

CBSE Class-11 Mathematics

NCERT Solutions

Chapter - 1 Sets

Exercise 1.3

1. Make correct statements by filling in the symbols \subset or $\not\subset$ in the blank spaces:

(i) $\{2, 3, 4\}$ _____ $\{1, 2, 3, 4, 5\}$

(ii) $\{a, b, c\}$ _____ $\{b, c, d\}$

(iii) $\{x: x \text{ is a student of class XI of your school}\}$ _____ $\{x: x \text{ student of your school}\}$

(iv) $\{x: x \text{ is a circle in the plane}\}$ _____ $\{x: x \text{ is a circle in the same plane with radius 1 unit}\}$

(v) $\{x: x \text{ is a triangle in plane}\}$ _____ $\{x: x \text{ is a rectangle in the same plane}\}$

(vi) $\{x: x \text{ is an equilateral triangle in a plane}\}$ _____ $\{x: x \text{ is a rectangle in the same plane}\}$

(vii) $\{x: x \text{ is an even natural number}\}$ _____ $\{x: x \text{ is an integer}\}$

Ans. (i) \subset

(ii) $\not\subset$

(iii) \subset

(iv) $\not\subset$

(v) $\not\subset$

(vi) \subset

(vii) \subset

2. Examine whether the following statements are true or false:

(i) $\{a, b\} \not\subset \{b, c, a\}$

(ii) $\{a, e\} \subset \{x : x \text{ is a vowel in the English alphabet}\}$

(iii) $\{1, 2, 3\} \subset \{1, 3, 5\}$

(iv) $\{a\} \subset \{a, b, c\}$

(v) $\{a\} \in \{a, b, c\}$

(vi) $\{x : x \text{ is an even natural number less than } 6\} \subset \{x : x \text{ is a natural number which divide } 36\}$

Ans. (i) Let $A = \{a, b\}$ and $B = \{b, c, a\}$

Here, every element of set A is an element of set B.

$\therefore A \subset B$

Therefore, statement is false.

(ii) Let $A = \{a, e\}$ and B

$= \{x : x \text{ is a vowel in the English alphabet}\}$

$= \{a, e, i, o, u\}$

Here, every element of set A is an element of set B.

$\therefore A \subset B$

Therefore, statement is true.

(iii) Let $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$

Here, $2 \in A$ but $2 \notin B$

$\therefore A \not\subset B$

Therefore, statement is false.

(iv) Let $A = \{a\}$ and $B = \{a, b, c\}$

Here, every element of set A is an element of set B.

$$\therefore A \subset B$$

Therefore, statement is true.

(v) Let $A = \{a\}$ and $B = \{a, b, c\}$

Here, $\{a\} \notin B$

Therefore, statement is false.

(vi) Let $A = \{x : x \text{ is an even natural number less than } 6\}$

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

And $B = \{x : x \text{ is a natural number which divide } 36\}$

$$= \{1, 2, 3, 4, 6, 12, 18, 36\}$$

Here, every element of set A is an element of set B.

$$\therefore A \subset B$$

Therefore, statement is true.

3. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why:

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

(ii) $\{3, 4\} \in A$

(iii) $\{\{3, 4\}\} \subset A$

(iv) $1 \in A$

(v) $1 \subset A$

(vi) $\{1, 2, 5\} \subset A$

(vii) $\{1, 2, 5\} \in A$

(viii) $\{1, 2, 3\} \subset A$

(ix) $\phi \in A$

(x) $\phi \subset A$

(xi) $\{\phi\} \subset A$

Ans. (i) $\{3, 4\}$ is a member of set A.

$\Rightarrow \{3, 4\} \in A$

Therefore, $\{3, 4\} \subset A$ is incorrect.

(ii) $\{3, 4\}$ is a member of set A. Therefore, $\{3, 4\} \in A$ is correct.

(iii) $\{3, 4\}$ is a member of set A.

$\Rightarrow \{\{3, 4\}\}$ is a set.

Therefore, $\{\{3, 4\}\} \subset A$ is correct

(iv) 1 is a member of set A. Therefore $1 \in A$ is correct.

(v) 1 is not a set, it is a member of set A. Therefore, $1 \subset A$ is incorrect.

(vi) 1, 2, 5 are the members of set A.

$\Rightarrow \{1, 2, 5\}$ is a subset of set A.

Therefore, $\{1, 2, 5\} \subset A$ is correct.

(vii) 1, 2, 5 are the members of set A.

$\Rightarrow \{1, 2, 5\}$ is a subset of set A.

Therefore, $\{1, 2, 5\} \in A$ is incorrect.

(viii) 3 is not a member of set A.

$\Rightarrow \{1, 2, 3\}$ is not a subset of set A.

Therefore, $\{1, 2, 3\} \subset A$ is incorrect.

(ix) \emptyset is not a member of set A. Therefore, $\emptyset \in A$ is incorrect.

(x) \emptyset is subset of all sets. Therefore, $\emptyset \subset A$ is correct.

(xi) \emptyset is a subset of A and it is not an element of A. So this statement is incorrect.

4. Write down all the subsets of the following sets:

(i) $\{a\}$

(ii) $\{a, b\}$

(iii) $\{1, 2, 3\}$

(iv) \emptyset

Ans. (i) Number of elements in given set = 1.

Number of subsets of given set = $2^1 = 2$

Therefore, Subsets of given set are $\emptyset, \{a\}$.

(ii) Number of elements in given set = 2

Number of subsets of given set = $2^2 = 4$

Therefore, Subsets of given set are

$\emptyset, \{a\}, \{b\}, \{a, b\}$.

(iii) Number of elements in given set = 3

Number of subsets of given set = $2^3 = 8$

Therefore, Subsets of given set are

$$\phi, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 2, 3\}.$$

(iv) Number of elements in given set = 0

Number of subsets of given set = $2^0 = 1$

Therefore, Subsets of given set are ϕ .

5. How many elements has P(A), if $A = \phi$?

Ans. Number of elements in set $A = 0$

Number of subsets of given set = $2^0 = 1$

Therefore, number of elements of P (A) is 1.

6. Write the following as intervals:

(i) $\{x: x \in \mathbb{R}, -4 < x \leq 6\}$

(ii) $\{x: x \in \mathbb{R}, -12 < x < -10\}$

(iii) $\{x: x \in \mathbb{R}, 0 \leq x < 7\}$

(iv) $\{x: x \in \mathbb{R}, 3 \leq x \leq 4\}$

Ans. (i) Let $A = \{x: x \in \mathbb{R}, -4 < x \leq 6\}$

It can be written in the form of interval as $(-4, 6]$

(ii) Let $A = \{x: x \in \mathbb{R}, -12 < x < -10\}$

It can be written in the form of interval as $(-12, -10)$

(iii) Let $A = \{x: x \in \mathbb{R}, 0 \leq x < 7\}$

It can be written in the form of interval as $[0, 7)$

(iv) Let $A = \{x : x \in \mathbb{R}, 3 \leq x \leq 4\}$

It can be written in the form of interval as $[3, 4]$

7. Write the following intervals in set-builder form:

(i) $(-3, 0)$

(ii) $[6, 12]$

(iii) $(6, 12]$

(iv) $[-23, 5)$

Ans. (i) $\{x : x \in \mathbb{R}, -3 < x < 0\}$

(ii) $\{x : x \in \mathbb{R}, 6 \leq x \leq 12\}$

(iii) $\{x : x \in \mathbb{R}, 6 < x \leq 12\}$

(iv) $\{x : x \in \mathbb{R}, -12 \leq x < 5\}$

8. What universal set(s) would you propose for each of the following:

(i) The set of right triangles

(ii) The set of isosceles triangles

Ans. (i) Right triangle is a type of triangle. Therefore, the set of triangles contain all types of triangles.

$\therefore U = \{x : x \text{ is a triangle in plane}\}$

(ii) Isosceles triangle is a type of triangle. Therefore, the set of triangles contain all types of triangles.

$\therefore U = \{x : x \text{ is a triangle in plane}\}$

9. Given the set $A = \{1, 3, 5\}$, $B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$, which of the following may be considered as universal set(s) for all the three sets A, B and C:

(i) $\{0, 1, 2, 3, 4, 5, 6\}$

(ii) \emptyset

(iii) $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(iv) $\{1, 2, 3, 4, 5, 6, 7, 8\}$

Ans. (i) $\{0, 1, 2, 3, 4, 5, 6\}$ is not a universal set for A, B, C because $8 \in C$ but 8 is not a member of $\{0, 1, 2, 3, 4, 5, 6\}$.

(ii) \emptyset is a set which contains no element. therefore, it is not a universal set for A, B, C.

(iii) $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ is a universal set for A, B, C because all members of A, B, C are present in $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$.

(iv) $\{1, 2, 3, 4, 5, 6, 7, 8\}$ is not a universal set for A, B, C because $0 \in C$ but 0 is not a member of $\{1, 2, 3, 4, 5, 6, 7, 8\}$.