NCERT Solutions for Class-XI Maths

Chapter-1 Exercise-1.5

NCERT Math Class 11

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) $(A\cup C)'$

(iv) $(A\cup B)'$

(v) $(A')'$

(vi) $(B-C)'$

1. $U=\{1,2,3,4,5,6,7,8,9\}\ A=\{1,2,3,4\}\ B=\{2,4,6,8\}$

$C=\{3,4,5,6\}$

(i) $A'=\{5,6,7,8,9\}$

(ii) $B'=\{1,3,5,7,9\}$

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

$\therefore (A\cup C)'=\{7,8,9\}$

(iv) $A\cup B=\{1,2,3,4,6,8\}$

$(A\cup B)'=\{5,7,9\}$

(v) $(A')'=A=\{1,2,3,4\}$

(vi) $B-C=\{2,8\}$

$\therefore (B-C)'=\{1,3,4,5,6,7,9\}$

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}

2. (i) We have to find complement of A, which is given by (U - A)

$\Rightarrow$ A' = U - A

$\Rightarrow$ A' = {a, b, c, d, e, f, g, h} - {a, b, c}

⇒ A' = {d, e, f, g, h}
(ii) B' = U - B
⇒ B' = {a, b, c, d, e, f, g, h} - {d, e, f, g}
⇒ B' = {a, b, c , h}
(iii) C' = U - C
⇒ C' = {a, b, c, d, e, f, g, h} - {a, c, e, g}
⇒ C' = {b, d , f, h}
(iv) D' = U - D
⇒ D' = {a, b, c, d, e, f, g, h} - {f, g , h , a}
⇒ 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 $2x + 1 > 10\}$

3. $U = N$: 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 of3$\}' = \{x : x \in N$ 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 by3 and5$\}' = \{x : x$ 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) $\{x : x \geq 7\}' = \{x : x \in N \text{ and } x < 7\}$

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

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 ∪ B)' = A' ∩ B' (ii) (A ∩ B)' = A' ∪ B'

4. (i)First solving for left hand side,
(A ∪ B)' = U - (A ∪ B)
First we find (A ∪ B),
(A ∪ B) = {2, 4, 6, 8} ∪ {2, 3, 5, 7}
⇒ (A ∪ B) = {2, 3, 4, 5, 6, 7, 8}
Now,
(A ∪ B)' = U - (A ∪ B)
⇒ (A ∪ B)' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2, 3, 4, 5, 6, 7, 8}
⇒ (A ∪ B)' = {1, 9}
Now, solving for right hand side,
A' = U - A
A' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2, 4, 6, 8}
A' = {1, 3, 5, 7, 9}
B' = U - B
B' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2, 3, 5, 7}
B' = {1, 4, 6, 8, 9}
A' ∩ B' = {1, 3, 5, 7, 9} ∩ {1, 4, 6, 8, 9}
⇒ A' ∩ B' = {1, 9}
∴ LHS = RHS, Hence verified.
(ii) First solving for left hand side,
(A ∩ B)' = U - (A ∩ B)
First we find (A ∩ B),
(A ∩ B) = {2, 4, 6, 8} ∩ {2, 3, 5, 7}
⇒ (A ∩ B) = {2}
Now,
(A ∩ B)' = U - (A ∩ B)
⇒ (A ∩ B)' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2}
⇒ (A ∩ B)' = {1, 3, 4, 5, 6, 7, 8, 9}
Now, solving for right hand side,
A' = U - A
A' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2, 4, 6, 8}
A' = {1, 3, 5, 7, 9}
B' = U - B
B' = {1, 2, 3, 4, 5, 6, 7, 8, 9} - {2, 3, 5, 7}

B' = {1, 4, 6, 8, 9}
A' ∪ B' = {1, 3, 5, 7, 9} ∪ {1, 4, 6, 8, 9}
⇒ A' ∪ B' = {1, 3, 4, 5, 6, 7, 8, 9}
∴ LHS = RHS, Hence verified.

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

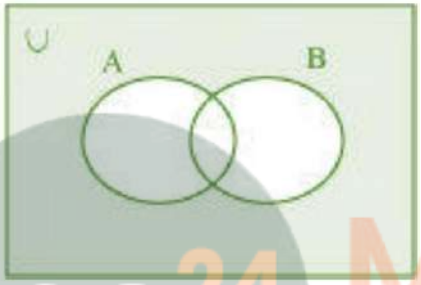
(i) $(A \cup B)'$

(ii) $A' \cap B'$

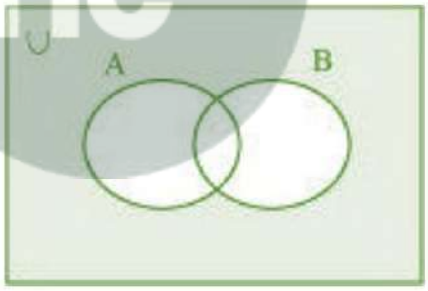
(iii) $(A \cap B)'$

(iv) $A' \cup B'$

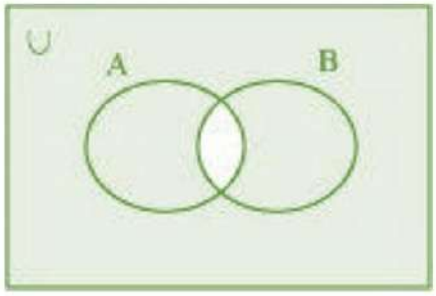
5. (i) $(A \cup B)'$



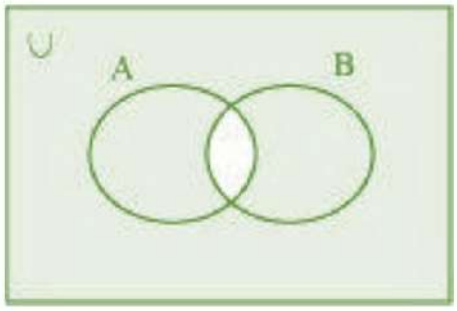
(ii) $A' \cap B'$



(iii) $(A \cap B)'$



(iv) $A' \cup B'$



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'?

6. Given that,

U = {x: x is a triangle in the plane}

A = {x: x is a triangle with atleast one angle not equal to 60°}

A' = U - A = {x : x is a triangle with all angles equal to 60°}

∴ A' = {x: x is set of all equilateral triangle}.

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

(i) $A \cup A' = \ldots$

(ii) $\Phi' \cap A = \ldots$

(iii) $A \cap A' = \ldots$

(iv) $U' \cap A = \ldots$

7. (i) $A \cup A' = U$

(ii) $\Phi' \cap A = U \cap A = A$

$\therefore \Phi' \cap A = A$

(iii) $A \cap A' = \Phi$

(iv) $U' \cap A = \Phi \cap A = \Phi$

$\therefore U' \cap A = \Phi$