NCERT Solutions for Class-XI Maths

Chapter-1 Exercise-1.4

NCERT Math Class 11

1. Find the union of each of the following pairs of sets:

(i) $X=\{1,3,5\};\ Y=\{1,2,3\}$

(ii) $A=\{a,e,i,o,u\};\ B=\{a,b,c\}$

(iii) $A=\{x:x$ is a natural number and multiple of $3\}$

$B=\{x:x$ is a natural number less than $6\}$

(iv) $A=\{x:x$ is a natural number and $1<x\leq 6\}$

$B=\{x:x$ is a natural number and $6<x<10\}$

(v) $A=\{1,2,3\};\ B=\Phi$

1. (i) $X=\{1,3,5\}\ Y=\{1,2,3\}$

$X\cup Y=\{1,2,3,5\}$

(ii) $A=\{a,e,i,o,u\}B=\{a,b,c\}$

$A\cup B=\{a,b,c,e,i,o,u\}$

(iii) $A=\{x:x$ is a natural number and multiple of $3\}=\{3,6,9\ldots\}$

$B=\{x:x$ is a natural number less than $6\}=\{1,2,3,4,5,6\}$

$A\cup B=\{1,2,4,5,3,6,9,12\ldots\}$

$\therefore\ A\cup B=\{x:x=1,2,4,5$ or a multiple of $3\}$

(iv) $A=\{x:x$ is a natural number and $1<x\leq 6\}=\{2,3,4,5,6\}$

$B=\{x:x$ is a natural number and $6<x<10\}=\{7,8,9\}$

$A\cup B=\{2,3,4,5,6,7,8,9\}$

$\therefore\ A\cup B=\{x:x\in N$ and $1<x<10\}$

(v) $A=\{1,2,3\},\ B=\Phi$

$A\cup B=\{1,2,3\}$

2. Let A = {a, b}, B = {a, b, c}. Is $A\subset B$? What is $A\cup B$?

2. It is given in the question that,

A = {a, b}

And, B = {a, b, c}
Here, it is clearly seen that all the elements of set A are present in set B
$\therefore A \subset B$
And, $A \cup B = \{a, b, c\} = B$

3. If A and B are two sets such that $A \subset B$, then what is $A \cup B$?

3. If A and B are two sets such that $A \subset B$, then $A \cup B = B$.

4. If A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C = {5, 6, 7, 8 }and D = { 7, 8, 9, 10 }; find:

4. (i) A ∪ B

Sol. It is given in the question that,
A = {1, 2, 3, 4}
And, B = {3, 4, 5, 6}
$\therefore A \cup B = \{1, 2, 3, 4, 5, 6\}$

(ii) A ∪ C

Sol. It is given in the question that,
A = {1, 2, 3, 4}
And, C = {5, 6, 7, 8}
$\therefore A \cup C = \{1, 2, 3, 4, 5, 6, 7, 8\}$

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(iii) B ∪ C

Sol. It is given in the question that,
B = {3, 4, 5, 6}
And, C = {5, 6, 7, 8}
$\therefore B \cup C = \{3, 4, 5, 6, 7, 8\}$

(iv) B ∪ D

Sol. It is given in the question that,
B = {3, 4, 5, 6}
And, D = {7, 8, 9, 10}
$\therefore B \cup D = \{3, 4, 5, 6, 7, 8, 9, 10\}$

(v) A ∪ B ∪ C

Sol. It is given in the question that,
A = {1, 2, 3, 4}
B = {3, 4, 5, 6}
And, C = {5, 6, 7, 8}

$\therefore A \cup B \cup C = \{1, 2, 3, 4\} \cup \{3, 4, 5, 6\} \cup \{5, 6, 7, 8\}$

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

(vi) A ∪ B ∪ D

Sol. It is given in the question that,

A = {1, 2, 3, 4}

B = {3, 4, 5, 6}

And, D = {7, 8, 9, 10}

$\therefore A \cup B \cup D = \{1, 2, 3, 4\} \cup \{3, 4, 5, 6\} \cup \{7, 8, 9, 10\}$

$= \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(vii) B ∪ C ∪ D

Sol. It is given in the question that,

B = {3, 4, 5, 6}

C = {5, 6, 7, 8}

And, D = {7, 8, 9, 10}

$\therefore B \cup C \cup D = \{3, 4, 5, 6\} \cup \{5, 6, 7, 8\} \cup \{7, 8, 9, 10\}$

$= \{3, 4, 5, 6, 7, 8, 9, 10\}$

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5. Find the intersection of each pair of sets:

(i) $X = \{1,3,5\}$

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

(ii) $A = \{a,e,i,o,u\}$

$B = \{a,b,c\}$

(iii) $A = \{x : x$ is a natural number and multiple of $3\}$

$B = \{x : x$ is a natural number less than $6\}$

(iv) $A = \{x : x$ is a natural number and $1 < x \leq 6\}$

$B = \{x : x$ is a natural number and $6 < x < 10\}$

(v) $A = \{1,2,3\}$, $B = \Phi$

5. (i) $X = \{1,3,5\}$, $Y = \{1,2,3\}$

$X \cap Y = \{1,3\}$

(ii) $A = \{a,e,i,o,u\}$, $B = \{a,b,c\}$

$A \cap B = \{a\}$

(iii) $A = \{x : x$ is a natural number and multiple of $3\} = (3,6,9\ldots\}$

$B = \{x : x \text{ is a natural number less than } 6\} = \{1,2,3,4,5\}$

$\therefore A \cap B = \{3\}$

(iv) $A = \{x : x \text{ is a natural number and } 1 < x \leq 6\} = \{2,3,4,5,6\}$

$B = \{x : x \text{ is a natural number and } 6 < x < 10\}$

$= \{7,8,9\}$

$A \cap B = \Phi$

(v) $A = \{1,2,3\}$, $B = \Phi$. So, $A \cap B = \Phi$

6. If A = {3, 5, 7, 9, 11}, B = {7, 9, 11, 13}, C = {11, 13, 15}and D = {15, 17}; find:

6. (i) A ∩ B

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

And, $B = \{7,9,11,13\}$

$\therefore A \cap B = \{3,5,7,9,11\} \cap \{7,9,11,13\}$

$= \{7,9,11\}$

(ii) B ∩ C

Sol. It is given in the question that,

B = {7, 9, 11, 13}

And, $C = \{11,13,15\}$

$\therefore B \cap C = \{7,9,11,13\} \cap \{11,13,15\}$

$= \{11,13\}$

(iii) A ∩ C ∩ D

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

$C = \{11,13,15\}$

And, D = {15, 17}

$\therefore A \cap C \cap D = \{3,5,7,9,11\} \cap \{11,13,15\} \cap \{15,17\}$

$= \varnothing$

(iv) A ∩ C

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

And, $C = \{11,13,15\}$

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$\therefore A \cap C = \{3, 5, 7, 9, 11\} \cap \{11, 13, 15\}$

$= \{11\}$

(v) B ∩ D

Sol. It is given in the question that,

B = {7, 9, 11, 13}

And, D = {15, 17}

$\therefore B \cap D = \{7, 9, 11, 13\} \cap \{15, 17\}$

$= \varnothing$

(vi) A ∩ (B ∪ C)

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

B = (7, 9, 11, 13}

And, $C = \{11, 13, 15\}$

$\therefore A \cap (B \cup C) = \{3, 5, 7, 9, 11\} \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13, 15, 17\}$

= {7, 9, 11}

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(vii) A ∩ D

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

And, D = {15, 17}

$\therefore A \cap D = \{3, 5, 7, 9, 11\} \cap \{15, 17\}$

$= \varnothing$

(viii) A ∩ (B ∪ D)

Sol. It is given in the question that,

A = {3, 5, 7, 9, 11}

B = (7, 9, 11, 13}

And, D = {15, 17}

$\therefore A \cap (B \cup D) = \{3, 5, 7, 9, 11\} \cap (\{7, 9, 11, 13\} \cup \{15, 17\})$

$= \{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13, 15, 17\}$

= {7, 9, 11}

(ix) (A ∩ B) ∩ (B ∪ C)

Sol. It is given in the question that,

$A = \{3, 5, 7, 9, 11\}$

$B = (7, 9, 11, 13\}$

And, $C = \{11, 13, 15\}$

$\therefore (A \cap B) \cap (B \cup C) = (\{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13\}) \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{7, 9, 11\} \cap \{7, 9, 11, 13, 15\}$

$= \{7, 9, 11\}$

(x) $(A \cup D) \cap (B \cup C)$

Sol. It is given in the question that,

$A = \{3, 5, 7, 9, 11\}$

$B = (7, 9, 11, 13\}$

$C = \{11, 13, 15\}$

And, $D = \{15, 17\}$

$\therefore (A \cup D) \cap (B \cup C) = (\{3, 5, 7, 9, 11\} \cup \{15, 17\}) \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{3, 5, 7, 9, 11, 15, 17\} \cap \{7, 9, 11, 13, 15\}$

$= \{7, 9, 11, 15\}$

7. If $A = \{x : x$ is a natural number $\}, B = \{x : x$ is an even natural number $\}$ $C = \{x : x$ is an odd natural number $\}$ and $D = \{x : x$ is a prime number $\}$, find

(i) $A \cap B$

(ii) $A \cap C$

(iii) $A \cap D$

(iv) $B \cap C$

(v) $B \cap D$

(vi) $C \cap D$

7. $A = \{x : x$ is a natural number $\} = \{1, 2, 3, 4, 5 \ldots\}$

$B = \{x : x$ is an even natural number $\} = \{2, 4, 6, 8 \ldots\}$

$C = \{x : x$ is an odd natural number $\} = \{1, 3, 5, 7, 9 \ldots\}$

$D = \{x : x$ is a prime number $\} = \{2, 3, 5, 7 \ldots\}$

(i) $A \cap B = \{x : x$ is a even natural number $\} = B$

(ii) $A \cap C = \{x : x$ is an odd natural number $\} = C$

(iii) $A \cap D = \{x : x$ is a prime number $\} = D$

(iv) $B \cap C = \Phi$

(v) $B \cap D = \{2\}$

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(vi) $C \cap D = \{x : x \text{ is odd prime number }\}$

8. Which of the following pairs of sets are disjoint?

8. (i) {1, 2, 3, 4} and {x: x is a natural number and $4 \leq x \leq 6$}

Sol. Let us assume, A = {1, 2, 3, 4}

And, B = {x: x is a natural number and $4 \leq x \leq 6$}

= {4, 5, 6}

$\therefore A \cap B = \{4\}$

Hence, A and B are not disjoint.

(ii) {a, e, i, o, u} and {c, d, e, f}

Sol. Let us assume, A = {a, e, i, o, u}

And, B = {c, d, e, f}

$\therefore A \cap B = \varnothing$

Hence, A and B are disjoint

(iii) {x: x is an even integer} and {x: x is an odd integer}

Sol. Let us assume, A = {x: x is an even integer}

And, B = {x: x is an odd integer}

$\therefore A \cap B = \varnothing$

Hence, A and B are disjoint

9. If $A = \{3,6,9,12,15,18,21\}, B = \{4,8,12,16,20\}$,

$C = \{2,4,6,8,10,12,14,16\}, D = \{5,10,15,20\}$; find

(i) $A - B$

(ii) $A - C$

(iii) $A - D$

(iv) $B - A$

(v) $C - A$

(vi) $D - A$

(vii) $B - C$

(viii) $B - D$

(ix) $C - B$

(x) $D - B$

(xi) C-D

(xii) $D - C$

9. (i) $A - B = \{3,6,9,15,18,21\}$

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(ii) $A - C = \{3,9,15,18,21\}$

(iii) $A - D = \{3,6,9,12,18,21\}$

(iv) $B - A = \{4,8,16,20\}$

(v) $C - A = \{2,4,8,10,14,16\}$

(vi) $D - A = \{5,10,20\}$

(vii) $B - C = \{20\}$

(viii) $B - D = \{4,8,12,16\}$

(ix) $C - B = \{2,6,10,14\}$

(x) $D - B = \{5,10,15\}$

(xi) $C - D = \{2,4,6,8,12,14,16\}$

(xii) $D - C = \{5,15,20\}$

10. If X= {a, b, c, d} and Y = {f, b, d, g}, find:

10.

(i) X – Y

Sol. It is given in the question that,

X = {a, b, c, d}

And, Y = {f, b, d, g}

∴ X – Y = {a, b, c, d} - {f, b, d, g}

= {a, d}

(ii) Y – X

Sol. It is given in the question that,

Y = {f, b, d, g}

And, X = {a, b, c, d}

∴ Y – X = {f, b, d, g} - {a, b, c, d}

= {f, g}

(iii) X ∩ Y

Sol. It is given in the question that,

X = {a, b, c, d}

And, Y = {f, b, d, g}

∴ $X \cap Y = \{a, b, c, d\} \cap \{f, b, d, g\}$

= {b, d}

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11. If R is the set of real numbers and Q is the set of rational numbers, then what is $R - Q$?

11. R: set of real numbers
Q: set of rational numbers
Therefore, $R - Q$ is a set of irrational numbers.

12. State whether each of the following statement is true or false. Justify your answer.

12. (i) { 2, 3, 4, 5 } and { 3, 6} are disjoint sets.

Sol. Let us assume, A = {2, 3, 4, 5}
And, B = {3, 6}
$\therefore A \cap B = \{2, 3, 4, 5\} \cap \{3, 6\}$
$= \{3\}$
Hence, A and B are not disjoint sets
∴ The given statement is false

(ii) { a, e, i, o, u } and { a, b, c, d }are disjoint sets.

Sol. Let us assume, A = {a, e, i, o, u}
And, B = {a, b, c, d}
$\therefore A \cap B = \{a, e, i, o, u\} \cap \{a, b, c, d\}$
$= \{a\}$
Hence, A and B are not disjoint sets
∴ The given statement is false

(iii) { 2, 6, 10, 14 } and { 3, 7, 11, 15} are disjoint sets.

Sol. Let us assume, A = {2, 6, 10, 14}
And, B = {3, 7, 11, 15}
$\therefore A \cap B = \{2, 6, 10, 14\} \cap \{3, 7, 11, 15\}$
$= \varnothing$
Hence, A and B are disjoint sets
∴ The given statement is true

(iv) { 2, 6, 10 } and { 3, 7, 11} are disjoint sets.

Solution: Let us assume, A = {2, 6, 10}
And, B = {3, 7, 11}
$\therefore A \cap B = \{2, 6, 10\} \cap \{3, 7, 11\}$
$= \varnothing$
Hence, A and B are disjoint sets
∴ The given statement is true

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