Assignment - 01

Q 1

(a) → Ans The total number of 3 digit numbers = $4 \times 3 \times 2 = 24$

Note repetition is not allowed in this case.

(b) Singleton Set:- It contains only one element. It is denoted by {a} Ex → S = {8}

Void set -: It's set not a element present.

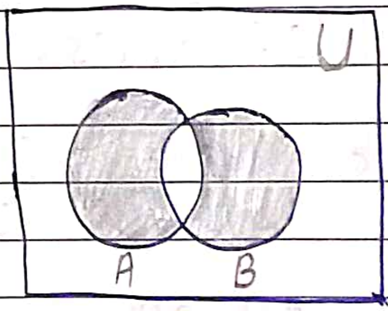
Ex → ϕ or { }

(c) Ans A multiset is an unordered collection of element.

(b) In this set element repeated.

(Ex) → {l, l, m, m, n, n, S, S, Y}

(d) Ans $A \oplus B$ = symmetric D. set's
$= (A \cup B) - (A \cap B)$



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2 →

(a) Ans Consider a relation P on the set N is given by $P = \{(a,b) \in N \times N :$ a divison of $b\}$.

Yes this is a set transitive.

because

Note The relation R is a $\{a, b, c\}$ as for every (a,b) (b,c) belong to R we have $(a,c) \in R$.

(b) Ans Power set any given set S is the set of all subsets of S and is denoted by P(S)

EX → $S = \{5, 7, 9\}$

$P(A) = 2^n \rightarrow 2^3$

$\boxed{= 8}$

subset

3 →

(1) $A \cap B = B \cap A$

Solve To Prove $A \cap B = B \cap A$

$A \cap B = \{x : x \in A$ and $x \in B\}$

($\because$ order is not preserved in case of set)

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

$B = \{3, 4, 2\}$

$\{2, 3\} = \{2, 3\}$ Proved

→ $A \cup B = B \cup A$

Ans $A \cup B = \{x : x \in A \text{ or } x \in B\} = \{x : x \in B \text{ or } x \in A\}$

$\subset$ $A \cup B = B \cup A$

Hence proved

EX $A = \{S, Y, R\}$
$B = \{S, Y, V\}$

$\{S, Y, R, V\} = \{S Y, R, V\}$ Proved

(b) $A \oplus U = A^c$ → this is called complement

Solve $A \cup A^c = U$

Every set is a subset of U

$\therefore A \cup A^c \subset U$ ——— (1)

we have show that $U \subseteq A \cup A^c$

let $x \in U$

→ $x \in A$ or $x \notin A$

$x \in A$ or $x \in A^c$

$x \in A \cup A^c$

$U \subseteq A \cup A^c$ ——— (2)

from (1) and (ii) we get $\boxed{A \cup A^c = U}$

(4) $\longrightarrow$

(a) $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap B| - |B \cap C|$
$+ |A \cap B \cap C|$

Solve

$A = \{1, 2, 3\}$
$B = \{3, 4, 5\}$
$C = \{4, 5, 6\}$

$|\{1,2,3,4,5,6\}| = |\{1,2,3\}| + |\{3,4,5\}|$
$+ |\{4,5,6\}| - |\{3\}|$
$- |\{3\}| - |\{4,5\}| + |\{3\}|$

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

(b) $\longrightarrow$ $(A \cup B) \subseteq (A \cup B \cup C)$

Solve we take an arbitary $x \in A \cap B \cap C$

$x \in A \cap B \cap C \longleftrightarrow x \in A \wedge x \in B \wedge x \in C$
$\longrightarrow$ $x \in A \wedge x \in B$

$\rightarrow$ $x \in A \cap B$. Thus we recpive
$A \cap B \cap C \subseteq A \cap B$

(5) Bijective = one to one
= onto

(a) Ans

$f(x) = 2x+1$

= Let $x_1, x_2 \in R$ and let us assume
$f(x_1) = f(x_2)$

$2x_1+1 = 2x_2+1$

$x_1 = x_2$

Hence we have $f(x_1) = f(x_2)$ one-one (injective)

$-\infty < x < \infty$
$-\infty < 2x < \infty$
$-\infty < 2x+1 < \infty$
$-\infty < f(x) < \infty$

(b) $f(x) = x^2+1$
we know that
$-\infty < x < \infty$
$0 \leq x^2 < \infty$
$1 \leq x^2+1 < \infty$
$1 \leq f(x) < \infty$

So, the co-Domain of f is R, but the range of F is $[1, \infty]$, So f(x) is not surjective

→ Hence f(x) not bijective

(b) Ans A = {4, 6, 8, 10}
R = {(4,4), (4,10), (6,6), (6,8)
(1) (8,10)} is relation on set A. Determine transitive closure of R.

So

$$M_R = \begin{array}{c|cccc} & 4 & 6 & 8 & 10 \\ \hline 4 & 1 & 0 & 0 & 1 \\ 6 & 0 & 1 & 1 & 0 \\ 8 & 0 & 0 & 0 & 1 \\ 10 & 0 & 0 & 0 & 0 \end{array}$$

$$M_R^2 = \begin{array}{c|cccc} & 4 & 6 & 8 & 10 \\ \hline 4 & 1 & 0 & 0 & 1 \\ 6 & 0 & 1 & 1 & 1 \\ 8 & 0 & 0 & 0 & 0 \\ 10 & 0 & 0 & 0 & 0 \end{array} \longrightarrow M_R^3 = \begin{array}{c|cccc} & 4 & 6 & 8 & 10 \\ \hline 4 & 1 & 0 & 0 & 1 \\ 6 & 0 & 1 & 1 & 1 \\ 8 & 0 & 0 & 0 & 0 \\ 10 & 0 & 0 & 0 & 0 \end{array}$$

$$M_R^4 = \begin{array}{c|cccc} & 4 & 6 & 8 & 10 \\ \hline 4 & 1 & 0 & 0 & 1 \\ 6 & 0 & 1 & 1 & 1 \\ 8 & 0 & 0 & 0 & 0 \\ 10 & 0 & 0 & 0 & 0 \end{array}$$

$M_{R^*} = M_R \vee M_R^2 \vee M_R^3 \vee M_R^4$

(ii) Given that $\sqrt{2}$

$\sqrt{2} = p/q$

$\Rightarrow 2 = (p/q)^2$ square on both side

$\Rightarrow 2q^2 = p^2$ —— (1)

$= p^2/2 = q^2$

so 2 divides p and q is a multiple of 2

$p = 2m$

$$p^2 = 4m^2 \quad \text{---} \quad (2)$$

from eq^n (1) and (2) we get

$$2q^2 = 4m^2$$

$$q^2 = 2m^2$$

q^2 is a multiple of 2

q is a m^n of 2

Hence p, q common factor 2.

$\sqrt{2}$ is an irrational number.