NCERT Solutions for Class-XI Maths

Chapter-1 Exercise-1.3

NCERT Math Class 11

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

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

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

(iii) $\{x : x$ is a student of Class XI of your school $\}\ldots\{x : x$ student of your school $\}$

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

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

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

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

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

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

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

(iv) $\{x : x$ is a circle in the plane $\}\not\subset\{x : x$ is a circle in the same plane with radius 1 unit $\}$

(v) $\{x : x$ is a triangle in a plane $\}\not\subset\{x : x$ is a rectangle in the plane $\}$

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

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

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

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

(ii) $\{a,e\}\subset\{x : x$ 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) $\{x : x$ is an even natural number less than 6$\}\subset\{x : x$ is a natural number which divides 36$\}$

2. (i) Let us assume that A = {a, b} and B = {b, c, a}

Now, we can observe that every element of A is an element of B.
Thus, $A \subset B$
$\therefore$ The statement is false.

(ii) Let us assume that A = {a, e} and
B = {x: x is a vowel in the English alphabets}
={a, e, i, o, u}
Now, we can observe that every element of A is an element of B.
Thus, $A \subset B$
$\therefore$ The statement is true.

(iii) Let us assume that A = {1, 2, 3} and B = {1, 3, 5},
Now, we can observe that 2 belongs to A but 2 does not belongs to B.
Thus, $A \not\subset B$
$\therefore$ The statement is false.

(iv) Let us assume that A = {a} and B = {b, c, a}
Now, we can observe that every element of A is an element of B.
Thus, $A \subset B$
$\therefore$ The statement is true.

(v) Let us assume that A = {a} and B = {b, c, a}
Now, we can observe that every element of A is an element of B.
Thus, $A \subset B$
$\therefore$ The statement is false.

(vi) Let us assume that A = {x:x is an even natural number less than 6}
= {2, 4}
and B = {x:x is a natural number which divide 36}
= {1, 2, 3, 4, 6, 9, 12, 18, 36}
Now, we can observe that every element of A is an element of B.
Thus, $A \subset B$
$\therefore$ The statement is true.

3. Let $A = \{1, 2, \{3,4\}, 5, \}$. Whichofthefollowingstatementsareincorrect 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) $\{\Phi\} \subset A$

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

(i) The statement $\{3,4\} \subset A$ is incorrect because $3 \in \{3,4\}$; however, $3 \notin A$.

(ii) The statement $\{3,4\} \in A$ is correct because $\{3,4\}$ is an element of A.

(iii) The statement $\{\{3,4\}\} \subset A$ is correct because $\{3,4\} \in \{\{3,4\}\}$ and $\{3, 4\} \in A$.

(iv) The statement $1 \in A$ is correct because 1 is an element of A.

(v) The statement $1 \subset A$ is incorrect because an element of a set can never be a subset of itself.

(vi) The statement $\{1,2,5\} \subset A$ is correct because each element of $\{1,2,5\}$ is also an element of A.

(vii) The statement $\{1,2,5\} \in A$ is incorrect because $\{1,2,5\}$ is not an element of A.

(viii) The statement $\{1,2,3\} \subset A$ is incorrect because $3 \in \{1,2,3\}$; however, $3 \notin A$.

(ix) The statement $\Phi \in A$ is incorrect because Φ is not an element of A.

(x) The statement $\Phi \subset A$ is correct because Φ is a subset of every set.

(xi) The statement $\{\Phi\} \subset A$ is incorrect because $\Phi \in \{\Phi\}$; however, $\Phi \in A$.

4. Write down all the subsets of the following sets:
(i) {a}
(ii) {a, b}
(iii) {1, 2, 3}
(iv) ϕ

4. (i) Let A={a}
Now, number of elements in A = 1
Number of subsets of A = 2^1
∴ subsets of A are: ϕ, {a}

(ii) Let A={a, b}
Now, number of elements in A = 2
Number of subsets of A = $2^2 = 4$
∴ subsets of A are: ϕ, {a}, {b}, {a, b}

(iii) Let A={1, 2, 3}
Now, number of elements in A = 3
Number of subsets of A = $2^3 = 8$

∴ subsets of A are:
ϕ, {1}, {2}, {3}, {1, 2}, {1, 3}, {2, 3}, {1, 2, 3}

(iv) Let A=ϕ
Now, number of elements in A = 0
Number of subsets of A = $2^0 = 1$
∴subsetof A is: ϕ

5. How many elements has P(A), if A = Φ?

5. We know that if A is a set with m elements i.e., $n(A)=m$, then $n[P(A)]=2^m$.

If $A=\Phi$, then $n(A)=0$.

$$\therefore n[P(A)]=2^0=1$$

Hence, $P(A)$ has one element.

6. Write the following as intervals:
(i) {x: x ∈R, – 4 < x ≤ 6}
(ii) {x : x ∈R, – 12 < x <–10}
(iii) {x: x ∈R, 0 ≤ x < 7}
(iv) {x : x∈ R, 3 ≤ x ≤ 4}

6.
(i) Let us assume that A = {x: x ∈R, – 4 < x ≤ 6}
∴ Set A can be written in the form of intervals as follows:
= (-4, 6]
(ii) Let us assume that A = {x : x ∈R, – 12 < x <–10}
∴ Set A can be written in the form of intervals as follows:
= (-12, -10)
(iii) Let us assume that A = {x: x ∈R, 0 ≤ x < 7}
∴ Set A can be written in the form of intervals as follows:
= [0, 7)
(iv) Let us assume that A = {x : x∈ R, 3 ≤ x ≤ 4}
∴ Set A can be written in the form of intervals as follows:
= [3, 4]

7. Write the following intervals in set-builder form:
(i) $(-3,0)$
(ii) $[6,12]$
(iii) $(6,12]$
(iv) $[-23,5)$

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

(ii) $[6,12]=\{x: x\in R, 6\le x\le 12\}$

(iii) $(6,12]=\{x: x\in R, 6<x\le 12\}$

(iv) $[-23,5)=\{x: x\in R, -23\le x<5\}$

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.

8.

(i) We know that right triangles are a type of triangle with an angle 90°
Thus, a set of triangles will contain all the right triangles.
∴ universal set, U = {x: x is a triangle in plane}

(ii) We know that isosceles triangles are a type of triangle with any two of the angles equal in measure.
Thus, a set of triangles will contain all the isosceles triangles.
∴ universal set, U = {x: x is a triangle in plane}

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

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

(ii) Φ

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

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

9. (i) It can be seen that $A\subset\{0,1,2,3,4,5,6\}$

$B\subset\{0,1,2,3,4,5,6\}$

However, $C\not\subset\{0,1,2,3,4,5,6\}$

Therefore, the set $\{0,1,2,3,4,5,6\}$ cannot be the universal set for the sets A, B, and C.

(ii) $A\not\subset\Phi, B\not\subset\Phi, C\not\subset\Phi$

Therefore, Φ cannot be the universal set for the sets A, B, and C.

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

$B\subset\{0,1,2,3,4,5,6,7,8,9,10\}$

$C \subset \{0,1,2,3,4,5,6,7,8,9,10\}$

Therefore, the set $\{0,1,2,3,4,5,6,7,8,9,10\}$ is the universal set for the sets A, B, and C.

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

$B \subset \{1,2,3,4,5,6,7,8\}$

However, C $\{1,2,3,4,5,6,7,8\}$

Therefore, the set $\{1,2,3,4,5,6,7,8\}$ cannot be the universal set for the sets A, B, and C.