

EXERCISE 13C

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1. Fill in the blanks:

- (i) If each element of set P is also an element of set Q, then P is said to be of Q and Q is said to be of P.
(ii) Every set is a of itself.
(iii) The empty set is a of every set.
(iv) If A is proper subset of B, then $n(A) \dots n(B)$.

Solution:

- (i) If each element of set P is also an element of set Q, then P is said to be subset of Q and Q is said to be of P.
(ii) Every set is a subset of itself.
(iii) The empty set is a subset of every set.
(iv) If A is proper subset of B, then $n(A)$ is less than $n(B)$.

2. If $A = \{5, 7, 8, 9\}$; then which of the following are subsets of A?

- (i) $B = \{5, 8\}$
(ii) $C = \{0\}$
(iii) $D = \{7, 9, 10\}$
(iv) $E = \{ \}$
(v) $F = \{8, 7, 9, 5\}$

Solution:

(i) $B = \{5, 8\}$
Hence, $B \subset A$.

(ii) $C = \{0\}$
Hence, $C \not\subset A$.

(iii) $D = \{7, 9, 10\}$
Hence, $D \not\subset A$.

(iv) $E = \{ \}$
Hence, $E \subset A$ as we know that an empty set is a subset of every set.

(v) $F = \{8, 7, 9, 5\}$
Hence, $F \subset A$ as every set is a subset of itself.

Therefore, (i), (iv) and (v) are subsets of A.

3. If $P = \{2, 3, 4, 5\}$; then which of the following are proper subsets of P?

- (i) $A = \{3, 4\}$
(ii) $B = \{ \}$
(iii) $C = \{23, 45\}$
(iv) $D = \{6, 5, 4\}$
(v) $E = \{0\}$

Solution:

It is given that $P = \{2, 3, 4, 5\}$

(i) $A = \{3, 4\}$

(ii) $B = \{ \}$

(iii) $C = \{23, 45\}$

(iv) $D = \{6, 5, 4\}$

(v) $E = \{0\}$

Here only A and B are the proper subsets of P.

4. If $A = \{\text{even numbers less than 12}\}$,

$B = \{2, 4\}$,

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

$D = \{2, 6\}$ and $E = \{4\}$

State which of the following statements are true :

(i) $B \subset A$

(ii) $C \subseteq A$

(iii) $D \subset C$

(iv) $D \not\subset A$

(v) $E \supseteq B$

(vi) $A \supseteq B \supseteq E$

Solution:

$A = \{\text{even numbers less than 12}\} = \{2, 4, 6, 8, 10\}$

$B = \{2, 4\}$

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

$D = \{2, 6\}$ and $E = \{4\}$

(i) $B \subset A$ is true.

(ii) $C \subseteq A$ is false.

(iii) $D \subset C$ is false.

(iv) $D \not\subset A$ is false.

(v) $E \supseteq B$ is false

(vi) $A \supseteq B \supseteq E$ is true.

5. Given $A = \{a, c\}$, $B = \{p, q, r\}$ and $C = \text{Set of digits used to form number 1351}$.

Write all the subsets of sets A, B and C.

Solution:

$A = \{a, c\}$

Hence, the subsets are $\{ \}$ or Φ , $\{a\}$, $\{c\}$ and $\{a, c\}$.

$$B = \{p, q, r\}$$

Hence, the subsets are $\{\}$ or Φ , $\{p\}$, $\{q\}$, $\{r\}$, $\{p, q\}$, $\{p, r\}$, $\{q, r\}$ and $\{p, q, r\}$.

$$C = \text{Set of digits used to form number } 1351$$

Hence, the subsets are $\{\}$ or Φ , $\{1\}$, $\{3\}$, $\{5\}$, $\{1, 3\}$, $\{3, 5\}$, $\{1, 5\}$ and $\{1, 3, 5\}$.

6. (i) If $A = \{p, q, r\}$, then number of subsets of $A = \dots\dots$

(ii) If $B = \{5, 4, 6, 8\}$, then number of proper subsets of $B = \dots\dots$

(iii) If $C = \{0\}$, then number of subsets of $C = \dots\dots$

(iv) If $M = \{x : x \in \mathbb{N} \text{ and } x < 3\}$, then M has $\dots\dots$ proper subsets.

Solution:

(i) If $A = \{p, q, r\}$, then number of subsets of $A = 2^3 = 2 \times 2 \times 2 = 8$.

(ii) If $B = \{5, 4, 6, 8\}$, then number of proper subsets of $B = 2^4 - 1 = 2 \times 2 \times 2 \times 2 - 1 = 16 - 1 = 15$.

(iii) If $C = \{0\}$, then number of subsets of $C = 2^1 = 2$.

(iv) If $M = \{x : x \in \mathbb{N} \text{ and } x < 3\}$, then M has $= 2^2 - 1 = 4 - 1 = 3$ proper subsets.

7. For the universal set $\{4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$; find its subsets A , B , C and D such that

(i) $A = \{\text{even numbers}\}$

(ii) $B = \{\text{odd numbers greater than } 8\}$

(iii) $C = \{\text{prime numbers}\}$

(iv) $D = \{\text{even numbers less than } 10\}$.

Solution:

(i) $A = \{\text{even numbers}\} = \{4, 6, 8, 10, 12\}$

(ii) $B = \{\text{odd numbers greater than } 8\} = \{9, 11, 13\}$

(iii) $C = \{\text{prime numbers}\} = \{5, 7, 11, 13\}$

(iv) $D = \{\text{even numbers less than } 10\} = \{4, 6, 8\}$