Example 4: If \( U = \{a, b, c, d, e, f, g\} \) and \( A = \{a, b, f\} \), \( B = \{c, d, e, g\} \) Find:

1) \( A \cup B = \{a, b, f, c, d, e, g\} = U \)

2) \( A \cap B = \{\phi\} \)

**Partition:**
- a) Union is all or: \( A \cup B = U \)
- b) Nothing in Common or: \( A \cap B = \phi \)

Example 5: Mark has two sets of courses to choose from:
- Set \( A = \{\text{Chemistry, Math, English}\} = \{C, M, E\} \)
- Set \( B = \{\text{French, History, Geology}\} = \{F, H, G\} \)

Find:

a) the number of courses that are in \( A \) and \( B \).

b) the number of courses that are in \( A \) or \( B \).

\[ n(A) = 3 \quad n(B) = 3 \]
Example 6: Mike has two sets of courses to choose from:
Set A = \{Chemistry, Math, English, History\} = \{C,M,E,H\}
Set B = \{Math, English, French\} = \{M,E,F\}

Find:

a) the number of courses that are in A and B. \implies n(A \cap B)
\[
n (A \cap B) = 2
\]

\[A \cap B = \{M, E\}\]

b) the number of courses that are in A or B. \implies n(A \cup B)
\[
n (A \cup B) = 4 + 3 - 2 = 5
\]

\[A \cup B = \{C, M, E, H, F\}\]

c) the number of courses that are in A only.
\[
n (A \setminus B) = 2
\]

\[A \setminus B = \{C, H\}\]

\[
n(A \cup B) = n(A) + n(B) - n(A \cap B)
\]
Example 7: In a survey of 80 people, it was found that:
45 read the Sport magazine (S)
40 read the Time magazine (T)
10 read both magazines (T & S)
Find the number of people that read:

a) Time only
30

b) Sport only
35

c) neither magazine
5

d) either magazine
\[ n(S \cup T) = 45 + 40 - 10 = 75 \]

\[ m = 80 \]

\[ S = 45 \]

\[ T = 40 \]

\[ 35 \quad 10 \quad 30 \]

\[ 5 \]
Example 8: In a survey of 200 people, it was found that:
150 listen to Rock music (R)
80 listen to Slow music (S)
55 listen to Classic music (C)
60 listen to Rock and Slow music (R & S)
25 listen to Classic and Slow music (C & S)
40 listen to Rock and Classic (R & C)
15 listen to all (R & S & C)

Find the number of people that listen to:
a) Rock only  b) 2 kind of music  c) Rock and Slow but not Classic  d) none

\[ U = 200 \]
\[ R = 150 \]
\[ S = 80 \]
\[ C = 55 \]
\[ R \cap S = 45 \]
\[ R \cap C = 10 \]
\[ S \cap C = 15 \]
\[ R \cap S \cap C = 5 \]
\[ \text{None} = 25 \]

\[ 2^3 = 8 \]
Example 9: In a survey, it was found that:

- 55 students took History ($H$)
- 45 students took English ($E$)
- 25 students took Geography ($G$)
- 7 students took English and History but not Geography
- 5 students took Geography and History but not English
- 3 students took Geography and English but not History
- 30 students took English only

Find the number of students that took:

a) the three subjects at the same time  

b) History only

\[
H = 55 \\
E = 45 \\
G = 25 \\
3 \times 3 = 9 \\
\frac{3}{8} \\
\frac{7}{7} \\
\frac{30}{30} \\
\frac{12}{12} \\
\frac{5}{5} \\
x = 5
\]

\[
45 = 30 + 7 + 3 + x \\
x = 5
\]
Example 10: If $A$ and $B$ are subsets of $U$ and: $n(A) = 5$, $n(B') = 7$, $n(A' \cap B') = 3$. Find $n(A \cap B)$.

\[
\begin{align*}
    n(A) &= 5 \\
    n(B') &= 7 \\
    n(A' \cap B') &= 3
\end{align*}
\]

\[\begin{array}{c}
    \text{outside } B = 7 \\
    (5 - x) + 3 = 7 \\
    8 - x = 7 \\
    1 = x
\end{array}\]