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Answers Key:

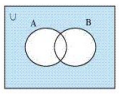
5 Marks

1. Step I Let P(n) be the given statement
i.e.P(n) : n(n + 1) (n + 5) is a multiple of 3.
Step II Forn = 1,we have P(1) : 1(1 + 1)(1 + 5) = 1 × 2 × 6 =12=3×4
Which is a multiple of 3.
So, P(1) is true.
Step III Let P(k) be true form = k.
i.e.P(k) : k(k + 1)(k + 5) is a multiple of 3.
Then,k(k + 1)(k + 5) = 3λ
⇒k(k^2 + 5k + k5) = 3λ
⇒k^3 + 6k^2 + 5k = 3λ....(i)
Step IV Now,we shall prove the statement form = k + 1.
For this,we have to show that (k + 1)(k + 1 + 1)(k + 1+5)is a multiple of 3.
Then,(k+1)(k+1+1)(k+1+5)=(k+1)(k+2)(k+6)
=(k^2+2k+k+2)(k+6)=(k^2+3k+2)(k+6)
=k^3+6k^2+3k^2+18k+2k+12
=k^3+9k^2+20k+12
=(3λ−6k^2−5k)+9k^2+20k+12 [fromEq.(i),k^3=3λ−6k^2−5k]
=3λ+3k^2+15k+12=3(λ+k^2+5k+4)
Which is a multiple of 3 .
Thus,P(k+1) is true, whenever P(k) is true.
Hence,by principle of mathematical induction,the statement is true for all natural numbers n.
2. (i) {3, 4} is a member of set A.
∴ {3, 4} ∈ A
Hence {3, 4}⊂ A is incorrect.
(ii) {3, 4} is a member of set A.
∴{3, 4} ∈ A is correct.
(iii) Here {3, 4} is a member of set A.
∴ {{3,4}} is a set
∴ {{3,4}} ⊂ A is correct.
(iv) 1 is a member of set A.
∴ 1 ∈ A is correct.
(v) 1 is not a set, it is a member of set A.
∴ 1⊂ A is incorrect.
(vi) 1, 2, 5 are members of set A.
∴ {1, 2, 5} is a subset of set A.
∴ {1, 2, 5} ⊂ A is correct.
(vii) 1, 2, 5 are members of set A.
∴ {1, 2, 5} is a subset of set A.
∴ {1, 2, 5} ∈ A is incorrect.
(viii) 3 is not a member of set A.
∴ {1, 2, 3} is not a subset of set A.
∴ {1, 2, 3} ⊂ A is incorrect.
(ix) ϕ is not a member of set A.
∴ ϕ ∈ A is incorrect.
(x) Since ϕ is subset of every set,
∴ϕ ⊂ A is correct.
(xi)ϕ is not a member of set A.
∴ {ϕ} ⊂ A is incorrect.
3. (i) X = {1, 3, 5} Y = {1, 2, 3}
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 = {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} B = {x : x is a natural number less than 6}
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 } B = {x : x is a natural number and 6 < x < 10 }

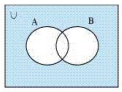
A = {x : x is a natural number and $1 < x \leq 6$} = {2, 3, 4, 5, 6}
B = {x : x is a natural number and $6 < x < 10$} = {7, 8, 9}
A∪ B = {2, 3, 4, 5, 6, 7, 8, 9}
∴ A∪ B = {x: x ∈ N and $1 < x < 10$}
(v) A = {1, 2, 3}, B = ϕ
A = {1, 2, 3}, B = Φ A∪ B = {1, 2, 3}

3 Marks

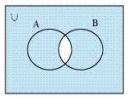
4. $n(E \cap S \cap \overline{E}) = n(E \cap S) - n(E \cap M \cap S)$
=74=3
5. $\{\frac{1}{2}, 1, \frac{3}{2}\}$
6. (i) { 2, 3, 4 } . . . { 1, 2, 3, 4,5 }
{2, 3, 4} ⊂ {1, 2, 3, 4, 5}
(ii) { a, b, c } . . . { b, c, d }
{a, b, c} ⊄ {b, c, d}
(iii) {x : x is a student of Class XI of your school}. . .{x : x student of your school}
{x: x is a student of class XI of your school}⊂ {x: x is student of your school}
(iv) {x : x is a circle in the plane} . . .{x : x is a circle in the same plane with radius 1 unit}
{x: x is a circle in the plane} ⊄ {x: x is a circle in the same plane with radius 1 unit}
(v) {x : x is a triangle in a plane} . . . {x : x is a rectangle in the plane}
{x: x is a triangle in a plane} ⊄ {x: x is a rectangle in the plane}
(vi) {x : x is an equilateral triangle in a plane} . . . {x : x is a triangle in the same plane}
{x: x is an equilateral triangle in a plane}⊂ {x: x in a triangle in the same plane}
(vii) {x : x is an even natural number} . . . {x : x is an integer}
{x: x is an even natural number} ⊂ {x: x is an integer}
7. (i) (A ∪ B)′



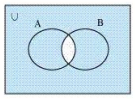
(ii). A′ ∩ B′



(iii). (A ∩ B)′



(iv). A′ ∪ B′



8. (i) A ∪ (A ∩ B) = A
To show: A ∪ (A ∩ B) = A
We know that
A ⊂ A
A ∩ B ⊂ A
∴ A ∪ (A ∩ B) ⊂ A ... (1)
Also, A ⊂ A ∪ (A ∩ B) ... (2)
∴ From (1) and (2), A ∪ (A ∩ B) = A
(ii) A ∩ (A ∪ B) = A.
To show: A ∩ (A ∪ B) = A
A ∩ (A ∪ B) = (A ∩ A) ∪ (A ∩ B)
= A ∪ (A ∩ B)
= A {from (1)}

2 Marks

9. Let A = {1, 2, 3, 4}, B = {2, 3, 4, 5, 6},C = {2, 3, 4, 9, 10}.
∴ A ∩ B = {1, 2, 3, 4} ∩ {2, 3, 4, 5, 6}
= {2, 3, 4}
A ∩ C = {1, 2, 3, 4} ∩ {2, 3, 4, 9, 10}
= {2, 3, 4}
Now we have

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$A \cap B = A \cap C$.

But $B \neq C$.

10. 12
11. We have, V − B = { e, o }, since the elements e, o belong to V but not to B and B − V = { k }, since the element k belongs to B but not to V. We note that V − B ≠ B − V. Using the setbuilder notation, we can rewrite the definition of difference as $A - B = \{ x : x \in A \text{ and } x \notin B \}$ The difference of two sets A and B can be represented by Venn diagram . The shaded portion represents the difference of the two sets A and B.

    Remark The sets A − B, A Ç B and B − A are mutually disjoint sets, i.e., the intersection of any of these two sets is the null

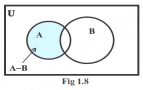


Fig 1.8

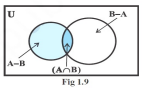


Fig 1.9

12. If A and B are two sets such that $A \subset B$, then $A \cup B = B$.
13. A′ is the set of all equilateral triangles.

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