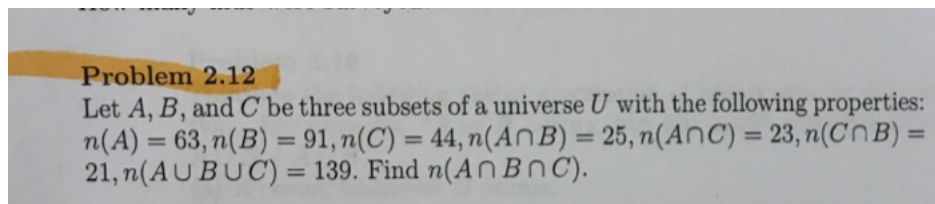


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Question: Problem 2.12 Let A, B, and C be three subsets of a universe U ...



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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 $n(A \cap B \cap C)$.

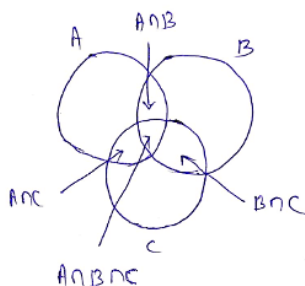
Firstly we derive the formula for $n(A \cup B \cup C)$.

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

Hence

$$\begin{aligned}
 n(A \cup B \cup C) &= n(A) + n(B) + n(C) - n(A \cap B) \\
 &\quad - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)
 \end{aligned}$$

We have to use the above formula for the given problem



Now,

$$\begin{aligned}
 n(A \cup B \cup C) &= n(A) + n(B) + n(C) - n(A \cap B) \\
 &\quad - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)
 \end{aligned}$$



$$\begin{aligned}
 & + n(A \cap B \cap C) \\
 \Rightarrow 139 &= 198 - 69 + n(A \cap B \cap C) \\
 \Rightarrow 139 &= 129 + n(A \cap B \cap C) \\
 \Rightarrow n(A \cap B \cap C) &= 139 - 129 = 10 \\
 \Rightarrow \boxed{n(A \cap B \cap C) = 10} & \\
 & \text{(Ans)} \\
 & \text{Thank You..}
 \end{aligned}$$

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If $n(A) = 25$, $n(B) = 24$, $n(C) = 23$, $n(A \cap B) = 7$, $n(A \cap C) = 10$, $n(B \cap C) = 6$, and $n(A \cup B \cup C) = 53$, find $n(A \cap B \cap C)$.

[See answer](#)

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Q: Question 1 Let A, B, C be three subsets of a universe U with the following properties: $n(A) = 63$, $n(B) = 91$, $n(C) = 44$, $n(A \cap B) = 25$, $n(A \cap C) = 23$, $n(B \cap C) = 21$, $n(A \cup B \cup C) = 138$. Find $n(A \cap B \cap C)$.

A: [See answer](#)

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

A: [See answer](#)

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