

NCERT Solutions for Class 11 Maths/SETS – Chapter 1

Text book solutions/Model Questions/Sets/Chapter 1/Exercise 1.3

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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)  $\{x: \text{is a student of Class XI of your school}\}$  -----  $\{x: \text{x student of your school}\}$

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

v)  $\{x: \text{x is a triangle in a plane}\}$  ----  $\{x; \text{x is a rectangle in the plane}\}$

vi)  $\{x; \text{x is an equilateral triangle in a plane}\}$  -----  $\{x: \text{x is a triangle in the same plane}\}$

vii)  $\{x: \text{x is an even natural number}\}$  -----  $\{x; \text{x is an integer}\}$

Solution:

i) A set A is said to be a subset of a set B if every element of A is also an element of B.

$\{2, 3, 4\}$  is also in the set  $\{1, 2, 3, 4, 5\}$

Therefore,  $\{2, 3, 4\} \subset \{1, 2, 3, 4, 5\}$

ii)  $\{a, b, c\}$  is not in the set  $\{b, c, d\}$

Therefore,  $\{a, b, c\} \not\subset \{b, c, d\}$

iii) The set of students of Class XI of your school is also included in the set of student of your school.

Therefore,  $\{x: \text{x is a student of Class XI of your school}\} \subset \{x: \text{x student of your school}\}$

iv) A set of a circle in the plane is not in the set of a circle in the same plane with radius 1 unit.

Therefore,  $\{x: x \text{ is a circle in the plane}\} \not\subset \{x: x \text{ is a circle in the same plane with radius 1 unit}\}$

v) The set of triangle in the plane are not in the set of rectangles.

Therefore,  $\{x: x \text{ is a triangle in a plane}\} \not\subset \{x: x \text{ is a rectangle in the plane}\}$

vi) The set of equilateral triangle in the plane is in the set of triangle in the same plane}

Therefore,  $\{x: x \text{ is an equilateral triangle in a plane}\} \subset \{x: x \text{ is a triangle in the same plane}\}$

vii) The set of even natural numbers are in the set of integers.

Therefore,  $\{x: x \text{ is an even natural number}\} \subset \{x: x \text{ is an integer}\}$

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

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

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

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

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

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

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

Solution:

i) The element in the set  $\{a, b\}$  is also in the set  $\{b, c, a\}$ .

Therefore, the given statement is false. So  $\{a, b\} \not\subset \{b, c, a\}$

ii) The element in the set  $\{a, e\}$  is also in the set  $\{a, e, i, o, u\}$

Therefore the given statement is true.

iii) The element in the set  $\{1, 2, 3\}$  is not in the set  $\{1, 3, 5\}$

Therefore, the given statement is false. So  $\{1, 2, 3\} \not\subset \{1, 3, 5\}$

iv) The element in the set  $\{a\}$  is also in the set  $\{a, b, c\}$

Therefore, the given statement is true.

v) The given statement is false. So we can say  $\{a\} \subset \{a, b, c\}$

vi) The set of even natural numbers less than 6 are  $\{2, 4\}$ .

The set of natural numbers which divides 36 are  $\{1, 2, 3, 4, 6, 9, 12, 18, 36\}$

The element in the set  $\{2, 4\}$  is also in the set  $\{1, 2, 3, 4, 6, 9, 12, 18, 36\}$ .

Therefore, the given statement is true.

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

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

Solution:

The given statement is incorrect, because  $3 \in \{3, 4\}$  but  $3 \notin A$ .

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

Solution:

The given statement is correct because  $\{3, 4\}$  is an element of  $A$ .

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

Solution:

The given statement is correct because the element in the set  $\{\{3, 4\}\}$  is also in the set  $\{1, 2, \{3, 4\}, 5\}$

iv)  $1 \in A$

Solution:

Since 1 is an element of the set  $A$ , the given statement is correct.

v)  $1 \subset A$

Solution:

The given statement is incorrect because an element of a set can never be a subset of itself. Therefore,  $1 \notin A$

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

Solution:

The elements in the set  $\{1, 2, 5\}$  is also in the set A.

Therefore, the given statement is correct.

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

Solution:

The element of  $\{1, 2, 5\}$  is not an element of A. So  $\{1, 2, 5\} \notin A$ .

Therefore, the given statement is incorrect.

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

Solution:

The given statement is incorrect because  $3 \notin A$ .

Therefore,  $\{1, 2, 3\} \not\subset A$

ix)  $\emptyset \in A$

Solution:

The given statement is incorrect, because  $\emptyset$  is not an element of A.

x)  $\emptyset \subset A$

Solution:

The given statement is correct because  $\emptyset$  is a subset of every set.

xi)  $\{\emptyset\} \subset A$

Solution:

The given statement is incorrect, because  $\emptyset$  is an element of A and it is not a subset of A.

4. Write down all the subsets of the following sets

i)  $\{a\}$

Solution:

Subsets of  $\{a\}$  are  $\emptyset$  and  $\{a\}$

ii)  $\{a, b\}$

Solution:

Subsets of  $\{a, b\}$  are  $\emptyset, \{a\}, \{b\}, \{a, b\}$

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

Subsets of  $\{1, 2, 3\}$  are  $\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 2, 3\}$

iv)  $\emptyset$

Solution:

Subset of  $\emptyset$  is  $\emptyset$  itself.

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

Solution:

If  $A$  is a set with  $n(A) = m$ , then it can be shown that  $n[P(A)] = 2^m$ .

If  $A = \emptyset$ ,  $n(A) = 0$

Therefore,  $n[P(A)] = 2^0 = 1$

$P(A)$  has only one element.

6. Write the following as intervals:

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

Solution:  $(-4, 6]$

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

Solution:  $(-12, -10)$

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

Solution:  $[0, 7)$

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

Solution:  $[3, 4]$

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

i)  $(-3, 0)$

ii)  $[6, 12]$

iii)  $(6, 12]$

iv)  $[-23, 5)$

Solution:

i)  $\{x: x \in R, -3 < x < 0\}$

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

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

iv)  $\{x: x \in R, -23 \leq x < 5\}$

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

Solution:

i) The universal set may be all kinds of triangles or the set of polygons.

ii) The universal set may be all kinds of triangles or the set of polygons or the set of two dimensional pictures

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

Solution:

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

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

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

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

ii)  $\emptyset$  cannot be an universal set for A, B and C, because

$A \not\subset \emptyset$

$B \not\subset \emptyset$

$C \not\subset \emptyset$

iii) The set  $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$  is the universal set for A, B and C because A, B, C are subsets of the given set.

iv) The set  $\{1, 2, 3, 4, 5, 6, 7, 8\}$  is not the universal set for A, B and C, because

A and B are subsets of the given set. But C is not a subset.