Tutorial 1

1 Bus, Train & Automobile

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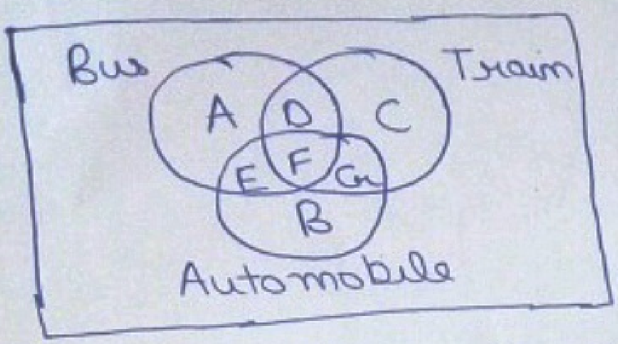


30 people in Bus, ie. $A+D+E+F=30 \Rightarrow A+D=15$

35 people in Train, ie. $C+D+G+F=35 \Rightarrow C+D=15$

100 people in Automobile, ie $E+F+G+B=100$

Bus & Automobile $\longrightarrow$ $E+F=15$

Train & Automobile $\longrightarrow$ $F+G=20$

All three people $\longrightarrow$ $F=5$

Bus & Train $\hookrightarrow$ $D+F=15$

Solving the equations,

$E=10, G=15, F=5, B=70, D=10, A=C=5$

Total people, $A+B+C \cdots + G$
$= 120$

Method 2

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

$$= 30+35+100-15-20-15+5$$
$$= 120$$

Total 120 students,

$\{2,4,6 \cdots 120\} \rightarrow$ opt for physics (A)

Total $\rightarrow$ 60 students

$\{5,10,15 \cdots 120\} \rightarrow$ opt for chemistry (B)

Total $\rightarrow$ 24 students

$\{7,14,21 \cdots 119\} \rightarrow$ opt for Maths (C)

Total $\rightarrow$ ~~18~~ 17 students

$A \cap B \rightarrow \{10,20,30 \cdots 120\}$

$= 12$ students

$B \cap C \rightarrow \{35,70,105\}$

$= 3$ students

$A \cap C \rightarrow \{14,28,42 \cdots 112\}$

$= 8$ students

$A \cap B \cap C \rightarrow \{70\}$

$= 1$ student

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

$$= 60 + 24 + 17 - 12 - 3 - 8 + 1$$

$$= \cancel{69}\ 79$$

Students who opted for none were 41 students

3. (a) $A_i = \{0, i\}$ | $\bigcup_{i=1}^{n} A_i = \{0,1,2,3 \cdots \infty\}$

Set of natural numbers

$\bigcap_{i=1}^{n} A_i = \{0\}$

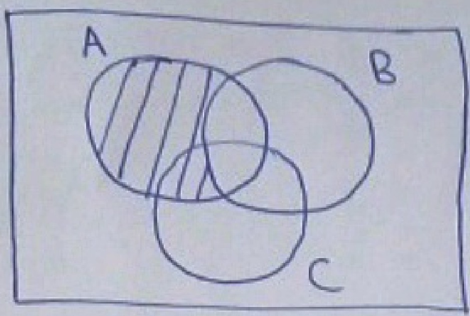
(b) $A_i = \{\cdots -2,-1,0,1,2,\cdots i\}$ | $\bigcup_{i=1}^{n} = \{\cdots -2,-1,0,1,2 \cdots\}$

Set of all integers

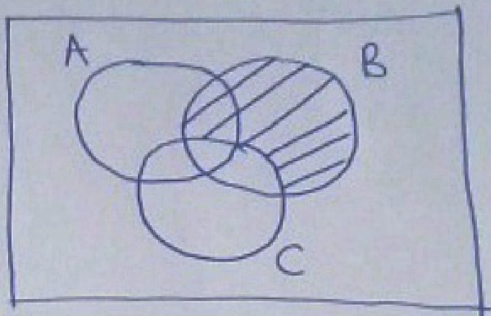
$\bigcap_{i=1}^{n} A_i = \{\cdots -2,-1,0,1\}$

(c)

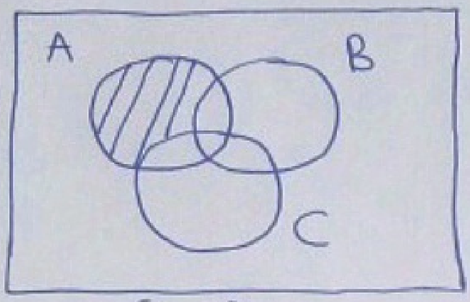
Let's consider three sets A, B & C



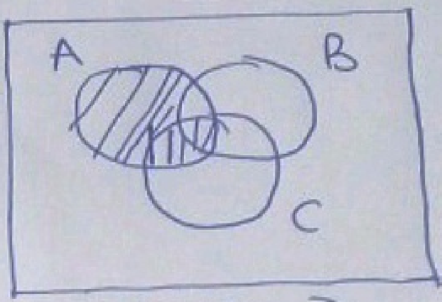
$(A-B)$



$(B-C)$



$(A-B)-C$

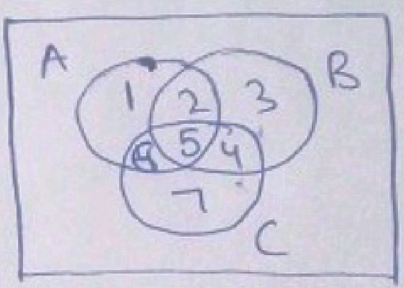


$A-(B-C)$

~~Yeah~~, it is not true that,

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

5. $A \oplus B = (A-B) \cup (B-A)$



$(A \oplus B) \oplus C$

$(A-B) \cup (B-A) \oplus C$

$\{(1,6) \cup (3,4)\} \oplus C$

$\underbrace{(1,6,3,4)}_{a} \oplus C$

$(a-c) \cup (c-a) \longrightarrow (1,5) \cup (3,7)$

$\downarrow$

$(1,3,5,7)$

$A \oplus \{(B-C) \cup (C-B)\}$

$A \oplus 6\ \underbrace{\{2,3,6,7\}}_{y}$

$(A-y) \cup (y-A)$

$(1,5) \cup (3,7)$

Hence it is associative $\Rightarrow (1,5,3,7)$

$$|A-B| \longrightarrow A-(B\cap A)$$

$$|B-A| \longrightarrow B-(A\cap B)$$

$$|A\oplus B| \longrightarrow (A-B)\cup(B-A)$$

$$|\underbrace{(A-B)}_{D}-C| \longrightarrow (D-C) \longrightarrow D-(D\cap C)$$

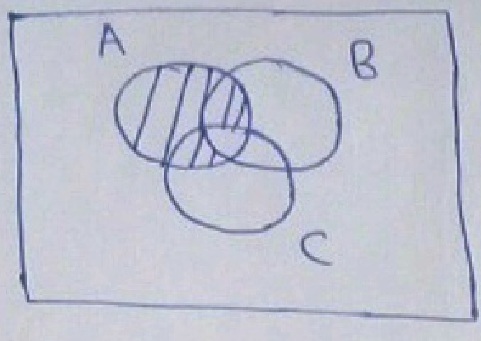
$$(A-B)-\{(A-B)\cap C\}$$

$$\{A-(B\cap A)\}-\{[A-B\cap A]\cap C\}$$

$$A\cap B\cap C \longrightarrow A+B+C+(A\cap B\cap C)-(A\cap B)-(B\cup C)$$

$$-(C\cup A)$$

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



From the diagram it is clear that,

$(A-B)\cup(A-C) = A$

when $(A\cap B\cap C)$ is a null set

8. $1800 = 2^3\times 3^2\times 5^2$

Total no of factors $= 4\times 3\times 3 = 36$

$2460 = 2^2\times 3\times 5\times 41$

Total no of factors $= 3\times 2\times 2\times 2 = 24$

$GCD(1800, 2460) = 2^2\times 3\times 5 = 60$

No of factors $= 3\times 2\times 2 = 12$

Total required no of divisors $= 36+24-12$

$= 48$

U → Universal set $\qquad$ A → length = n

$a_1, a_2 \ldots a_n$

i^{th} bit in A is 1 if a_i belongs to A and 0 if $a_i \notin A$

~~Ex U~~

C program: →

```
#include <stdio.h>
int main {
int n,t;
scanf("%d%d", &n,&t);
int uset[n], sets[n], arr[n] = {0};
for (int i = 0; i<n; i++)
{ scanf("%d", &uset[i]); }
for (int i=0; i<n; i++)
{ scanf("%d", &sets[i]); }
for (int i=0; i<n; i++) {
    for (int j=0; j<n; j++) {
        if (sets[j] == uset[i]) {
            arr[i]=1;
            break;
        }
    }
}
for (int i=0; i<n; i++) {
    printf("%d", arr[i]);
}
return 0;
}
```