Sets, Number & Interval

~~Sets Groups of well defined things~~

100 soldiers

Onehand + One leg + One eye = ~~3~~

60 + 50 + 40 = 150

100 $\Rightarrow$ $(L+E)+(H+E)+(L+H)+(L+H+E)$ $\pm$ ~~L+H+E~~

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

$\boxed{\text{Sets - Set is a collection of well defined objects}}$

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 - no

3. collection of most dangerous animals of world no

4. collection of all even integers yes

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

~~6. ab,~~

★ A, B, C ... Z ⇒ Set denotion

a, b, C ..., 1, 2 ... ⇒ Elements

★ Element a belongs to set A

$a \in A$

belongs to

★ Element a not belongs to A

$a \notin A$

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

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. $A = \{\underbrace{x}_{\text{Elements}} \underbrace{:}_{\text{Such that}} \underbrace{P(x)}_{\text{Property}}\}$

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

(2)

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 $1 \le x \le 10\}$

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 $k\}$

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

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

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

Practice Set

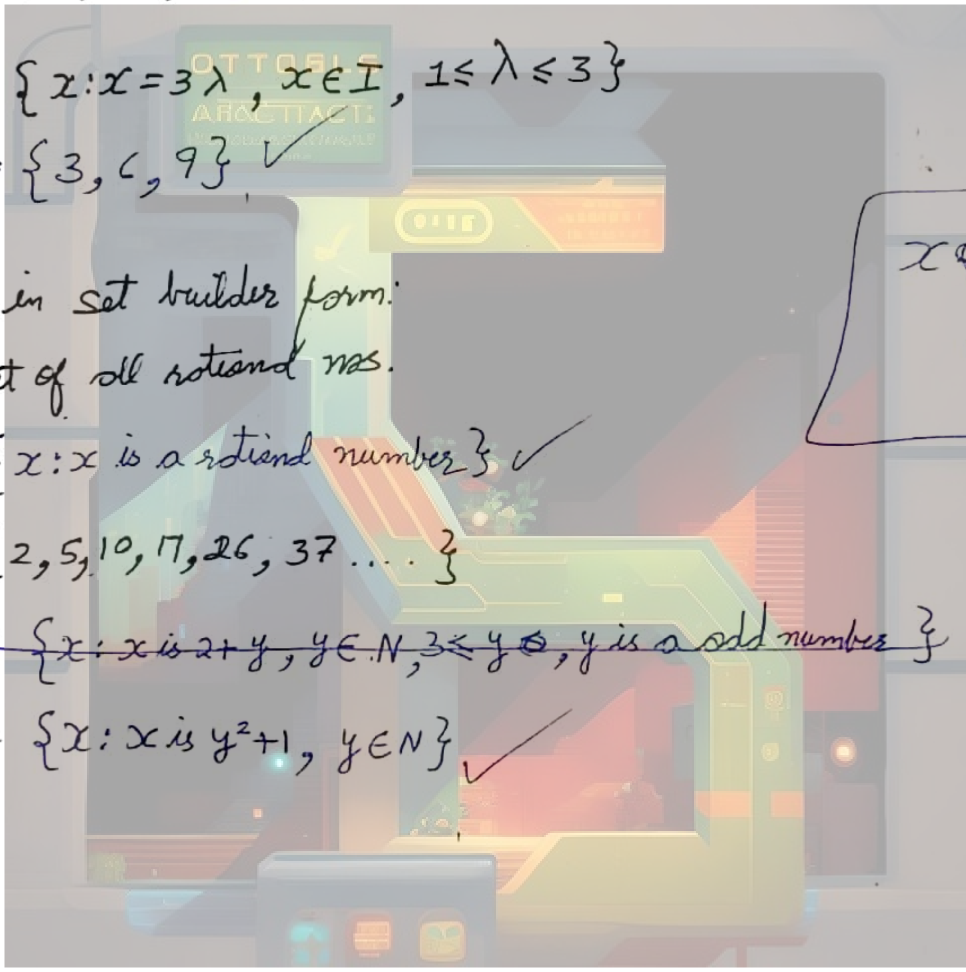
Q1. Set or not?

1. collection of natural nos. between 2 & 20. | Yes ✓
2. collection of ~~real~~ 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. $A = \{x : x \text{ is a +ve prime} < 10\}$

A $A = \{2, 3, 5, 7\}$ ✓



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

$B = \{3, 6, 9\}$ ✓

Q 3. write in set builder form:

A 1. set of all rational nos.

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

$x \in Q$

Rational

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

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

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

Types of Sets

	Set name	Definition	Example
1	Null/ Void/ Empty set	a) set having no elements. b) $A = \{\ \}$ or $A = \phi$ (phi) 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.	$A = \{1, 2, 3 \ldots\}$ $B = \{x : x \text{ is prime no.}\}$

6

Q Match the following :-

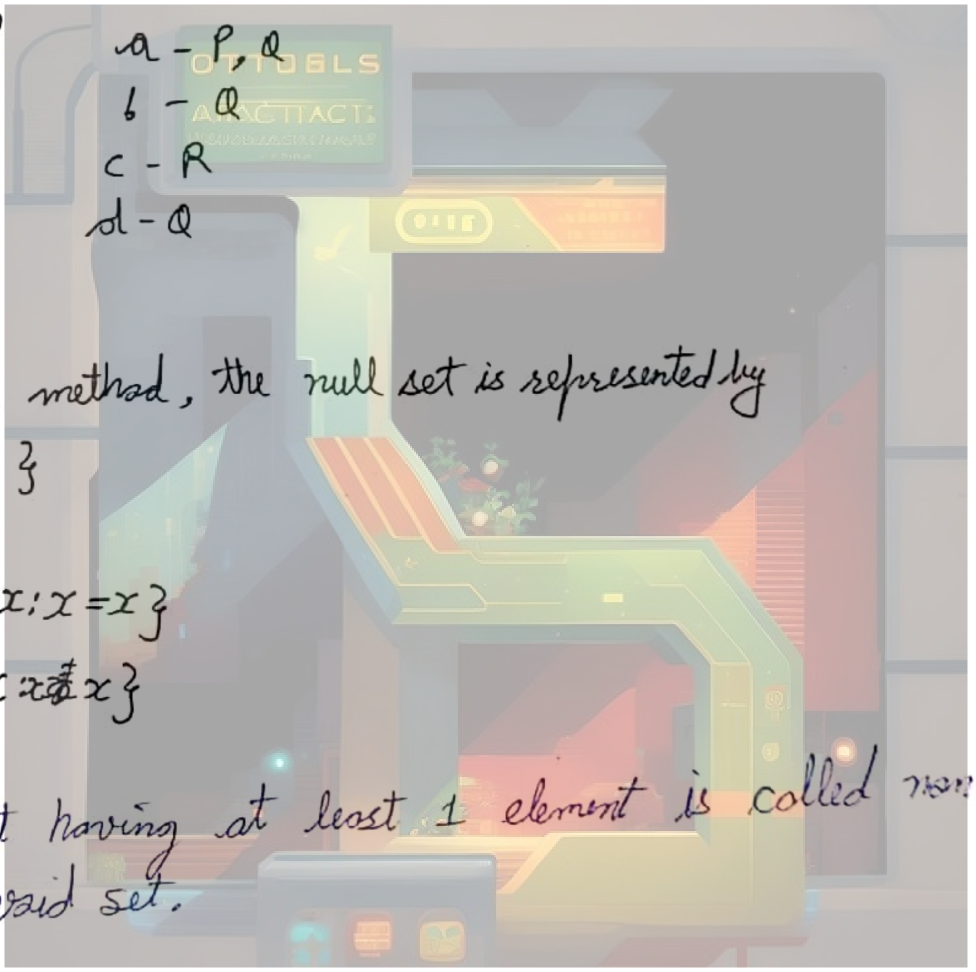
a ~~1~~. $A = \{x : x^2 = 4, x \text{ is odd}\}$ — P) Null set ~~1~~

b) ~~2~~. B = {set of all Men living presently in Udaipur} — Q) Finite set ~~2~~

c) ~~3~~. C = set of all points on a line — R) Infinite set ~~3~~

d ~~4~~. Set of solutions of $x^2 - 16 = 0$ — S) singleton

~~a - P, Q~~
~~b - Q~~
~~c - R~~
~~d - S~~
~~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 $\{x : x \neq x\}$

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

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. $Q = \{A, L, L, O, Y\}$
$P = \{L, O, Y, A, L\}$
$R = \{O, L, A, Y\}$
$P = Q = R$

5. 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

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, B}

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

* 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. $T = \{\text{Munni}, \text{Chameli}, \text{Sheela}\}$

Proper Subsets = $\{\ \}$, $\{\text{Munni}\}$, $\{\text{Chameli}\}$, $\{\text{Sheela}\}$, $\{\text{Munni}, \text{Chameli}\}$, $\{\text{Munni}, \text{Sheela}\}$ $\{\text{Chameli}, \text{Sheela}\}$

Subsets = P. Subsets and $\{\text{Munni}, \text{Chameli}, \text{Sheela}\}$

* Every set is a subset of itself
* Empty set is a subset of every set
* If $\underbrace{n(A) = m}_{\text{no. of elements in } A}$,

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

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

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 ~~sub~~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

$2^m + 48 = 2^n$

~~$2^m - 2^n = -48$~~

~~$48 = 2^n - 2^m$~~

$48 = 2^m - 2^n$

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

2^n

$2^n = 2^4$

$n = 4$

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

$2^{m-4} = 4$

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

$m - 4 = 2$

$\boxed{m = 6}$

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

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

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

(Reject)

Power Set

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

→ It is denoted ~~by~~ 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 $\{3, 7\} \in P(X)$ ✓

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

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

(A) $\{1\} \subset W$ ✓

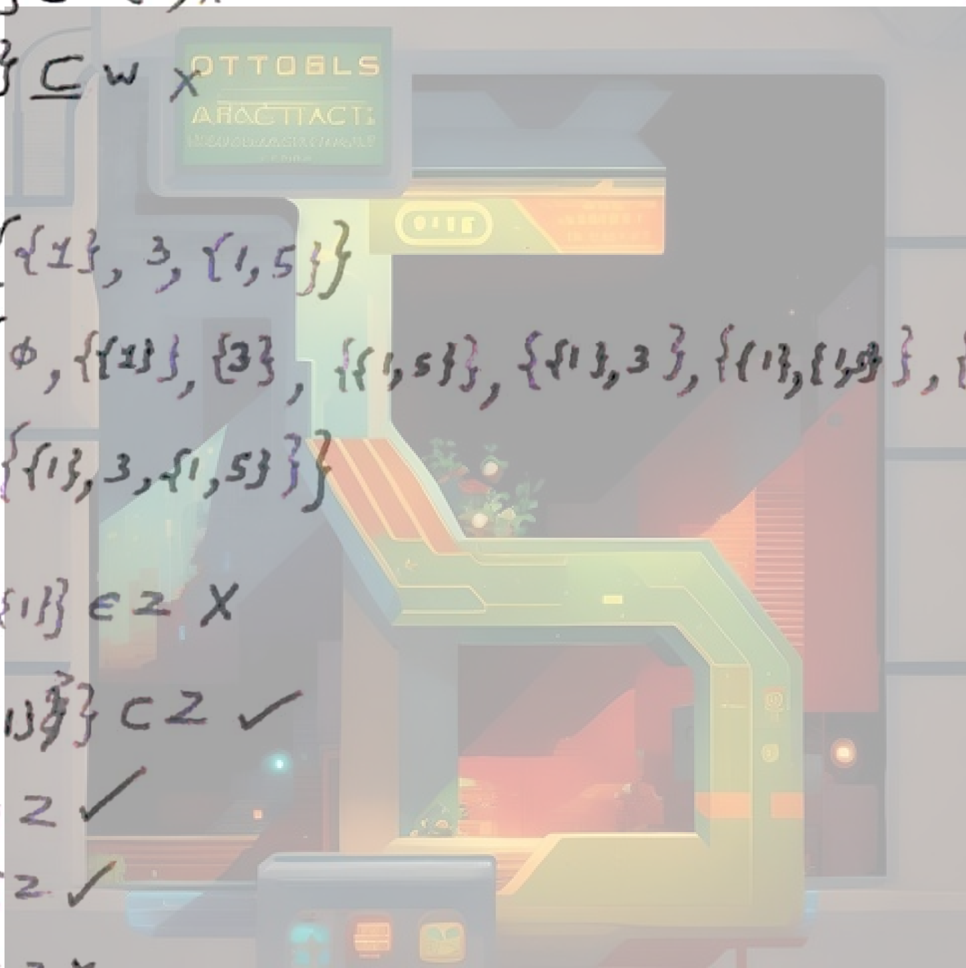
(B) $\{1\} \subset P(W)$ ✗

(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) $\{3\} \subset Z$ ✓

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

DYS-1 (Q6, Q7, 8, 9 ~~7~~, 11, 12)

DYS-2 (Q3)

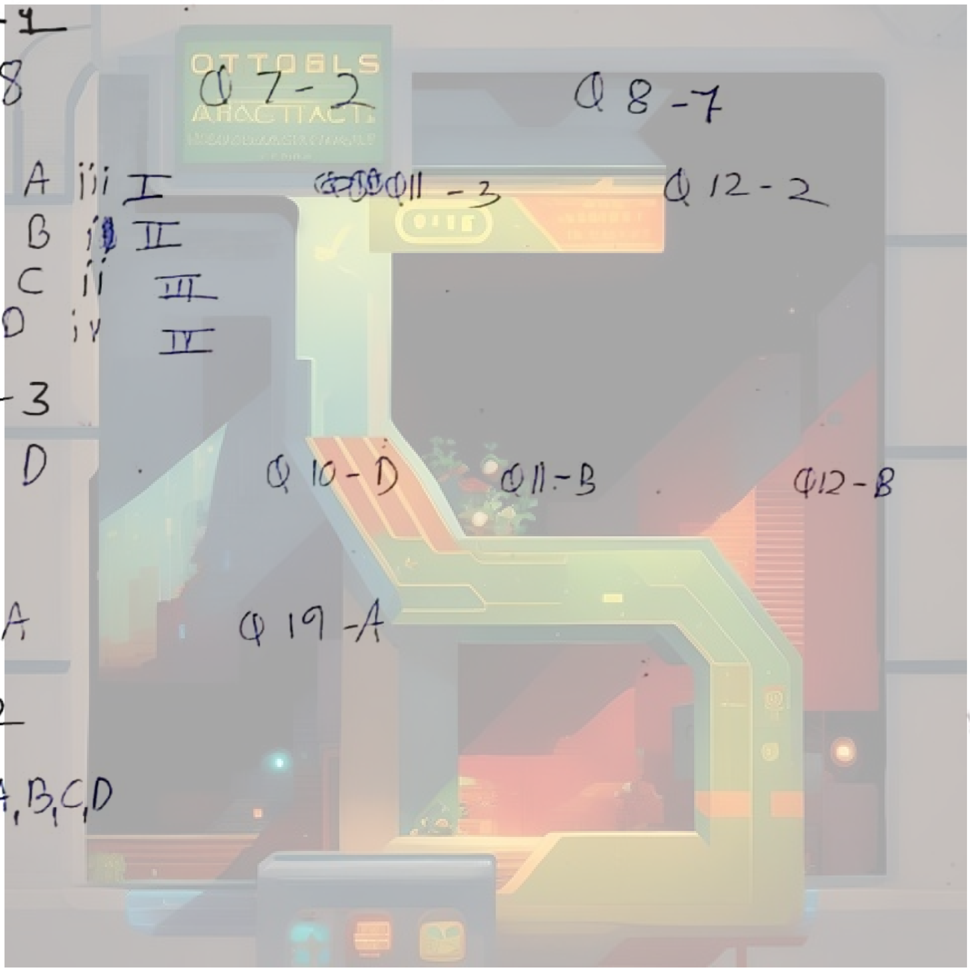
DYS-3 (Q8, 10, 11; 12)

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

O-2 (Q12)

Answers

DYS-1



Q 6 - 8   Q 7 - 2   Q 8 - 7

Q 9 - A iii I
B ii II
C ii III
D iv IV

~~Q10~~ Q11 - 3   Q 12 - 2

DYS-3

Q 8 - D   Q 10 - D   Q 11 - B   Q12 - B

O - 1

Q17 - A   Q 19 - A

O - 2

Q12 - A, B, C, D

★ 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.

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 $\cancel{P(P(P(\phi)))}$ $P(\underset{2}{P(\phi)})$ & $P(P(\underset{4}{P(\phi)}))$ 16 256

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

$\phi = \cancel{\{\phi\}}$

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

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

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

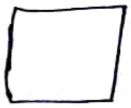
* In any particular discussion, no element can exist out of universal set. It should be noted that universal set is not unique, it may differ in problem to problem.

1 2 4 16 256

0 1 2 4 16

Operation on sets

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

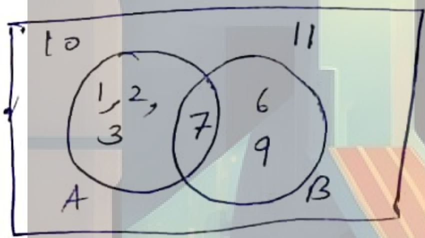
 → shows universal set

 → ~~universal~~ set

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

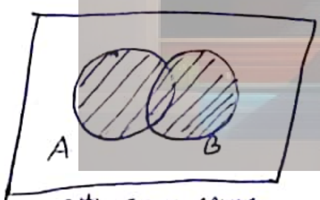
$A = \{1, 2, 3, 7\}$

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



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

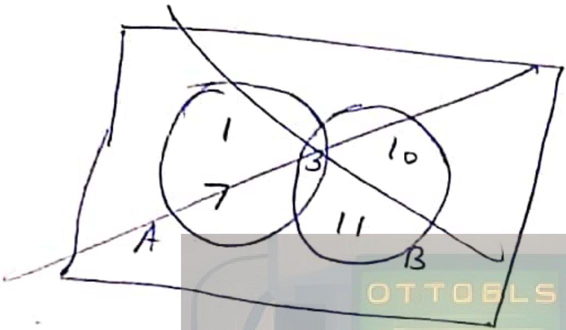

with no common

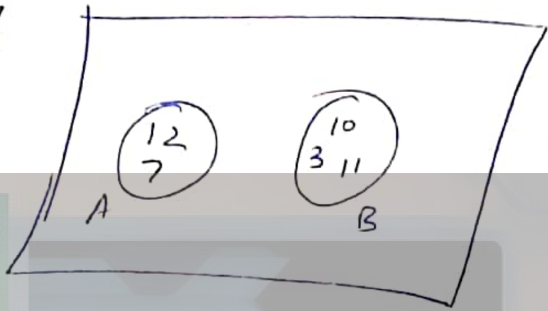
shaded area shows $A \cup B$

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

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

$A \cup B = \{1, 2, 3, 7, 10, 11\}$

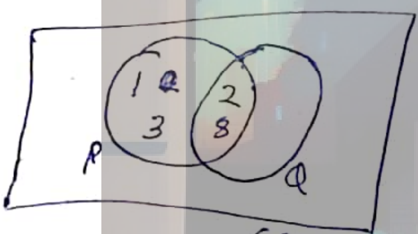


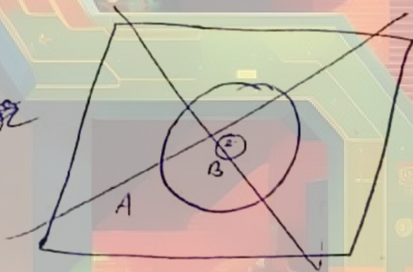


Q2. $P = \{1, 2, 3, 8\}$

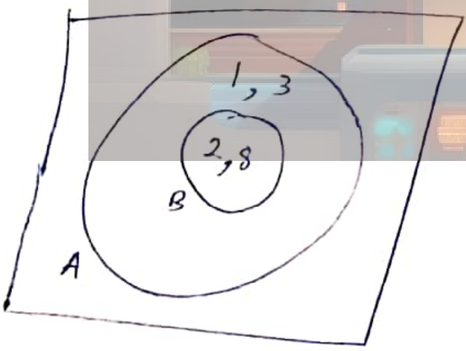
$Q = \{2, 8\}$

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





Or



H.W. 12-04-23

~~Q-1~~

DYS-1 (Q 2,)

~~DYS-2~~

O-2 (9, 10)

JA (Q2, 4)

DYS-1

Q2. c)

O-2

Q9) ABD

Q 10 BCD

J-A

Q2 3)

Q4 2).

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

elements in c

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

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

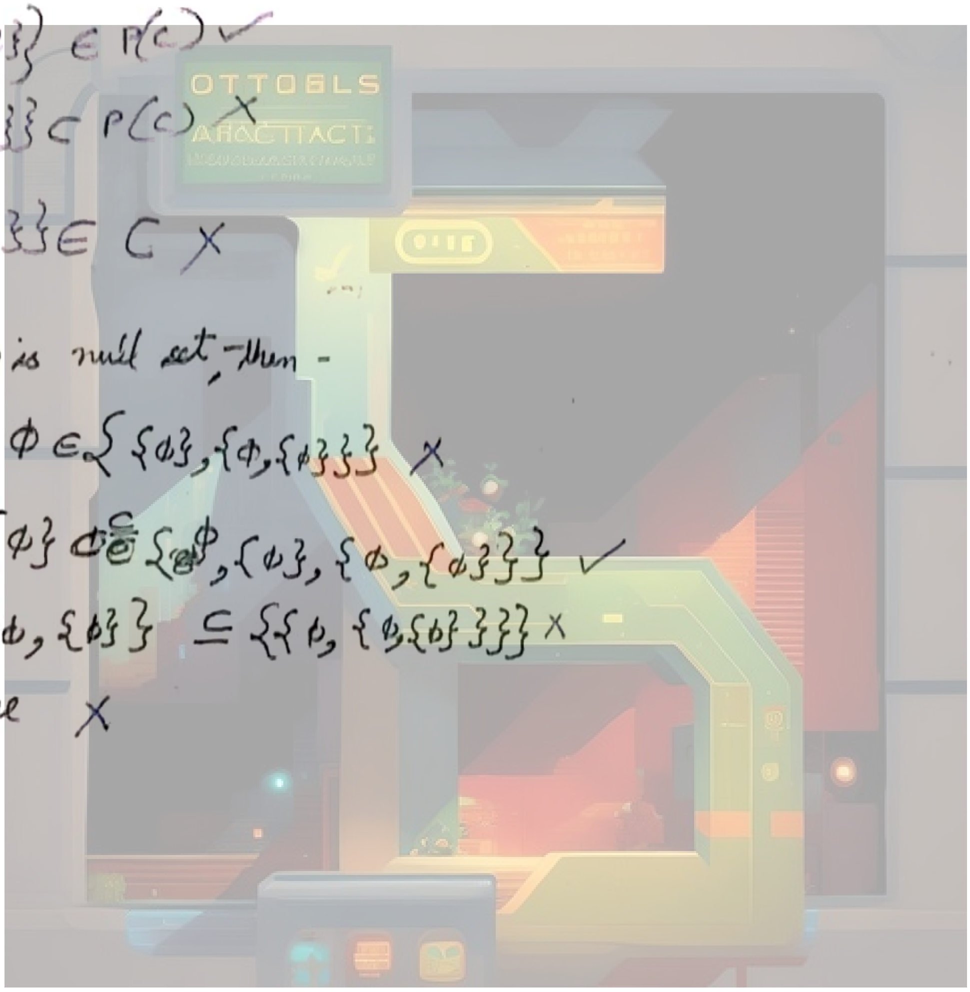
Q $C = \{1, \{2\}\}$

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

$\{\{2\}\} \in P(C)$ ✓

$\{\{2\}\} \subset P(C)$ ✗

$\{\{2\}\} \in C$ ✗



Q If ϕ is null set, then -

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

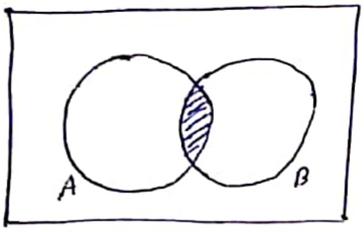
(b) $\{\phi\} \subseteq \{\phi, \{\phi\}, \{\phi, \{\phi\}\}\}$ ✓

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

d) none ✗

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 Idempotent	$A \cup A = A$	$A \cap A = A$
④ Law of identity - compare with ϕ and U	$A \cup U = U$ $A \cup \phi = A$	$A \cap U = A$ $A \cap \phi = \phi$

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

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

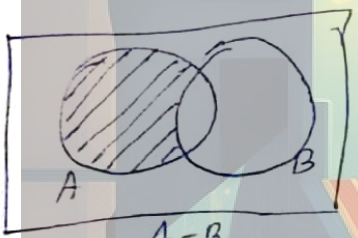
~~n sets $A, B, C \ldots z \rightarrow A \cup B \cup C \ldots z$~~

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

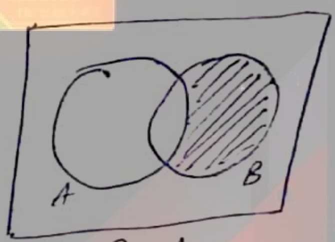
$\rightarrow \bigcap_{i=1}^{n} A_i$

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

$\rightarrow$ 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 ~~AB~~ $A-B = B-A$)

~~eg.~~

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

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

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

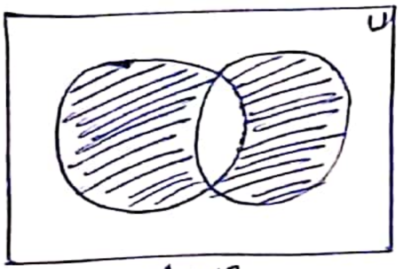
$A-B = \{7, 9\}$

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

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

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

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

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 $= A$)

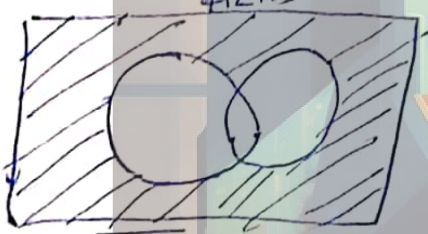
⑥ $\bar{\bar{\bar{A}}} = \bar{A}$ (odd times $= \bar{A}$)

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

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

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

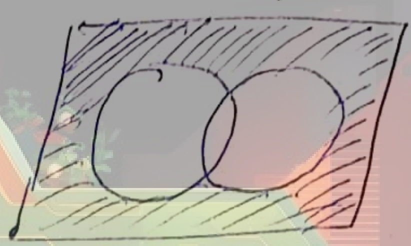
LHS



$\overline{A \cup B}$

=

RHS



$\bar{A} \cap \bar{B}$

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

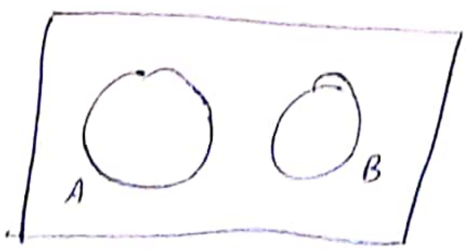
7. **Disjoint Sets** - For any two sets A and B if $A \cap B = \phi$ then set A and set B are called disjoint sets.

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

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

$A \cap B = \phi$

A & B are disjoint sets.



H.W. 13-04-2024

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

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

Q1 $U=\{1,2,3,4,5,6,7,8,9,10\}$

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

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

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

① $\bar{A} = \{4,6,7,8,9,10\}$

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

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

③ $\bar{\bar{A}} = \{1,2,3,5\}$

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 $(A\cup B\cup C)' = \{6\}$

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

$\cancel{21, 42} \; \cancel{\boxed{21N}}$

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

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

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

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

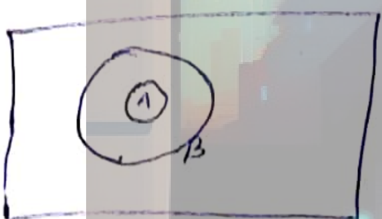
$3N\cap 7N=\{21, 42, 63, \dots\}$

$\cancel{\boxed{=7N}}$

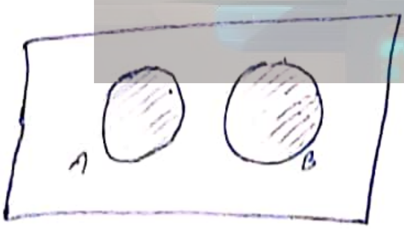
$LCM(3N, 7N) \; \boxed{=21N} \quad LCM(3,7)N$

Q 4. draw venn diagram

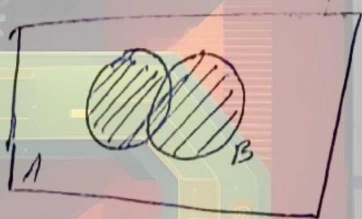
(1) A is a subset of B



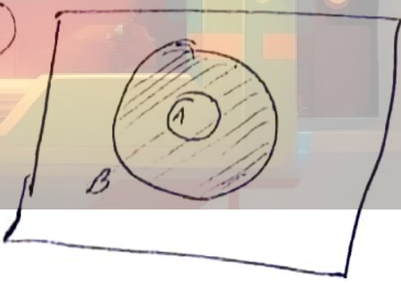
(2) $A\cup B$, when $A\cap B=\phi$



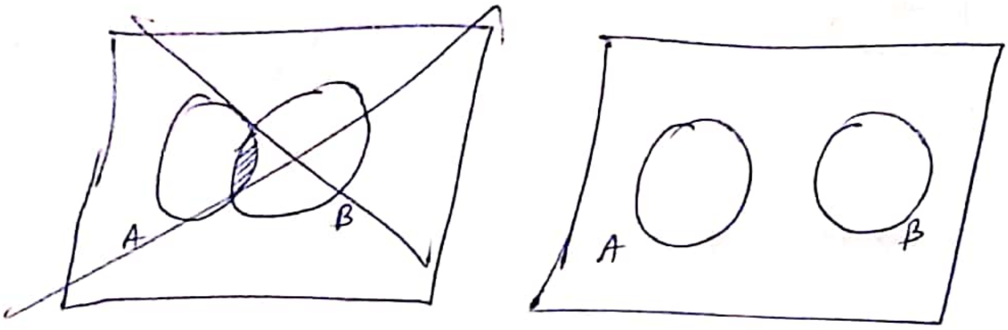
(3) $A\cup B$ when $A\cap B\neq\phi$



(4) $A\cup B$ when $A\subseteq B$



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



Q Match the column

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

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

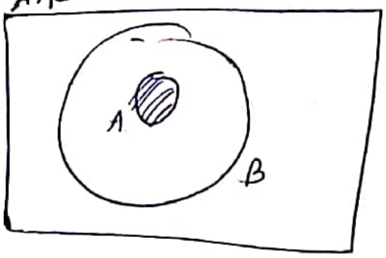
C) $A \Delta B$

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

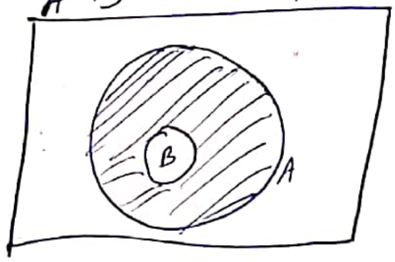
A - R)
B - Q)
C - P)
D - S)

Q Venn diagram

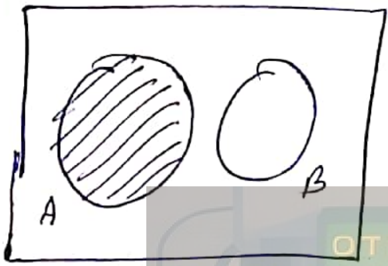
① $A \cap B$ & $A \subseteq B$



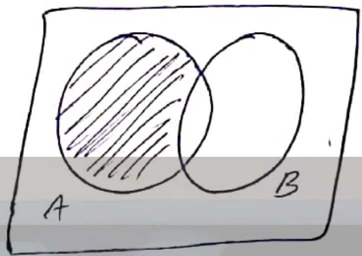
② $A - B$ & $B \subseteq A$



③ $A - B$ & $A \cap B = \emptyset$

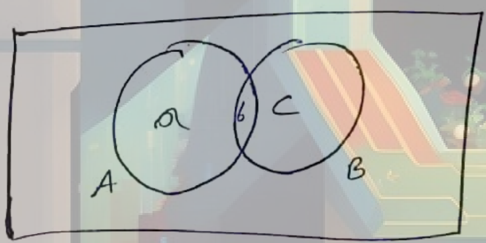


④ $A - B$ & $A \not\subset B$ & $B \not\subset A$



Q ~~Some~~ Sum results for problem solving

1. For any two finite sets A & B



$n(A) = a + b$

$n(B) = b + c$

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

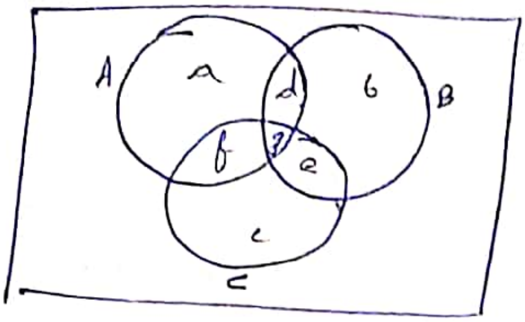
$n(A \cap B) = b$

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

2. elements only in set A = a

" " " set B = c

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

H.W. 15-04-2024

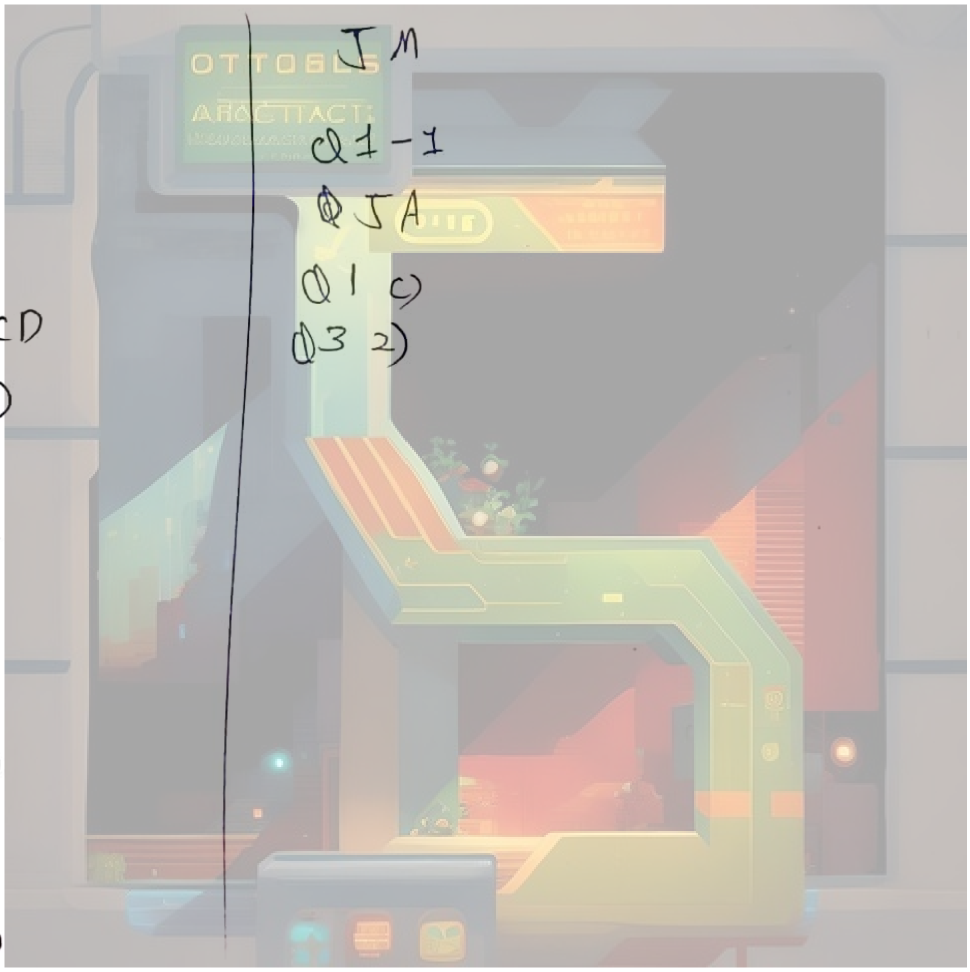
O-1 (Q7)

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)

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

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

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

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

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

7. For two sets A & B

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

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

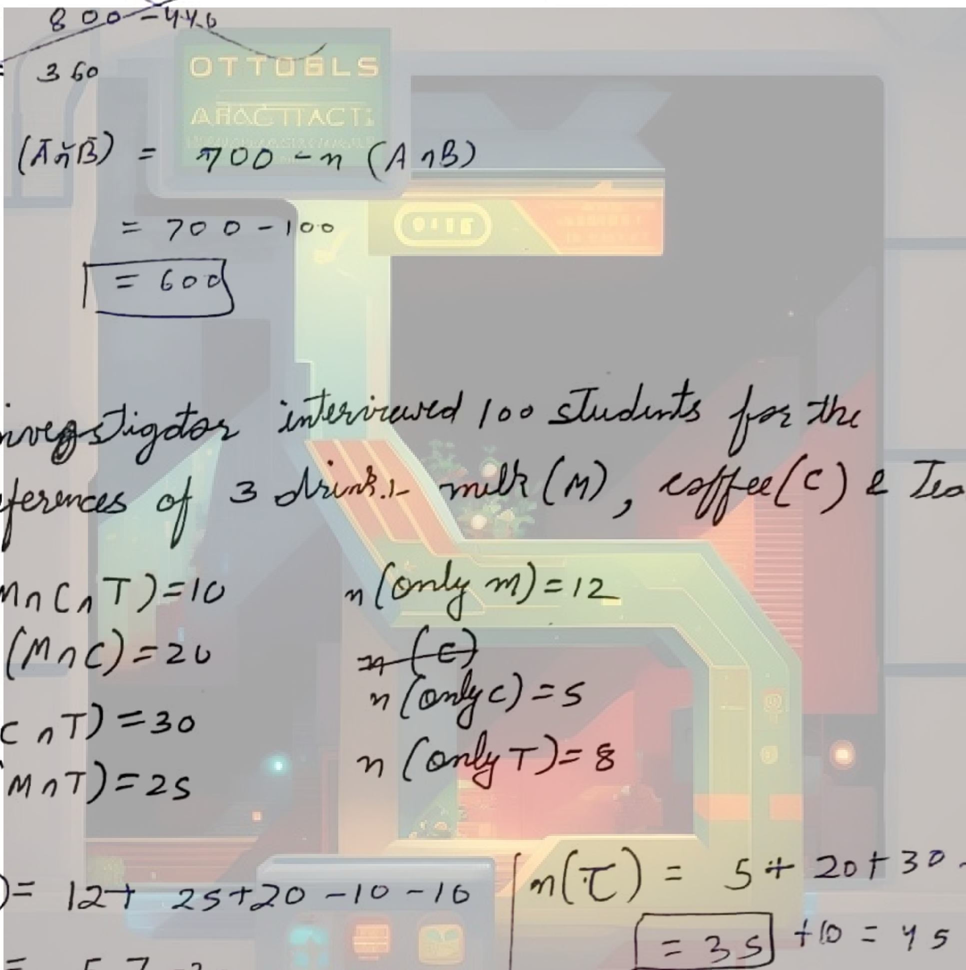
Q If $n(U)=700$,
$n(A)=200$,
$n(B)=240$
$n(A\cap B)=100$
$n(\bar{A}\cap \bar{B})=?$

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

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

$\cancel{= 800 - 440}$

$\cancel{= 360}$



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

$= 700 - 100$

$\boxed{= 600}$

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

$n(M\cap C\cap T)=10$ $n(\text{only } m)=12$

$n(M\cap C)=20$ $\cancel{n(C)}$ $n(\text{only } c)=5$

$n(C\cap T)=30$ $n(\text{only } T)=8$

$n(M\cap T)=25$

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

$= 57 - 20$

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

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

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

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

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

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

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

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

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

$\cancel{100 - 125}$

~~25~~

~~MACAT~~

$115 - 40 - 60 - 25 + 30$

$115 - 125 + 30$

$145 - 125 = 20$

~~$2\,35 + 55 = 80$~~

$25 +$

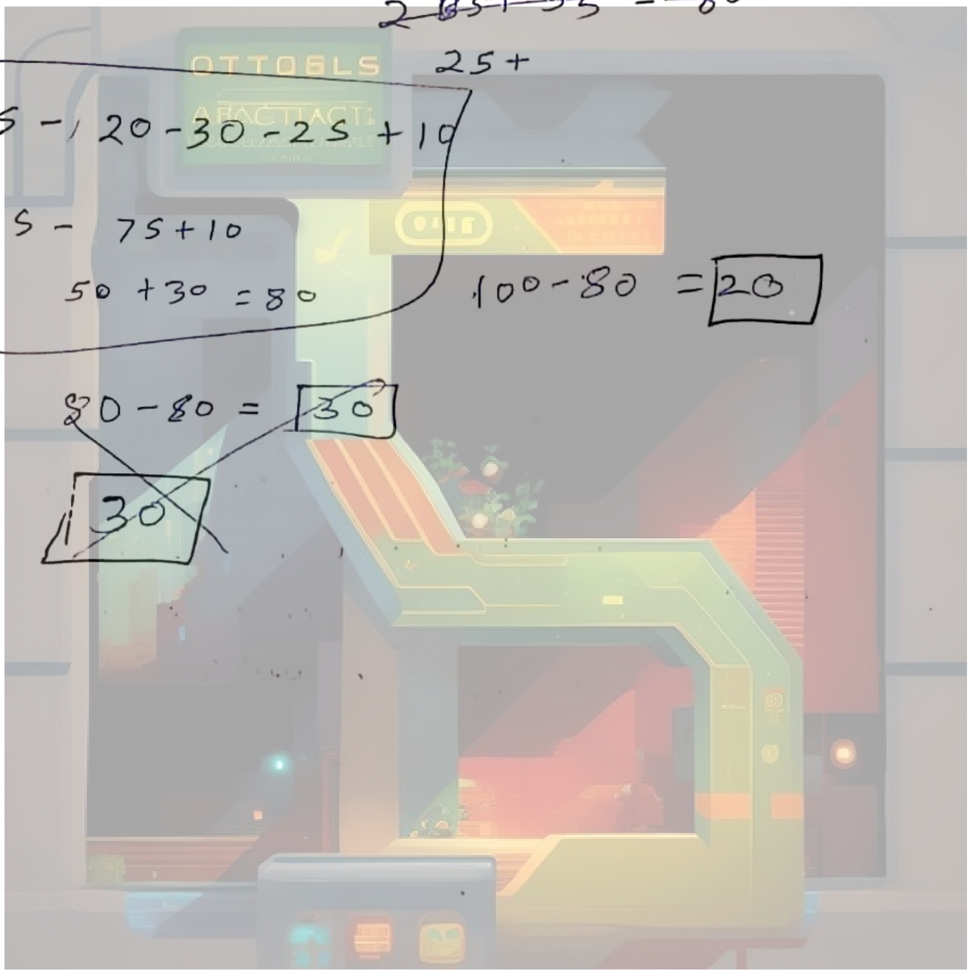
$115 - 20 - 30 - 25 + 10$

$115 - 75 + 10$

$50 + 30 = 80$

$100 - 80 = \boxed{20}$

$80 - 80 = \boxed{30}$



~~$\boxed{130}$~~

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

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

$n(M \cap P) = 12$

$n(M \cap C) = 9$

$n(P \cap C) = 7$

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

nf exact one sub

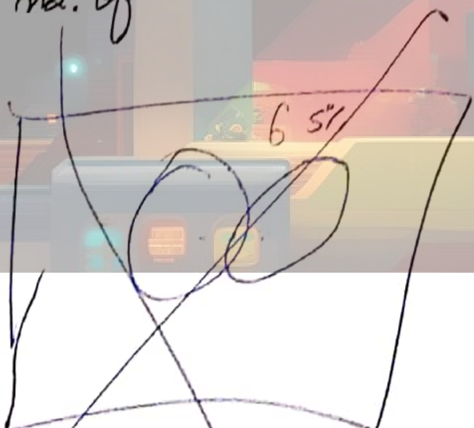
$23 + \cancel{24} + 19 - \cancel{24} - 18 - 14 + 12$

$+1 + 35 - 14$

$\boxed{22}$

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

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



$n(P) = 25$

$n(S) = 15$

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

$P \cup S = 35$

$n(\bar{P} \cap S) = 65$

75n

$$Total = x$$

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

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

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

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

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

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

Cartesian Product of two sets

↳ It is denoted by ~~a×b~~ A×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 $B \times B = \{(p,p), (p,q), (p,r), (q,p), (q,q), (q,r), (r,p),$
$(r,q), (r,r)\}$

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

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

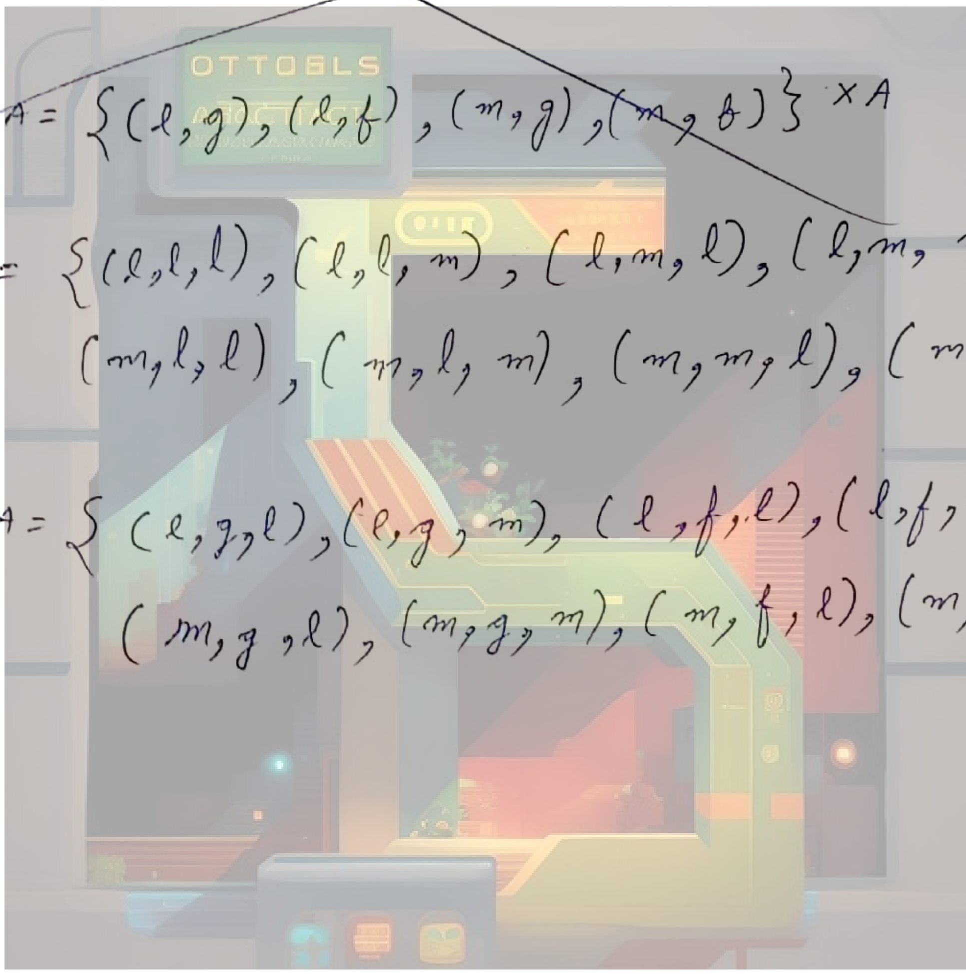
Q

$A = \{l, m\}$

$B = \{g, f\}$

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

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



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

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

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

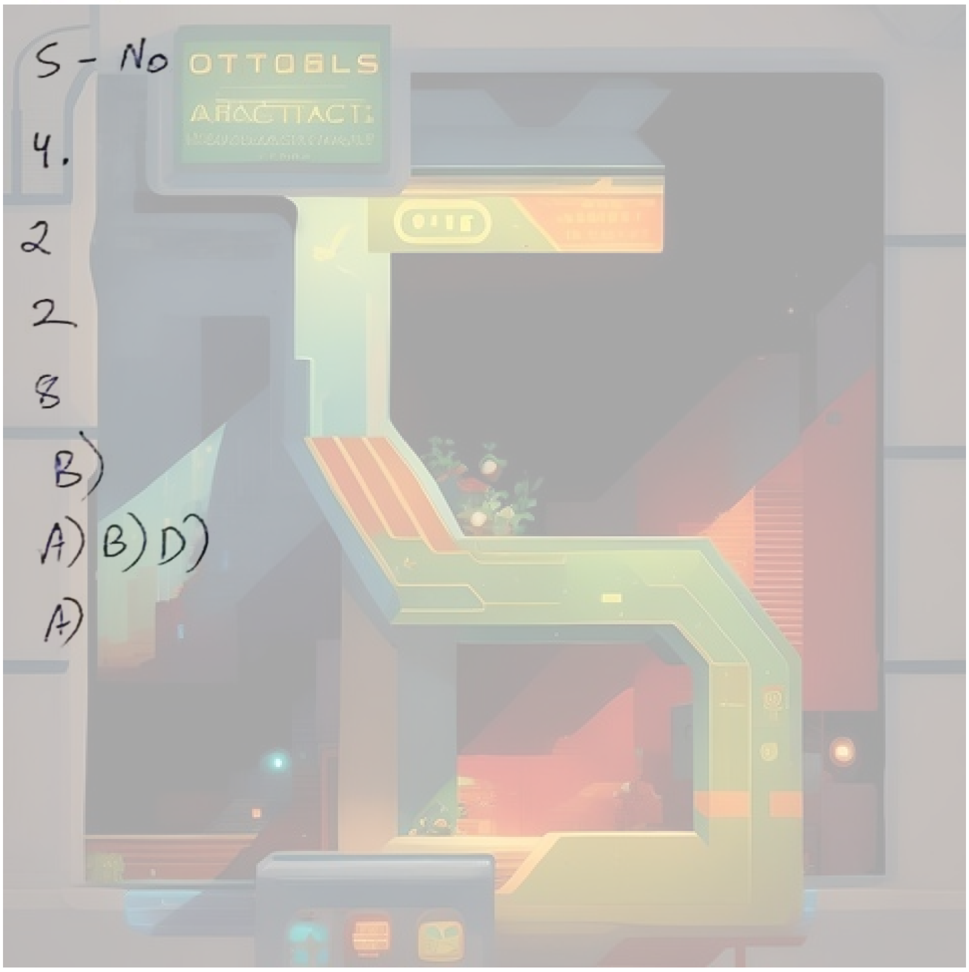
H.W. 14-04-2024

DYS-3 (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)

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

$2x - y = 15$

$y = 2x - 15$

$2x + y = 25$

$2x + 2x - 15 = 25$

$4x = 40$

$\boxed{x = 10}$

$y = 20 - 15$

$\boxed{y = 5}$

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

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

$A = \{2, 3\}$

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

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

$(a, b) = \cancel{(2,4)}$

$$\boxed{\begin{aligned} &= (2, 16) \\ &(2, 23) \\ &(3, 16) \\ &(3, 23) \end{aligned}}$$

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

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

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

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

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) $n[P(P(P(A)))] = 81^2 = 2^{256}$~~

~~$= 4^{128}$~~

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

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

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

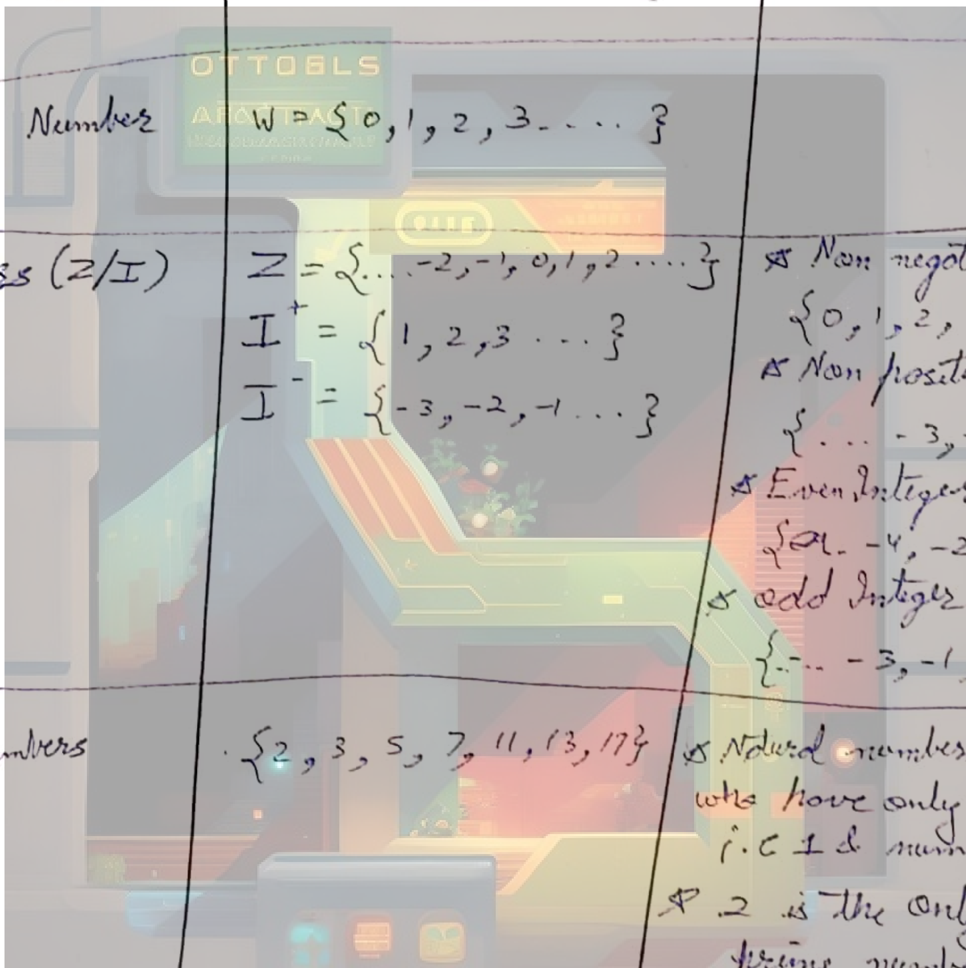
d = $n[P(P(P(A)))] = 2^{256}$

$= 256^{16}$

$= 65536^8$

Theory of Numbers

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



Type	Example	Special Point
1. Natural Numbers (N)	$N = \{1, 2, 3, 4 \ldots\}$	
2. Whole Number (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 & number itself * 2 is the only even prime number
5. composite Number	$\{4, 6, 8, 9, 10, 12, 14\}$	* Natural numbers except 1 who have more than 2 factors. * 4 is the smallest composite no

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)	$\frac{1}{2}, \frac{3}{5}, \frac{-9}{8}, \frac{7}{21}$	☆ 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. Complex Numbers (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

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

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

Q. find conjugate

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

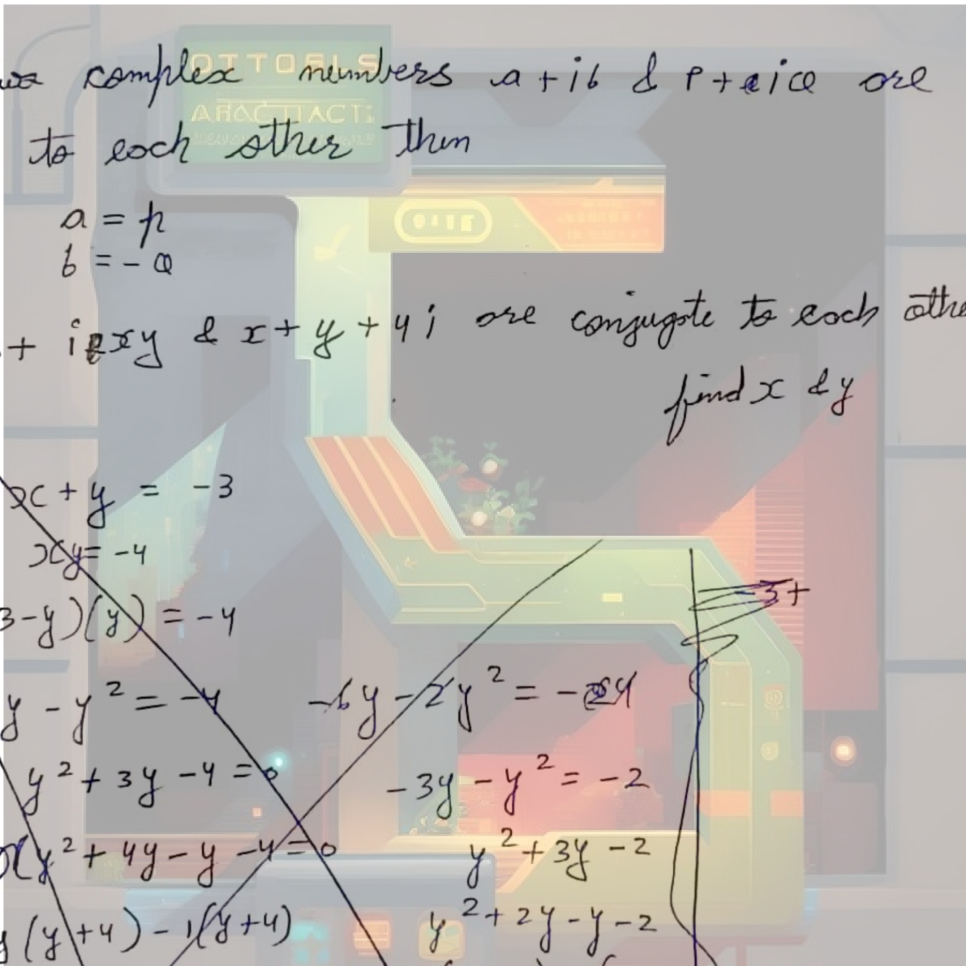
b) $\sqrt{2}+i3 \to \sqrt{2}-i3$

c) $i2-7 \to -7-i2$

$-3-i5 \to -3+i5$

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

$6 \to 6$



→ 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

$x+y = -3$

$xy = -4$

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

$-3y - y^2 = -4$ $\quad$ $-6y-2y^2 = -4$

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

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

$y(y+4)-1(y+4)$ $\quad$ $y^2+2y-y-2$

$(y-1)(y+4)$ $\quad$ $y(y+2)-1(y+2)$

$y=1$, $y=-4$ | $x=-4$, $y=1$ $\quad$ $\boxed{y=1,\ y=-2}$

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

$\boxed{-4,1}$

$\boxed{-2,1}$

(11) ~~Perfect nos.~~ =

$$x + y = -3$$

$$xy = -4$$

$$x = -3 - y$$

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

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

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

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

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

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

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

Note:-

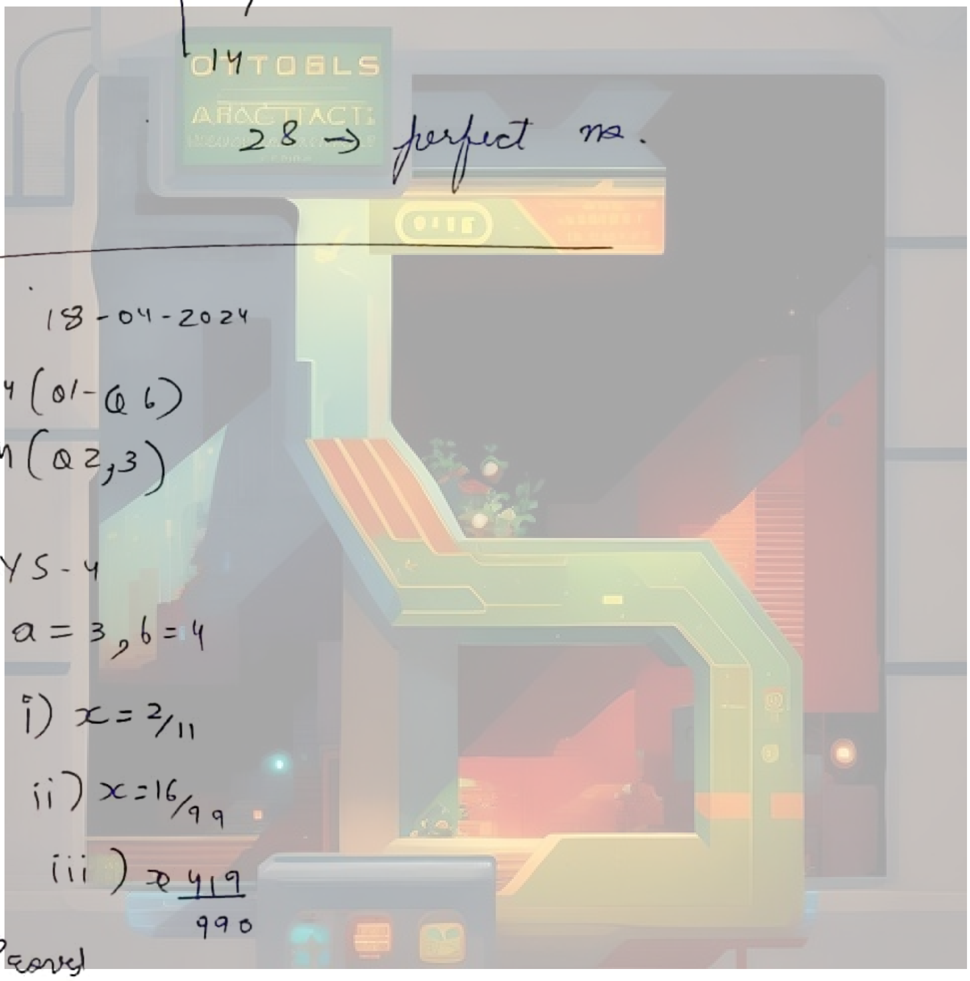
$$\boxed{Z \supset R \supset I \supset W \supset N}$$

11. Perfect number - Sum of proper divisors of a number is the number itself then it is called a perfect number.

eg. $6 \begin{cases} 1 \\ 2 \\ 3 \end{cases}$ $1+2+3=6$

$6 \rightarrow$ perfect no.

$28 \begin{cases} 1 \\ 2 \\ 4 \\ 7 \\ 14 \end{cases}$ $1+2+4+7+14 = 28$



$28 \rightarrow$ 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)

Note -

① Rational $\pm$ Irrational = Irrational

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

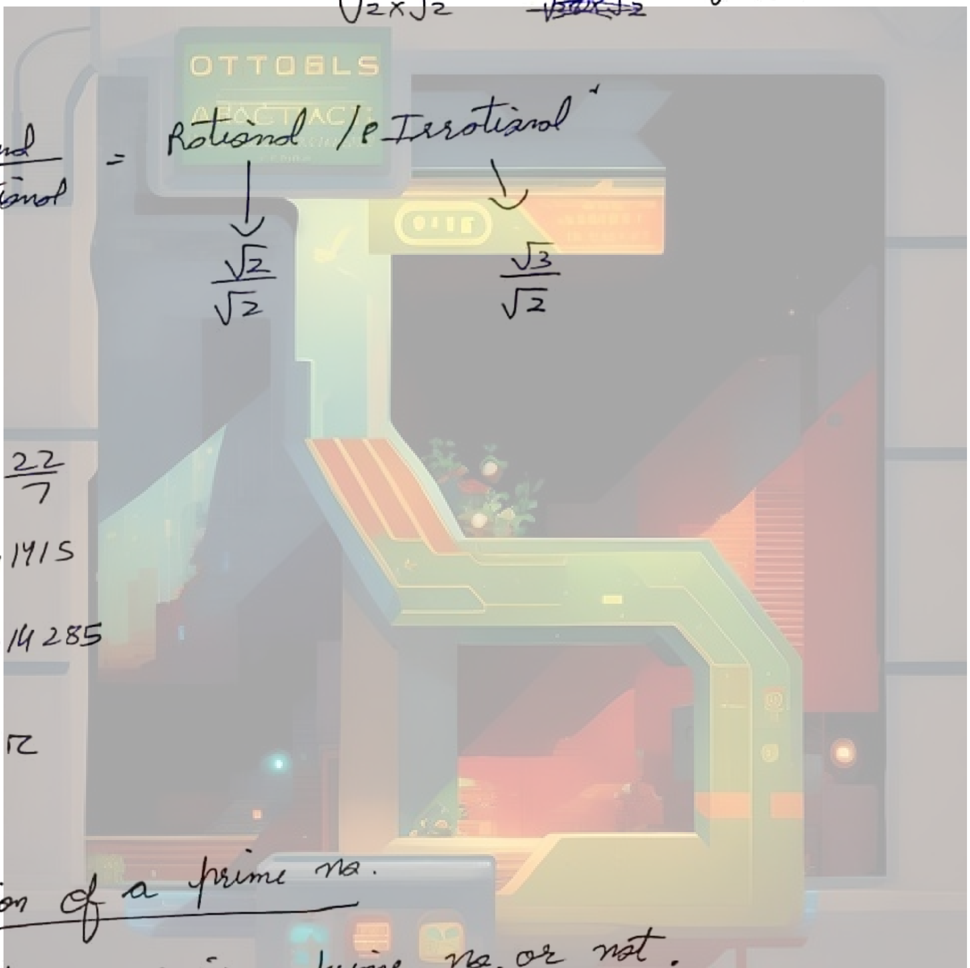
③ Irrational $\pm$ Irrational = Rational / Irrational

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

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

④ Irrational $\times$ Irrational = Rational / Irrational

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



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

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

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

$\pi = 3.1415$

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

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

Investigation of a prime no.

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

$\sqrt{17} = 4.$ something

2 & 3

$\dfrac{4.\text{som}}{2}$ × $\qquad$ $\dfrac{4.\text{som}}{3}$ ×

So 17 is a prime.

eg 2. 18

$\sqrt{18} = \cancel{4.\text{some}}$

$= 3\sqrt{2}$

divisible = 3

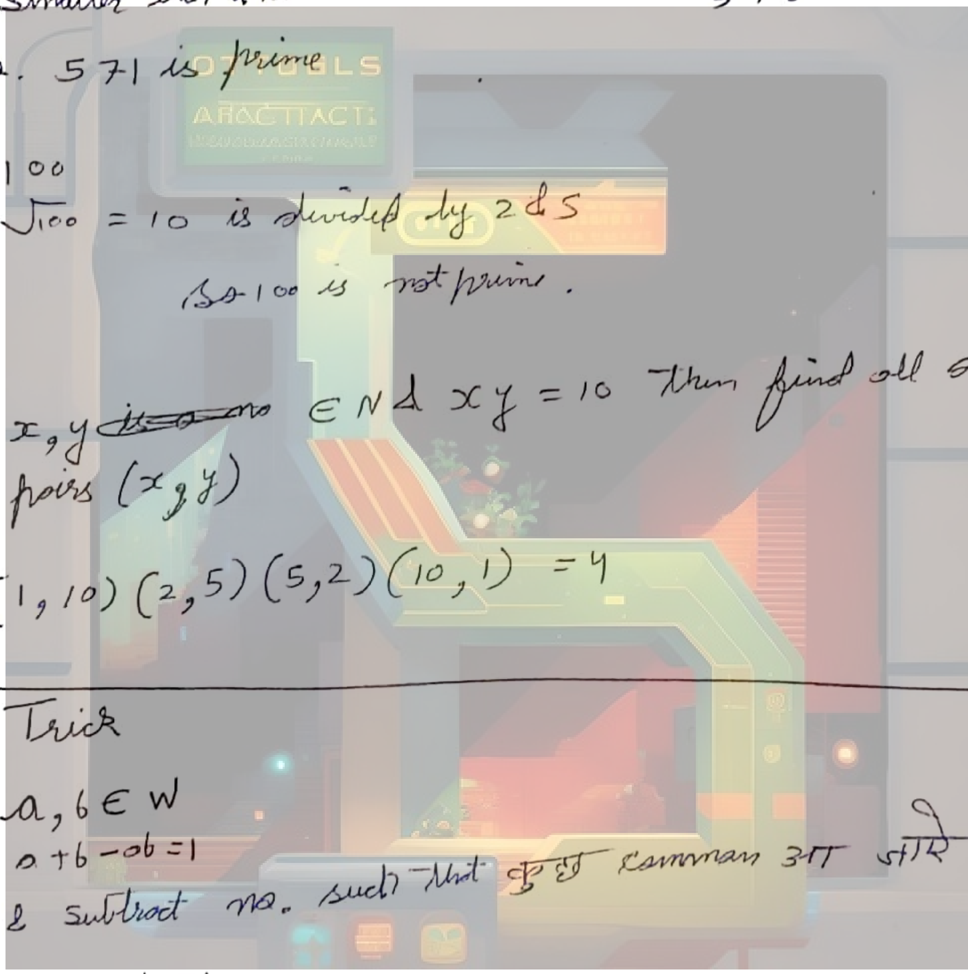
not prime

eg 3. 571

$\sqrt{571} = 23.\text{some}$

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

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



So. 571 is prime.

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 जाए

eg $a + b - ab = 1$

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

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

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

$b(1-a) - \cancel{(a-1)}(1-a) = 0$

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

$\boxed{a = 1 \\ b = 1}$

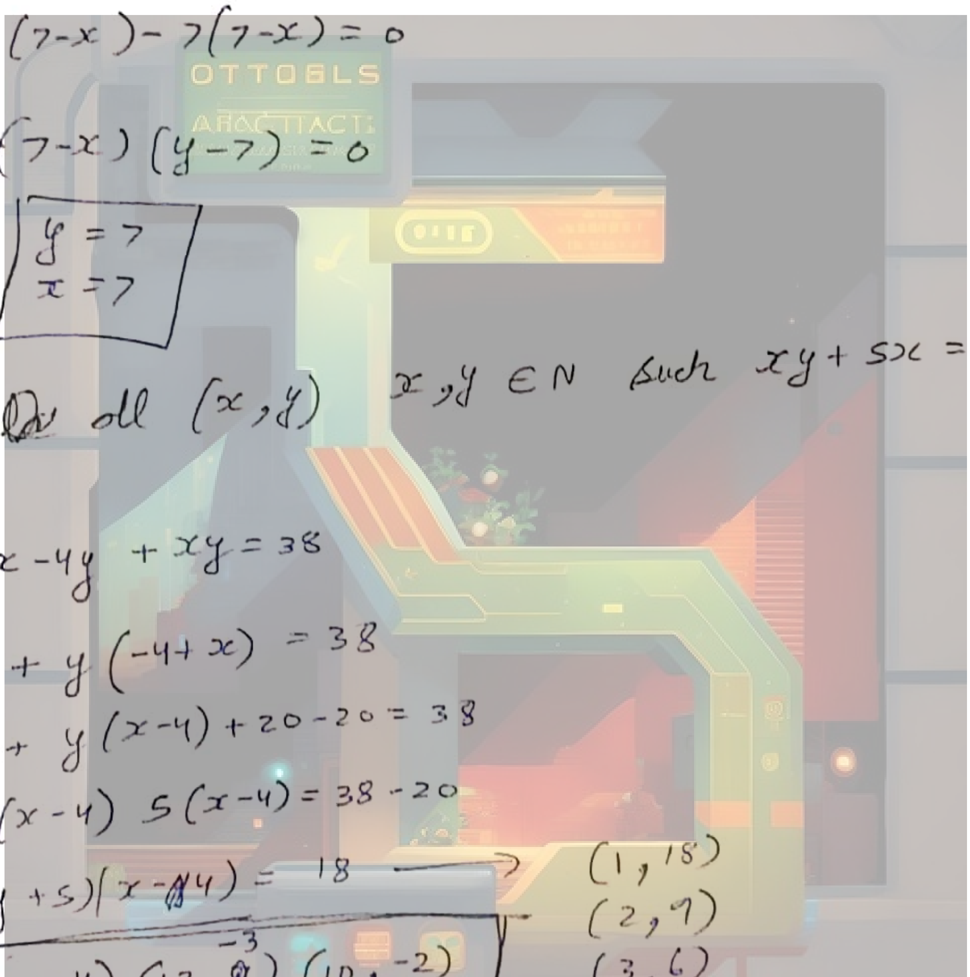
Q. $7x + 7y - xy = 49$ (factorise)

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

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

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

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



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

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

$$\boxed{\begin{aligned} y &= 7 \\ x &= 7 \end{aligned}}$$

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

$$5x - 4y + xy = 38$$

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

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

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

$$(y+5)(x-4) = 18 \longrightarrow$$

$(1, 18)$
$(2, 9)$
$(3, 6)$
$(6, 3)$
$(9, 2)$
$(18, 1)$

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

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

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

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)
a) are multiple of 3 or 5

500 + 200 + 1 = 701

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

= 233 + 140 + 1 (zero)
$\boxed{=378}$ - 47
$\boxed{=327}$

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

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

~~$373 - 467$~~

~~$373 - 467$~~

~~$\boxed{327} - 467$~~

~~$\boxed{280}$~~

~~$15)700($~~

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 +1~~

~~2 3 3~~

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.

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

$-66.66 \leq x \leq 166.6$

$-66 \leq x \leq 166$

$166-(-66)+1 = 233$ 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) $3 \Delta 5 = n(3) + n(5) - 2(n\, 3 \cap 5)$

$= 327 - 47$

$\boxed{= 280}$

Q which is greater?

① $\frac{8}{9}$ or $\frac{7}{8}$

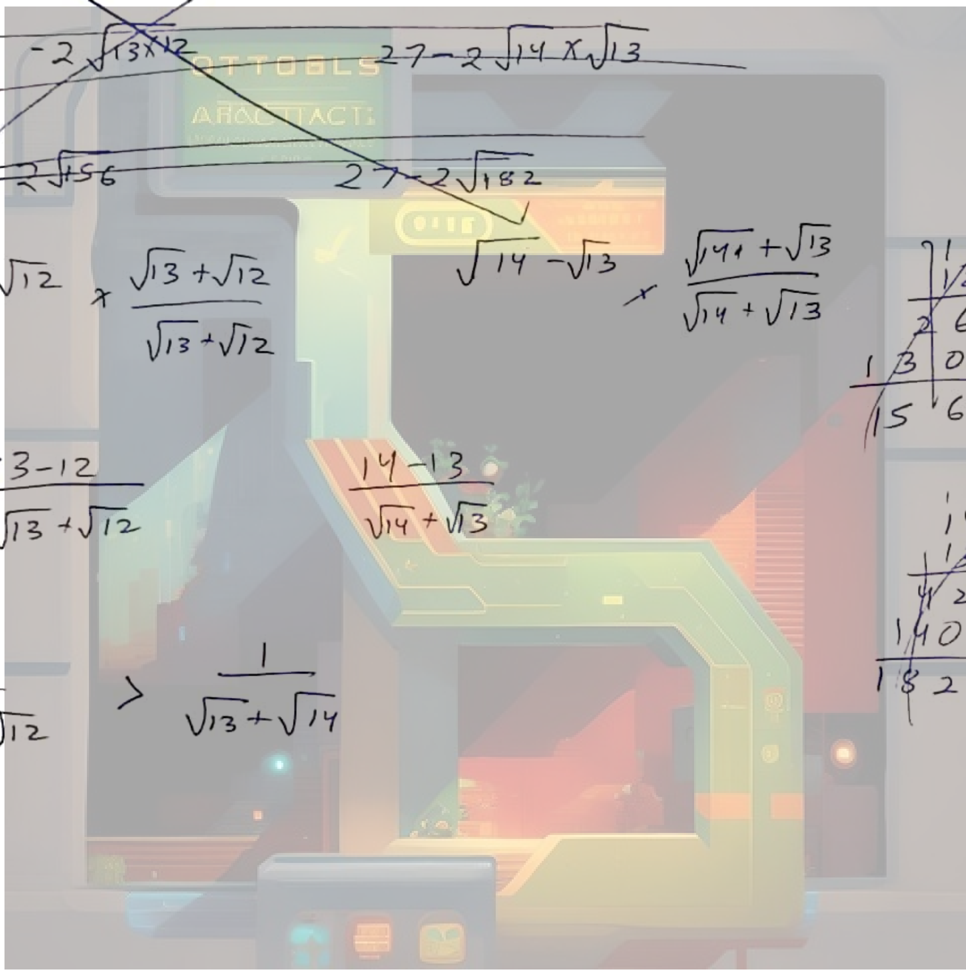
$$\frac{8}{9} > \frac{7}{8}$$

② $\cancel{\sqrt{13}-\sqrt{12} \text{ or } \sqrt{14}-\sqrt{13}}$

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

$\cancel{25-2\sqrt{13\times 12}}$ $\quad$ $\cancel{27-2\sqrt{14}\times\sqrt{13}}$

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



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

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

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

13
× 12
26
130
156

14
× 13
42
140
182

Divisiblity

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

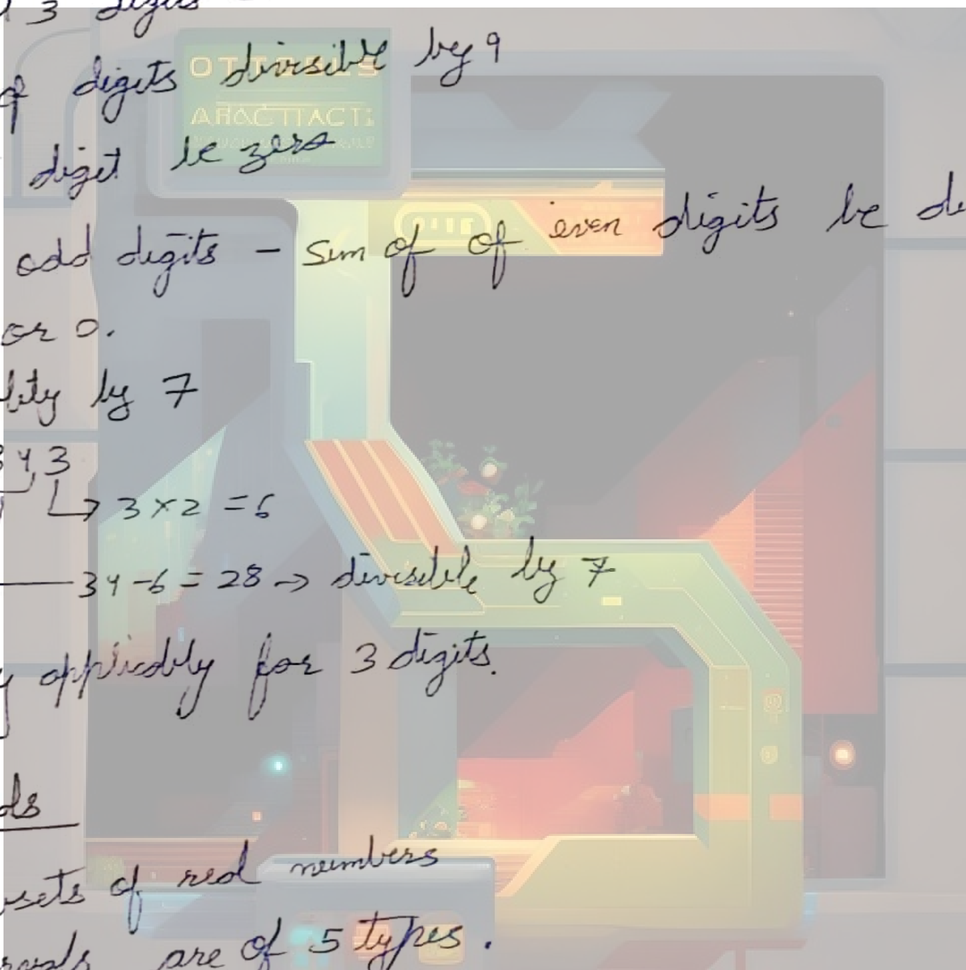
8 → last 3 digits should be divisible by 8

9 → Sum of digits divisible by 9

10 → last digit be zero

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

Divisiblity by 7



$$343$$

$$3 \times 2 = 6$$

$$34 - 6 = 28 \rightarrow \text{divisible by } 7$$

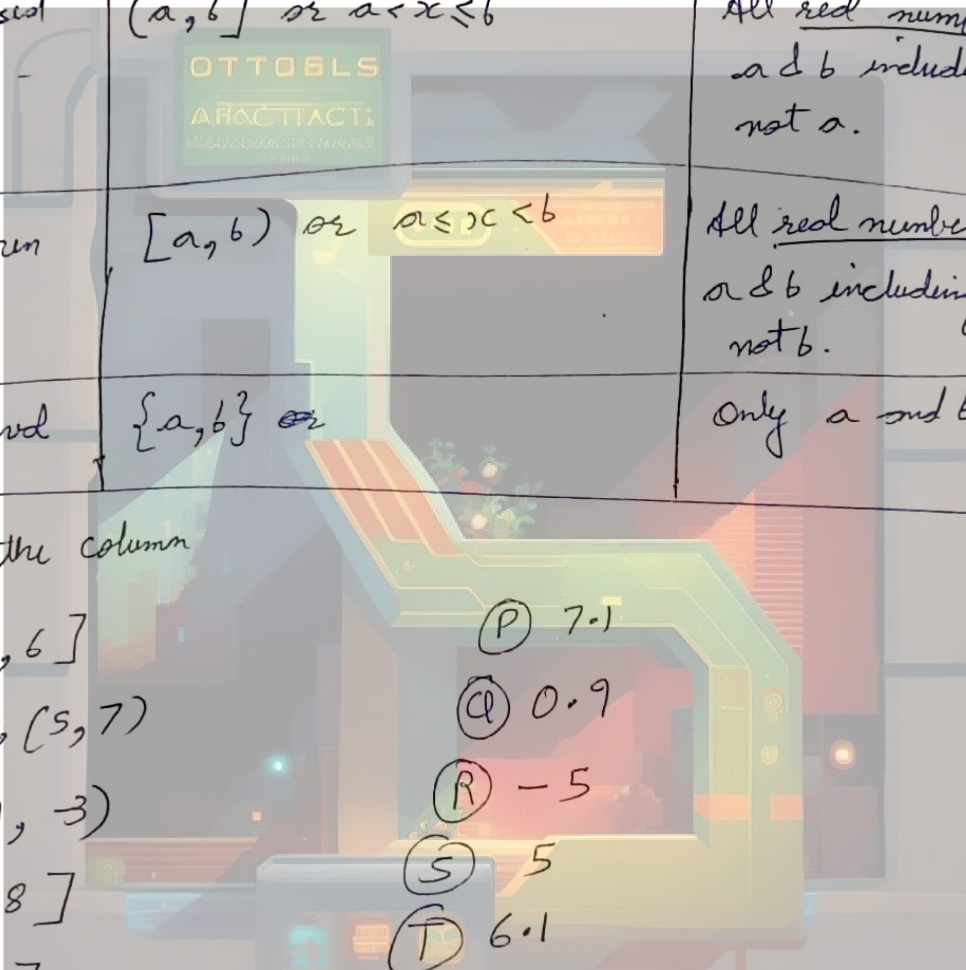
Only applicable for 3 digits.

Intervals

→ Subsets of real numbers

→ Intervals are of 5 types.

Interval	Notation (B > A)	Definition
① Closed Interval	$[a, b]$ or $a \leq x \leq b$	All real ~~nount~~ 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.



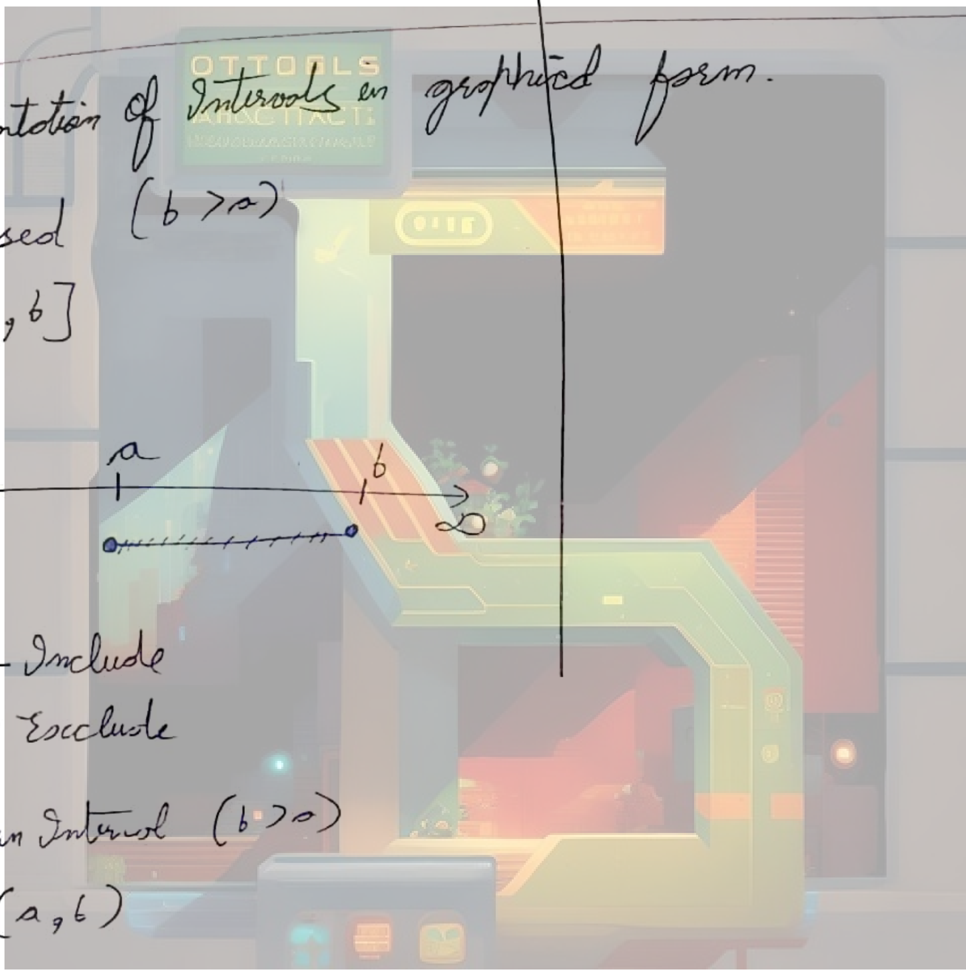
Q1. Match the column

(A) $[-3, 6]$	(P) 7.1
(B) $(5, 7)$	(Q) 0.9
(C) $(-9, -3)$	(R) −5
(D) $[0, 8]$	(S) 5
(E) $[6, 9]$	(T) 6.1
	(U) 4.3

(A) − Q S U
(B) − T
(C) − R
(D) − P Q S T U
(E) − P T

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 $(b > a)$

$[a, b]$

a b

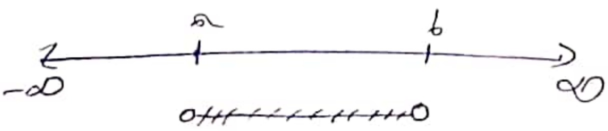
$-\infty$ ∞

• - Include

o - Exclude

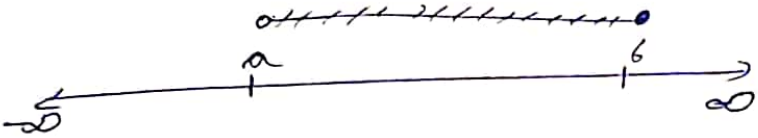
② Open Interval $(b > a)$

(a, b)



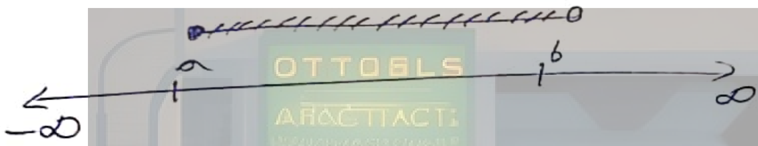
(3) Open-closed Interval

$(a, b]$



(4) Closed-open Interval

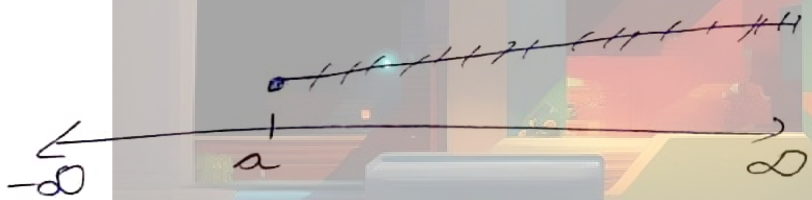
$[a, b)$



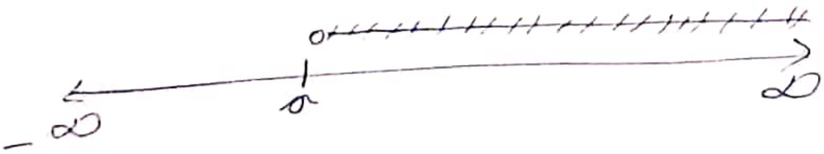
(5) Curly Interval

$\{a, b\}$

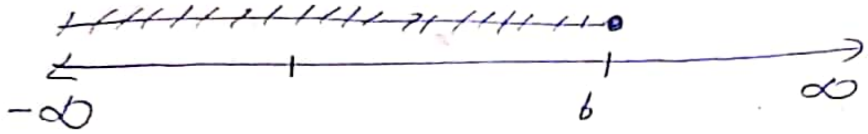
(6) $[a, \infty)$



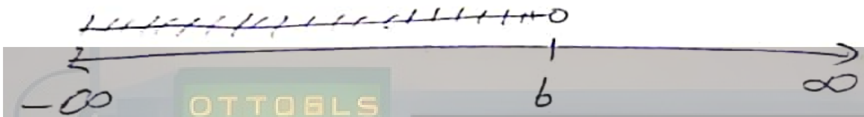
(7) (a, ∞)



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

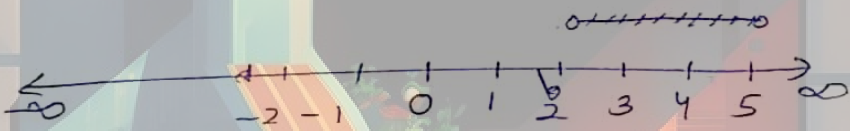


(9) $(-\infty, 6)$

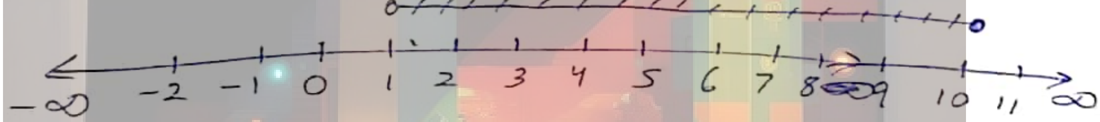


Q1. Represent the ~~sets~~ intervals on number line:

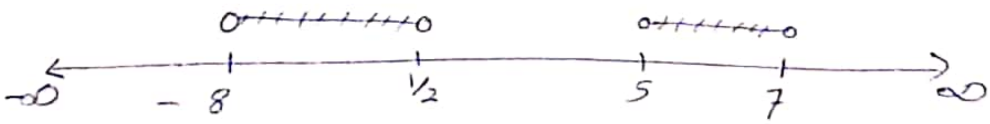
(1) $(2, 5)$



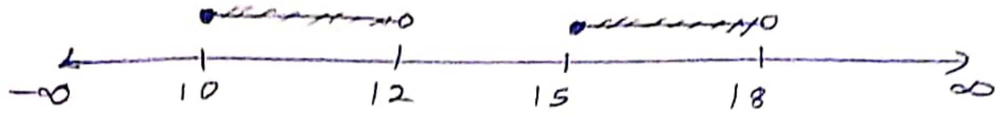
(2) $(1, 10]$



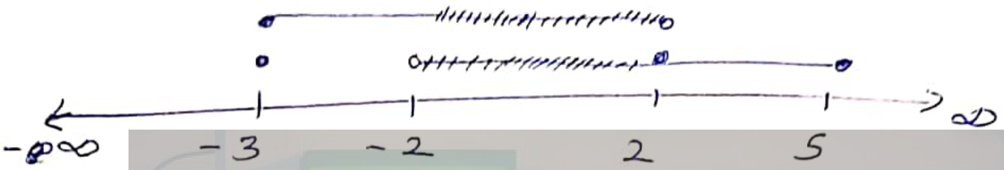
(3) $(-8, \frac{1}{2}) \cup (5, 7)$



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

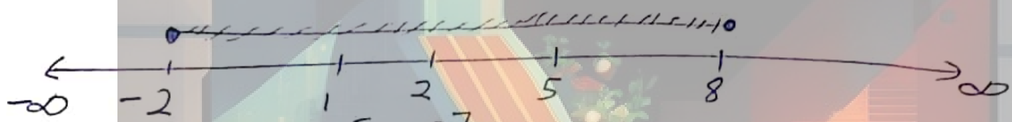


(5) $(-2, 5] \cap [-3, 2)$



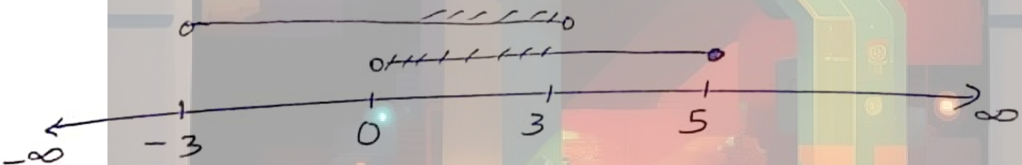
$(-2, 2)$

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



$[-2, 8]$

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



$(0, 3)$

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

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

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

H.W. 20-4-2024

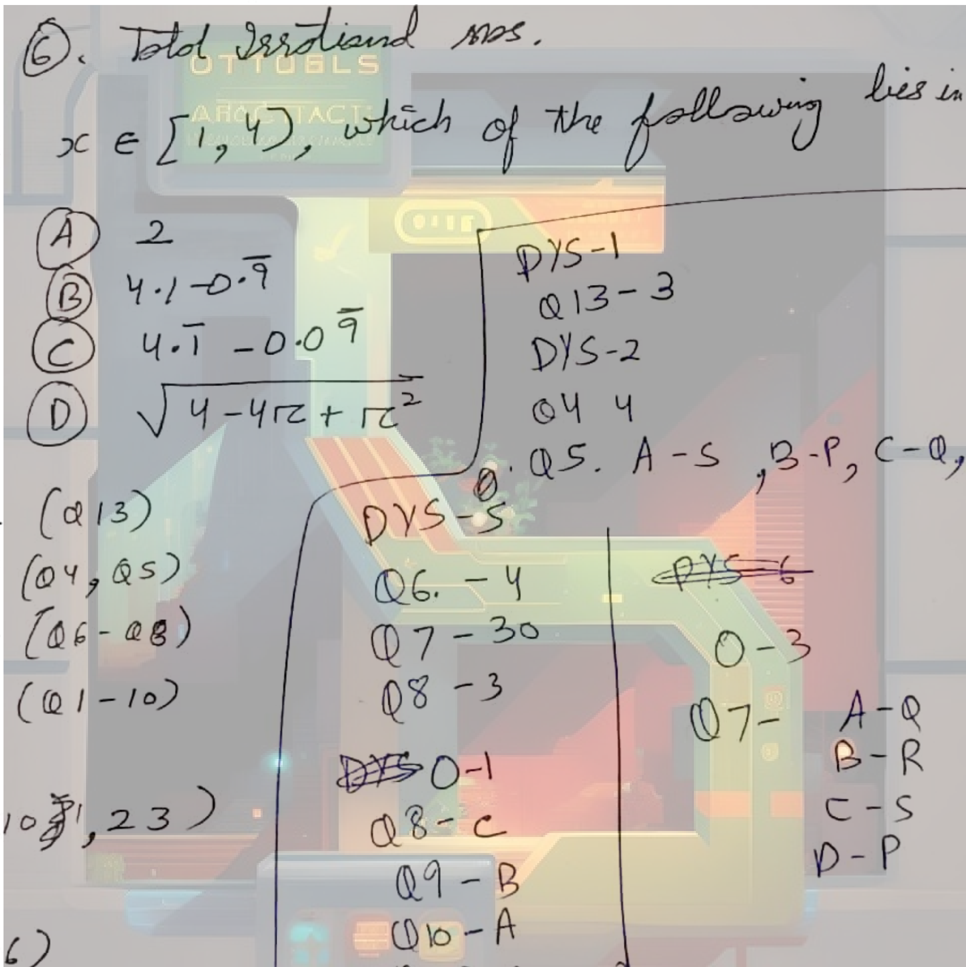
Q1. Represent [1, 4] or [-4, 1) on number line.

Q2. (-8, -1] ∪ [-3, 10] 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) $4.1 - 0.\bar{9}$
(C) $4.\bar{1} - 0.0\bar{9}$
(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, 11, 23)
O-2
(Q3, 5, 6)
O-3
(Q7)

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

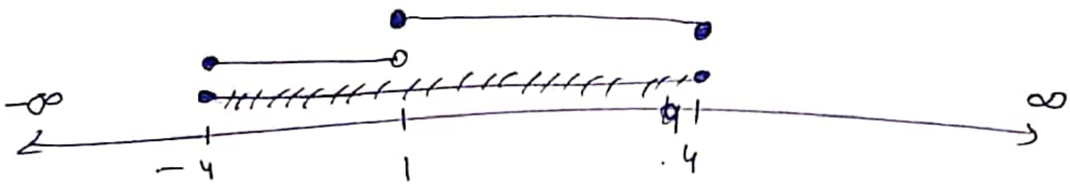
O-1
Q8 - C
Q9 - B
Q10 - A
Q23 B

O-2
Q3 AD
Q5 CD
Q6. AB

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

60

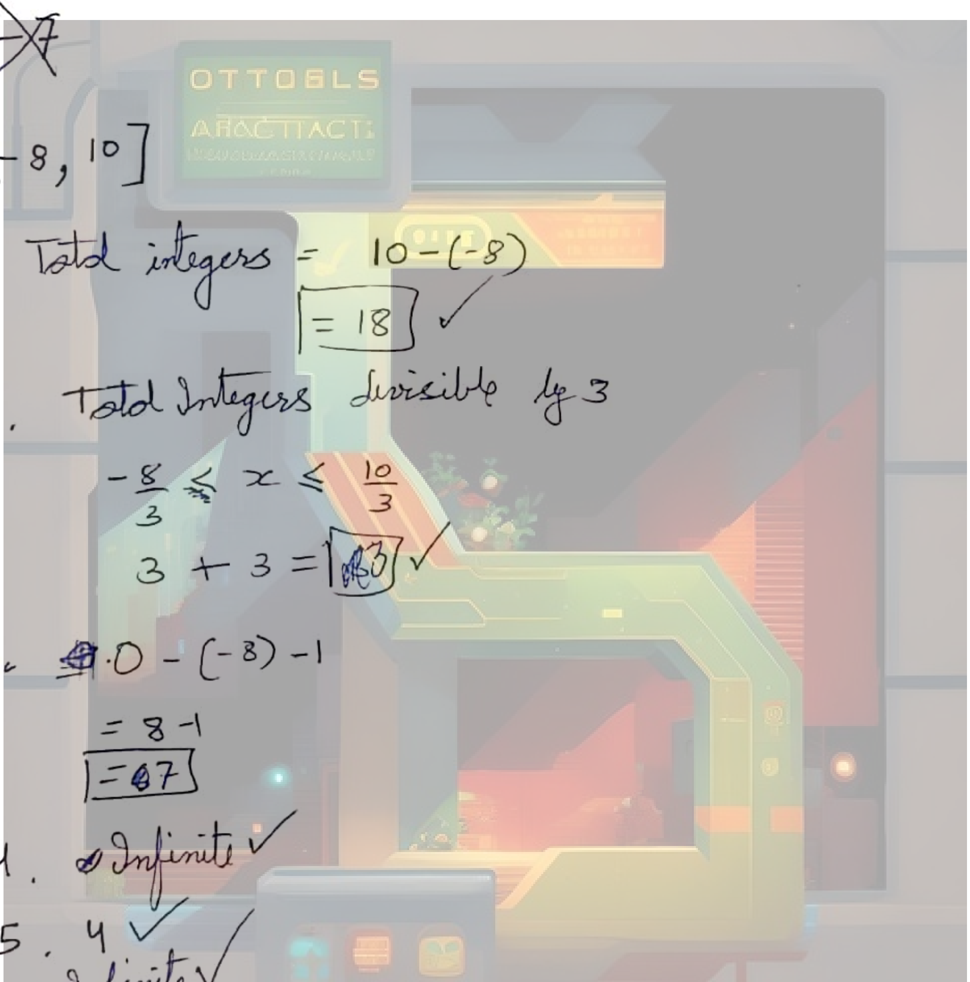
Q1. $[1, 4] \cup [-4, 1)$



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

$\cancel{[-7}$

$(-8, 10]$



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

$\boxed{= 18}$ ✓

2. Total Integers divisible by 3

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

$3 + 3 = \boxed{3}$ ✓

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

$= 8 - 1$

$\boxed{= 7}$

4. Infinite ✓

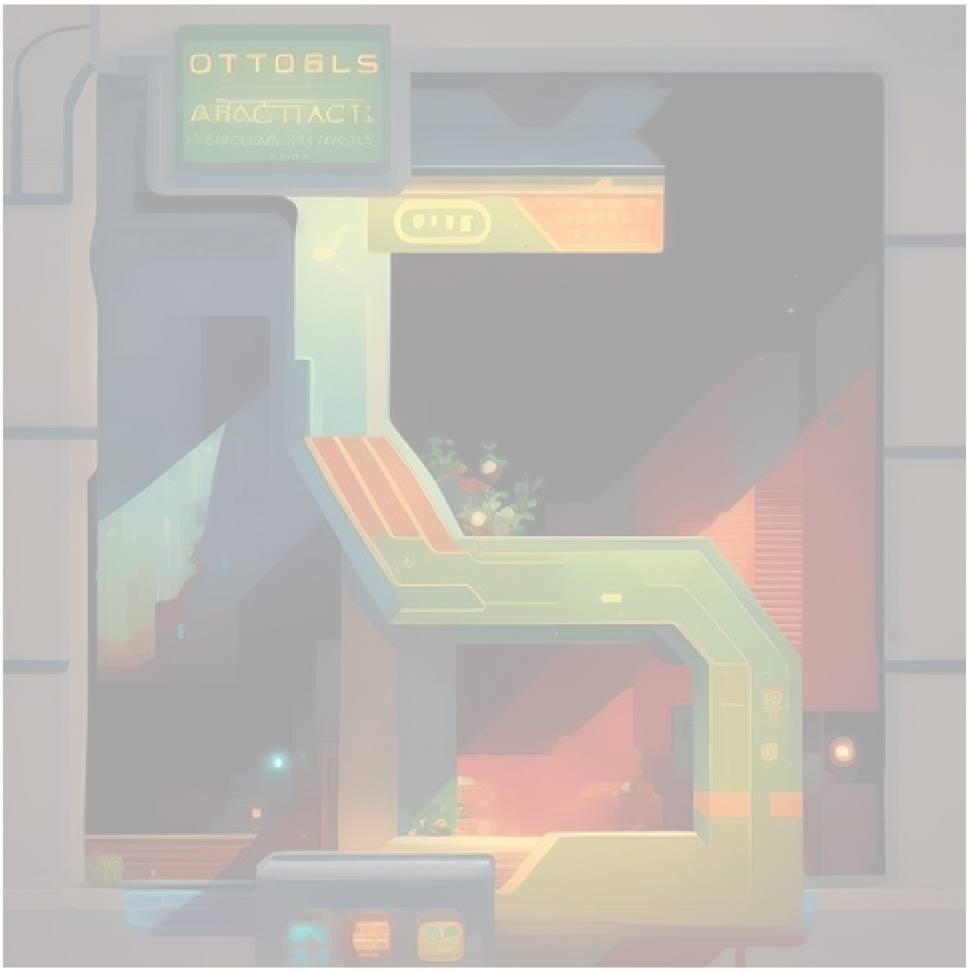
5. 4 ✓

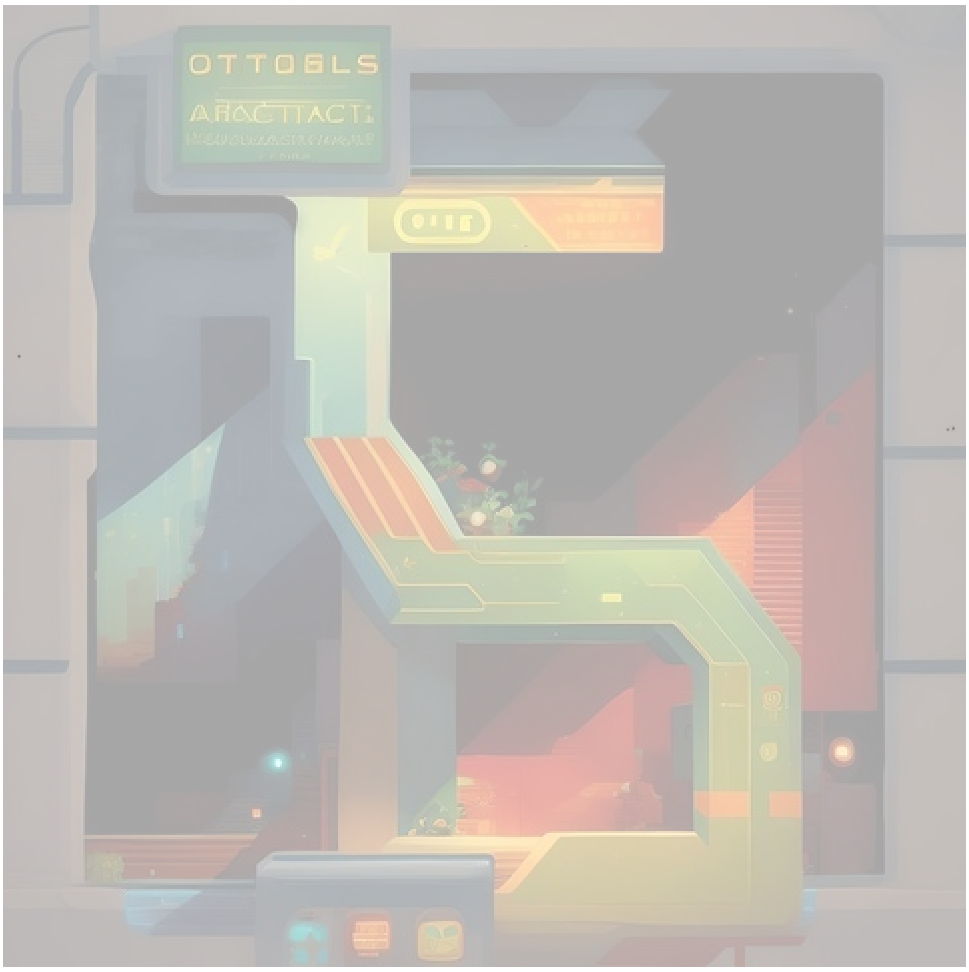
6. Infinite ✓

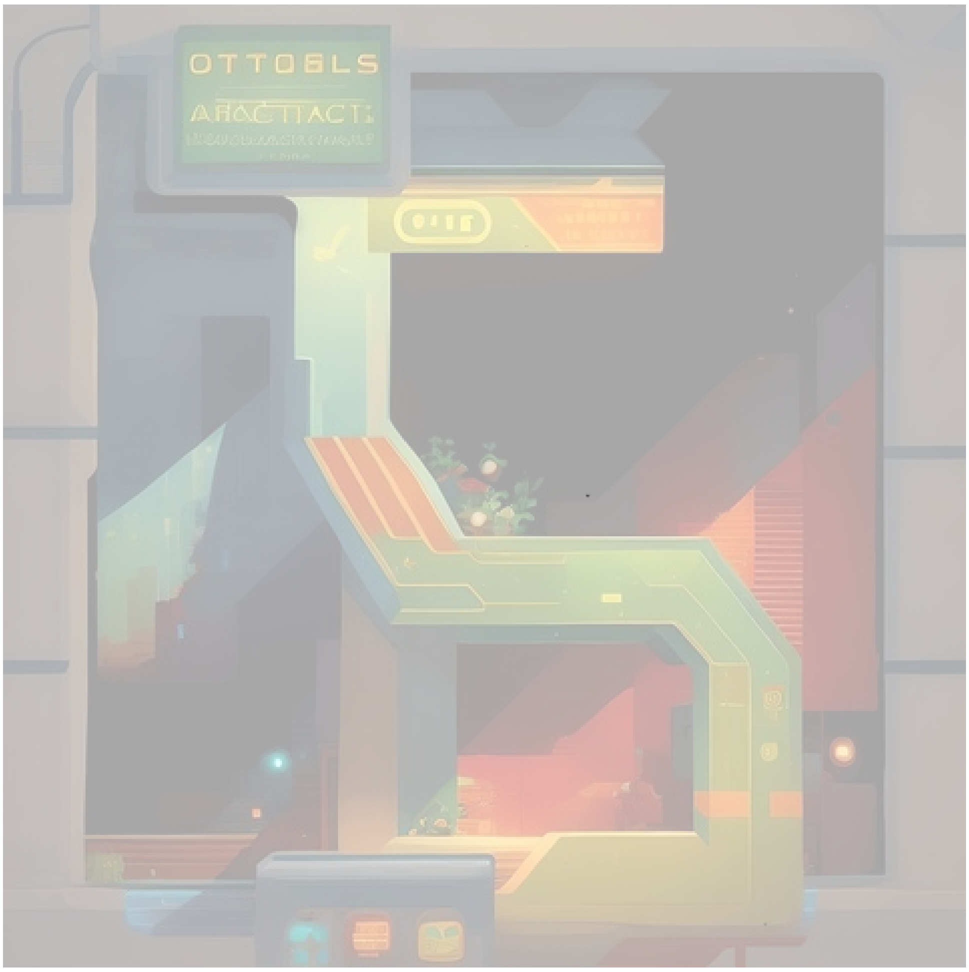
Q3. (A) (B) (B)

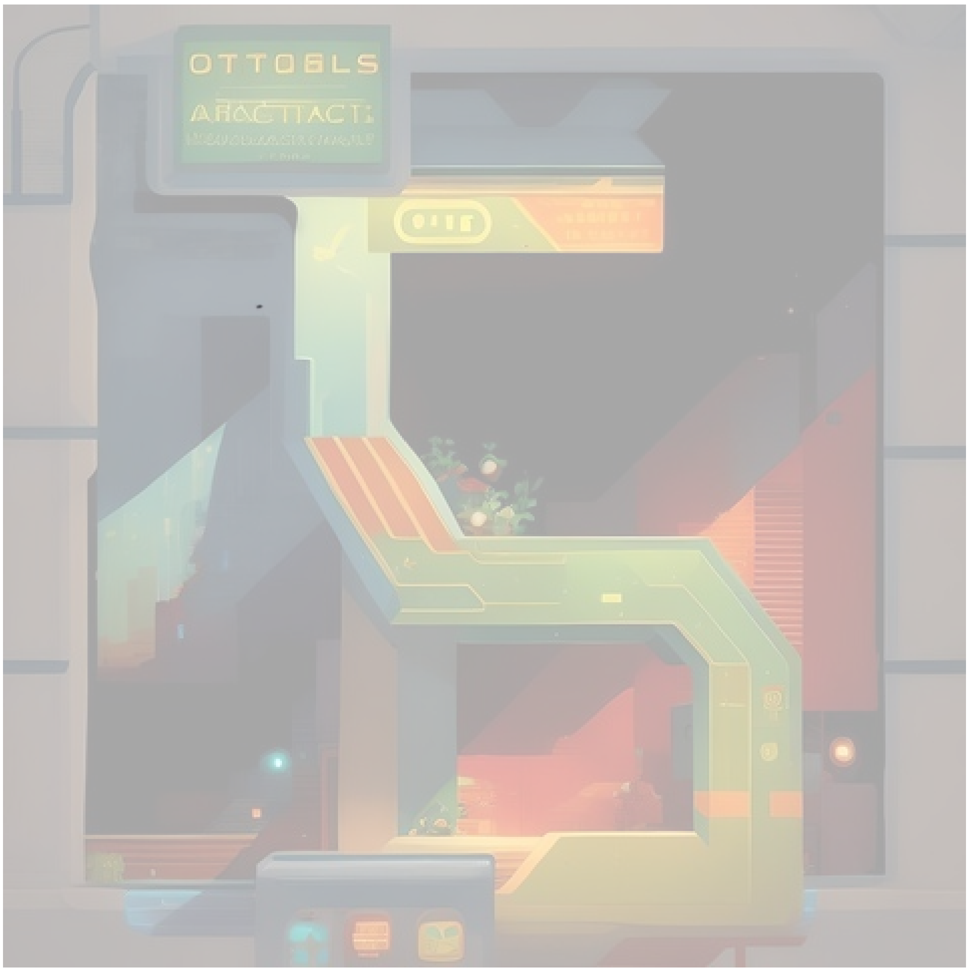
IYS-24

~~Q13~~





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