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कक्षा - 11

गणित

अध्याय – 1

समुच्चय

भाग – 16

विविध प्रश्नावली (7 से 10)

हर्ष गोयल

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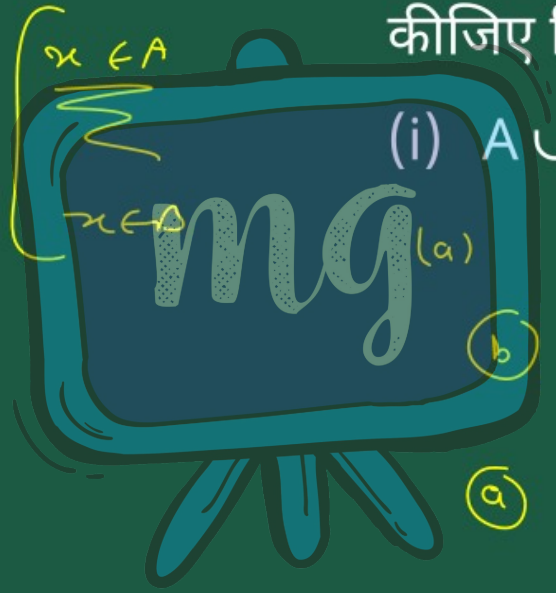
विविध प्रश्नावली

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7. समुच्चयों के गुणधर्मों का प्रयोग करके सिद्ध कीजिए कि:

(i) $A \cup (A \cap B) = A$



$A \cup (A \cap B) \subset A$

$A \subset A \cup (A \cap B)$

माना $x \in A \cup (A \cap B)$

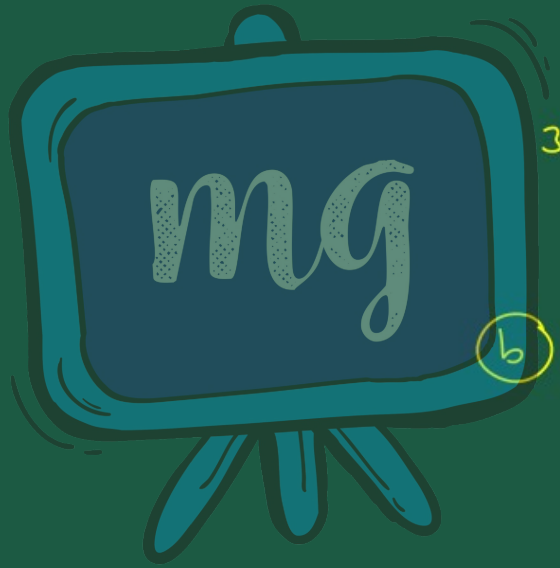
$\Rightarrow x \in A$ या $x \in A \cap B$

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$x \in A$ या $x \in A \cap B$

$\Rightarrow$ $x \in A$ या $x \in A$ और $x \in B$



$\Rightarrow$ $x \in A$

अत: $A \cup (A \cap B) \subset A$ — (1)

माना $y \in A$

$\Rightarrow$ $y \in A \cup B$

$\Rightarrow$ $y \in A \cap (A \cup B)$

$\Rightarrow$ $y \in (A \cap A) \cup (A \cap B)$

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$y \in (A \cap A) \cup (A \cap B)$

$\Rightarrow y \in A \cup (A \cap B)$

अतः $A \subset A \cup (A \cap B)$ ②

तभी ① व ② से

$A = A \cup (A \cap B)$



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(ii) $A \cap (A \cup B) = A$.



(a) $A \cap (A \cup B) \subset A$

$A \subset A \cap (A \cup B)$

माना $x \in A \cap (A \cup B)$

$\Rightarrow$ $x \in A$ और $x \in A \cup B$

$\Rightarrow$ $x \in A$ और $x \in A$ या $x \in B$

$\Rightarrow$ $x \in A$

अतः $A \cap (A \cup B) \subset A$

(3)

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$A \subset A \cap (A \cup B)$

माना $y \in A$

$\Rightarrow y \in A \cup B$

$y \in A$

$\Rightarrow y \in A \cup B$



$\Rightarrow y \in A \cap (A \cup B)$

अतः $A \subset A \cap (A \cup B)$

तथा (3) व (4) से (1)

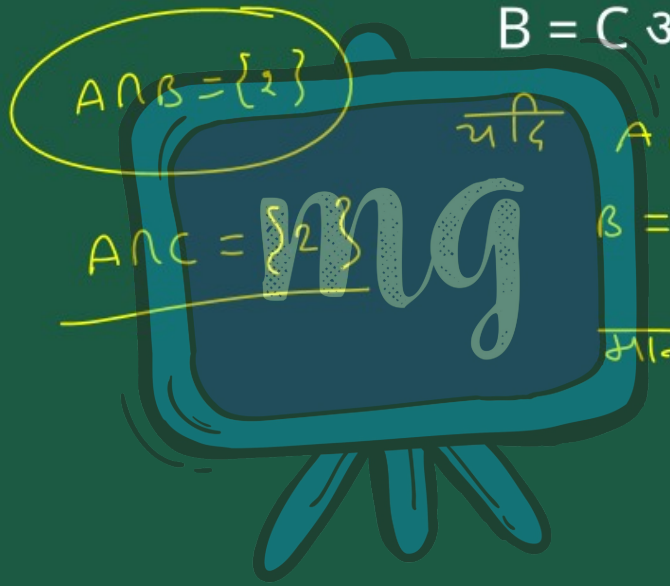
$\Rightarrow A = A \cap (A \cup B)$

सिद्ध

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8. दिखाइए कि $A \cap B = A \cap C$ का तात्पर्य $B = C$ आवश्यक रूप से नहीं होता है।



यदि $A \cap B = A \cap C$ है तो $B = C$ हमेशा सही नहीं होता

माना $A = \{1, 2\}$

$B = \{2, 3\}$

$C = \{2, 4\}$

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$\therefore \quad A \cap B = \{2\}$

तथा $\quad A \cap C = \{2\}$

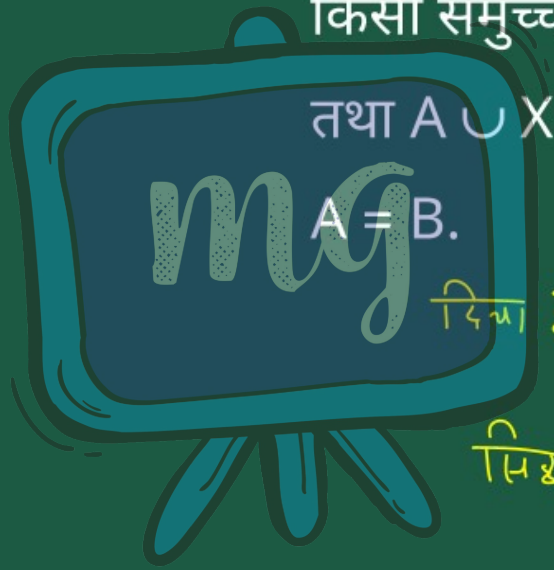
$\therefore \quad A \cap B = A \cap C$

परंतु $\quad B \neq C$

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9. मान लीजिए कि A और B समुच्चय हैं। यदि किसी समुच्चय X के लिए $A \cap X = B \cap X = \phi$ तथा $A \cup X = B \cup X$, तो सिद्ध कीजिए कि $A = B$.



दिया है : $A \cap X = B \cap X = \phi$ ... (1)

$A \cup X = B \cup X$ ... (2)

सिद्ध करना है : $A = B$

(i) $A \subset B$

(ii) $B \subset A$

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(1) $A \subset B$

माना $x \in A$

$\Rightarrow x \in A \cup x$

$\Rightarrow x \in A \cap (A \cup x)$

माना (2) से $(A \cup x = B \cup x)$

$\Rightarrow x \in A \cap (B \cup x)$

$\Rightarrow x \in (A \cap B) \cup (A \cap x)$

(माना (1) से

$A \cap x = \phi$)

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$\Rightarrow x \in (A \cap B) \cup \phi$

$\Rightarrow x \in A \cap B$

$\Rightarrow x \in A$ और $x \in B$

$\Rightarrow A \subset B$ — (1)



(b) सिद्ध करना है $B \subset A$

माना $y \in B$

$\Rightarrow y \in B \cup X$

$\Rightarrow y \in B \cap (B \cup X)$

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समी ② से

$(B \cup x = A \cup x)$

$\Rightarrow y \in B \cap (A \cup x)$

$\Rightarrow y \in (B \cap A) \cup (B \cap x)$

समी ① से

$(A \cap x = B \cap x = \phi)$

$\Rightarrow y \in (B \cap A) \cup \phi$

$\Rightarrow y \in B \cap A$

$\Rightarrow y \in B$ और $y \in A$

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अतः BCA — (2)

सभी (1) व (2) से

ACB

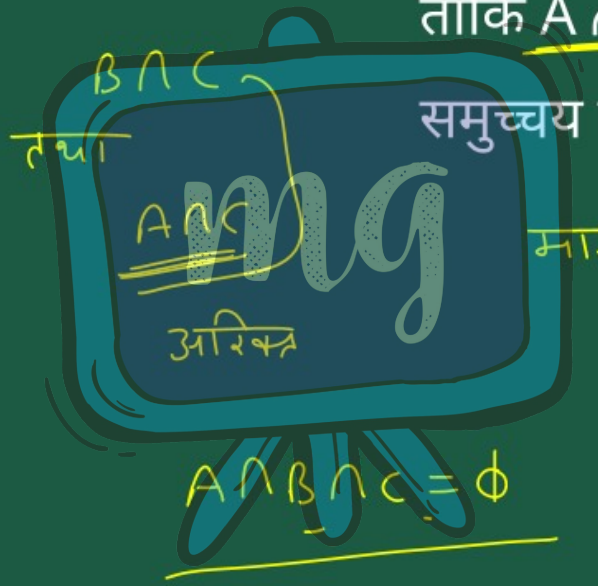
तथा BCA

A = B होंगे ।।

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10. ऐसे समुच्चय A, B और C ज्ञात कीजिए ताकि $A \cap B$, $B \cap C$ तथा $A \cap C$ अरिक्त समुच्चय हों और $A \cap B \cap C = \phi$.



$A = \{1, 2\}$

$B = \{2, 3\}$

$C = \{1, 3\}$

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$A \cap B = \{2\} \neq \phi$

$B \cap C = \{3\} \neq \phi$

$A \cap C = \{1\} \neq \phi$



$A \cap B \cap C = \{\ \} = \phi$

$A = \{1, 2\}$

$B = \{2, 3\}$

$C = \{1, 3\}$

Ans