	SETS ***Class XI***	
Q.1)	Is it true for any sets A and B ; $P(A) \cup P(B) = P(A \cup B)$. Justify your answer.	
Sol.1)	To check: $P(A) \cup P(B) = P(A \cup B)$ Let $A = \{1,2\}$ and $B = \{2,3\}$ $P(A) = \{\langle 1\rangle, \langle 2\rangle, \langle 1,2\rangle, \not\subset\}$; $P(B) = \{\langle 2\rangle, \langle 3\rangle, \langle 2,3\rangle, \emptyset\}$ $A \cup B = \{1,2,3\}$ $P(A \cup B) = \{\langle 1\rangle, \langle 2\rangle, \langle 3\rangle, \langle 1,2\rangle, \langle 2,3\rangle, \langle 3,1\rangle, \langle 1,2,3\rangle, \emptyset\}$ $P(A) \cup P(B) = \{\langle 1\rangle, \langle 2\rangle, \langle 3\rangle, \langle 1,2\rangle, \langle 2,3\rangle, \not\subset\}$ Clearly, $P(A) \cup P(B) \neq P(A \cup B)\ ans.$	
Q.2)	State and prove $DE - MORGAN'S\ LAW$.	
Sol.2)	De-Morgan's Law (i)$(A \cup B)^1 = A^1 \cap B^1$ Let $x \in (A \cup B)^1$ $\Rightarrow x \notin (A \cup B)$ $\Rightarrow x \notin \mathrm{A}$ and $x \notin \mathrm{B}$ $\Rightarrow x \in \mathrm{A}^1$ and $x \in \mathrm{B}^1$ $\Rightarrow x \in \mathrm{A}^1 \cup \mathrm{B}^1$ $\therefore (A \cup B)^1 \subset A^1 \cap B^1$ .... (1) Now let $y \in A^1 \cap B^1$ $\Rightarrow y \notin (A \cup B)$ $\Rightarrow y \in \mathrm{A}^1$ and $y \in \mathrm{B}^1$ $\Rightarrow y \notin \mathrm{A}$ and $y \notin \mathrm{B}$ $\Rightarrow y \notin (A \cup B)$ $\Rightarrow y \in (A \cup B)^1$ $\therefore A^1 \cap B^1 \subset (A \cup B)^1$ .... (2) From (1) and (2), $(A \cup B)^1 = A^1 \cap B^1$(proved) (ii) $(A \cap B)^1 = A^1 \cup B^1$ Let $x \in (A \cap B)^1$ $\Rightarrow x \notin (A \cap B)$ $\Rightarrow x \notin \mathrm{A}$ or $x \notin \mathrm{B}$ $\Rightarrow x \in \mathrm{A}^1$ or $x \in \mathrm{B}^1$ $\Rightarrow x \in (\mathrm{A}^1 \cup \mathrm{B}^1)$ $\therefore (A \cap B)^1 \subset A^1 \cup B^1$ .... (1) Now let $y \in A^1 \cup B^1$ $\Rightarrow y \in \mathrm{A}^1$ or $x \in \mathrm{B}^1$ $\Rightarrow y \notin \mathrm{A}$ and $y \notin \mathrm{B}$ $\Rightarrow y \notin A \cap B$ $\Rightarrow y \in (A \cap B)^1$ $\therefore A^1 \cup B^1 \subset (A \cap B)^1$ .... (2) (proved) From (1) and (2), $(A \cap B)^1 = A^1 \cup B^1$(proved)	
Q.3)	State and prove DISTRIBUTIVE LAW.	
Sol.3)	(i)$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ Let $x \in A \cup (B \cap C)$ $\Rightarrow x \in \mathrm{A}$ and $x \in (B \cap C)$ $\Rightarrow x \in \mathrm{A}$ or $(x \in B\ and\ x \in C)$ $\Rightarrow (x \in \mathrm{A}$ or $x \in \mathrm{B})$ and $(x \in A\ or\ x \in C)$	

SELF	$\Rightarrow x \in (A \cup B)$ and $x \in (A \cup C)$ $\Rightarrow x \in [(A \cup B) \cap (A \cup C)]$ $\therefore A \cup (B \cap C) \subset (A \cup B) \cap (A \cup C)$ ……. (1) Now let $y \in (A \cup B) \cap (A \cup C)$ $\Rightarrow y \in (A \cup B)\ and\ (A \cup C)$ $\Rightarrow (y \in A$ or $y \in B)$ and $(y \in A$ or $y \in C)$ $\Rightarrow y \in A$ or $y \in (B \cap C)$ $\Rightarrow y \in A \cup (B \cap C)$ $\therefore (A \cup B) \cap (A \cup C) \subset A \cup (B \cap C)$ ……. (2) From (1) and (2), $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ (proved) (ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	
Q.4)	Two finite sets have $m\ and\ n$ elements. The number of elements in the power set of first set is 48 more than the number of elements in power set of the second set. find the values of $m\ and\ n$.	
Sol.4)	Let two sets are A and B Given $n(A) = n$ and $n(B) = m$ No. of subsets of Set A = 2^n (OR) No. of elements in P(A) No. of subsets of Set B = 2^m (OR) No. of elements in P(B) Given that, $2^n - 2^m = 48$ $\Rightarrow 2^n - 2^m = 48$ $\Rightarrow 2^n - 2^m = 64 - 16$ $\Rightarrow 2^n - 2^m = 2^6 - 2^4$ Compare both sides, $n = 6\ and\ m = 4$ ans.	
Q.5)	if A=$\not\subset$, fond $P(A), P(P(A))$ and $P\left(P(P(A))\right)$	
Sol.5)	A=$\not\subset$ $\Rightarrow n(A) = 0$ No. of subsets of $A = 2^0 = 1$ Subsets $=\not\subset$ $\therefore P(A) = \{\not\subset\}$ Here, $n(P(A)) = 1$ No. of subsets of $P(A) = 2^1 = 2$ Subsets $= \{\not\subset\}, \not\subset$ $\therefore P(P(A)) = \{\not\subset\}, \not\subset$ Here, $n\left(P(P(A))\right) = 2$ No. of subsets of $\left(P(P(A))\right) = 2^2 = 4$ Subsets $= \{\{\not\subset\}\}, \{\not\subset\}, \{\{\not\subset\}, \not\subset\}, \not\subset$ $\therefore \left(P(P(A))\right) = \{\{\not\subset\}\}, \{\not\subset\}, \{\{\not\subset\}, \not\subset\}, \not\subset$ ans.	
Q.6)	Show that $A - (B - C) = (A - B) \cup (A \cap C)$	
Sol.6)	L.H.S. $A - (B - C)$ = $A - (B \cap C^1)$ ……… $\{A - B = A \cap B^1\}$ = $A \cap (B \cap C^1)^1$ ………… $\{A - B = A \cap B^1\}$ = $A \cap (B^1 \cup C)$ …….. $\{De - morgan's\ law\}$ = $(A \cap B^1) \cup (A \cap C)$ …….. $\{Distributive\ property\}$ = $(A - B) \cup (A \cap C)$ R.H.S. ans.	

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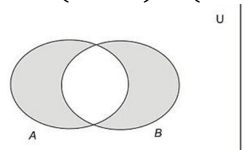
Q.7)	Draw Venn diagram of $A\Delta B$	
Sol.7)	$\Delta\rightarrow$is called "Symmetric Difference" $A\Delta B = (A - B) \cup (B - A)$ 	
Q.8)	Write in Roster Form $A = \{x: x\ is\ a\ positive\ number\ less\ than\ 10\ and\ 2^{x-1}\ is\ an\ odd\ number\}$	
Sol.8)	$A = \{1,2,3,4,5,6,7,8,9\}$ Since, 2^{x-1} is always an odd no. for all $x < 10$	
Q.9)	Show that $(A - B) \cap (C - B) = (A \cap C) - B$	
Sol.9)	L.H.S. $(A - B) \cap (C - B)$ = $(A \cap B^1) \cap (C \cap B^1)$ …….. $\{A - B = A \cap B^1\}$ = $(A \cap C) \cap B^1$ ……… $\{Distributive\ property\}$ = $(A \cap C) - B$ R.H.S. (proved)	
Q.10)	If $y = \{t: t^3 = t; t \in R\}$	
Sol.10)	$t^3 = t$ $\Rightarrow t^3 - t = 0$ $\Rightarrow t(t^2 - 1) = 0$ $\Rightarrow t = 0, t = \pm 1$ $\therefore y = \{0, -1, 1\}$ ans.	