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Subject :- DM

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DM Assignment No :- 1

Q4

$$\begin{aligned} n(U) &= 60, & n(N \cap F) &= 9 \\ n(N) &= 25, & n(N \cap T) &= 11 \\ n(T) &= 28, & n(T \cap F) &= 8 \\ n(F) &= 26, & n(N \cap F) &= 8 \end{aligned}$$

For a) -

$$n(U) = n(N \cup T \cup F)$$

$$60 = n(N \cup T \cup F) + 8$$

$$n(N \cup T \cup F) = 52$$

Now,

$$\begin{aligned} n(N \cup T \cup F) &= n(N) + n(T) + n(F) - n(N \cap F) - n(N \cap T) \\ &\quad - n(T \cap F) + n(N \cap T \cap F) \end{aligned}$$

$$52 = 25 + 28 + 26 - 9 - 11 - 8 + n(N \cap T \cap F)$$

$$28 - 25 = n(N \cap T \cap F)$$

$$n(N \cap T \cap F) = 3$$

No. of people who read all 3 mag. is 3.

Q6 b - $n(N \cup T \cup F) - n(N \cap F) - n(N \cap T) - n(T \cap F) + 2(n(N \cap T \cap F))$

$$= 52 - 9 - 11 - 8 + 2(3)$$

$$= 52 - 28 + 6 = 30$$

$$= 30$$

N



Q5 Let $U = \{1, 2, 3, \dots, 60\}$

$$A = \{x : x \in U \text{ and divisible by } 2\}$$

$B = \{x : x \in U \text{ and divisible by } 3\}$

$C = \{x : x \in U \text{ and divisible by } 5\}$

$$\therefore |A| = \left\lfloor \frac{60}{2} \right\rfloor = \underline{30}, \quad |B| = \left\lfloor \frac{60}{3} \right\rfloor = \underline{20}, \quad |C| = \left\lfloor \frac{60}{5} \right\rfloor = \underline{12}$$

$$|A \cap B| = \left\lfloor \frac{60}{6} \right\rfloor = \underline{10}$$

(divisible by 2 and 5)

$$|B \cap C| = \left\lfloor \frac{60}{15} \right\rfloor = \underline{4}, \quad |A \cap C| = \left\lfloor \frac{60}{10} \right\rfloor = \underline{6}$$

$$|(A \cap B \cap C)| = \left\lfloor \frac{60}{30} \right\rfloor = \underline{2}$$

By inclusion and exclusion principle,

$$\begin{aligned} |(A' \cap B' \cap C')| &= |U| - |(A \cup B \cup C)| \\ &= |U| - \left[|A| + |B| + |C| - (|A \cap B|) - |A \cap C| \right. \\ &\quad \left. + |B \cap C| - |A \cap B \cap C| \right] \\ &= 60 - (30 + 20 + 12 - 10 - 6 - 4 + 2) \\ &= \underline{16} \end{aligned}$$

There no.s are -1, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 49, 53, 59.

$$|A \cap C| - |A \cap B \cap C| = 6 - 2 = 4$$

$$\text{Hence } |B \cap C| - |A \cap B \cap C| = 4 - 2 = 2$$

Hence, the no. div by 5 but not by 2, 3 = $12 - 4 - 2 - 2 = \underline{4}$

No.s are = 5, 25, 35, 55.

Q.8-

P = "Swimming at the New Jersey Shore is allowed"

q = "Sharks have been spotted near the shore"

(a) $\neg q$ = "Sharks have not been spotted near the shore"

(b) $P \wedge q$ = "Swimming at the New Jersey shore is allowed and Sharks have been spotted near the shore."

(c) $\neg P \vee q$ = "Swimming at the New Jersey shore is not allowed or sharks have been spotted near the shore".

Q.9-

c. Truth Table: $(P \rightarrow q) \vee (\neg P \rightarrow x)$.

P	q	x	$P \rightarrow q$	$\neg P$	$\neg P \rightarrow x$	$(P \rightarrow q) \vee (\neg P \rightarrow x)$
T	T	T	T	F	T	T
T	T	F	T	F	T	T
T	F	T	F	F	T	T
T	F	F	F	F	T	T
F	T	T	T	T	T	T
F	T	F	T	T	F	T
F	F	T	T	T	T	T
F	F	F	T	T	F	T

Q.11. $\neg(P \vee q) = \neg P \wedge \neg q$ (by De Morgan's law)

Also by truth table

P	q	$P \vee q$	$\neg(P \vee q)$	$\neg P$	$\neg q$	$\neg P \wedge \neg q$
T	T	T	F	F	F	F
T	F	T	F	F	T	F
F	T	T	F	T	F	F
F	F	F	T	T	T	T

From truth table it is clear that $\neg(P \vee q)$ and $\neg P \wedge \neg q$ are equivalent.

$$18.2 - (p \rightarrow (\neg q \rightarrow r)) \wedge (p \rightarrow \neg q) \rightarrow (p \rightarrow r)$$

Assuming that given Statement is in following manner.

$$(A) \wedge (B) \rightarrow (C).$$

$$\rightarrow (\neg p \vee (\neg q \rightarrow r)) \wedge \neg (p \rightarrow \neg q) \vee (p \rightarrow r)$$

$$(\neg p \vee (q \vee r)) \wedge \neg (\neg p \vee \neg q) \vee (\neg p \vee r)$$

$$(\neg p \vee (\neg q \vee r)) \wedge (p \wedge q) \vee (\neg p \vee r)$$

$$\rightarrow (\neg p \vee \neg (q \vee r)) \wedge (p \vee (\neg p \vee r)) \wedge (q \vee (\neg p \vee r)).$$