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 = $\emptyset$

Solution:

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

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

iii) A= {3, 6, 9, 12, --------}

B= {1, 2, 3, 4, 5}

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

iv) A = {2, 3, 4, 5, 6}

B = {7, 8, 9}

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

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

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

Solution:

Yes, A⊂B.

A∪B = {a, b, c}

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

Solution:

A∪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∪B

ii) A∪C

iii) B∪C

iv) B∪D

v) A∪ $B ∪ C$

vi) A∪ $B ∪ D$

vii) $B ∪ C ∪ D$

Solution:

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}

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

Solution:

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 = {3, 6, 9, 12----------}

B = {1, 2, 3, 4, 5}

A∩B = {3}

iv) A = {2, 4, 5, 6}

B = {7, 8, 9}

A∩B = Ø

v) A = {1, 2, 3} B = Ø

A∩B = Ø

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)

Solution:

i) A∩B = {7, 9, 11}

ii) B∩C = {11, 13}

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

iv) A∩C = {11}

v) B∩D = ∅

vi) A∩(B∪C) = (A∩B) ∪(A∩C) = {7,9,11} ∪{11} = {7, 9, 11}

vii)A∩D = ∅

viii) A∩(B∪D) = (A∩B)∪(A∩D) = {7, 9, 11} ∪ ∅ = {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}

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

Solution:

Given A = {1, 2, 3, 4, 5………}

B = {2, 4, 6, 8, 10………}

C = {1, 3, 5, 7, 9………………}

D = {2, 3, 5, 7 ………..}

i) A∩B = {2, 4, 6, 8………..} = {x: x is an even natural number} = B

ii) A∩C = {1, 3, 5, 7.............} = {x; x is an odd natural number} = C

iii) A∩D = {2, 3, 5, 7.................} = {x: x is a prime number} = D

iv) B∩C = Ø

v) B∩D = {2}

vi) C∩D = {3, 5, 7.............} = {x; x is an odd prime number}

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}

Solution:

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

{1, 2, 3, 4} ∩{4, 5, 6} = {4}

So this pair of sets is not disjoint.

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

So this pair of sets is not disjoint.

iii) {x: x is an even integer} = {2, 4, 6, 8, 10.............}

{x: x is an odd integer} = {1, 3, 5, 7..................}

{2, 4, 6, 8..............} ∩ {1, 3, 5, 7..................} = Ø

So this pair of sets is 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

Solution:

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}

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

i) X – Y

ii) Y – X

iii) X ∩ Y

Solution:

i) X – Y = {a, c}

ii) Y – X = {f, g}

iii) X∩Y = {b, d}

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

Solution:

If R – Q is the set of real numbers and Q is the set of rational numbers,

then R – Q is a set of irrational numbers.

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} are disjoint sets.

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

Solution:

i) False.

Because {2, 3, 4, 5} ∩ {3, 6} = {3}

ii) False.

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

iii) True.

Because {2, 6, 10, 14}∩{3, 7, 11, 15} = ∅

iv)True

Because {2, 6, 10} ∩{3, 7, 11} = ∅