

$$\therefore (A \cup B)' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{1, 2, 3, 4, 6, 8\} = \{5, 7, 9\}.$$

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(v) $A' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{1, 2, 3, 4\} = \{5, 6, 7, 8, 9\}$

$$(A')' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{5, 6, 7, 8, 9\} = \{1, 2, 3, 4\}.$$

(vi) $B - C = \{2, 4, 6, 8\} - \{3, 4, 5, 6\} = \{2, 8\}$

$$(B - C)' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{2, 8\} = \{1, 3, 4, 5, 6, 7, 9\}.$$

2. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets :

$A = \{a, b, c\}$, $B = \{d, e, f, g\}$, $C = \{a, c, e, g\}$, $D = \{f, g, h, a\}$.

Sol. (i) $A' = U - A = \{a, b, c, d, e, f, g, h\} - \{a, b, c\} = \{d, e, f, g, h\}$.

(ii) $B' = \{a, b, c, d, e, f, g, h\} - \{d, e, f, g\} = \{a, b, c, h\}$.

(iii) $C' = \{a, b, c, d, e, f, g, h\} - \{a, c, e, g\} = \{b, d, f, h\}$.

(iv) $D' = \{a, b, c, d, e, f, g, h\} - \{f, g, h, a\} = \{b, c, d, e\}$.

3. Taking the set of natural numbers as universal set, write down the complements of the following sets :

(i) $\{x : x \text{ is an even number}\}$

(ii) $\{x : x \text{ is an odd number}\}$

(iii) $\{x : x \text{ is a positive multiple of 3}\}$

(iv) $\{x : x \text{ is a prime number}\}$

(v) $\{x : x \text{ is a natural number divisible by 3 and 5}\}$

(vi) $\{x : x \text{ is a perfect square}\}$

(vii) $\{x : x \text{ is a perfect cube}\}$

(viii) $\{x : x + 5 = 8\}$

(ix) $\{x : 2x + 5 = 9\}$

(x) $\{x : x \geq 7\}$

(xi) $\{x : x \in \mathbb{N} \text{ and } 2x + 1 > 10\}$

Sol. (i) $\{x : x \text{ is an odd natural number}\}$

(ii) $\{x : x \text{ is an even natural number}\}$

(iii) $\{x : x \in \mathbb{N} \text{ and } x \text{ is not a multiple of 3}\}$

(iv) $\{x : x \text{ is a composite number or } x = 1\}$

(v) $\{x : x \in \mathbb{N} \text{ and } x \text{ is neither divisible by 3, nor by 5}\}$

(vi) $\{x : x \in \mathbb{N}, \text{ and } x \text{ is not a perfect square}\}$

(vii) $\{x : x \in \mathbb{N} \text{ and } x \text{ is not a perfect cube}\}$

(viii) $\{x : x \in \mathbb{N}, \text{ and } x \neq 3\}$

(ix) $\{x : x \in \mathbb{N}, \text{ and } x \neq 2\}$

(x) $\{x : x \in \mathbb{N}, \text{ and } x < 7\}$

(xi) $\left\{x : x \in \mathbb{N} \text{ and } x \leq \frac{9}{2}\right\}$

(iv) $A' \cup B' =$ All shaded area formed by all horizontal and vertical lines.

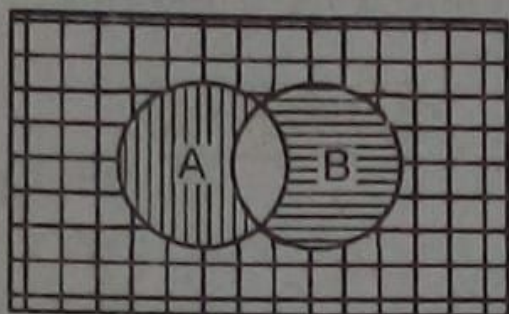


Fig. (iv)

6. Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60° , what is A' ?

Sol. A is the set of triangles in which no triangle is equilateral.
 $\therefore A' =$ set of equilateral triangles.

7. Fill in the blanks to make each of the following a true statement :

- | | |
|-------------------------------------|---------------------------------------|
| (i) $A \cup A' = \dots\dots\dots$ | (ii) $\phi' \cap A = \dots\dots\dots$ |
| (iii) $A \cap A' = \dots\dots\dots$ | (iv) $U' \cap A = \dots\dots\dots$ |

Sol. Let U be the universal set.

- | | |
|--------------------------|---------------------------------------|
| (i) $A \cup A' = U$ | (ii) $\phi' \cap A = U \cap A = A$ |
| (iii) $A \cap A' = \phi$ | (iv) $U' \cap A = \phi \cap A = \phi$ |

EXERCISE 1.5

1. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, $C = \{3, 4, 5, 6\}$

Find: (i) A'

(ii) B'

(iii) $(A \cup C)'$

(iv) $(A \cup B)'$

(v) $(A')'$

(vi) $(B - C)'$

Sol. (i)

$$A' = U - A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{1, 2, 3, 4\} \\ = \{5, 6, 7, 8, 9\}.$$

(ii)

$$B' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{2, 4, 6, 8\} \\ = \{1, 3, 5, 7, 9\}.$$

$$(iii) \quad A \cup C = \{1, 2, 3, 4\} \cup \{3, 4, 5, 6\} = \{1, 2, 3, 4, 5, 6\}$$

$$\therefore (A \cup C)' = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{1, 2, 3, 4, 5, 6\} = \{7, 8, 9\}.$$

$$(iv) \quad A \cup B = \{1, 2, 3, 4\} \cup \{2, 4, 6, 8\} = \{1, 2, 3, 4, 6, 8\}.$$