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Class XI : Maths
Chapter 1 : Sets

Questions and Solutions | Exercise 1.4 - NCERT Books

Question 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 = Φ

Answer

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

X∪ Y= {1, 2, 3, 5}

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

A∪ B = {*a*, *b*, *c*, *e*, *i*, *o*, *u*}

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

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

A ∪ B = {1, 2, 4, 5, 3, 6, 9, 12 …}

∴ A ∪ B = {*x*: *x* = 1, 2, 4, 5 or a multiple of 3}

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

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

A∪ B = {2, 3, 4, 5, 6, 7, 8, 9}

∴ A∪ B = {*x*: *x* ∈ N and 1 < *x* < 10}

(v) A = {1, 2, 3}, B = Φ

A∪ B = {1, 2, 3}

Question 2:

Let A = {*a*, *b*}, B = {*a*, *b*, *c*}. Is A ⊂ B? What is A ∪ B?

Answer

Here, A = {*a*, *b*} and B = {*a*, *b*, *c*}

Yes, A ⊂ B.

A∪ B = {*a*, *b*, *c*} = B

Question 3:

If A and B are two sets such that A ⊂ B, then what is A ∪ B?

Answer

If A and B are two sets such that A ⊂ B, then A ∪ B = B.

Question 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 ∪ B

(ii) A ∪ C

(iii) B ∪ C

(iv) B ∪ D

(v) A ∪ B ∪ C

(vi) A ∪ B ∪ D

(vii) B ∪ C ∪ D

Answer

A = {1, 2, 3, 4], B = {3, 4, 5, 6}, C = {5, 6, 7, 8} and D = {7, 8, 9, 10}

(i) A ∪ B = {1, 2, 3, 4, 5, 6}

(ii) A ∪ C = {1, 2, 3, 4, 5, 6, 7, 8}

(iii) B ∪ C = {3, 4, 5, 6, 7, 8}

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

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

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

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

Question 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 = Φ

Answer

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

X ∩ Y = {1, 3}

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

A ∩ B = {a}

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

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

∴ A ∩ B = {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 ∩ B = Φ

(v) A = {1, 2, 3}, B = Φ

A ∩ B = Φ

Question 6:

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

(i) A ∩ B

(ii) B ∩ 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)

Answer

 (i) A ∩ B = {7, 9, 11}

(ii) B ∩ C = {11, 13}

(iii) A ∩ C ∩ D = { A ∩ C} ∩ D = {11} ∩ {15, 17} = Φ

(iv) A ∩ C = {11}

(v) B ∩ D = Φ

(vi) A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C)

= {7, 9, 11} ∪ {11} = {7, 9, 11}

(vii) A ∩ D = Φ

(viii) A ∩ (B ∪ D) = (A ∩ B) ∪ (A ∩ D)

= {7, 9, 11} ∪ Φ = {7, 9, 11}

(ix) (A ∩ B) ∩ (B ∪ C) = {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, 15}

= {7, 9, 11, 15}

Question 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

Answer

A = {x: x is a natural number} = {1, 2, 3, 4, 5 …}

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

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

D = {x: x is a prime number} = {2, 3, 5, 7 …}

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

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

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

(iv) B ∩ C = Φ

(v) B ∩ D = {2}

(vi) C ∩ D = {x: x is odd prime number}

Question 8:

Which of the following pairs of sets are disjoint

(i) {1, 2, 3, 4} and {x: x is a natural number and 4 ≤ x ≤ 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}

Answer

 (i) {1, 2, 3, 4}

{x: x is a natural number and 4 ≤ x ≤ 6} = {4, 5, 6}

Now, {1, 2, 3, 4} ∩ {4, 5, 6} = {4}

Therefore, this pair of sets is not disjoint.

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

Therefore, {a, e, i, o, u} and (c, d, e, f} are not disjoint.

(iii) {x: x is an even integer} ∩ {x: x is an odd integer} = Φ

Therefore, this pair of sets is disjoint.

Question 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

Answer

 (i) A – B = {3, 6, 9, 15, 18, 21}

(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}

Question 10:

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

(i) X – Y

(ii) Y – X

(iii) X ∩ Y

Answer

 (i) X – Y = {*a*, *c*}

(ii) Y – X = {*f*, *g*}

(iii) X ∩ Y = {*b*, *d*}

Question 11:

If **R** is the set of real numbers and **Q** is the set of rational numbers, then what is **R** − **Q**?

Answer

R: set of real numbers

Q: set of rational numbers

Therefore, R – Q is a set of irrational numbers.

Question 12:

State whether each of the following statement 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.

Answer

 (i) False

As 3 ∈ {2, 3, 4, 5}, 3 ∈ {3, 6}

⇒ {2, 3, 4, 5} ∩ {3, 6} = {3}

(ii) False

As *a* ∈ {*a*, *e*, *i*, *o*, *u*}, *a* ∈ {*a*, *b*, *c*, *d*}

⇒ {*a*, *e*, *i*, *o*, *u* } ∩ {*a*, *b*, *c*, *d*} = {*a*}

(iii) True

As {2, 6, 10, 14} ∩ {3, 7, 11, 15} = Φ

(iv) True

As {2, 6, 10} ∩ {3, 7, 11} = Φ