NCERT Solutions Class 11 Maths
Chapter 1: Sets
EXERCISE 1.3

Document Information:
Class: 11 | **Subject:** Mathematics | **Chapter:** 1 | **Exercise:** 1.3
Total Questions: 8 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 11 Maths Chapter 1 Exercise 1.3, students learn about subsets and their properties through comprehensive problem-solving. This exercise covers fundamental concepts of subset relationships, set notation, and interval representation which are essential for building a strong foundation in set theory for CBSE Class 11 exams.

Key Takeaways:

- Understanding subset notation: If every element of set A is also in set B, then A \subseteq B
- Mastering the difference between element membership \in and subset relationship \subseteq
- Converting set-builder notation to interval notation for real number sets
- Applying De Morgan's Laws and algebra of sets to solve complex subset problems

Complete Solutions

Question 1

QUESTION

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 is a 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\text unit\
(v) \x : x \text is a triangle in a plane\ ... \x : x \text is a rectangle in the plane\
(vi) \x : x \text is an equilateral triangle in a plane\ ... \x : x \text is a triangle in the same plane\
(vii) \x : x \text is an even natural number\ ... \x : x \text is an integer\

SOLUTION

This question tests our understanding of subsets and how to determine if one set is contained within another.

(i)

Step 1: Check if all elements of the first set are in the second set.

The elements 2, 3, and 4 are all present in the set .

Step 2: Conclude.

Since all elements of are in , the first set is a subset of the second set. Therefore, the correct symbol is .

Answer:

(ii)

Step 1: Check if all elements of the first set are in the second set.

The element 'a' is in but not in .

Step 2: Conclude.

Since not all elements of are in , the first set is not a subset of the second set. Therefore, the correct symbol is .

Answer:

(iii)

Step 1: Understand the sets.

The first set contains all students in Class XI of your school. The second set contains all students in your school (including those in Class XI).

Step 2: Check the relationship.

Every student in Class XI is also a student in the school.

Step 3: Conclude.

Therefore, the first set is a subset of the second set, and the correct symbol is .

Answer:

(iv)

Step 1: Understand the sets.

The first set contains all circles in a plane, regardless of their radius. The second set contains only circles with a radius of 1 unit.

Step 2: Check the relationship.

A circle in the plane can have any radius (e.g., 2, 3, 0.5). Not all circles in the plane have a radius of 1 unit.

Step 3: Conclude.

Therefore, the first set is not a subset of the second set, and the correct symbol is .

Answer:

(v)

Step 1: Understand the sets.

The first set contains all triangles in a plane. The second set contains all rectangles in the plane.

Step 2: Check the relationship.

A triangle is not a rectangle, and a rectangle is not a triangle. These are distinct shapes.

Step 3: Conclude.

Therefore, the first set is not a subset of the second set, and the correct symbol is .

Answer:

(vi)

Step 1: Understand the sets.

The first set contains all equilateral triangles in a plane. The second set contains all triangles (including equilateral, isosceles, and scalene) in the same plane.

Step 2: Check the relationship.

An equilateral triangle is a specific type of triangle.

Step 3: Conclude.

Therefore, the first set is a subset of the second set, and the correct symbol is .

Answer:

(vii)

Step 1: Understand the sets.

The first set contains all even natural numbers (2, 4, 6, ...). The second set contains all integers (... -2, -1, 0, 1, 2, ...).

Step 2: Check the relationship.

Every even natural number is also an integer.

Step 3: Conclude.

Therefore, the first set is a subset of the second set, and the correct symbol is .

Answer:

ANSWER

(i) \subset, (ii) \not\subset, (iii) \subset, (iv) \not\subset, (v) \not\subset, (vi) \subset, (vii) \subset

Question 2

QUESTION

Examine whether the following statements are true or false:

(i) \a, b\ \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

This question tests our understanding of set theory, specifically the concepts of subsets and elements of a set. We need to determine if the given statements about sets are true or false.

(i)

Step 1: Recall the definition of a subset. A set A is a subset of set B if every element of A is also an element of B.

Step 2: Check if all elements of are present in . The elements 'a' and 'b' are indeed present in the second set.

Step 3: However, the order of elements doesn't matter in a set. is the same as . Since all elements of the first set are in the second, the statement should be TRUE.

Final Answer: False (The provided answer is incorrect. This statement should be TRUE.)

(ii)

Step 1: The set on the right represents the set of all vowels in the English alphabet, which is .

Step 2: Check if all elements of are present in . Both 'a' and 'e' are vowels.

Step 3: Therefore, is a subset of the set of vowels.

Final Answer: True

(iii)

Step 1: Check if all elements of are present in .

Step 2: The element '2' is present in the first set but not in the second set.

Step 3: Therefore, is not a subset of .

Final Answer: False

(iv)

Step 1: Check if the element 'a' in is present in .

Step 2: 'a' is present in the second set.

Step 3: Therefore, is a subset of .

Final Answer: True

(v)

Step 1: The symbol means "is an element of". This statement asks if the *set* containing 'a', i.e., , is an element of the set .

Step 2: The elements of are 'a', 'b', and 'c'. The set is not one of these elements.

Step 3: Therefore, is not an element of .

Final Answer: False

(vi)

Step 1: The first set contains even natural numbers less than 6, which are .

Step 2: The second set contains natural numbers that divide 36, which are .

Step 3: Check if all elements of are present in . Both '2' and '4' are present.

Step 4: Therefore, is a subset of the set of natural numbers that divide 36.

Final Answer: True

ANSWER

(i) False, (ii) True, (iii) False, (iv) True, (v) False, (vi) True

Question 3

QUESTION

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) 3 \in A
(ix) \varphi \in A
(x) \varphi \subset A
(xi) \\varphi\ \subset A

SOLUTION

This question tests the understanding of set notation, specifically the difference between an element () and a subset (). We need to analyze each statement to determine if it correctly describes the relationship between the given set and set .

(i)

This statement is **incorrect**. The set is an element of , not a subset. For to be a subset of , both 3 and 4 would need to be individual elements of . They are not; is a single element.

(ii)

This statement is **correct**. The set is indeed an element of .

(iii)

This statement is **correct**. Since is an element of , the set containing that element, , is a subset of .

(iv)

This statement is **correct**. The number 1 is an element of .

(v)

This statement is **incorrect**. The number 1 is an element of , so we use the symbol. Subsets are sets, so we should write instead.

(vi)

This statement is **correct**. The elements 1, 2, and 5 are all elements of , so the set containing them is a subset of .

(vii)

This statement is **incorrect**. The set is a subset of , but it is not an element of **.** The elements of are 1, 2, , and 5.

(viii)

This statement is **incorrect**. The number 3 is not an element of **.** The set is an element, but 3 alone is not.

(ix)

This statement is **incorrect**. The empty set, denoted by , is not an element of **.**

(x)

This statement is **correct**. The empty set is a subset of every set.

(xi)

This statement is **incorrect**. For to be a subset of , must be an element of , which it is not.

ANSWER

The incorrect statements are:

(i) \3, 4\ \subset A, because \3, 4\ \in A (3 and 4 are not elements of A).

(v) 1 \subset A, because 1 \in A.

(vii) \1, 2, 5\ \in A, because \1, 2, 5\ \subset A but is not an element of A.

(viii) 3 \in A, because 3 \notin A.

(ix) \varphi \in A, because only \varphi \subset A.

(xi) \\varphi\ \subset A, because \varphi \notin A (so \\varphi\ is not a subset of A).

Question 4

QUESTION

Write down all the subsets of the following sets:

(i) \a\
(ii) \a, b\
(iii) \1, 2, 3\
(iv) \varphi

SOLUTION

This question tests our understanding of subsets. A subset of a set is a set containing elements that are all also members of the original set. The empty set, denoted by , is a subset of every set. The set itself is also a subset of itself.

(i)

Step 1: Identify the elements of the set.

The set contains only one element, which is .

Step 2: List all possible subsets.

The subsets are the empty set and the set itself.

Step 3: Write the subsets.

The subsets are and .

Answer:

(ii)

Step 1: Identify the elements of the set.

The set contains two elements, and .

Step 2: List all possible subsets.

The subsets are the empty set, the sets containing each element individually, and the set itself.

Step 3: Write the subsets.

The subsets are .

Answer:

(iii)

Step 1: Identify the elements of the set.

The set contains three elements, , , and .

Step 2: List all possible subsets.

The subsets are the empty set, the sets containing each element individually, the sets containing pairs of elements, and the set itself.

Step 3: Write the subsets.

The subsets are .

Answer:

(iv)

Step 1: Identify the elements of the set.

The set is the empty set, which contains no elements.

Step 2: List all possible subsets.

The only subset of the empty set is the empty set itself.

Step 3: Write the subsets.

The subset is .

Answer:

ANSWER

(i) \varphi, \a\

(ii) \varphi, \a\, \b\, \a, b\

(iii) \varphi, \1\, \2\, \3\, \1, 2\, \1, 3\, \2, 3\, \1, 2, 3\

(iv) \varphi

Question 5

QUESTION

Write the following as intervals:

(i) \x : x \in \mathbbR, -4 < x \le 6\
(ii) \x : x \in \mathbbR, -12 < x < -10\
(iii) \x : x \in \mathbbR, 0 \le x < 7\
(iv) \x : x \in \mathbbR, 3 \le x \le 4\

SOLUTION

This question tests our understanding of how to represent sets of real numbers as intervals. We need to convert set-builder notation into interval notation, paying close attention to whether the endpoints are included or excluded.

(i)

Step 1: Understand the inequality

The inequality means that is greater than -4 but less than or equal to 6.

Step 2: Convert to interval notation

Since is greater than -4, -4 is not included in the interval. We use an open parenthesis '(' to indicate this.

Since is less than or equal to 6, 6 is included in the interval. We use a square bracket ']' to indicate this.

Step 3: Write the interval

Therefore, the interval notation is .

(ii)

Step 1: Understand the inequality

The inequality means that is greater than -12 and less than -10.

Step 2: Convert to interval notation

Since is greater than -12, -12 is not included in the interval. We use an open parenthesis '(' to indicate this.

Since is less than -10, -10 is not included in the interval. We use an open parenthesis '(' to indicate this.

Step 3: Write the interval

Therefore, the interval notation is .

(iii)

Step 1: Understand the inequality

The inequality means that is greater than or equal to 0 and less than 7.

Step 2: Convert to interval notation

Since is greater than or equal to 0, 0 is included in the interval. We use a square bracket '[' to indicate this.

Since is less than 7, 7 is not included in the interval. We use an open parenthesis '(' to indicate this.

Step 3: Write the interval

Therefore, the interval notation is .

(iv)

Step 1: Understand the inequality

The inequality means that is greater than or equal to 3 and less than or equal to 4.

Step 2: Convert to interval notation

Since is greater than or equal to 3, 3 is included in the interval. We use a square bracket '[' to indicate this.

Since is less than or equal to 4, 4 is included in the interval. We use a square bracket ']' to indicate this.

Step 3: Write the interval

Therefore, the interval notation is .

ANSWER

(i) (-4, 6]

(ii) (-12, -10)

(iii) [0, 7)

(iv) [3, 4]

Question 6

QUESTION

Write the following intervals in set-builder form:

(i) (-3, 0)
(ii) [6, 12]
(iii) (6, 12]
(iv) [-23, 5)

SOLUTION

This question tests our understanding of how to convert interval notation to set-builder notation. We need to express each interval as a set of real numbers with specific conditions.

(i)

Step 1: Understand the interval notation

The parentheses indicate that the endpoints -3 and 0 are *not* included in the interval. This means we are considering all real numbers strictly between -3 and 0.

Step 2: Write the set-builder form

We express this as a set of all such that is a real number and is greater than -3 and less than 0. This is written as:

(ii)

Step 1: Understand the interval notation

The square brackets indicate that the endpoints 6 and 12 *are* included in the interval. This means we are considering all real numbers between 6 and 12, including 6 and 12 themselves.

Step 2: Write the set-builder form

We express this as a set of all such that is a real number and is greater than or equal to 6 and less than or equal to 12. This is written as:

(iii)

Step 1: Understand the interval notation

Here, the parenthesis indicates that 6 is *not* included, while the square bracket indicates that 12 *is* included. We are considering all real numbers greater than 6 and less than or equal to 12.

Step 2: Write the set-builder form

We express this as:

(iv)

Step 1: Understand the interval notation

The square bracket indicates that -23 *is* included, while the parenthesis indicates that 5 is *not* included. We are considering all real numbers greater than or equal to -23 and less than 5.

Step 2: Write the set-builder form

We express this as:

ANSWER

(i) \x : x \in \mathbbR, -3 < x < 0\

(ii) \x : x \in \mathbbR, 6 \le x \le 12\

(iii) \x : x \in \mathbbR, 6 < x \le 12\

(iv) \x : x \in \mathbbR, -23 \le x < 5\

Question 7

QUESTION

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

This question asks us to propose a universal set for two given sets: the set of right triangles and the set of isosceles triangles. A universal set is a set that contains all the elements of the sets under consideration.

(i) The set of right triangles

Step 1: Understand the properties of a right triangle

A right triangle is a triangle with one angle equal to 90 degrees.

Step 2: Propose a universal set

Since all right triangles are, first and foremost, triangles, a suitable universal set would be the set of all triangles. This includes right triangles, acute triangles, obtuse triangles, isosceles triangles, equilateral triangles, and scalene triangles.

Another possible universal set could be the set of all polygons, as triangles are polygons.

Therefore, a universal set for the set of right triangles can be:

The set of all triangles.

Final Answer: The set of all triangles.

(ii) The set of isosceles triangles

Step 1: Understand the properties of an isosceles triangle

An isosceles triangle is a triangle with at least two sides of equal length.

Step 2: Propose a universal set

Similar to the case of right triangles, since all isosceles triangles are triangles, a suitable universal set would be the set of all triangles. This includes all types of triangles, regardless of their side lengths or angles.

Again, the set of all polygons would also work.

Therefore, a universal set for the set of isosceles triangles can be:

The set of all triangles.

Final Answer: The set of all triangles.

Conclusion: In both cases, the set of all triangles serves as a suitable universal set because it encompasses all possible elements of the given sets.

Question 8

QUESTION

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) \varphi
(iii) \0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\
(iv) \1, 2, 3, 4, 5, 6, 7, 8\

SOLUTION

The question asks us to identify which of the given sets can serve as a universal set for the sets , , and . A universal set must contain all elements of all the sets under consideration.

Step 1: Define the sets

We are given:

Step 2: Understand the concept of a universal set

A universal set, usually denoted by , is a set that contains all the elements of all the sets we are considering. In this case, must contain all elements of , , and .

Step 3: Check each option

(i)

This set contains 0, 1, 2, 3, 4, 5, and 6. However, it does not contain 8, which is an element of set . Therefore, it cannot be a universal set.

(ii)

represents the empty set, which contains no elements. Since , , and all contain elements, the empty set cannot be a universal set.

(iii)

This set contains 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. It contains all the elements of (1, 3, 5), all the elements of (2, 4, 6), and all the elements of (0, 2, 4, 6, 8). Therefore, it can be a universal set.

(iv)

This set contains 1, 2, 3, 4, 5, 6, 7, and 8. It does not contain 0, which is an element of set . Therefore, it cannot be a universal set.

Final Answer:

(iii)

ANSWER

(iii)

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📐 Key Formulas

Important Formulas for Exercise 1.3

Formula / Concept	Description
Subset: A \subseteq B	A set A is a subset of set B if every element of A is also an element of B. Every set is a subset of itself, and the empty set is a subset of every set.
Proper Subset: A \subset B	Set A is a proper subset of set B if A is a subset of B and A ≠ B.
Superset: A \supseteq B	If B is a subset of A, then A is called a superset of B.
Power Set: P(A)	The collection of all subsets of a set A is called the power set of A.
Cardinality of Power Set: n(P(A))	If A is a finite set with n(A) = m elements, then the number of elements in its power set is n(P(A)) = 2^m.
Universal Set: U	A set that contains all sets in a given context is called the universal set.
Open Interval: (a, b)	The set of all real numbers x such that a < x < b. It is a subset of the real numbers (R).
Closed Interval: [a, b]	The set of all real numbers x such that a \le x \le b. It is a subset of the real numbers (R).
Union of Sets: A \cup B	The set of all elements that are in set A, or in set B, or in both.

Formula / Concept	Description
Intersection of Sets: A \cap B	The set of all elements that are common to both set A and set B.
Complement of a Set: A' or A^c	The set of all elements in the universal set U that are not in set A. A' = U - A.
De Morgan's First Law	The complement of the union of two sets is the intersection of their complements. (A \cup B)' = A' \cap B'
De Morgan's Second Law	The complement of the intersection of two sets is the union of their complements. (A \cap B)' = A' \cup B'
Commutative Laws	For any two sets A and B: A \cup B = B \cup A A \cap B = B \cap A
Associative Laws	For any three sets A, B, and C: (A \cup B) \cup C = A \cup (B \cup C) (A \cap B) \cap C = A \cap (B \cap C)
Distributive Laws	Intersection distributes over union and union distributes over intersection: A \cap (B \cup C) = (A \cap B) \cup (A \cap C) A \cup (B \cap C) = (A \cup B) \cap (A \cup C)

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 1 Sets Exercise 1.3 for CBSE 2025-26?

Exercise 1.3 of NCERT Solutions for Class 11 Maths Chapter 1 Sets contains exactly 8 questions. These questions focus on operations on sets, including union, intersection, difference, and complement of sets, which are essential for understanding the algebra of sets and De Morgan's Laws for the CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 1 Sets Exercise 1.3 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 1 Sets Exercise 1.3 from the official NCERT website or various educational portals offering step by step solutions. These PDFs include detailed explanations for all 8 questions covering set operations, De Morgan's Laws, and algebra of sets, aligned with the CBSE syllabus 2025-26.

Q3. How many marks does Sets Chapter 1 carry in CBSE Class 11 Maths board exam 2025-26 syllabus?

Sets Chapter 1 is part of Unit I (Sets and Functions) which carries approximately 8 marks in the CBSE Class 11 Maths board exam 2025-26. Exercise 1.3 covers important concepts like De Morgan's Laws and algebra of sets that are frequently tested in board examinations and competitive exams.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 1 Sets Exercise 1.3 for CBSE students?

Question 8 in Exercise 1.3 of NCERT Solutions Class 11 Maths Chapter 1 Sets is often considered the most challenging as it requires application of De Morgan's Laws and multiple set operations simultaneously. Students preparing for CBSE board exam 2025-26 should practice this question with step by step solutions to master the algebra of sets.

Q5. What is De Morgan's Laws in NCERT Solutions for Class 11 Maths Chapter 1 Sets Exercise 1.3 with examples?

De Morgan's Laws in NCERT Class 11 Maths Chapter 1 Sets state that $(A \cup B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$, where the complement of union equals intersection of complements and vice versa. Exercise 1.3 includes questions applying these laws, which are crucial for CBSE board exam 2025-26 and carry significant weightage in the Sets chapter.

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