EXERCISE 1.5 PAGE: 20

1. Let U = {1, 2, 3; 4, 5, 6, 7, 8, 9}, A = {1, 2, 3, 4}, B = {2, 4, 6, 8} and C = {3, 4, 5, 6}. Find

(i) A’

(ii) B’

(iii) (A U C)’

(iv) (A U B)’

(v) (A’)’

(vi) (B – C)’

Solution:

It is given that

U = {1, 2, 3, 4, 5, 6, 7, 8, 9}

A = {1, 2, 3, 4}

B = {2, 4, 6, 8}

C = {3, 4, 5, 6}

(i) A’ = {5, 6, 7, 8, 9}

(ii) B’ = {1, 3, 5, 7, 9}

(iii) A U C = {1, 2, 3, 4, 5, 6}

So we get

(A U C)’ = {7, 8, 9}

(iv) A U B = {1, 2, 3, 4, 6, 8}

So we get

(A U B)’ = {5, 7, 9}

(v) (A’)’ = A = {1, 2, 3, 4}

(vi) B – C = {2, 8}

So we get

(B – C)’ = {1, 3, 4, 5, 6, 7, 9}

2. If U = {*a, b, c, d, e, f, g, h*}, find the complements of the following sets:

(i) A = {*a, b, c*}

(ii) B = {*d, e, f, g*}

(iii) C = {*a, c, e, g*}

(iv) D = {*f, g, h, a*}
Solution:

(i) A = {*a*, *b*, *c*}

So we get

A’ = {d, e, f, g, h}

(ii) B = {*d*, *e*, *f*, *g*}

So we get

B’ = {a, b, c, h}

(iii) C = {*a*, *c*, *e*, *g*}

So we get

C’ = {b, d, f, h}

(iv) D = {*f*, *g*, *h*, *a*}

So we get

D’ = {b, c, d, e}

3. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

(i) {*x*: *x* is an even natural number}

(ii) {*x*: *x* is an odd natural number}

(iii) {*x*: *x* is a positive multiple of 3}

(iv) {*x*: *x* is a prime number}

(v) {*x*: *x* is a natural number divisible by 3 and 5}

(vi) {*x*: *x* is a perfect square}

(vii) {*x*: *x* is perfect cube}

(viii) {*x*: *x* + 5 = 8}

(ix) {x: 2x + 5 = 9}

(x) {x: $x \geq 7$}

(xi) {x: $x \in$ N and 2x + 1 > 10}

Solution:

We know that

U = N: Set of natural numbers

(i) {x: x is an even natural number}´ = {x: x is an odd natural number}

(ii) {x: x is an odd natural number}´ = {x: x is an even natural number}

(iii) {x: x is a positive multiple of 3}´ = {x: $x \in$ N and x is not a multiple of 3}

(iv) {x: x is a prime number}´ ={x: x is a positive composite number and x = 1}

(v) {x: x is a natural number divisible by 3 and 5}´ = {x: x is a natural number that is not divisible by 3 or 5}

(vi) {x: x is a perfect square}´ = {x: $x \in$ N and x is not a perfect square}

(vii) {x: x is a perfect cube}´ = {x: $x \in$ N and x is not a perfect cube}

(viii) {x: $x + 5 = 8$}´ = {x: $x \in$ N and $x \neq 3$}

(ix) {x: $2x + 5 = 9$}´ = {x: $x \in$ N and $x \neq 2$}

(x) {x: $x \geq 7$}´ = {x: $x \in$ N and $x < 7$}

(xi) {x: $x \in$ N and $2x + 1 > 10$}´ = {x: $x \in$ N and $x \leq 9/2$}

4. If U = {1, 2, 3, 4, 5,6,7,8, 9}, A = {2, 4, 6, 8} and B = {2, 3, 5, 7}. Verify that

(i) (A U B)’ = A’ ∩ B’

(ii) (A ∩ B)’ = A’ U B’

Solution:

It is given that

U = {1, 2, 3, 4, 5,6,7,8, 9}

A = {2, 4, 6, 8}

B = {2, 3, 5, 7}

(i) (A U B)’ = {2, 3, 4, 5, 6, 7, 8}’ = {1, 9}

A’ ∩ B’ = {1, 3, 5, 7, 9} ∩ {1, 4, 6, 8, 9} = {1, 9}

Therefore, (A U B)’ = A’ ∩ B’.

(ii) (A ∩ B)’ = {2}’ = {1, 3, 4, 5, 6, 7, 8, 9}

A’ U B’ = {1, 3, 5, 7, 9} U {1, 4, 6, 8, 9} = {1, 3, 4, 5, 6, 7, 8, 9}

Therefore, (A ∩ B)’ = A’ U B’.

5. Draw appropriate Venn diagram for each of the following:

(i) (A U B)’

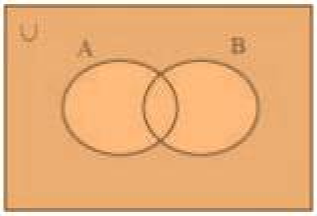
(ii) A’ ∩ B’

(iii) (A ∩ B)’

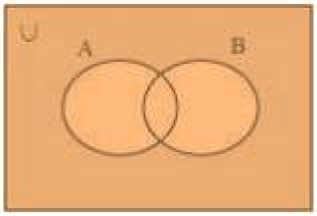
(iv) A’ U B’

Solution:

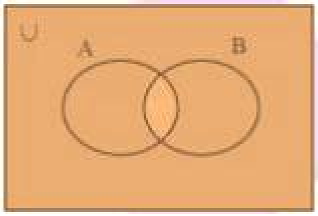
(i) (A U B)’



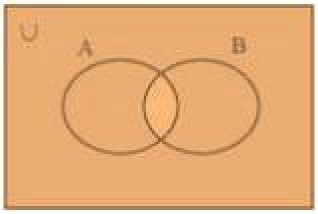
(ii) A’ ∩ B’



(iii) (A ∩ B)’



(iv) A’ U B’



6. Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60°, what is A'?

Solution:

A' is the set of all equilateral triangles.

7. Fill in the blanks to make each of the following a true statement:

(i) A U A' = ……..

(ii) Φ′ ∩ A = …….

(iii) A ∩ A' = …….

(iv) U' ∩ A = …….

Solution:

(i) A U A' = U

(ii) Φ′ ∩ A = U ∩ A = A

So we get

Φ′ ∩ A = A

(iii) A ∩ A' = Φ

(iv) U' ∩ A = Φ ∩ A = Φ

So we get

U' ∩ A = Φ