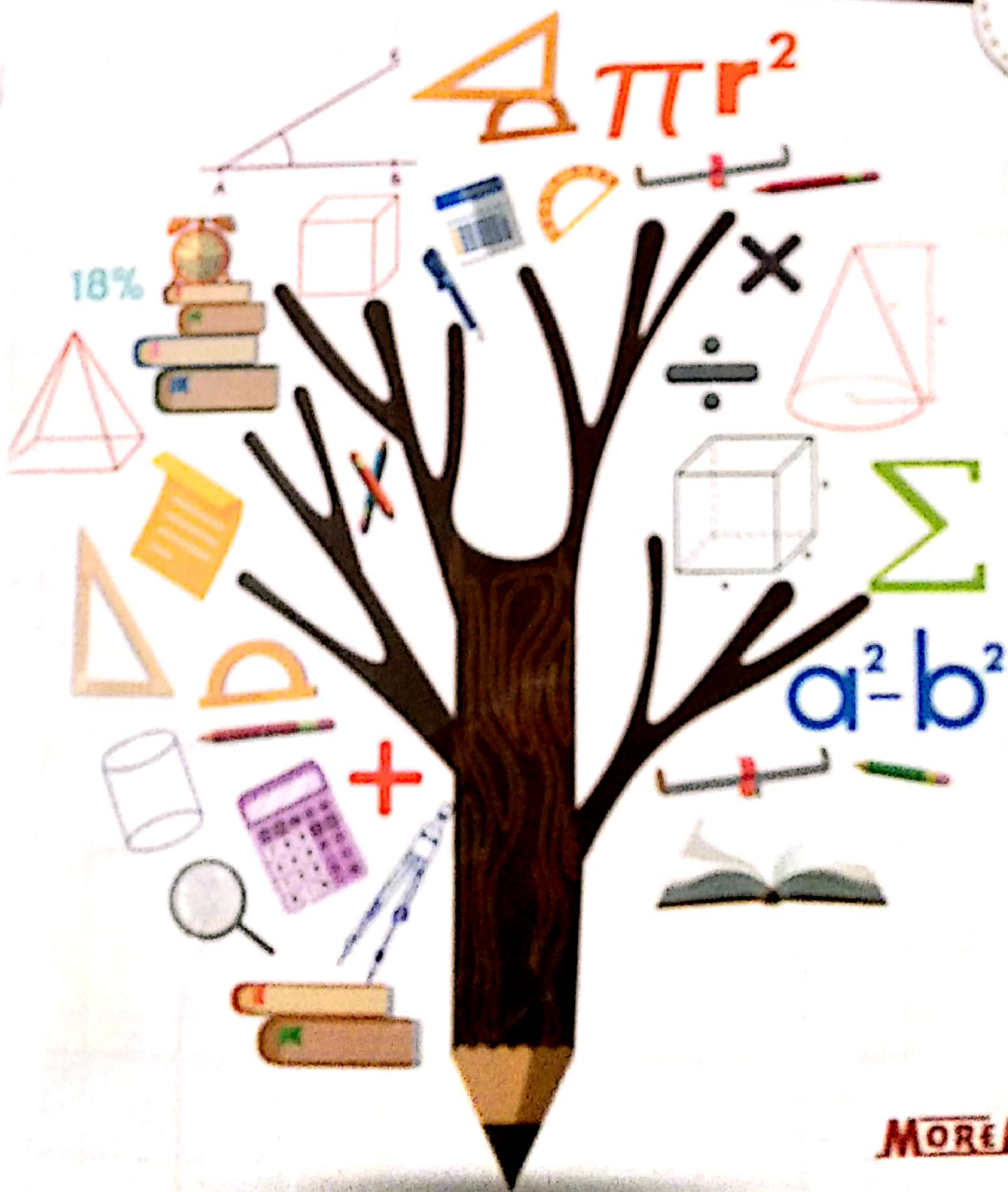


Joy of Mathematics



8



MOREMATHS

Exercise 1.3

1. If $A = \{4, 5, 6\}$ and $B = \{x : x \in W \text{ and } x < 5\}$, find:
 - a. $A \cup B$
 - b. $A \cap B$
 - c. $A - B$
 - d. $B - A$
2. Let $A = \{\text{letters of the word NEW JERSEY}\}$ and $B = \{\text{letters of the word NEW YORK}\}$, then find:
 - a. $A \cup B$
 - b. $A \cap B$
 - c. $A - B$
 - d. $B - A$
3. Let universal set $U = \{x : x \text{ is a whole number } \leq 9\}$, $A = \{\text{odd numbers}\}$, $B = \{\text{multiples of 3}\}$ and $C = \{\text{factors of 18}\}$, find:
 - a. $A \cup B$
 - b. $B \cup C$
 - c. $(A \cup B) \cap (B \cup C)$
 - d. $(A \cup B)'$
 - e. $A \cap B$
 - f. $(B \cup A) \cap C$
4. If $A = \{x : x \in W \text{ and } 4 < x < 9\}$, $B = \{x : x \in N \text{ and } 4 \leq x \leq 8\}$ and $C = \{\text{natural numbers less than 5}\}$, find:
 - a. $A \cup B$
 - b. $A \cap B$
 - c. $A \cup (B \cup C)$
 - d. $A \cap (B \cap C)$
 - e. $(A \cup B) \cup C$
 - f. $(A \cap B) \cap C$
5. If $U = \{1, 2, 3, 4, \dots, 10\}$, $A = \{1, 3, 5, 7, 9\}$, $B = \{x : x = 2n, n \in N\}$, $C = \{\text{multiples of 3 less than 10}\}$, $D = \{x : x^2 - 12x + 32 = 0\}$ and $E = \phi$, then find:
 - a. $A \cup B$
 - b. $B \cup C$
 - c. $C \cup D$
 - d. $D \cup E$
 - e. $A \cap B$
 - f. $B \cap C$
 - g. $B - C$
 - h. A'
 - i. B'
 - j. $(A \cup B)'$
 - k. $(B \cap C)'$
 - l. $(C \cup D)'$
6. If $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{\text{multiples of 2 less than 10}\}$ and $C = \{x : 3 \leq \frac{x}{2} + 1 \leq 4, x \in N\}$, show that:
 - a. $A - (B \cup C) = (A - B) \cap (A - C)$
 - b. $A - (B \cap C) = (A - B) \cup (A - C)$
 - c. $A \cap (B \cap C) = (A \cap B) \cap C$
7. If $A = \{\text{even numbers less than or equal to 10}\}$, $B = \{1, 3, 5, 7, 10\}$ and $C = \{1, 4, 8, 10\}$, then verify that:
 - a. $(A \cup B) \cap (A \cup C) = A \cup (B \cap C)$
 - b. $(A \cap B) \cup (A \cap C) = A \cap (B \cup C)$
8. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 3, 5, 6\}$ and $B = \{2, 3, 5, 7\}$, then verify that:
 - a. $(A \cup B)' = A' \cap B'$
 - b. $(A \cap B)' = A' \cup B'$
9. If $U = \{1, 2, 3, \dots, 15\}$, $A = \{\text{multiples of 2}\}$ and $B = \{\text{multiples of 3}\}$, show that:
 - a. $(A \cup B)' = A' \cap B'$
 - b. $(A \cap B)' = A' \cup B'$
10. If $n(A) = 20$, $n(B) = 16$ and $n(A \cup B) = 30$, find $n(A \cap B)$.
11. If $n(U) = 35$, $n(A - B) = 15$, $n(B - A) = 10$ and $n(A \cap B) = 5$, show that:
 - a. $n(A \cup B) = 30$
 - b. $n(A)' = 15$
 - c. $n(B) = 15$
12. There are 10 elements in set A, 7 elements in set B and 14 elements in set $A \cup B$. Are the sets A and B disjoint or overlapping. Also, find $n(A \cap B)$.

$$4. A = \{x : x \in \mathbb{W} \text{ and } 4 < x < 9\}$$

$$B = \{x : x \in \mathbb{N} \text{ and } 4 \leq x \leq 8\}$$

$$C = \{\text{natural numbers less than 5}\}$$

$$A = \{5, 6, 7, 8\}$$

$$B = \{4, 5, 6, 7, 8\}$$

$$C = \{1, 2, 3, 4\}$$

$$(a) A \cup B = \{4, 5, 6, 7, 8\}$$

$$(b) A \cap B = \{5, 6, 7, 8\}$$

$$(c) A \cup (B \cup C)$$

$$A = \{5, 6, 7, 8\}$$

$$B \cup C = \{1, 2, 3, 4, 5, 6, 7, 8\}$$

$$A \cup (B \cup C) = \{1, 2, 3, 4, 5, 6, 7, 8\}$$

(d) $A \cap (B \cap C)$

$$A = \{5, 6, 7, 8\}$$

$$B \cap C = \{4\}$$

$$A \cap (B \cap C) = \{ \}$$

(e) $(A \cup B) \cup C$

$$A \cup B = \{4, 5, 6, 7, 8\}$$

$$C = \{1, 2, 3, 4\}$$

$$(A \cup B) \cup C = \{1, 2, 3, 4, 5, 6, 7, 8\}$$

(f) $(A \cap B) \cap C = \{ \}$

$$A \cap B = \{5, 6, 7, 8\}$$

$$C = \{1, 2, 3, 4\}$$

$$(A \cap B) \cap C = \{ \}$$

5. $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$$A = \{1, 3, 5, 7, 9\}$$

$$B = \{x : x = 2n, n \in \mathbb{N}\}$$

$$\therefore B = \{2, 4, 6, 8, 10\}$$

$$C = \{ \text{multiples of 3 less than 10} \}$$

$$\therefore C = \{ 3, 6, 9 \}$$

$$D = \{ x : x^2 - 12x + 32 = 0 \}$$

$$x^2 - 12x + 32 = 0$$

$$x^2 - 8x - 4x + 32 = 0$$

$$x(x-8) - 4(x-8) = 0$$

$$(x-4)(x-8) = 0$$

$$x-4 = 0$$

$$x = 0 + 4$$

$$x = 4$$

$$x-8 = 0$$

$$x = 0 + 8$$

$$x = 8$$

$$\therefore D = \{ 4, 8 \}$$

$$E = \{ \}$$

$$(a) A \cup B = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$$

$$(b) B \cup C = \{ 2, 3, 4, 6, 8, 9, 10 \}$$

$$(c) C \cup D = \{ 3, 4, 6, 8, 9 \}$$

$$(d) D \cup E = \{ 4, 8 \}$$

$$(e) A \cap B = \{ \}$$

$$(f) B \cap C = \{ 6 \}$$

$$(g) B - C = \{ 2, 4, 8, 10 \}$$

$$(h) A' = \{ \}$$

$$A = \{ 1, 3, 5, 7, 9 \}$$

$$U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$$

$$A' = \{ 2, 4, 6, 8, 10 \}$$

$$(i) B'$$

$$B = \{ 2, 4, 6, 8, 10 \}$$

$$U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$$

$$B' = \{ 1, 3, 5, 7, 9 \}$$

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

$$A \cup B = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$$

$$U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$$

$$(A \cup B)' = \{ \}$$

$$(k) (B \cap C)'$$

$$B \cap C = \{6\}$$

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$(B \cap C)' = \{1, 2, 3, 4, 5, 7, 8, 9, 10\}$$

$$(L) (C \cup D)'$$

$$C \cup D = \{3, 4, 6, 8, 9\}$$

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$(C \cup D)' = \{1, 2, 5, 7, 10\}$$

$$6- A = \{1, 2, 3, 4, 5, 6\}$$

$$B = \{\text{multiple of 2 less than 10}\}$$

$$\therefore B = \{2, 4, 6, 8\}$$

$$C = \left\{x : 3 \leq \frac{x}{2} + 1 \leq 4, x \in \mathbb{N}\right\}$$

$$3 \leq \frac{x}{2} + 1 \leq 4$$

$$3 - 1 \leq \frac{x}{2} \leq 4 - 1$$

$$2 \leq \frac{x}{2} \leq 3$$

$$2 \times 2 \leq x \leq 3 \times 2$$

$$4 \leq x \leq 6$$

$$\therefore C = \{4, 5, 6\}$$