

Set Theory

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1) If $A \cup B = A \cap B$, then which one is true?

(a) $A \subseteq B$ (b) $B \subseteq A$ (c) $A = B$ (d) None of these

2) The set $A \cap (A \cup B)^c$ equals to -

(a) A (b) A^c (c) B^c (d) ϕ

3) If $A - B = \phi$, then which one is true?

(a) $A \neq B$ (b) $A \subset B$ (c) $B \subset A$ (d) $A \cap B = \phi$

4) If $A \cap B = B$, then which one is true?

(a) $A \subseteq B$ (b) $B \subseteq A$ (c) $A = B$ (d) $A = \phi$

5) The set $(A \cup B^c)^c$ equals to -

(a) ϕ (b) B (c) $A - B$ (d) $B - A$

6) If $A \subset B$, then $A^c \cap B^c$ equals to -

(a) A^c (b) B^c (c) ϕ (d) None of these

7) The set $(A \cap B) \cap (A^c \cup B^c)$ equals to -

(a) A^c (b) B^c (c) ϕ (d) None of these

8) If $A \cap B = A$ then $A \cup B$ equals to -

(a) A (b) B (c) ϕ (d) None of these

9) If $A - B = A$, then $A \cap B$ equals to which set?

10) If $A \cap B^c = \phi$, then which is true?

(a) $A \subset B$ (b) $B \subset A$ (c) None of these

11) If $A = \{\{1\}, \{2\}, \{1, 2\}\}$ then which of the following is true?

(a) $1 \in A$ (b) $\{1\} \in A$ (c) $\{1, 2\} \subset A$ (d) $\phi \in A$

12) For any set, which is true?

(a) $\{1\} \in \{1, 2, 3\}$ (b) $1 \notin \{1, 2, 3\}$ (c) $1 \subset \{1, 2, 3\}$ (d) $\{1\} \subset \{1, 2, 3\}$

13) If $a\mathbb{N} = \{ax \mid x \in \mathbb{N}\}$, then find $3\mathbb{N} \cap 7\mathbb{N}$

14) If $B \subseteq A$, then prove that $B - A = \phi$

15) Find the H.C.F. of 15, 40, 105 and L.C.M of 12, 15, 20 by Set Theory.

16) If $A = \{x: -1 < x \leq 5\}$ and $B = \{x: -3 \leq x < 4\}$, then find $A \cap B$

17) If U be the universal set and A, B are two subsets of U where $U = \{1, 3, 5, 7, 9, 12, 15\}$, $A = \{1, 5, 9, 15\}$, $B = \{3, 7, 9, 12, 15\}$, then find the following sets.

(a) A^c , (b) $A \cup B$, (c) $A \cap B$, (d) $A - B$, (e) $B - A$, (f) $A^c \cup B^c$, (g) $A^c \cap B^c$, (h) $(A \cap B) \cup (A - B)$

18) If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5\}$, $C = \{1, 4, 5\}$ then verify the following relations.

(a) $A - (B \cup C) = (A - B) \cap (A - C)$ (b) $A \cup (B - C) = (A \cup B) - (A \cup C)$

19) If $A = \{1, 3\}$, $B = \{3, 5\}$, $C = \{5, 10\}$ then verify the following relations.

(a) $A \times (B \cup C) = (A \times B) \cup (A \times C)$, (b) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

20) For any two set A & B , prove that -

(a) $A \cap (B - A) = \phi$

(b) $A \cup (B - A) = A \cup B$

(c) If $A \cup B = A \cap B$ then prove that $A = B$

(d) If $A \cap B^c = \phi$ and $A^c \cap B = \phi$ then show that $A = B$

(e) $A - B = A - (A \cap B)$

21) For any two sets A & B , prove that -

(a) $A \subseteq A \cup B$ and $B \subseteq A \cup B$

(b) $A \cap B \subseteq A$ and $A \cap B \subseteq B$

22) For any two sets A & B , if $A \subseteq B$, then show that $A \cup B = B$ and $A \cap B = A$

23) For any three sets A, B, C -

(a) if $A \subseteq C$ and $B \subseteq C$, then show that $A \cup B \subseteq C$

(b) if $C \subseteq A$ and $C \subseteq B$, then show that $C \subseteq A \cap B$

24) For any three sets A, B, C , prove that -

(a) $A \cap (B - C) = (A \cap B) - (A \cap C)$

(b) $(A \cup B) - C = (A - C) \cup (B - C)$

(c) $(A \cap B) - C = (A - C) \cap (B - C)$

(d) $A - (B \cup C) = (A - B) \cap (A - C)$

(e) $A - (B \cap C) = (A - B) \cup (A - C)$

(f) $A - (B - C) = (A - B) \cup (A \cap C)$

25) If $A = \{1, 2, 3, 4, 5\}$ and $B \cup C = \{3, 4, 6\}$, then find $(A - B) \cap (A - C)$.

26) For any three sets A, B, C , if $A \cap C = B \cap C = \phi$ and $A \cup C = B \cup C$, then prove that $A = B$

27) For any three sets A, B, C , if $A \cap C = B \cap C = \phi$ and $A \cap C^c = B \cap C^c$, then prove that $A = B$

28) For any three sets A, B, C , if $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then prove that $B = C$

29) Three daily newspapers X, Y, Z are published in a city. 65% of the people in the city read X magazine, 54% Y magazine and 45% Z magazine. 38% of people read X and Y; 32% of people read Y and Z; 28% read X and Z magazines and 12% do not read any of these three types of magazines. If the total population of the city is 1000000, determine how many people in the city read all three magazines.

30) In any exam, 70% of the candidates passed in Mathematics, 68% passed in Physics and 60% passed in both subjects. If 44 candidates fail in both the subjects, determine the total number of candidates.

31) Out of 1000 students in a college, 540 play football, 465 play cricket and 370 play volleyball. Of the total students, 325 play football and cricket, 260 play football and volleyball, 235 play cricket and volleyball and 125 play each game. How many students (i) do not play any game (ii) play only one game and (iii) play exactly two games?

32) There are several students in a group and everyone in the group can speak at least one of Bengali, Hindi and English. 65 students can speak Bengali, 54 can speak Hindi and 37 can speak English. 31 can speak both Bengali and Hindi, 17 can speak both Hindi and English and 18 can speak both Bengali and English. Determine the largest and smallest number of students in the group.