CBSE Class–11 Mathematics

NCERT Solutions

Chapter - 1 Sets

Exercise 1.4

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

(i) X = {1, 3, 5} and Y = {1, 2, 3}

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

(iii) A = {x:x is a natural number and multiple of 3} and B = {x:x is a natural number less than 6}

(iv) A = {x:x is a natural number and $1 < x \leq 6$} and B = {x:x is a natural number and 6<x<10}

(v) A = {1, 2, 3} and B = ϕ

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

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

(iii) A $\cup$ B = {1, 2, 3, 4, 5, 6, 9, 12, 15, ...} or

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

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

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

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

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

Ans. Given: A = $\{a, b\}$ and B = $\{a, b, c\}$.

Here all 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?

Ans. Given: A and B are two sets such that A $\subset$ B

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

So 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:

(i) A $\cup$ B

(ii) A $\cup$ C

(iii) B $\cup$ C

(iv) B $\cup$ D

(v) A $\cup$ B $\cup$ C

(vi) A $\cup$ B $\cup$ D

(vii) B $\cup$ C $\cup$ D

Ans. Given: A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C

= {5, 6, 7, 8} and D = {7, 8, 9, 10}

(i) A $\cup$ B = {1, 2, 3, 4} $\cup$ {3, 4, 5, 6}

So, A $\cup$ B= {1, 2, 3, 4, 5, 6}

(ii) A $\cup$ C = {1, 2, 3, 4} $\cup$ {5, 6, 7, 8}

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

(iii) B $\cup$ C = {3, 4, 5, 6} $\cup$ {5, 6, 7, 8}

So, B $\cup$ C = {3, 4, 5, 6, 7, 8}

(iv) B $\cup$ D = {3, 4, 5, 6} $\cup$ {7, 8, 9, 10}

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

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

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

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

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

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

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

5. Find the intersections of each pair of sets of question 1 above.

Ans. (i) X $\cap$ Y = {1, 3}

(ii) A $\cap$ B = $\{a\}$

(iii) A $\cap$ B = {3}

(iv) A $\cap$ B = ϕ

(v) A $\cap$ B = ϕ

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

(i) A $\cap$ B

(ii) B $\cap$ C

(iii) A ∩ C ∩ D

(iv) A ∩ C

(v) B ∩ D

(vi) A ∩ (B ∪ C)

(vii) A ∩ D

(viii) A ∩ (B ∪ D)

(ix) (A ∩ B) ∩ (B ∪ C)

(x) (A ∪ D) ∩ (B ∪ C)

Ans. Given: A = {3, 5, 7, 9, 11},

B = {7, 9, 11, 13},

C = {11, 13, 15} and D = {15, 17}

(i) A ∩ B = {3, 5, 7, 9, 11} ∩ {7, 9, 11, 13}

= {7, 9, 11}

(ii) B ∩ C = {7, 9, 11, 13} ∩ {11, 13, 15}

= {11, 13}

(iii) A ∩ C ∩ D

= {3, 5, 7, 9, 11} ∪ {11, 13, 15} ∩ {15, 17} = ϕ

(iv) A ∩ C = {3, 5, 7, 9, 11} ∩ {11, 13, 15} = {11}

(v) B ∩ D = {7, 9, 11, 13} ∩ {15, 17} = ϕ

(vi) A ∩ (B ∪ C) = {3, 5, 7, 9, 11} ∩ ({7, 9, 11, 13} ∪ {11, 13, 15})

= {3, 5, 7, 9, 11} ∩ {7, 9, 11, 13, 15, 17} = {7, 9, 11}

(vii) A ∩ C = {3, 5, 7, 9, 11} ∩ {15, 17} = ϕ

(viii) A ∩ (B ∪ D) = {3, 5, 7, 9, 11} ∩ ({7, 9, 11, 13} ∪ {15, 17})

= {3, 5, 7, 9, 11} ∩ {7, 9, 11, 13, 15, 17} = {7, 9, 11}

(ix) (A ∩ B) ∩ (B ∪ C)

= ({3, 5, 7, 9, 11} ∩ {7, 9, 11, 13}) ∩ ({7, 9, 11, 13} ∪ {11, 13, 15})

= {7, 9, 11} ∩ {7, 9, 11, 13, 15} = {7, 9, 11}

(x) (A ∪ D) ∩ (B ∪ C)

= ({3, 5, 7, 9, 11} ∪ {15, 17}) ∩ ({7, 9, 11, 13} ∪ {11, 13, 15})

= {3, 5, 7, 9, 11, 15, 17} ∩ {7, 9, 11, 13, 15} = {7, 9, 11, 15}

:x:

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 ∩ B

(ii) A ∩ C

(iii) A ∩ D

(iv) B ∩ C

(v) B ∩ D

(vi) C ∩ D

Ans. (i) A ∩ B = {x: x is a natural number} ∩ {x: x is an even natural number} = B

(ii) A ∩ C = {x: x is a natural number} ∩ {x: x is an odd natural number} = C

(iii) A ∩ D = {x: x is a natural number} ∩ {x: x is a prime number} = D

(iv) B $\cap$ C = {x: x is an even natural number} $\cap$ {x: x is an odd natural number} = ϕ

(v) B $\cap$ D = B $\cap$ C = {x: x is an even natural number} $\cap$ {x: x is a prime number} = {2}

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

= {x: x is an odd prime number}

---

8. Which of the following pair of sets are disjoint:

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

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

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

Ans. (i) Let A = {1, 2, 3, 4} and B = {x: x is a natural number and $4 \le x \le 6$} = {4, 5, 6}

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

Therefore, A and B are not disjoint.

(ii) Let A = $\{a, e, i, o, u\}$ and B = $\{c, d, e, f\}$

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

Therefore, A and B are not disjoint.

(iii) Let A = {x: x is an even integer} and B = {x: x is an odd integer}

$\therefore$ A $\cap$ B = ϕ

Therefore, 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

Ans. Given: 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};

(i) A – B = {3, 6, 9, 12, 15, 18, 21} – {4, 8, 12, 16, 20}

= {3, 6, 9, 15, 18, 21}

(ii) A – C = {3, 6, 9, 12, 15, 18, 21} – {2, 4, 6, 8, 10, 12 , 14, 16}

= {3, 9, 15, 18, 21}

(iii) A – D = {3, 6, 9, 12, 15, 18, 21} – {5, 10, 15, 20}

= {3, 6, 9, 12, 18, 21}

(iv) B – A = {4, 8, 12, 16, 20} – {3, 6, 9, 12, 15, 18, 21}

= {4, 8, 16, 20}

(v) C – A = {2, 4, 6, 8, 10, 12 , 14, 16} – {3, 6, 9, 12, 15, 18, 21}

= {2, 4, 8, 10,14, 16}

(vi) D – A = {5, 10, 15, 20} – {3, 6, 9, 12, 15, 18, 21}

= {5, 10, 20}

(vii) B – C = {4, 8, 12, 16, 20} – {2, 4, 6, 8, 10, 12 , 14, 16} = {20}

(viii) B – D = {4, 8, 12, 16, 20} – {5, 10, 15, 20}

= {4, 8, 12, 16}

(ix) C – B = {2, 4, 6, 8, 10, 12 , 14, 16} – {4, 8, 12, 16, 20}

= {2, 6, 10, 14}

(x) D – B = {5, 10, 15, 20} – {4, 8, 12, 16, 20}

= {5, 10, 15}

(xi) C – D = {2, 4, 6, 8, 10, 12 , 14, 16} – {5, 10, 15, 20}

= {2, 4, 6, 8, 12, 14, 16}

(xii) D – C = {5, 10, 15, 20} – {2, 4, 6, 8, 10, 12 , 14, 16}

= {5, 15, 20}

---

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

(i) X – Y
(ii) Y – X
(iii) X $\cap$ **Y**

Ans. Given: X = $\{a, b, c, d\}$ and Y = $\{f, b, d, g\}$

(i) X – Y = $\{a, b, c, d\} - \{f, b, d, g\} = \{a, c\}$

(ii) Y – X = $\{f, b, d, g\} - \{a, b, c, d\} = \{f, g\}$

(iii) X $\cap$ Y = $\{a, b, c, d\} \cap \{f, b, d, g\} = \{b, d\}$

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

Ans. We know that set of real numbers contain rational and irrational numbers.

Therefore, R – Q = set of irrational numbers.

---

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

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

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

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

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

Ans. (i) Let A = {2, 3, 4, 5} and B = {3, 6}

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

$\therefore$ A and B are not disjoint. Therefore, statement is false.

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

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

$\therefore$ A and B are not disjoint. Therefore, statement is false.

(iii) Let A = {2, 6, 10, 14} and B = {3, 7, 11, 15}

$\therefore$ A $\cap$ B = ϕ

$\therefore$ A and B are disjoint. Therefore, statement is true.

(iv) Let A = {2, 6, 10} and B = {3, 7, 11}

$\therefore$ A $\cap$ B = ϕ

$\therefore$ A and B are disjoint. Therefore, statement is true.