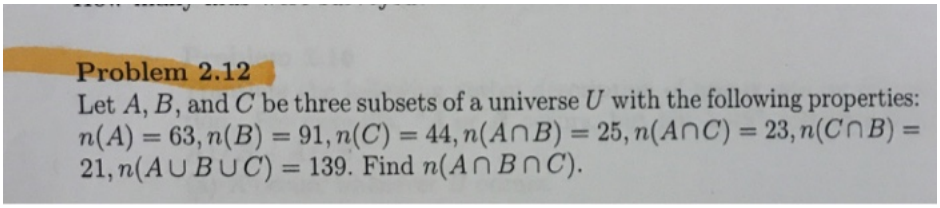
Question: Problem 2.12 Let A, B, and C be three subsets of a universe U ...



Problem 2.12

Let A, B, and C be three subsets of a universe U with the following properties: $n(A) = 63, n(B) = 91, n(C) = 44, n(A \cap B) = 25, n(A \cap C) = 23, n(C \cap B) = 21, n(A \cup B \cup C) = 139$. Find $n(A \cap B \cap C)$.

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Expert Answer

JYOTIRANJAN answered this
646 answers

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Given that A, B and C are three subset of a universe U. Also given that $n(A) = 63$, $n(B) = 91$, $n(C) = 44$, $n(A \cap B) = 25$, $n(A \cap C) = 23$, $n(C \cap B) = 21$, $n(A \cup B \cup C) = 139$.

We have to find $n(A \cap B \cap C)$.

Firstly we derive the formula for $n(A \cup B \cup C)$.

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

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

$$= n(A) + n(B) - n(A \cap B) + n(C) - [n\{(A \cap C) \cup (B \cap C)\}] \quad \text{(by the properties of set theory)}$$

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

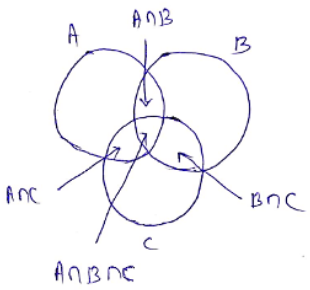
$$= n(A) + n(B) + n(C) - n(A \cap B) - [n(A \cap C) + n(B \cap C) - n(A \cap B \cap C)]$$

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

Hence

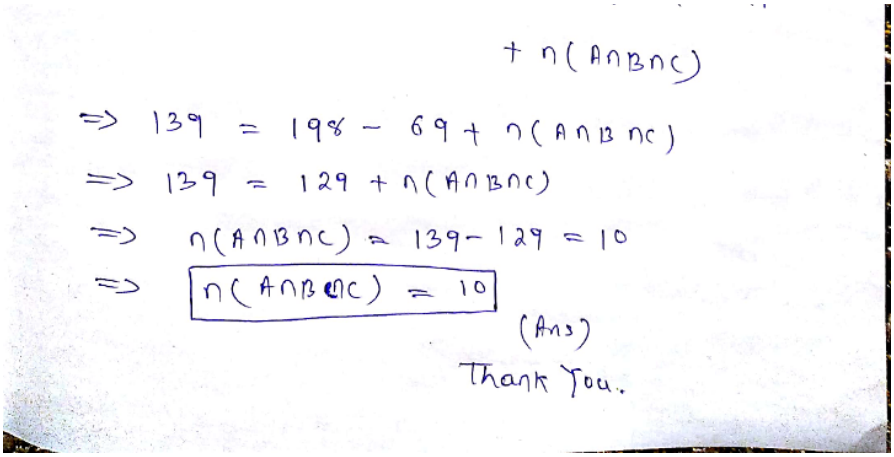
$$\boxed{n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)}$$

We have to use the above formula for the given problem



Now,

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



Comment

Up next for you in Advanced Math

If n(A) = 25, n(B) = 24, n(C) = 23, n(A ∩ B) = 7, n(A ∩ C) = 10, n(B ∩ C) = 6, and n(A ∪ B ∪ C) = 53, find n(A ∩ B ∩ C).

See answer

See more questions for subjects you study

Questions viewed by other students

Q: Question 1 Let A, B, C be three subsets of a universe U with the following properties: n(A) = 63, n(B) = 91, n(C) = 44, n(ANB) 25, n(ANC) = 23, n(BNC) = 21, n(AUBUC) = 138. Find n(ABC).

A: See answer

Q: Let A,B, and C be three subsets of a universe S with the following properties: N(A) = 87 N(B) = 87 N(C) = 54 N(A∩B) = 16 N(A∩C) = 15 N(C ∩ B) = 14 N(AUBUC) = 209. Find N(A∩B∩C).

A: See answer

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