Answer on Question #53686 – Math – Discrete Mathematics

Out of 500 students investigated, 400 studies Hindi, 200 English and 50 both. Is this data correct?

Solution

Let A, B, C be sets of students who study Hindi, English and neither respectively.

Then $|A \cup B \cup C| = 500$, $|A| = 400$ and $|B| = 200$.

Set of students studying both Hindi and English is $A \cap B$.

Then using inclusion-exclusion formula:

$$|A \cap B| = |A| + |B| - |A \cup B|$$

Since $A \cup B \subseteq A \cup B \cup C$,

$$|A \cup B| \leq |A \cup B \cup C|,$$

therefore,

$$|A \cap B| = |A| + |B| - |A \cup B| \geq |A| + |B| - |A \cup B \cup C| = 400 + 200 - 500 = 100$$

That is, there must be at least 100 students studying both languages.

Thus, the given data is not correct.