Tutorial 2 week 6

1.

a) $(L \cap M) \cup (N \cap L)$

$= (L \cap M) \cup (L \cap N)$ Commutative Laws

$= L \cap (M \cup N)$ Distributive Laws inverse

b) $(R \cup B) \cap (B \cap D)$

$= (B \cup R) \cap (B \cap D)$ Commutative Laws

$= B \cup (R \cap D)$ Distributive laws inverse

c) $(M \cup B) \cap \bar{B}$

$= (M \cap \bar{B}) \cup (B \cap \bar{B})$ Distributive laws

$= (M \cap \bar{B}) \cup \varnothing$ Complement Laws

$= (M \cap \bar{B})$ Identity Laws

d) $M \cup (B \cap \bar{B})$

$= M \cup \varnothing$ Complement Laws

$= M$ Identity Laws

e) $(K \cap P) \cup \bar{K}$

$= (K \cup \bar{K}) \cap (P \cup \bar{K})$ Distributive Laws

$= \Omega \cap (P \cup \bar{K})$ Complement Laws

$= (P \cup \bar{K}) \cap \Omega$ Commutative Laws

$= (P \cup \bar{K})$ Identity laws

f) $K \cap (P \cup \bar{K})$

$= (K \cap P) \cup (K \cap \bar{K})$ Distributive Laws

$= (K \cap P) \cup \emptyset$ Complement Laws

$= K \cap P$ Identity laws

g) $(K \cup \bar{K}) \cap L$

$= \Omega \cap L$ Complement laws

$= L$ Identity laws

n) $(R \cap T) \cup \bar{R}$

$= (R \cup \bar{R}) \cap (T \cup \bar{R})$ Distributive Laws

$= \Omega \cap (T \cup R)$ Complement laws

$= T \cup R$ Identity laws

o) $\bar{K} \cap (S \cup K)$

$= (\bar{K} \cap S) \cup (\bar{K} \cap K)$ Distributive laws

$= (\bar{K} \cap S) \cup \emptyset$ Complement laws

$= \bar{K} \cap S$ Identity laws

p) $(M \cap \bar{N}) \cup \bar{M}$

$= (M \cup \bar{M}) \cap (\bar{N} \cup \bar{M})$ Distributive laws

$= \Omega \cap (\bar{N} \cup \bar{M})$ Complement laws

$= \bar{N} \cup \bar{M}$ Identity laws.

k) $(\bar{M} \cup \bar{N}) \cup N$

$= \bar{M} \cup (\bar{N} \cup N)$ Associative laws

$= \bar{M} \cup (N \cup \bar{N})$ Commutative laws

$= \bar{M} \cup \Omega$ Complement laws

$= \bar{M}$ Identity laws

l) $((M \cap \bar{N}) \cup \bar{M}) \cup N$

$= ((M \cup \bar{M}) \cap (\bar{N} \cup \bar{M})) \cup N$ Distribution laws

$= (\Omega \cap (\bar{N} \cup \bar{M})) \cup N$ Complement laws

$= (\bar{N} \cup \bar{M}) \cup N$ Identity laws

$= N \cup (\bar{N} \cup \bar{M})$ Commutative laws

$= (N \cup \bar{N}) \cup \bar{M}$ Associative laws

$= \Omega \cup \bar{M}$ Complement laws

$= \Omega$ Identity laws

m) $T \cap (M \cap \bar{T})$

$= (M \cap \bar{T}) \cap T$ Commutative laws

$= M \cap (\bar{T} \cap T)$ Associative laws

$= M \cap \emptyset$ Complement laws

$= M$ Identity laws

n) $\bar{T} \cap (M \cup T)$

$= (\bar{T} \cap M) \cup (\bar{T} \cap T)$ Distribution laws

$= (\bar{T} \cap M) \cup \emptyset$ Complement laws

$= \bar{T} \cap M$ Identity laws

o) $(T \cap M) \cup (\bar{T} \cap M)$

$= (T \cup \bar{T}) \cap M$ Inverse Distribution laws

$= \Omega \cap M$ Complement laws

$= M$ Identity laws

p) $((X \cup Z) \cap \bar{Z}) \cup (X \cap Z)$

$= ((X \cap \bar{Z}) \cup (Z \cap \bar{Z})) \cup (X \cap Z)$ Distribution laws

$= ((X \cap \bar{Z}) \cup \emptyset) \cup (X \cap Z)$ Complement laws

$= (X \cap \bar{Z}) \cup (X \cap Z)$ Identity laws

$= X \cup (\bar{Z} \cap Z)$ Inverse Distribution laws

$= X \cup \emptyset$ Complement laws

$= X$ Identity laws

q) $(A \cup (\bar{A} \cap B)) \cap (A \cup C)$

$= ((A \cup \bar{A}) \cap (A \cup B)) \cap (A \cup C)$ Distribution laws

$= (\Omega \cap (A \cup B)) \cap (A \cup C)$ Complement laws

$= (A \cup B) \cap (A \cup C)$ Identity laws

$= A \cup (B \cap C)$ Inverse Distribution laws

r) $(X \cup \bar{Y}) \cap ((X \cup Y) \cap (Y \cup \emptyset))$

$= (X \cup \bar{Y}) \cap ((X \cup Y) \cap Y)$ Identity laws

$= ((X \cup \bar{Y}) \cap (X \cup Y)) \cap Y$ Associative laws

$= (X \cup (\bar{Y} \cap Y)) \cap Y$ Inverse Distribution laws

$= (X \cup \emptyset) \cap Y$ Complement laws

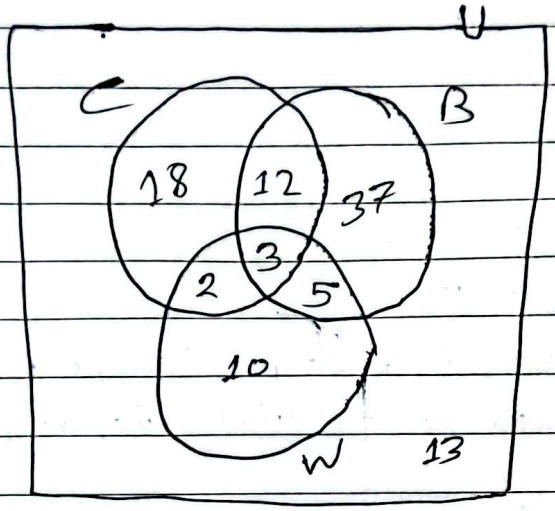
$= X \cap Y$ Identity laws

2.

Sol: Given,

$n(U) = 100\%$

Went to Camping	$n(C) = 35\%$	$n(A)$
Went to Beach	$n(B) = 57\%$	$n(B)$
Went to Waterslide	$n(W) = 20\%$	$n(C)$
Went to Camping & beach	$n(C \cap B) = 15\%$	$n(A \cap B)$
Went to beach & waterslide	$n(B \cap W) = 8\%$	$n(B \cap C)$
Went to Camping & Waterslide	$n(C \cap W) = 5\%$	$n(A \cap C)$
All three	$n(C \cap B \cap W) = 3\%$	$n(A \cap B \cap C)$



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

$n(B \cup W) = 57 + 20 - 8$

$= 69\%$

b) $n(C \cup W) = 35 + 20 - 5$

$= 50\%$

c) $n_0(C) + n_0(B) + n_0(W)$

$18 + 37 + 10$

65%

d) $\overline{(A \cup B \cup C)} = n(U) - n(A \cup B \cup C)$

Where,

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

$= 35 + 57 + 20 - 15 - 8 - 5 + 3$

$= 115 - 28$

$= 87\ \%$

now,

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

$= 100 - 87$

$= 13\ \%$

3.

Sol? Given,

$n(U) = 28$

part time job $n(A) = 12$

Volunteer work : Students who do part time job or do regular volunteer job - students who do part time job only

2.

Sol: Given,

Total number of students in class $n(U) = 28$

Number of students who like tea $n(T) = 12$

Number of students who like coffee $n(C) = x$, let $n(C) = x$

$n(T \cap C) = 2$

$n(T \cup C)' = 4$

We know that,

$n(T \cup C) = n(T) + n(C) - n(T \cap C)$

$\Rightarrow 28 - 4 = 12 + x - 2$

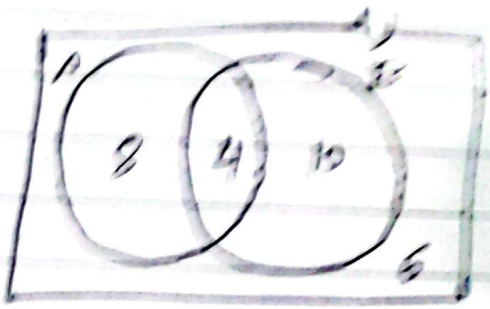
$\Rightarrow 24 = 10 + x$

$\Rightarrow x = 24 - 10$

$\Rightarrow x = 14$

$\therefore n(C) = 14$

a)



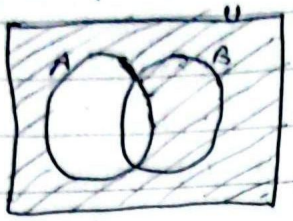
b) $n(T \cup C)' = n(U) - n(T \cup C)$

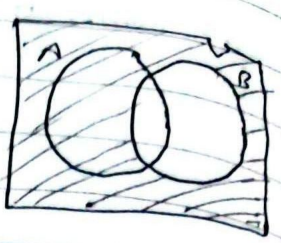
$= 28 - 22$

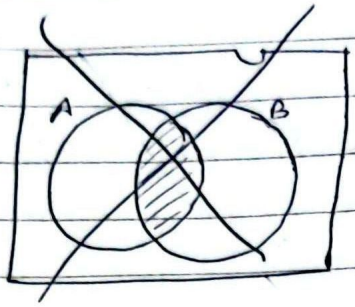
$= 6$

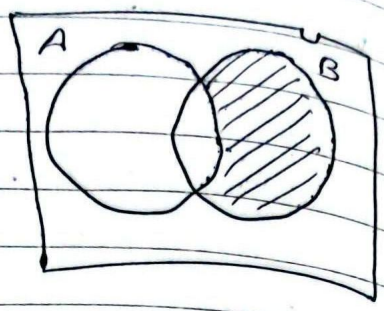
4.

a) $(\bar{A} - \bar{B})$

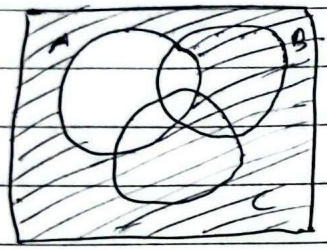
$\bar{A}$ = 

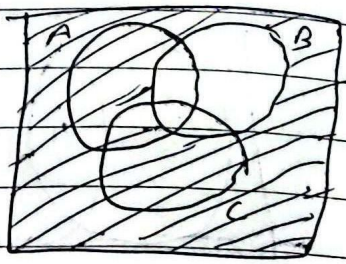
$\bar{B}$ = 

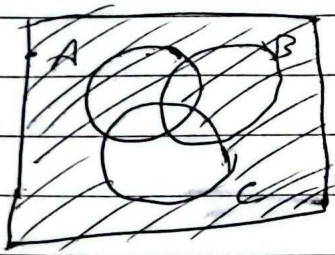
$\bar{A} - \bar{B}$ = 

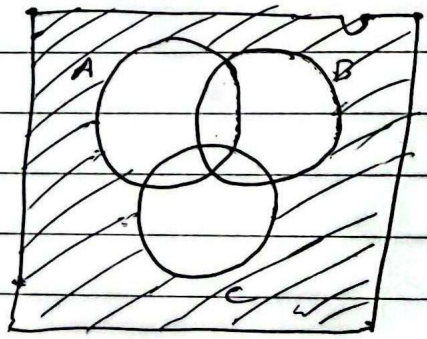


b) $\bar{A} \cap \bar{B} \cap \bar{C}$

$\bar{A}$ = 

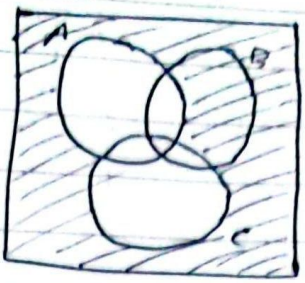
$\bar{B}$ = 

$\bar{C}$ = 

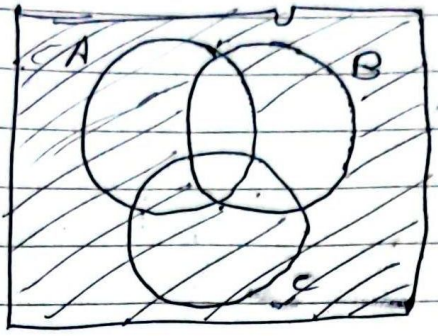
$\bar{A} \cap \bar{B} \cap \bar{C}$ 

c) $(\bar{A} \cap \bar{C}) \cup \bar{B}$

$\bar{A} \cap \bar{C} =$

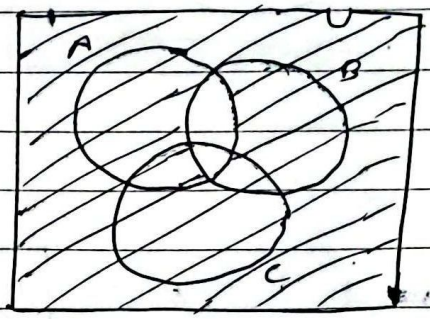


$(\bar{A} \cap \bar{C}) \cup \bar{B}$

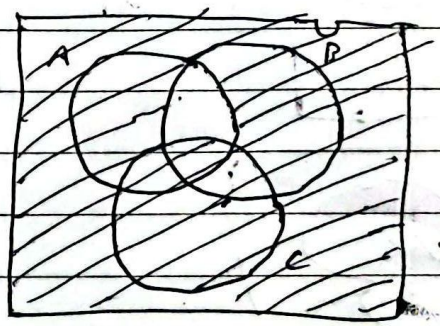


d) $\overline{(A \cap B)} \cup C$

$\overline{(A \cap B)} =$



$(\overline{A \cap B}) \cup C) =$

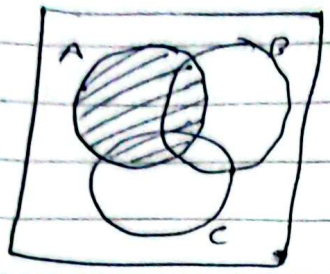


e $A \cup \bar{B} \cup \bar{C}$

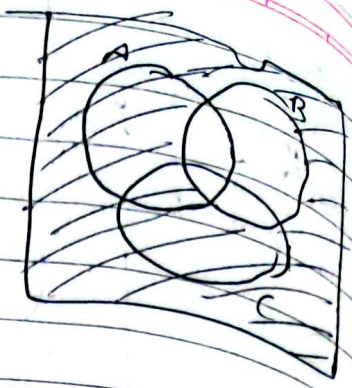
4.

a:

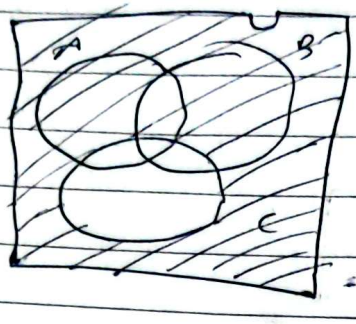
$A =$



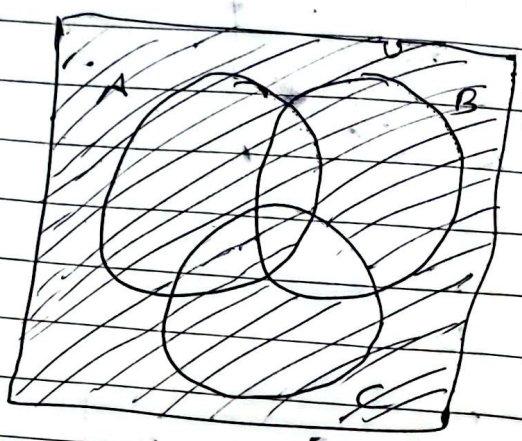
$\bar{B} =$



$\bar{C} =$

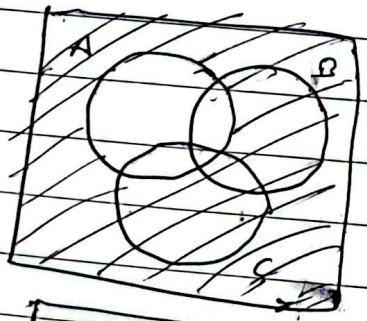


$A \cup \bar{B} \cup \bar{C} =$

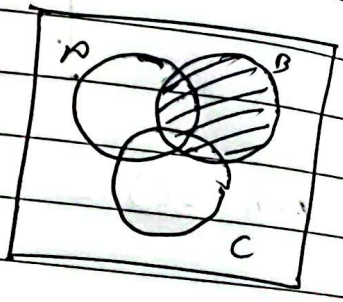


f. $\bar{A} \cup B \cup C$

$\bar{A} =$



$B =$



$C =$