*** Choose the right answer from the given options. [1 Marks Each]** **[20]**

1. Let n(A) = 28, n(A ∩ B) = 8, n(A ∪ B) = 52, then n(A ∩ B′) =.
   (A) 30 (B) 32 (C) 20 (D) none of these.

   Ans. :
   c. 20
   Solution:
   Given n(A) = 28, n(A ∩ B) = 8.
   We have A ∩ B′ = A − A ∩ B.
   This give n(A ∩ B′) = n(A) − n(A ∩ B)
   or, n(A ∩ B′) = 28 − 8 = 20.

2. If out of 150 students who read at least one newspaper The Times of India, The Hindustan Times and The Hindu. There are 65 who read The Times of India, 41 who read The Hindu and 50 who read The Hindustan Times.What is the maximum possible number of students who read all the three newspaper?
   (A) 7 (B) 42 (C) 3 (D) Cannot be determined

   Ans. :
   c. 3
   Solution:
   a + b + c = 150
   a + 2b + 3c = 156
   Hence b + 2c = 6
   To maximise c we take minimum value of b that is 0.
   Hence c = 3

3. If n(A) denotes the number of elements in set A and if n(A) = 4,n(B) = 5 and n(A ∩ B) = 3 then n[(A × B) ∩ (B × A)]=
   (A) 8 (B) 9 (C) 10 (D) 11

   Ans. :
   b. 9
   Solution:
   For (A × B) ∩ (B × A) we have to do the mapping of A × B or B × A between common elements.
   no. of ways of mapping will be 3 × 3 = 9
   n[(A × B) ∩ (B × A)] = 9

4. Given A = {a, b, c, d, e, f, g, h} and B = {a, e, i, o, u} then B - A is equal to:
   (A) {i, o, u} (B) {a, b, c} (C) {c, d, e} (D) {a, i, z}

   Ans. :
   a. {i, o, u}
   Solution:
   The sets A = {a, b, c, d, e, f, g, h} and B = {a, e, i, o, u}, in order to find the difference between the two sets as B−A, we begin by writing all the elements of B and then take away every element of A which is also the element of B. Since B share the elements a, e with A, so B - A = {i, o, u}.

5. Let F_1 be the set of all parallelograms, F_2 the set of all rectangles, F_3 the set of all rhombuses, F_4 the set of all squares and F_5 the set of trapeziums in a plane. Then F_1 may be equal to:
   (A) $F_2 \cap F_3$ (B) $F_3 \cap F_4$ (C) $F_2 \cup F_3$ (D) $F_2 \cup F_3 \cup F_4 \cup F_1$.

   Ans. :
   d. $F_2 \cup F_3 \cup F_4 \cup F_1$.
   Solution:
   We know that every rectangle, rhombus and square in a plane is a parallelogram but every trapezium is not a parallelogram.
   So, F_1 is either of F_1 or F_2 or F_3 or F_4.
   $\therefore F_1 = F_1 \cup F_2 \cup F_3 \cup F_4$
   Hence, the correct answer is option (d).

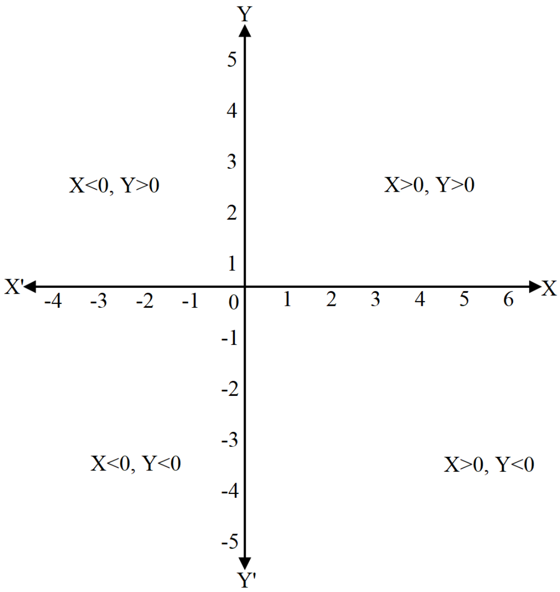
6. In 2nd quadrant?
   (A) X < 0, Y < 0 (B) X < 0, Y > 0 (C) X > 0, Y > 0 (D) X > 0, Y < 0

   Ans. :

b. X < 0, Y > 0

Solution:

In the second quadrant,



7. The symmetric difference of A = {1, 2, 3} and B = {3, 4, 5} is:

(A)	(B)	(C)	(D)
{1, 2}	{1, 2, 4, 5}	{4, 3}	{2, 5, 1, 4, 3}.

Ans. :

b. {1, 2, 4, 5}.

Solution:

Here,

$\mathrm{A} = \{1,2,3\}$ and

$\mathrm{B} = \{3,4,5\}$

The symmetric difference of A and B is given by:-

$(\mathrm{A}-\mathrm{B}) \cup (\mathrm{B}-\mathrm{A})$

Now, are have:

$(\mathrm{A}-\mathrm{B}) = \{1,2\}$

$(\mathrm{B}-\mathrm{A}) = \{4,5\}$

$(\mathrm{A}-\mathrm{B}) \cup (\mathrm{B}-\mathrm{A}) = \{1,2,4,5\}$.

8. In a class of 50 students 35 opted for Mathematics and 37 opted for Biology How may have opted for only Mathematics? (Assume that each student has to opt for at least one of the subjects)

(A) 15 (B) 17 (C) 13 (D) 19

Ans. :

c. 13

Solution:

Here n(M ∪ B) = 50, n(M) = 35, n(B) = 37

∴ n(M ∩ B) = n(M) + n(B) -n(M ∪ B)

= 35 + 37 - 50 = 22

⇒ 22 student have opted for both Mathematics and Biology.

Now the number of students who have opted for Mathematics only

= n(M) -n(M ∩ B)

= 35 - 22 = 13

9. A and B are two sets having 3 and 5 elements respectively and having 2 elements in common. Then the number of elements in A × B is:

(A) 6 (B) 36 (C) 15 (D) None of these

Ans. :

c. 15

Solution:

Total ordered pairs =n(A) × n(B) = 3 × 5 = 15.

10. If A = {x : x is a multiple of 3} and B = {x : x is a multiple of 5}, then A - B is:

(A) $\mathrm{A} \cap \mathrm{B}$ (B) $\mathrm{A} \cap \overline{\mathrm{B}}$ (C) $\overline{\mathrm{A}} \cap \overline{\mathrm{B}}$ (D) $\overline{\mathrm{A} \cap \mathrm{B}}$.

Ans. :

b. $A \cap \overline{B}$.

Solution:

A = {x : x is a multiple of 3}

A = 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, ...

B = {x : x is a multiple of 5}

B = 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, ...

Now, we have:

A - B = 3, 6, 9, 12, 18, 21, 24, 27, 30, 33,36, 39, 42, ...

$= A \cap \overline{B}$.

11. If A = {1, 2, 3, 4, 5}, then the number of proper subsets of A is:

(A) 120 (B) 30 (C) 31 (D) 32.

Ans. :

c. 31.

Solution:

The number of proper subsets of any set is given by the formula 2n - 1, where n is the number of elements in the set.

Here,

n = 5

$\therefore$ Number of proper subsets of A = 25 - 1 = 31.

12. An investigator interviewed 100 students to determine the performance of three drinks: milk, coffee and tea. The investigator reported that 10 students take all three drinks milk, coffee and tea; 20 students take milk and coffee; 25 students take milk and tea; 12 students take milk only; 5 students take coffee only and 8 students take tea only. Then the number of students who did not take any of three drinks is:

(A) 10 (B) 20 (C) 25 (D) 30.

Ans. :

b. 20.

Solution:

solve for None:

80 + None = 100

None = 20.

13. If A and B are two given sets, then $A \cap (A \cap B)^c$ is equal to:

(A) A (B) B (C) ϕ (D) $A \cap B^c$.

Ans. :

d. $A \cap B^c$.

Solution:

A and B are two sets.

$A \cap B$ is the common region in both the sets.

$A \cap B^c$ is all the region in the universal set except $A \cap B$.

Now,

$(A \cap A \cap B)^c = (A \cap B)^c$.

14. Let U be the universal set containing 700 elements. If A, B are subsets of U such that $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$. Then, $n(A' \cap B') =$

(A) 400 (B) 600 (C) 300 (D) None of these.

Ans. :

c. 300.

Solution:

$n(A' \cap B') = n(A \cup B')$

$= n(U) - n(A \cup B)$

$= 700 - 200 + 300 - 100 = 300.$

15. For any set A, (A')' is equal to:

(A) A' (B) A (C) ϕ (D) None of these.

Ans. :

b. A.

Solution:

The complement of the complement of a set is the set itself.

16. Suppose A_1, A_2, ..., A_{30} are thirty sets each having 5 elements and B_1, B_2, ..., B_n are n sets each with 3 elements. Let $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S$ and each element of S belong to exactly 10 of the $A_i{}^{'s}$ and exactly 9 of the $B_j{}^{'s}$, then n is equal to:

(A) 15 (B) 3 (C) 45 (D) 35.

Ans. :

c. 45.

Solution:

It is given that each set $A_j (1 \le i \le 30)$ contains 5 elements and $\bigcup_{i=1}^{30} A_i = S$.

$\therefore n(S) = 30 \times 5 = 150$

But, it is given that each element of *S* belong to exactly 10 of the $A_i{}^{'s}$.

$\therefore$ Number of distinct elements in $S = \frac{150}{10} = 15......(1)$

It is also given that each set $B_j (1 \le j \le n)$ contains 3 elements and $\bigcup_{j=1}^{n} B_j = S$.

$\therefore\ n(S) = n \times 3 = 3n$

Also, each element of S belong to eactly 9 of $B_j{}^{'s}$.

$\therefore$ Number of distinct elements in $S = \frac{3n}{9} \ldots\ldots (2)$

From (1) and (2), we have

$\frac{3n}{9} = 15$

$\Rightarrow n = 45.$

Hence, the correct answer is option (c).

17. Let A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. Then the number of subsets of A containing exactly two elements is:

(A) 20 (B) 40 (C) 45 (D) 90

Ans. :

c. 45

Solution:

Number of elements in A = 10

Number of subsets of A containing exactly two elements

= Number of ways we can select 2 elements from 10 elements

$10c_2 = \frac{10 \times 9}{2} = 45$

$\therefore$ Number of subsets of A containing exactly two elements = 45

18. While preparing the progress reports of the students, the class teacher found that 70% of the students passed in Hindi, 80% passed in English and only 65% passed in both the subjects. Find out the percentage of students who failed in both the subjects.

(A) 15% (B) 20% (C) 30% (D) 35%

Ans. :

a. 15%

Solution:

The sets E and H represent the students failing in the respective subjects.

n(H ∪ E) = 1− 0.65 = 0.35

By set theory

n(H ∩ E) = n(H) + n(E) − n(N ∪ E)

= 0.3 + 0.2 − 0.35 = 0.15

Hence 15% of students failed in both subjects.

19. { (A, B) : $A^2 + B^2 = 1$} on the sets has the following relation.

(A) Reflexive (B) Symmetric

(C) Reflexive and transitive (D) None

Ans. :

b. Symmetric

Solution:

Given {(a, b) : $a^2 + b^2 = 1$} on the set S.

Now $a^2 + b^2 = b^2 + a^2 = 1$

So, the given relation is symmetric.

20. The range of the function f(x) = 3x - 2, is.

(A) $(-\infty, \infty)$ (B) $R - (3)$ (C) $(-\infty, 0)$ (D) $(0, -\infty)$

Ans. :

a. $(-\infty, \infty)$

Solution:

Let the given function is

y = 3x - 2

⇒ y + 2 = 3x

$\Rightarrow \mathrm{x} = \frac{(\mathrm{y}+2)}{3}$

Now x is satisfied by all values.

So, Range {f(x)} = R $= (-\infty, \infty)$

----- -----