discussion.

It is denoted by 'U'

eg. $A = \{1, 2, 3\}$

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

$C = \{2, 4, 5, 6\}$

$U = \{1, 2, 3, 4, 5, 6, 7\}$

set A, B, C are subsets of Universal set.

Scanned with CamScanner

Q $U - \{1, 2, 3, 7, 6, 9, 10, 11\}$

$A - \{1, 2, 3, 7\}$

elements cannot repeat.

$B - \{6, 9, 10, 11\}$

Q find ~~P(P(P))~~ $P(P(\phi))$ & $P(P(P(\phi)))$

2 4 16 256

if $P(\phi) = \{\phi\}$

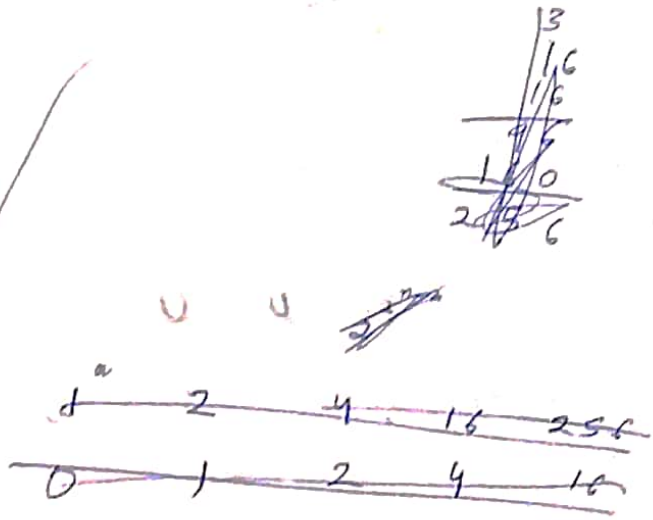
$\phi = \{\phi\}$

$P(\phi) = \{\phi\}$

$P(\{\phi\}) = \{\phi, \{\phi\}\}$

$P(P(P(\phi))) = \{\phi, \{\phi\}, \{\{\phi\}\}, \{\{\phi, \{\phi\}\}\}\}$

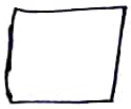
* In any particular discussion, no element can exist out of universal set. It should be noted that universal set is not unique, it may differ in problem to problem.



Scanned with CamScanner

Operation on sets

1. <u>Venn Diagram</u> :- It is a virtual representation of different relations between sets.

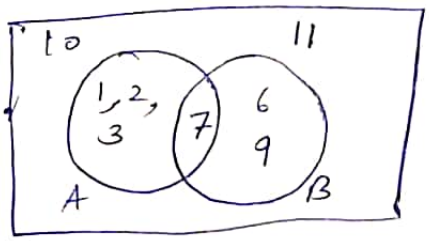
 → shows universal set

→ ~~universal~~ set

eg. $U = \{1, 2, 3, 7, 6, 5, 10, 11\}$

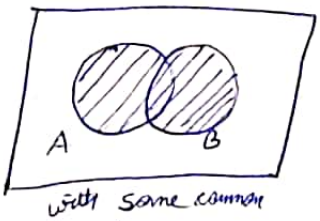
$A = \{1, 2, 3, 7\}$

$B = \{6, 7, 9\}$

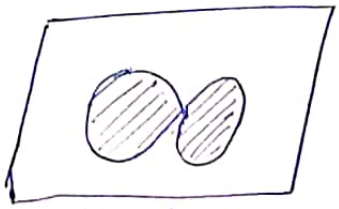


2. Union ($\cup$) - It contains all the elements which are either in set A or set B or in both.
   - It is denoted by $A \cup B$

→



with some common element



with no common

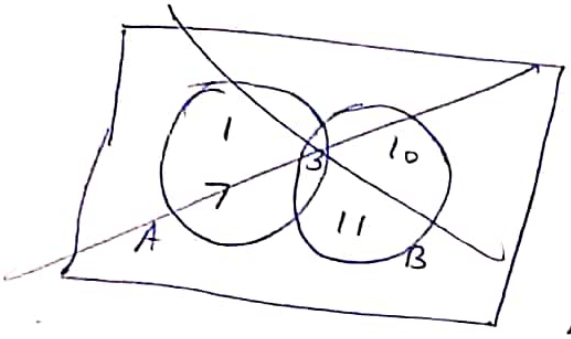
shaded area shows $A \cup B$

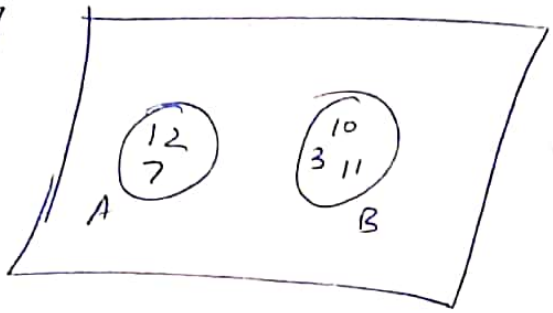
Scanned with CamScanner

Q $A = \{1, 2, 7\}$

$B = \{3, 10, 11\}$

$A \cup B = \{1, 2, 7, 10, 11\}$

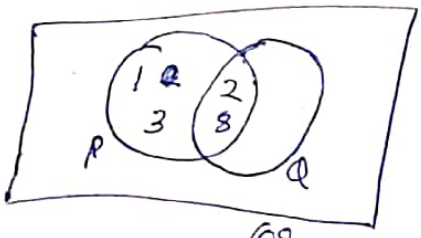


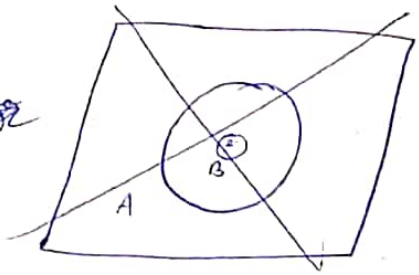


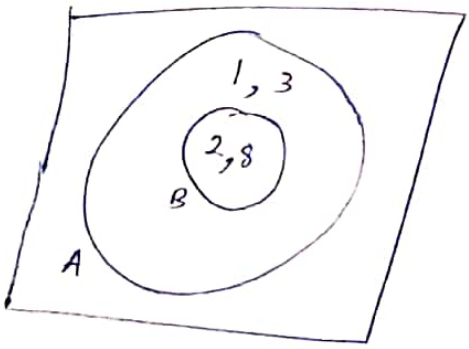
Q2. $P = \{1, 2, 3, 8\}$

$Q = \{2, 8\}$

$P \cup Q = \{1, 2, 3, 8\}$







Scanned with CamScanner

H.W. 12-04-23

~~Q-1~~

DYS - 1 (Q 2,)

~~DYS - Q2~~

O - Q2 (9, 13)

JA (Q2, 4)

DYS - 1

Q2. c)

O - 2

Q 9) ABD

Q 10 BCD

J-A

Q2 3)

Q4 2).

Scanned with CamScanner

Q $A = \{\{a, b\}, c\}$

elements in c

$2^2 = 4$ in $P(c)$

$P(c) = \{\{\}, \{c\}, \{\{a, b\}\}, \{\{a, b\}, c\}\}$

Q $c = \{1, \{2\}\}$

$P(c) = \{\{\}, \{1\}, \{\{2\}\}, \{\{2\}, 1\}\}$

$\{\{2\}\} \in P(c)$ ✓

$\{\{2\}\} \subset P(c)$ ✗

$\{\{2\}\} \in C$ ✗

Q If ϕ is null set, then -

(a) $\phi \in \{\{\phi\}, \{\phi, \{\phi\}\}\}$ ✗

(b) $\{\phi\} \subseteq \{\phi, \{\phi\}, \{\phi, \{\phi\}\}\}$ ✓

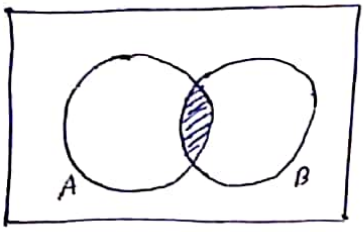
c) $\{\phi, \{\phi\}\} \subseteq \{\{\phi, \{\phi, \{\phi\}\}\}\}$ ✗

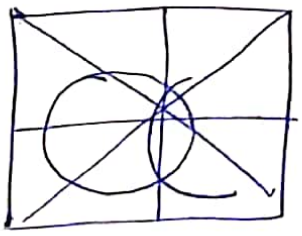
d) none ✗

Scanned with CamScanner

3. **Intersection** - It contains all elements which are present in set-A and set-B both.

→ It is denoted by $A \cap B$





eg. $A = \{1, 2, 7, 11\}$
$B = \{1, 2, 3, 5, 11, 55\}$

$A \cap B = \{1, 2, 11\}$

Property	Union	intersection
① Commutative	$A \cup B = B \cup A$ $A \cup B \cup C = B \cup C \cup A$	$A \cap B = B \cap A$
② Associative	$A \cup (B \cup C) = (A \cup B) \cup C$	$A \cap (B \cap C) = (A \cap B) \cap C$
③ Idepotent	$A \cup A = A$	$A \cap A = A$
④ Law of identity - compare with ϕ and U	$A \cup U = U$ $A \cup \phi = A$	$A \cap U = A$ $A \cap \phi = \phi$

Scanned with CamScanner

Note - For two sets A & B $\rightarrow A \cup B \rightarrow A \cap B$

3 sets A, B & $C \rightarrow A \cup B \cup C \rightarrow A \cap B \cap C$

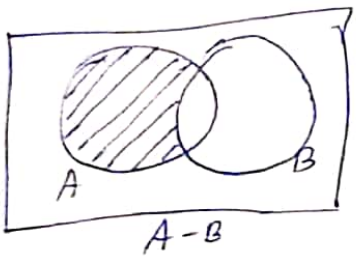
~~n sets $A, B, C \ldots \rightarrow A \cup B \cup C \ldots$~~

n sets $A_1, A_2, A_3 \ldots A_n \rightarrow \bigcup_{i=1}^{n} A_i$

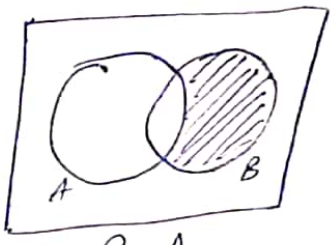
$\rightarrow \bigcap_{i=1}^{n} A_i$

4. <u>Difference of sets</u> - It contains all the elements which are in set-A and not present in set-B.

→ It is denoted by $A-B$



$A-B$



$B-A$

eg. $A-B = A-(A \cap B)$

$A-B \neq B-A$ (in some cases $A-B = B-A$)

Q. find difference $A-B$ & $B-A$

$A = \{1, 2, 7, 9\}$

$B = \{-1, 1, 2, 3, 4, 11\}$

$A-B = \{7, 9\}$

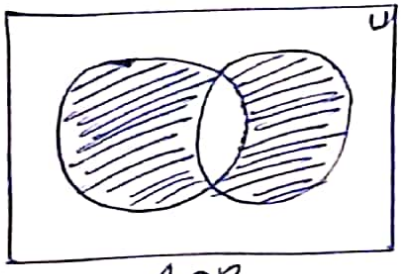
$B-A = \{-1, 3, 4, 11\}$

Scanned with CamScanner

5. Symmetric Difference of 2 sets:-

→ It is denoted by $A \Delta B$ or $A \oplus B$

→ For two sets A and B it is the part of the sets A & B except $\underline{A \cap B}$.



$A \oplus B$

* $A \Delta B = B \Delta A$

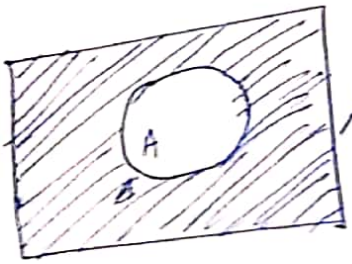
* $A \Delta A = \phi$

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

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

$A \Delta B = B \Delta A = \{-1, 5, 2\}$

6. Complimentry of set - A set containing all the elements of Universal set which are not present in set-A



$A', \bar{A}, A^c$

→ It is denoted by $\bar{A}, A', A^c$

→ $\bar{A} = U - A$

Q $U = \{1, 2, 3, 4, 5, 6, 7\}$

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

$\bar{A} = \{4, 5, 6, 7\}$

Scanned with CamScanner

Note:-

① $\phi' = U$

② $U' = \phi$

③ $A \cup A' = U$

④ $A \cap A' = \phi$

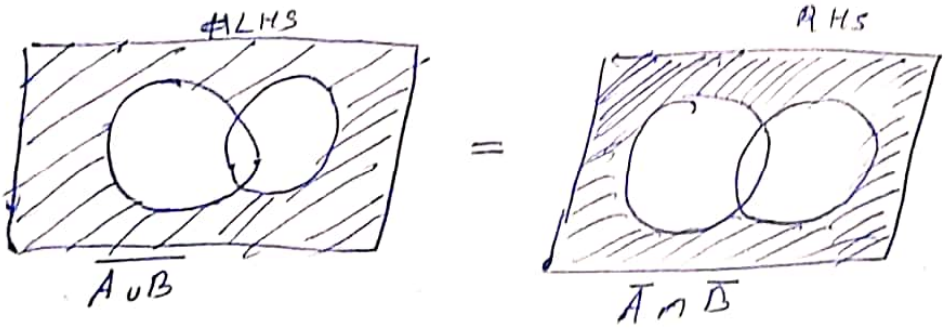
⑤ $\bar{\bar{A}} = A$ (Even times complimentry = A)

⑥ $\bar{\bar{\bar{A}}} = \bar{A}$ (odd times = A)

Demorgan's principle → For 2 sets A & B (valid for more sets)

$\overline{A \cup B} = \bar{A} \cap \bar{B}$

$\overline{A \cap B} = \bar{A} \cup \bar{B}$



$$\overline{\bigcup_{i=1}^{n} A_i} = \bigcap_{i=1}^{n} A_i$$

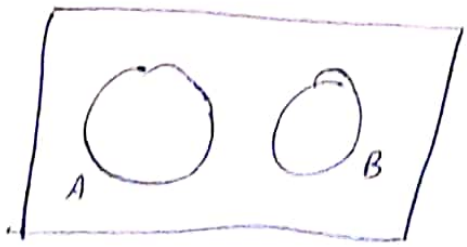
7. Disjoint Sets - For any two sets A and B if $A \cap B = \phi$ then set A and set B are called disjoint sets.

eg. $A = \{1, 2, 3, 4\}$

$B = \{P, Q, R\}$

$A \cap B = \phi$

A & B are disjoint sets.



Scanned with CamScanner

H.W. 13-04-2024

DYS-1 (Q1, 10, all except Q13)

~~DYS-2 (Q1, 2, 3, 4, 5 & 6, 6~~

DYS-2 (Q1(1-5), 2, 3, 6, 7)

DYS-3 (Q2, 3, 4, 5, 6, 7)

O-1 (Q3, 4, 5, 6)

O-3 (Q8, 9)

DYS-1

Q1. All are right

Q10. C)

DYS-2

Q1. All except ~~last~~ viii)

Q2. A-R, B-P, C-Q, D-S

Q3. 2

Q6. 2

Q7. 4

DYS-3

Q2. C)

Q3. B)

Q4. B)

Q5. B)

Q6. C)

Q7. C)

O-1

Q3. B)

Q4. A)

Q5. A)

Q6. A)

O-3

Q8. A-P, B-Q, C-R, D-S

Q9. A-Q, B-P, C-R, D-S

Scanned with CamScanner

Q $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

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

$B = \{2, 4, 6, 7\}$

$C = \{2, 3, 4, 8\}$

① $\bar{A} = \{4, 6, 7, 8, 9, 10\}$

~~② $\overline{(A-B)} = \{2, 4, 6, 7\}$~~

② $\overline{(A-B)} = \{4, 2, 6, 7, 8, 9, 10\}$

③ $\bar{A} = \{1, 2, 3, 5\}$

④ $\overline{B \cup C} = \bar{B} \cap \bar{C} = \{1, 9, 10, 5\}$

⑤ $\overline{C \cap A} = \{1, 4, 5, 6, 7, 8, 9, 10\}$

Q2. $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

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

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

$C = \{2, 4, 8, 10\}$

① $A \cap (B \cup C) = A \cap \{1, 2, 3, 4, 5, 7, 8, 9, 10\} = \{1, 2, 3, 4, 5\}$

② $(A \cap B) \cup (A \cap C) = \{1, 3, 5\} \cup \{2, 4\} = \{1, 2, 3, 4, 5\}$

③ $(A \cup B \cup C)' = \{6\}$

Scanned with CamScanner

Q 3. If $aN = \{ax : x \in N\}$, then set $3N \cap 7N$.

~~21, 42 = 21N~~

$3N = \{3x : x \in N\}$

$3N = \{3, 6, 9, 12 \ldots\}$

$7N = \{7x : x \in N\}$

$7N = \{7, 14, 21, 28, 35, 42, \ldots\}$

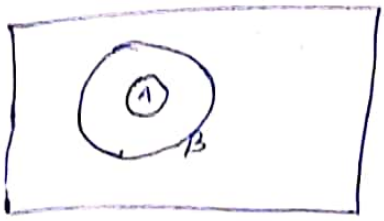
$3N \cap 7N = \{21, 42, 63 \ldots\}$

~~= 7N~~

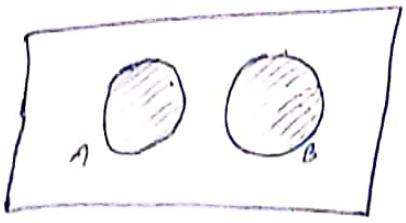
$LCM(3N, 7N)$ $\boxed{= 21N}$ $LCM(3, 7)N$

Q 4. draw venn diagram

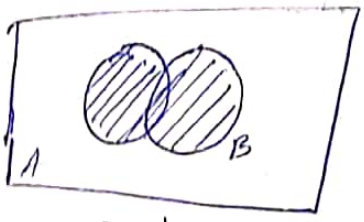
① A is a subset of B



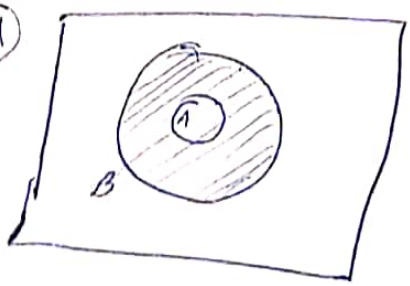
② $A \cup B$, when $A \cap B = \phi$



③ $A \cup B$ when $A \cap B \neq \phi$

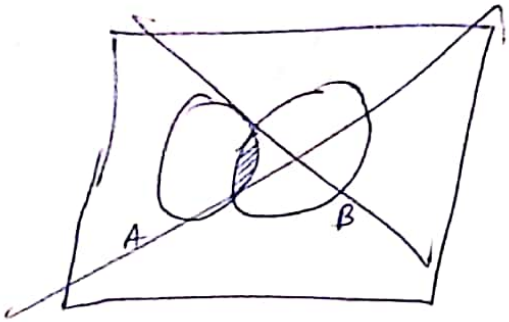


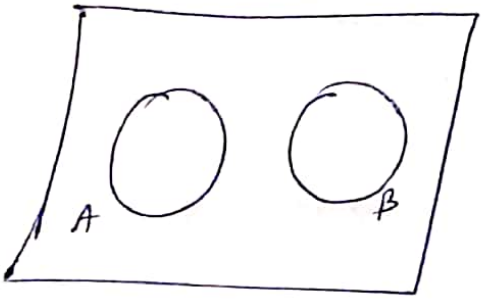
④ $A \cup B$ when $A \subseteq B$



Scanned with CamScanner

(5) $A \cap B$ when $A \cap B = \phi$





Q Match the column

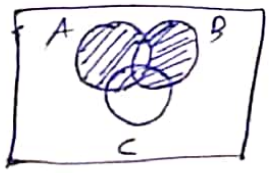
A) $C-(A \Delta B)$

B) $(A \Delta B)-C$

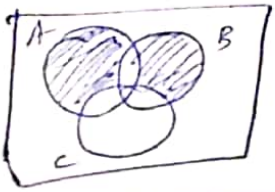
C) $A \Delta B$

D) $(A \Delta B) \Delta C$

P)

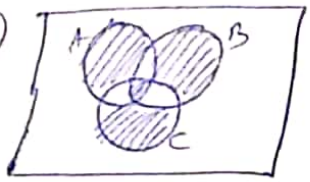


Q)



R)

S)

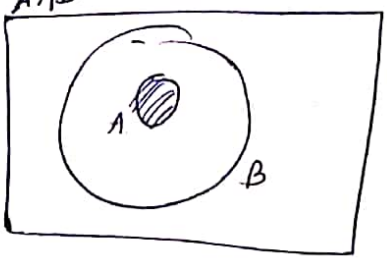


A - R)
B - Q)
C - P)
D - S)

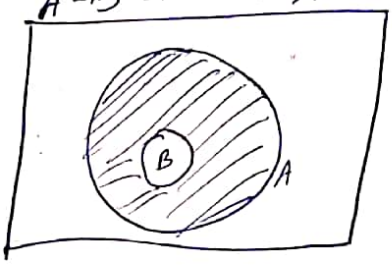
Scanned with CamScanner

Q Venn diagram

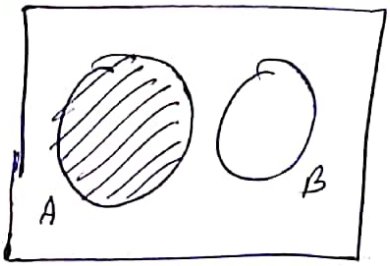
① $A \cap B$ & $A \subseteq B$



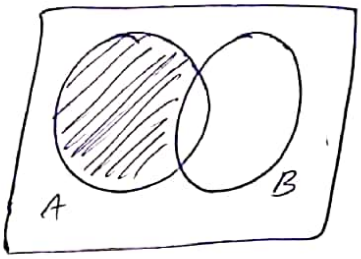
② $A - B$ & $B \subseteq A$



③ $A - B$ & $A \cap B = \phi$

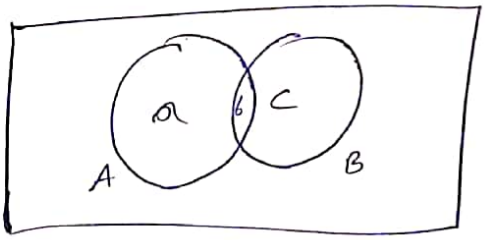


④ $A - B$ & $A \not\subset B$ & $B \not\subset A$



Q ~~Some~~ Sum results for problem solving

1. For any two finite sets A & B



$n(A) = a + b$

$n(B) = b + c$

$n(A \cup B) = a + b + c$

$n(A \cap B) = b$

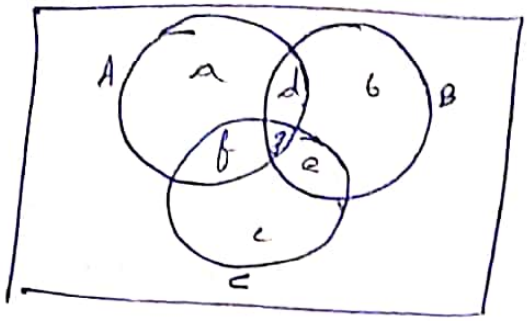
$$\boxed{n(A \cup B) = n(A) + n(B) - n(A \cap B)}$$

2. elements only in set A = a

" " " set B = c

Scanned with CamScanner

3. for any 3 finite sets,



$n(A) = a + d + f + g$
$n(B) = b + d + e + g$
$n(C) = c + e + f + g$

$n(A) + n(B) + n(C) = a + b + c + 2d + 2e + 2f + 3g$

$n(A \cap B) = d + g$
$n(B \cap C) = e + g$
$n(A \cap C) = f + g$

$n(A \cap B) + n(A \cap C) + n(B \cap C) = d + e + f + 3g$

$n(A \cap B \cap C) = g$

$n(A \cup B \cup C) = a + b + c + d + e + f + g$

$$\boxed{n(A \cup B \cup C) = n(A) + n(C) + n(B) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)}$$

Only in set A = a
set B = b
set C = c

Only in set A & B = d
A & C = f
B & C = e

Scanned with CamScanner

H.W. 15-04-2024

O-1 (Q7)

Q-2 (Q1, 2, 4, 7, 8, 14, 15, 16)

O-3 (Q1, 2, 3)

JM

(Q1)

JA

(Q1, 3)

O-1

Q7 B)

O-2

Q1- ACD

Q2-ABCD

Q4- BC

Q7-ABC

Q8-ABCD

Q14 - AB

Q15 - AD

Q16 - ABCD

O-3

Q1-ABD

Q2-ABCD

Q3-ABCD

JM

Q1-1

JA

Q1 c)

Q3 2)

Scanned with CamScanner

4. Number of Elements belonging to exactly two of the sets. ~~A & B~~

$$\boxed{n(A\cap B) + n(B\cap C) + n(A\cap C) - 3n(A\cap B\cap C) = \text{no. of elements in exactly two sets.}}$$

5. Number of elements belonging to exactly one of the sets A, B and C is

$$\boxed{n(A) + n(B) + n(C) - 2n(A\cap B) - 2n(A\cap C) - 2n(B\cap C) + 3n(A\cap B\cap C)}$$

$$\boxed{\Sigma n(A) - 2\Sigma n(A\cap B) + 3n(A\cap B\cap C)}$$

6. no. of elements in

1. ~~A∪B~~

$n(\bar{A}\cup\bar{B}) = n\overline{(A\cap B)} = n(U) - n(A\cap B)$

$n(\bar{A}\cap\bar{B}) = n\overline{(A\cup B)} = n(U) - n(A\cup B)$

$n(A\cap\bar{B}) = n\overline{(\bar{A}\cup B)} = n(A-B) = n(A) - n(A\cap B)$

$n(\bar{A}\cap B) = n\overline{(A\cup\bar{B})} = n(B-A) = n(B) - n(A\cap B)$

7. For two sets A & B

$A\cap B$ will be maximum when :- $A = B$

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

Scanned with CamScanner

Q If $n(U) = 700$,
$n(A) = 200$,
$n(B) = 240$
$n(A \cap B) = 100$
$n(\bar{A} \cap \bar{B}) = ?$

$\cancel{n(U) - n(\bar{A} \cup \bar{B}) = 700 - n(A) - n(B) + n(A \cap B)}$

$\cancel{= 700 - 200 - 240 + 100}$

$\cancel{= 800 - 440}$

$\cancel{= 360}$

$n(U) - n(\bar{A} \cap \bar{B}) = 700 - n(A \cap B)$

$= 700 - 100$

$\boxed{= 600}$

Q 2. An investigator interviewed 100 students for the preferences of 3 drinks:- milk (M), coffee (C) & Tea (T)

$n(M \cap C \cap T) = 10$
$n(M \cap C) = 20$
$n(C \cap T) = 30$
$n(M \cap T) = 25$

$n(\text{only } M) = 12$
$\cancel{n(C)}$
$n(\text{only } C) = 5$
$n(\text{only } T) = 8$

$n(M) = 12 + 25 + 20 - 10 - 10$

$= 57 - 20$

$\boxed{= 37} + 10 = 47$

$n(T) = 8 + 30 + 25 - 20$

$\boxed{= 43} + 10 = 53$

$n(C) = 5 + 20 + 30 - 20$

$\boxed{= 35} + 10 = 45$

$\cancel{n(\overline{M \cup C \cup T}) =}$

$\cancel{25 - (35 + 37 + 43 - 20 - 30 - 25 + 10)}$

$\cancel{25 - (115 - 75 + 10)}$

$\cancel{25 - 115 + 75 - 10}$

$\cancel{100 - 125}$

Scanned with CamScanner

~~25~~

~~MACAT~~

115 - 40 - 60 - 25 + 30

115 - 125 + 30

145 - 125 = 20

~~25 + 55 = 80~~

25 +

115 - 20 - 30 - 25 + 10

115 - 75 + 10

50 + 30 = 80

100 - 80 = $\boxed{20}$

~~80 - 80 = $\boxed{30}$~~

~~$\boxed{130}$~~

34

Scanned with CamScanner

Q In a class of 55 students, the no. of students studying diff subjects are

$n(M) = 23$, $n(P) = 24$, $n(C) = 19$,

$n(M \cap P) = 12$

$n(M \cap C) = 9$

$n(P \cap C) = 7$

$n(M \cap C \cap P) = 4$

~~n(~~ exact one sub

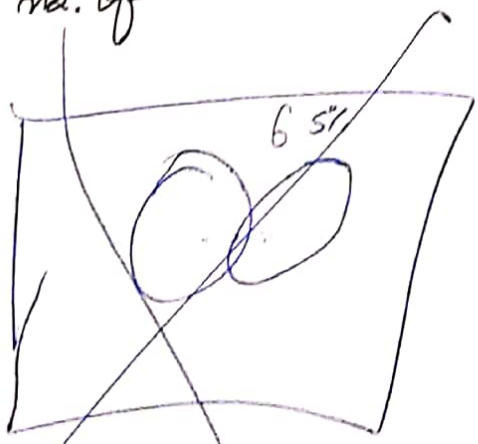
$23 + \cancel{24} + 19 - \cancel{24} - 18 - 14 + 12$

$+1 + 35 - 14$

$\boxed{22}$

$\Sigma n(A) - 2\Sigma n(A \cap B) + 3\, n(A \cap B \cap C)$

Q In udaipur city 25% ~~women~~ women ~~have~~ a cell phone, 15% women have a scooter & 65% have neither own a phone nor a scooter. if 1500 women have both then find total no. of women in udaipur.



$n(P) = 25$

$n(S) = 15$

$n(\overline{P \cup S}) = 65$

$P \cup S = 35$

$n(P \cap S) = 65$

$\cancel{= 75n}$

Scanned with CamScanner

Total $= x$

$n(c) = \frac{25x}{100}$

$n(s) = \frac{15x}{100}$

nothing $= \frac{65x}{100}$

$x = \frac{25x}{100} + \frac{15}{100} - 1500 + \frac{65x}{100}$

$1500 = \frac{105x - 100x}{100}$

$\boxed{x = 30\,000}$

Cartesian Product of two sets

↳ It is denoted by ~~axb~~ $A \times B$ for sets A & B

→ It is a set of ordered pairs (a, b) where a belongs to A & b belongs to B.

→ $A \times B = \{(a, b) : a \in A, b \in B\}$

eg. $A = \{1, 2\}$ $B = \{p, q, r\}$

① $A \times B = \{(1, p), (1, q), (1, r), (2, p), (2, q), (2, r)\}$

② $B \times A = \{(p, 1), (p, 2), (q, 1), (q, 2), (r, 1), (r, 2)\}$

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

④ $B \times B = \{(p, p), (p, q), (p, r), (q, p), (q, q), (q, r), (r, p), (r, q), (r, r)\}$

$n(A) \times n(B) = n(A \times B)$

Scanned with CamScanner

~~H.W. 14-04-2024~~

Q

$A = \{l, m\}$

$B = \{g, f\}$

$A \times A \times A = \{(l,l), (l,m), (m,l), (m,m\} \times \{l, m\}$

$= \{((l,l),l), ((l,l),m), ((l,m),l), ((l,m),m),$

$((m,l),l), ((m,l),m), ((m,m),l), ((m,m),m)\}$

$(A \times B) \times A = \{(l,g), (l,f), (m,g), (m,f)\} \times A$

$= \{(l,l,l), (l,l,m), (l,m,l), (l,m,m),$

$(m,l,l), (m,l,m), (m,m,l), (m,m,m)\}$

$(A \times B) \times A = \{(l,g,l), (l,g,m), (l,f,l), (l,f,m),$

$(m,g,l), (m,g,m), (m,f,l), (m,f,m)\}$

Scanned with CamScanner

H.W. 14-04-2024

DYS-23(Q1, 9, 13, 14, 15, 16, 17, 18, 19, 20)

Q1 -

Q 9 - B

Q 13 - P - 30
Q - 19
R - 60
S - No

Q 14 4.

Q15. 2

Q16. 2

Q17. 8

Q18. B)

Q19. A) B) D)

Q20. A)

Scanned with CamScanner

Note:- ① if $(a, b) = (x, y)$

$a = b$
$x = y$

② Generally $A \times B \neq B \times A$

③ $A \times B = \phi$, Then either $A = \{\}$ or $B = \{\}$ or both are empty

④ $(A, B) \neq (B, A)$

⑤ If set A and set B have m elements common then number of elements common in $A \times B$ is m^2.

$n(A \cap B) = m$

$n(A \times B \cap B \times A) = m^2$

eg. $A = \{1, 2\}$

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

$A \times B = \{(1,1), (1,2), (1,3), (2,1), (2,2), (2,3)\}$

$B \times A = \{(1,1), (1,2), (2,1), (2,2), (3,1), (3,2)\}$

Q 1. $A = \{\}$

$B = \{1, 2\}$

find $A \times B$

$A \times B = \phi$ or $\{\}$

Q 2. $(2x - y, 25) = (15, 2x + y)$

$2x - y = 15$

$y = 2x - 15$

$2x + y = 25$

$2x + 2x - 15 = 25$

$4x = 40$

$\boxed{x = 10}$

$y = 20 - 15$

$\boxed{y = 5}$

Scanned with CamScanner

Q3. $a \in A$ & $b \in B$

find (a, b) such that $a^2 < b$.

$A = \{2, 3\}$

$B = \{4, 16, 23\}$

$A \times B = \{(2,4), (2,16), (2,23), (3,4), (3,16), (3,23)\}$

$(a, b) = \cancel{(2,16)}$

$\boxed{\begin{array}{l} = (2,16) \\ (2,23) \\ (3,16) \\ (3,23) \end{array}}$

Q4. $A \times B = \{(2,3), (2,4), (5,3), (5,4)\}$

find set A & B

$A = \{2, 5\}$

$B = \{3, 4\}$

Q5. Given $A \times B$ has 15 ordered pairs & set A has 5 elements

find no. of elements in set B

$n(A) \times n(B) = 15$

$n(B) = \frac{15}{5}$

$\boxed{n(B) = 3}$

Scanned with CamScanner

~~Q6.~~

Q6. If 2 sets A & B have 44 elements in common, then no. of elements common in $A \times B$ & $B \times A$ are

$|A \cap B| = 44$

$|A \times B \cap B \times A| = 44^2$

$= 44 \times 44$

$$\begin{array}{r} 44 \\ 44 \\ \hline 176 \\ 1760 \\ \hline \end{array}$$

$\boxed{= 1936}$

Q7. $A = \{P, q, r\}$ find

a) $\boxed{n(A) = 3}$

b) $\boxed{n(P(A)) = 8}$

c) $\boxed{n(P(P(A))) = 2^8 = 256}$

~~d) $n[P(P(P(A)))] = 8^2 = 2^{256}$~~

~~$= 8 \times 8 = 4^{128}$~~

~~$= 8^{64}$~~

~~$= 16^{32}$~~

~~$= 256^{16}$~~

~~$\boxed{= 0.41}$~~

$d = n[P(P(P(A)))] = 2^{256}$

$= 256^{16}$

$= 65536^8$

$$\begin{array}{r} 655360 \\ 3 \\ \hline 196608 \\ 327680 \end{array}$$

$$\begin{array}{r} 256 \\ 256 \\ \hline 1536 \\ 0 \end{array}$$

$$\begin{array}{r} 256 \\ 256 \\ \hline 1536 \\ 12800 \\ 51200 \\ \hline 65536 \\ 65536 \\ \hline 393216 \\ 1966080 \\ 32768000 \\ 327680000 \\ 3932160000 \\ \hline 4294967296 \end{array}$$

Scanned with CamScanner

Theory of Numbers

→ It helps us to study the relationship between different type of numbers such as prime nos., odd nos.

Type	Example	Special Point
1. Natural Numbers (N)	$N = \{1, 2, 3, 4 \ldots\}$	
2. Whole Numbers (W)	$W = \{0, 1, 2, 3 \ldots\}$	
3. Integers (Z/I)	$Z = \{\ldots -2, -1, 0, 1, 2 \ldots\}$ $I^+ = \{1, 2, 3 \ldots\}$ $I^- = \{-3, -2, -1 \ldots\}$	☆ Non negative integers - $\{0, 1, 2, 3\}$ ☆ Non positive integers - $\{\ldots -3, -2, -1, 0\}$ ☆ Even Integers - $\{\ldots -4, -2, 0, 2, 4 \ldots\}$ ☆ odd Integers - $\{\ldots -3, -1, 1, 3 \ldots\}$
4. Prime Numbers	$\{2, 3, 5, 7, 11, 13, 17\}$	☆ Natural numbers except 1 who have only two factors i.e 1 & numbers itself ☆ 2 is the only even prime number
5. Composite Numbers	$\{4, 6, 8, 9, 10, 12, 14\}$	☆ Natural numbers except 1 who have more than 2 factors. ☆ 4 is the smallest composite no

Scanned with CamScanner

(6) Co-prime numbers (Relatively Prime)	(2,3), (7,8) (10,11), (12,13) etc. (11,13), (17,19)	☆ HCF of two numbers = 1 ☆ the numbers are not necessarily prime numbers ☆ any two consecutive nos. are co-prime. ☆ All odd nos. consecutive are co-prime) ☆ any two prime nos. are co-prime
(7) Twin primes	(3,5), (5,7), (17,19) (11,13)	☆ two prime numbers having difference of two. ☆ both must be prime.
(8) rational numbers (Q)	$\frac{1}{2}, \frac{3}{5}, \frac{-7}{8}, \frac{7}{21}$	☆ numbers in form $\frac{p}{q}$ $(q \neq 0)$ ☆ p & q are co-prime and don't have common factor
(9) Irrational nos. ($\bar{Q}$ or Q^c)	$\sqrt{2}, \sqrt{3}, \pi, e \ldots$	☆ The numbers which are not rational.
(10)		

10- <u>Complex Numbers</u> (z) ⇒ Numbers which are written in the form of $a + ib$ (i stands for iota)

$i = \sqrt{-1}$

a, b are real numbers

eg. $3+2i$, $-5+\frac{2}{3}i$, $3(3+i0)$, $-7+2i$

→ two complex numbers $a+ib$ and $p+iq$ are equal. ~~then~~ then $a=p$, $b=q$

→ Conjugate of a complex number

↓

$(2+\sqrt{3} \rightarrow 2-\sqrt{3})$

$z = a+ib \rightarrow \bar{z} = a-ib$

Scanned with CamScanner

Q. find conjugate

a) $3+i2 \rightarrow 3-i2$

b) $\sqrt{2}+i3 \rightarrow \sqrt{2}-i3$

c) $i2-7 \rightarrow -7-i2$

$-3-i5 \rightarrow -3+i5$

$(8+\sqrt{3})+2i \rightarrow (8+\sqrt{3})-2i$

$6 \rightarrow 6$

→ Two complex numbers $a+ib$ & $p+iq$ are conjugate to each other then

$a = p$
$b = -q$

Q $-3+ixy$ & $x+y+4i$ are conjugate to each other, then find x & y

$x+y = -3$
$xy = -4$

$2(-3-y)(y) = -4$

$-3y - y^2 = -4$

$y^2+3y-4=0$

$y^2+4y-y-4=0$

$y(y+4)-1(y+4)$

$(y-1)(y+4)$

$y=1$ | $x=-4$
$y=-4$ | $y=1$

$\boxed{-4, 1}$

$\boxed{-2, -1}$

$-6y-2y^2=-4$

$-3y-y^2=-2$

y^2+3y-2

$y^2+2y-y-2$

$y(y+2)-1(y+2$

$\boxed{y=1, y=-2}$

$\boxed{x=1, x=-2}$

Scanned with CamScanner

(11) ~~Perfect nos.~~ =

$x + y = -3$

$x \cdot y = -4$

$x = -3 - y$

$-3 - y\ (y) = -4$

$-3y - y^2 = -4$

$y^2 + 3y - 4 = 0$

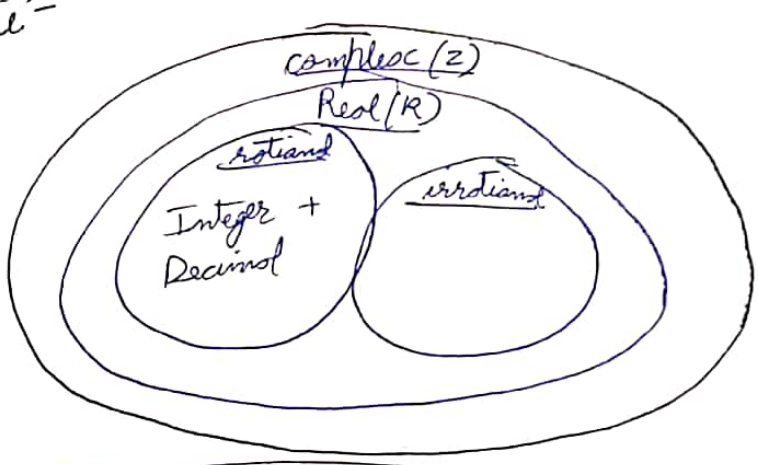
$y^2 + 4y - y - 4 = 0$

$y(y+4) - 1(y+4)$

$(y-1)(y+4)$

$$\boxed{\begin{array}{ll} y = 1, & y = -4 \\ x = -4, & x = 1 \end{array}}$$

Note:-



$$\boxed{Z \supset R \supset I \supset W \supset N}$$

Scanned with CamScanner

11. <u>Perfect number</u> - Sum of ~~on~~ proper ~~fo~~ divisors of a number is the number itself then it is called a perfect number.

eg. 6 < 1, 2, 3 $\quad 1+2+3=6$

6 → perfect no.

28 < 1, 2, 4, 7, 14 $\quad 1+2+4+7+14 = 28$

28 → perfect no.

H.W. 18-04-2024

DYS-4 (Q1-Q6)

J-M (Q2,3)

DYS-4

Q1 : $a=3, b=4$

Q2. i) $x = 2/11$

ii) $x = 16/99$

iii) $x = \frac{419}{990}$

Q3. Proved

Q4. i) all rational ii) may or may not iii) all irrational

Q6. irrational

JEE-M

Q2. 4)

Q3. 3)

Scanned with CamScanner

Note -

① Rational $\pm$ Irrational = Irrational

② Rational $\times$ Irrational = Irrational (for rational $\neq 0$)

③ Irrational $\pm$ Irrational = Rational / Irrational

eg $(2+\sqrt{3}) + (2-\sqrt{3}) \rightarrow$ rational

$(2+\sqrt{3}) + (2-\sqrt{5}) \rightarrow$ irrational

④ Irrational $\times$ Irrational = Rational / Irrational

$\sqrt{2} \times \sqrt{2}$ $\quad$ $\sqrt{3} \times \sqrt{2}$

⑤ $\dfrac{\text{Irrational}}{\text{Irrational}}$ = Rational / Irrational

$\dfrac{\sqrt{2}}{\sqrt{2}}$ $\quad$ $\dfrac{\sqrt{3}}{\sqrt{2}}$

$\pi \approx \dfrac{22}{7}$

$\pi = 3.1415$

$\dfrac{22}{7} = 3.14285$

$\dfrac{22}{7} > \pi$

<u>Investigation of a prime no.</u>

Q. Investigate 17 is a prime no. or not.

$\sqrt{17} = 4.$ something

2 & 3

$\dfrac{4.\text{ som}}{2}$ ✗ $\quad$ $\dfrac{4.\text{ som}}{3}$ ✗

So 17 is a prime.

Scanned with CamScanner

eg 2. 18

$\sqrt{18} = 4.$ ~~same~~

$= 3\sqrt{2}$

divisibly = 3

not prime

eg 3, 571

$\sqrt{571} = 23.$ same

~~23~~ 23 is not divided by any prime smaller than it

So. 571 is prime

$$\begin{array}{r} 1 \\ 24 \\ 24 \\ \hline 96 \\ 480 \\ \hline 576 \end{array}$$

eg 4. 100

$\sqrt{100} = 10$ is divided by 2 & 5

So 100 is not prime.

Q If x, y ~~is a no~~ $\in N$ & $xy = 10$ then find all ordered pairs (x, y)

$(1,10)\ (2,5)\ (5,2)\ (10,1) = 4$

★★ Trick

$a, b \in W$

$a + b - ab = 1$

Add & subtract no. such that ~~कुछ~~ common आ जाये

$a + b - ab = 1$

$a + b - ab - 1 + 1 = 1$

$a - 1 + b - ab + 1 = 1$

$(a-1) + b(1-a) = 0$

$b(1-a) - (a-1)(1-a) = 0$

$(1-a)(b-1) = 0$

$\boxed{\begin{array}{l} a = 1 \\ b = 1 \end{array}}$

Scanned with CamScanner

factorise

9. $7x + 7y - xy = 49$

$7x + y(7-x) = 49$

$7x + y(7-x) + 49 - 49 = 49$

$(7x - 49) + y(7-x) = 0$

$7(x-7) + y(7-x) = 0$

$y(7-x) - 7(7-x) = 0$

$(7-x)(y-7) = 0$

$$\boxed{\begin{array}{l} y = 7 \\ x = 7 \end{array}}$$

Q find all (x, y) $x, y \in N$ such $xy + 5x = 4y + 38$

$5x - 4y + xy = 38$

$5x + y(-4 + x) = 38$

$5x + y(x-4) + 20 - 20 = 38$

$y(x-4)\ 5(x-4) = 38 - 20$

$(y+5)(x-4) = 18 \longrightarrow$ $(1, 18)$, $(2, 9)$, $(3, 6)$, $(6, 3)$, $(9, 2)$, $(18, 1)$

$$\boxed{\begin{array}{l} (22, -4)\ (13, -3)\ (10, -2) \\ (7, 1)\ (6, 4)\ (5, 13) \end{array}}$$

$(22, -4)\ (13, -3)\ (10, -2)$ rejected as negative

$(7, 1)\ (6, 4)\ (5, 13)$

Scanned with CamScanner

Note - No. of integers btw a & b $= \boxed{b-a-1}$

eg. Btw 2 & 7 $= 7-2-1$

$= 7-3$

$\boxed{= 4}$

Btw 10 & 20 $= 20-10-1$

$= 20-11$

$\boxed{= 9}$

Btw 11 & 501 $= 501-11-1$

$\boxed{= 489}$

Note :- no. of integers btw a & b including a & b $= \boxed{b-a+1}$

eg. btw 5 & 10 $= 10-5+1$

$\boxed{= 6}$

btw 11 & 40 $= 40-11+1$

$= 40-10$

$\boxed{= 30}$

btw 207 & 509 $= 509-207+1$

$= 510-207$

$\boxed{= 303}$

Q How many integers in between -200 to 500 (Both inclusive) are multiple of 3 or 5

a) $500+200+1 = 701$

$= \frac{699}{3}$ $\quad \frac{700}{5}$

$= 233 + 140 + 1$ (zero)

$\boxed{= 378}$ 1-407

$\boxed{= 327}$

Scanned with CamScanner

b) are multiple of 3 or 5 but not 15.

$373 - \frac{700}{15} + 1$ (zero)

373 - 467

373 - 467

$\boxed{327}$ - 467

$\boxed{280}$

~~15) 700 (~~

H.W. 19-04-2024

DYS-5 (Q1, 2, 3, 4, 5)

Q-1
(Q24)

Q-4
(Q3)

DYS-5

Q1 6

Q2. i) (2, 2)

ii) 3

Q3. 3

Q4. 651

Q5. 293

Q-1

Q24. c)

Q-4

Q3. 7

~~166 166 11~~

~~233~~

Scanned with CamScanner

Q How many integers in between -200 to 500 (both inclusive)

a) divisible by 3 or 5

b) divisible by 3 or 5 but not 15.

$$-\frac{200}{3} \leq x \leq \frac{500}{3}$$

$$-66.66 \leq x \leq 166.6$$

$$-66 \leq x \leq 166$$

$$166-(-66)+1 = 233 \text{ nos}$$

$$-\frac{200}{5} \leq x \leq \frac{500}{5}$$

$$-40 \leq x \leq 100$$

$$100+40+1 = 141$$

$$-\frac{200}{15} \leq x \leq \frac{500}{15}$$

$$-13 \leq x \leq 33$$

$$33+13+1 = 47$$

a) 3 or 5

$$3 \cup 5 = n(3) + n(5) - n(3 \cap 5)$$

$$= 233 + 141 - 47$$

$$= 374 - 47$$

$$\boxed{= 327}$$

b) $$3 \Delta 5 = n(3) + n(5) - 2(n\, 3 \cap 5)$$

$$= 327 - 47$$

$$\boxed{= 280}$$

Scanned with CamScanner

Q which is greater?

① $\frac{8}{9}$ or $\frac{7}{8}$

$\frac{8}{9} > \frac{7}{8}$

~~② $\sqrt{13}-\sqrt{12}$ or $\sqrt{14}-\sqrt{13}$~~

~~$13+12-2\sqrt{13}\times\sqrt{12}$ $\quad$ $14+13-2\sqrt{14}\times\sqrt{13}$~~

~~$25-2\sqrt{13\times12}$ $\quad$ $27-2\sqrt{14}\times\sqrt{13}$~~

~~$25-2\sqrt{156}$ $\quad$ $27-2\sqrt{182}$~~

$\sqrt{13}-\sqrt{12} \times \frac{\sqrt{13}+\sqrt{12}}{\sqrt{13}+\sqrt{12}}$ $\quad$ $\sqrt{14}-\sqrt{13} \times \frac{\sqrt{14}+\sqrt{13}}{\sqrt{14}+\sqrt{13}}$

$$\begin{array}{r} 13 \\ \times\ 12 \\ \hline 26 \\ 130 \\ \hline 156 \end{array}$$

$\frac{13-12}{\sqrt{13}+\sqrt{12}}$ $\quad$ $\frac{14-13}{\sqrt{14}+\sqrt{13}}$

$$\begin{array}{r} 14 \\ \times\ 13 \\ \hline 42 \\ 140 \\ \hline 182 \end{array}$$

$\frac{1}{\sqrt{13}+\sqrt{12}} > \frac{1}{\sqrt{13}+\sqrt{14}}$

Scanned with CamScanner

Divisibility

2 → Last digit is even no.

3 → Sum of digits is divisible by 3

4 → last 2 digits divisible by 4

5 → last digit be 0 or 5

6 → divisible by 2 & 3

8 → o last 3 digits should be divisible by 8

9 → Sum of digits divisible by 9

10 → last digit be zero

11 → Sum of odd digits − Sum of of even digits be divisible by 11 or 0.

Divisibility by 7

343

→ 3 × 2 = 6

34 − 6 = 28 → divisible by 7

Only applicable for 3 digits.

Intervals

→ Subsets of real numbers

→ Intervals are of 5 types.

Scanned with CamScanner

Interval	Notation (B > A)	Definition
① Closed Interval	$[a, b]$ or $a \leq x \leq b$	All real ~~numb~~ numbers between a & b including a and b.
② open Interval	(a, b) or $a < x < b$	All real numbers between a & b excluding a and b.
③ open-closed Interval	$(a, b]$ or $a < x \leq b$	All real numbers between a & b including b but not a.
④ closed-open Interval	$[a, b)$ or $a \leq x < b$	All real numbers between a & b including a but not b.
⑤ curly interval	$\{a, b\}$ ~~or~~	Only a and b.

Q1. Match the column

(A) $[-3, 6]$

(B) $(5, 7)$

(C) $(-9, -3)$

(D) $[0, 8]$

(E) $[6, 9]$

(P) 7.1

(Q) 0.9

(R) −5

(S) 5

(T) 6.1

(U) 4.3

(A) - Q S U

(B) - T

(C) - R

(D) - P Q S T U

(E) - P T

Scanned with CamScanner

Infinite Intervals - It is of 4 types

① $[a, \infty)$ — All real nos. from a to infinite

② (a, ∞) — All real nos. from a to ∞ without a

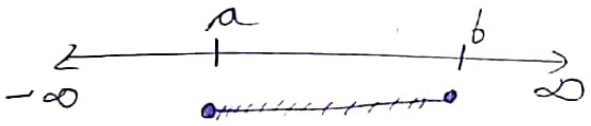
③ $[-\infty, b]$ — All real nos. from $-\infty$ to b including b

④ $(-\infty, b)$ — All real nos from $-\infty$ to b excluding b

Representation of Intervals in graphical form.

① Closed $(b > a)$

$[a, b]$

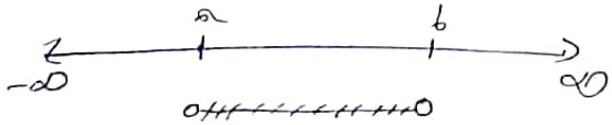


• - Include

o - Exclude

② Open Interval $(b > a)$

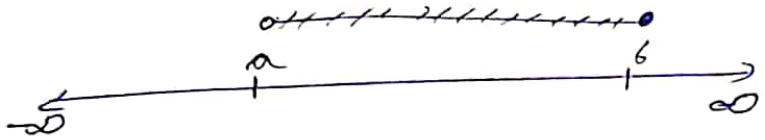
(a, b)



Scanned with CamScanner

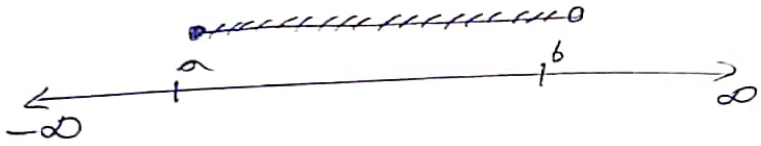
③ Open-closed interval

$(a, b]$



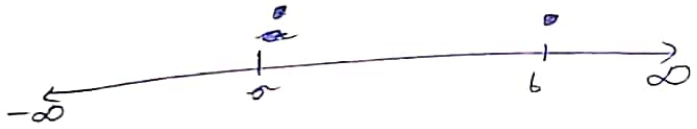
④ closed - open Interval

$[a, b)$

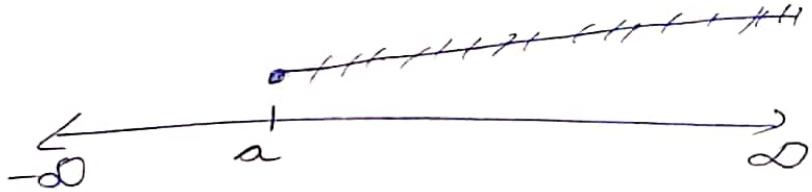


⑤ Curly Interval

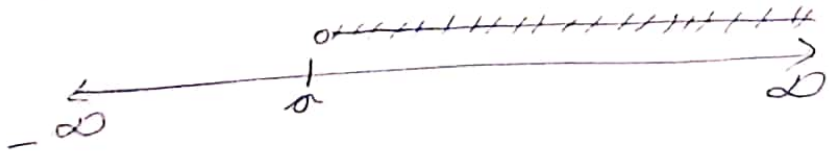
$\{a, b\}$



⑥ $[a, \infty)$

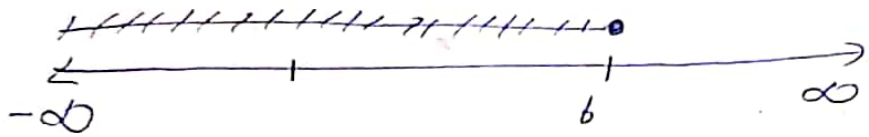


⑦ (a, ∞)

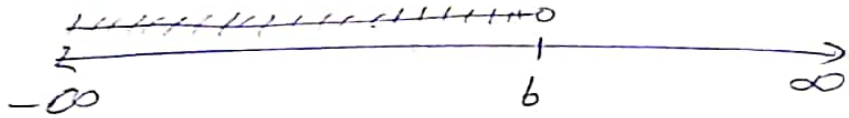


Scanned with CamScanner

(8) $(-\infty, 6]$

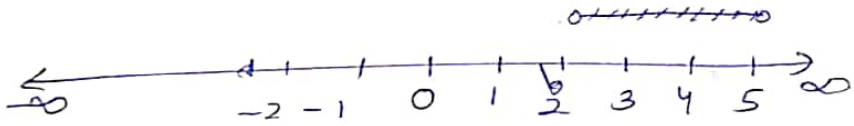


(9) $(-\infty, 6)$

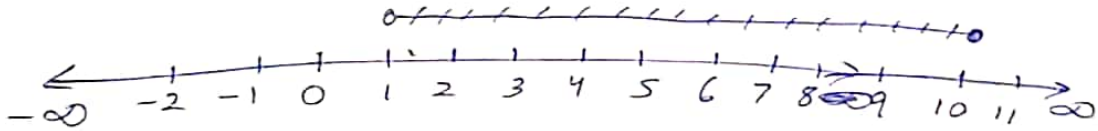


Q1. Represent the ~~sets~~ intervals on number line:

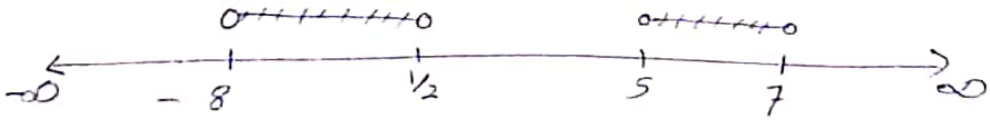
(1) $(2, 5)$



(2) $(1, 10]$

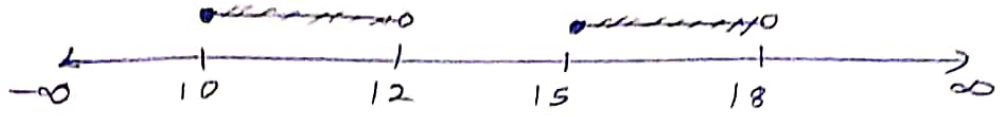


(3) $(-8, \frac{1}{2}) \cup (5, 7)$

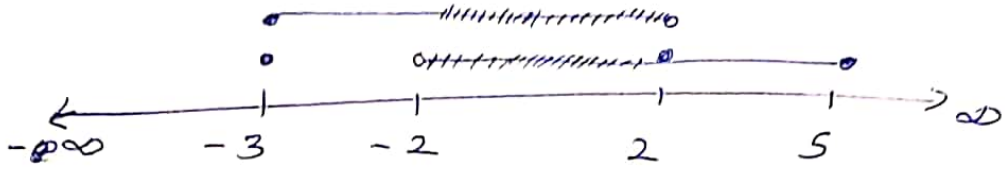


Scanned with CamScanner

(4) $[10, 12) \cup [15, 18)$

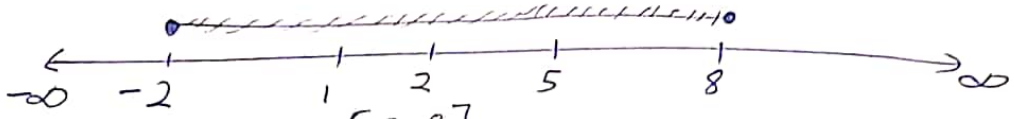


(5) $(-2, 5] \cap [-3, 2)$



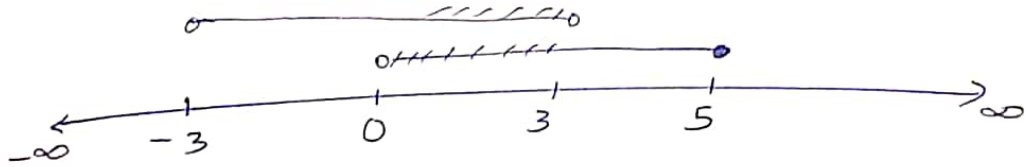
$(-2, 2)$

(6) $[-2, 5] \cup (1, 2] \cup [5, 8]$



$[-2, 8]$

(7) $(0, 5] \cap (-3, 3)$



$(0, 3)$

(8) $((-\infty, 5) \cup [4, 10]) - (-10, 10)$

$(-\infty, 10] - (-10, 10)$

$(-\infty, -10] \cup \{10\}$

Scanned with CamScanner

H.W. 20-4-2024

Q1. Represent $[1, 4]$ or $[-4, 1)$ on a number line.

Q2. $(-8, -1] \cup [-3, 6]$ find.

1. Total integers
2. Total ⊕ve integers divisible by 3
3. Total ⊖ve integers
4. Total real nos.
5. Total prime nos.
6. Total Irrational nos.

Q3. If $x \in [1, 4)$, which of the following lies in it.

(A) 2
(B) $4.1 - 0.\overline{9}$
(C) $4.\overline{1} - 0.0\overline{9}$
(D) $\sqrt{4 - 4\pi + \pi^2}$

DYS-1
Q13-3
DYS-2
Q4 4
Q5. A-S, B-P, C-Q, D-P

DYS-1 (Q13)
DYS-2 (Q4, Q5)
DYS-5 (Q6-Q8)
DYS-6 (Q1-10)

O-1
(Q8, 9, 10, 23)

O-2
(Q3, 5, 6)

O-3
(Q7)

DYS-5
Q6. -4
Q7 - 30
Q8 -3

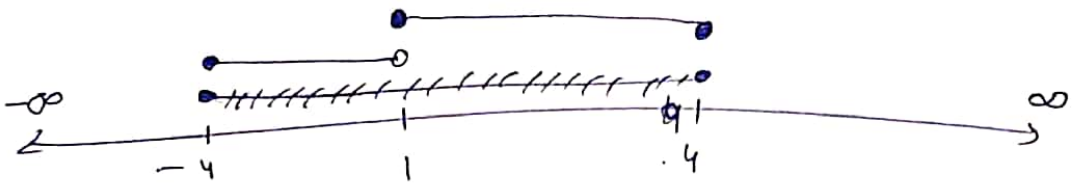
~~DYS~~ O-1
Q8 - C
Q9 - B
Q10 - A
Q23 B

O -2
Q3 AD
Q5 CD
Q6. AB

~~DYS-6~~
O-3
Q7- A-Q
B-R
C-S
D-P

Scanned with CamScanner

Q1. $[1, 4] \cup [-4, 1)$



Q2. $(-8, -1] \cup [-3, 10]$

~~$[-7$~~

$(-8, 10]$

1. Total integers $= 10 - (-8)$

$\boxed{= 18}$ ✓

2. Total Integers divisible by 3

$-\frac{8}{3} \leq x \leq \frac{10}{3}$

$3 + 3 = \boxed{6}$ ✓

3. $10 - (-8) - 1$

$= 8 - 1$

$\boxed{= 7}$

4. Infinite ✓

5. 4 ✓

6. Infinite ✓

Q 3. (A) (B) (B)

Scanned with CamScanner

~~DYS-4~~

~~Q13~~

Scanned with CamScanner

Scanned with CamScanner

Scanned with CamScanner

Scanned with CamScanner

Scanned with CamScanner