[20]

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

1. If A and B are two disjoint sets, then $n(A \cup B)$ is equal to:
   (A) $n(A) + n(B)$ (B) $n(A) + n(B) - n(A \cap B)$
   (C) $n(A) + n(B) + n(A \cap B)$ (D) $n(A)\, n(B)$.

   Ans. :
   a. $n(A) + n(B)$.
   Solution:
   Two sets are disjoint if they do not have a common element in them, i.e., $A \cap B = \phi$.
   $\therefore n(A \cup B) = n(A) + n(B)$.

2. In a city 20% of the population travels by car 50% travels by bus and 10% travels by both car and bus. Then, persons travelling by car or bus is:
   (A) 80% (B) 40% (C) 60% (D) 70%.

   Ans. :
   c. 60%.
   Solution:
   Suppose C and B represents the population travels by car and bus respectively.
   $n(C \cup B) = n(C) + n(B) - n(B \cap C)$
   $= 0.20 + 0.50 - 0.10$
   $= 0.6 \text{ or } 60\%$.

3. IF R = {(2, 1), (4, 3), (4, 5)}, then range of the function is?
   (A) Range R = {2, 4} (B) Range R = {1, 3, 5} (C) Range R = {2, 3, 4, 5} (D) Range R {1, 1, 4, 5}

   Ans. :
   b. Range R = {1, 3, 5}
   Solution:
   Given R = {(2, 1), (4, 3), (4, 5)}
   then Range (R) = {1, 3, 5}

4. If A = {2, 4, 6, 8, 10}, B = {1, 3, 5, 7, 9}, then A - B =_____:
   (A) {} (B) {2, 4, 6, 8, 10}
   (C) {1, 3, 5, 7, 9} (D) None

   Ans. :
   b. {2, 4, 6, 8, 10}
   Solution:
   A = {2, 4, 6, 8, 10}
   B = {1, 3, 5, 7, 9}
   A - B = {2, 4, 6, 8, 10} - {1, 3, 5, 7, 9} = {2, 4, 6, 8, 10}

5. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 420 consumers like product B.Then, the least number of consumers that must have liked both the products is:
   (A) 140 (B) 180 (C) 210 (D) 190

   Ans. :
   a. 140
   Solution:
   Total consumers = 1000
   Like product A = n(A) = 720
   Like product B = n(B) 420
   n (A ∩ B) (Both the products) = n(A) + n(B) − n(A ∪ B)
   = 720 + 420 − 1000
   = 140

6. Choose the correct answers from the given four option:
   In a class of 60 students, 25 students play cricket and 20 students play tennis, and 10 students play both the games. Then, the number of students who play neither is.
   (A) 0 (B) 25 (C) 35 (D) 45

   Ans. :
   d. 25

Solution:

Total number of students = 60

Number of students who play cricket = 25

Number of students who play tennis = 20

Number of students who play cricket and tennis both = 10

$\Rightarrow n(C \cap T) = 10$

$\therefore n(C \cap T) = n(C) + n(T) - n(C \cap T)$

$= 25 + 20 - 10 = 45 - 10 = 35$

$\therefore n(C' \cap T') = n(U) - n(C \cap T)$

$= 60 - 35 = 25$

Hence, the correct option is (b).

7. If $A \cup B^1$ then $n(A \cup B) = ?$

(A) $n(A) + n(B) - n(A \cap B)$ (B) $n(A) - n(B) + n(A \cap B)$

(C) $n(A) - n(B) - n(A \cap B)$ (D) $n(A) + n(B) + n(A \cap B)$

Ans. :

a. $n(A) + n(B) - n(A \cap B)$

8. Choose the correct answers from the given four option:

If sets A and B are defined as $A = \left\{(x,y)|y = \frac{1}{x}, 0 \neq x \in R\right\}$ $B = \{(x,y)|y = -x, x \in R\}$, then

(A) $A \cap B = A$ (B) $A \cap B = B$ (C) $A \cap B = \phi$ (D) $A \cup B = A$

Ans. :

c. $A \cap B = \phi$

Solution:

Given that: $A = \left\{(x,y|y = \frac{1}{x}, 0 \neq x \in R\right\}$,

and $B = \{(x,y|y = x, x \in R\}$

It is very clear that $y = \frac{1}{x}$ and y = -x

$\because \frac{1}{x} \neq -x$

$\therefore A \cap B = \phi$

Hence, the correct option is (c).

9. Two finite sets have m and n elements. The number of elements in the power set of first set is 48 more than the total number of elements in power set of the second set. Then, the values of m and n are:

(A) 7, 6 (B) 6, 3 (C) 7, 4 (D) 3, 7.

Ans. :

c. 6, 4.

Solution:

ATQ:

$2^m - 1 = 48 + 2^n - 1$

$\Rightarrow 2^m - 2^n = 48$

$\Rightarrow 2^m - 2^n = 2^6 - 2^4$

By comparing we get:

m = 6 and n = 4.

10. The equation $x + \cos x = a$ has exactly one positive root. Complete set of values of 'a' is:

(A) $(0,1)$ (B) $(-\infty,1)$ (C) $(-1,1)$ (D) $(1,\infty)$

Ans. :

d. $(1,\infty)$

Solution:

Let $f(x) = x + \cos x$ a

$\Rightarrow f'(x) = 1 - \sin \geq 0 \forall x \in R.$

Thus f(x) is increasing in $(-\infty,\infty)$, as zero of f'(x) don't for an interval. f(0) = 1a

For a positive root, 1 - a < 0

$\Rightarrow$ a > 1

11. In an examination 80% passed in English, 85% in Maths, 75% in both and 40 students failed in both subjects. Then the number of students appeared are:

(A) 300 (B) 400 (C) 500 (D) 600

Ans. :

b. 400

Solution:

$n(E) = 80$

$n(M) = 85$

$n(E \cap M) = 75$

$n(E \cup M) = n(E) + n(M) - n(E \cap m)$

$= 80 + 85 - 75 = 90$

$n(E \cup M)' = 10$

Let n be the total number of students appeared

$\frac{10}{100} \times n = 40$

$\therefore n = 400$

12. In a certain group of 36 people, 18 are wearing hats and 24 are wearing sweaters. If six people are wearing neither a hat nor a sweater, then how many people are wearing both a hat and a sweater?

(A) 30 (B) 22 (C) 12 (D) 8

Ans. :

c. 12

Solution:

Since 6 people are wearing neither hat nor sweater

n(H ∪ S) = 36 − 6 = 30

By set theory

n(H ∩ S) = n(H) + n(S) − n(H ∪ S)

= 18 + 24 − 30 = 12

13. Which of the following collections are sets?

(A) The collection of all the days of a week

(B) A collection of 11 best hockey player of India.

(C) The collection of all rich person of Delhi

(D) A collection of most dangerous animals of India.

Ans. :

a. The collection of all the days of a week

14. Choose the correct answers from the given four option:

A survey shows that 63% of the people watch a News Channel whereas 76% watch another channel. If x% of the people watch both channel, then

(A) x = 35 (B) x = 63 (C) $39 \leq x \leq 63$ (D) x = 39

Ans. :

c. $39 \leq x \leq 63$

Solution:

Let p% of the people watch a channel and q% of the people watch another channel

$\because n(p \cap q) = x\%$ and $n(p \cup q) \leq 100$

So, $n(p \cap q) \geq n(p) + n(q) - n(p \cap q)$

$100 \geq 63 + 76 - x$

$100 \geq 139 - x \Rightarrow x \geq 139 - 100 \Rightarrow x \geq 39$

Now n(p) = 63

$\therefore n(p \cap q) \leq n(p) \Rightarrow x \geq 63$

So $39 \leq x \geq 63$. Hence, the correcr option is (c).

15. There are 19 hockey players in a club. On a particular day 14 were wearing the prescribed hockey shirts, while 11 were wearing the prescribed hockey pants. None of then was without hockey pant or hockey shirt. How many of them were in complete hockey uniform?

(A) 8 (B) 6 (C) 9 (D) 7

Ans. :

b. 6

Solution:

We can look at it in 2 ways

First by set theory

n(A ∩ B) = n(A) + n(B) − n(A ∪ B)

= 14 + 11 − 19 = 6

Qualitatively, we know that 14 people are wearing prescribed hockey shirts,which leaves us with 5 players who must be wearing hockey pants. So out of 11 players who are wearing hockey pants, 5 are not wearing hockey shirts while the other 6 are in complete uniform.

16. The cardinality of the set P(P(P(f))) is.

(A) 0 (B) 1 (C) 2 (D) 4

Ans. :

d. 4

17. The set $(A \cup B')' \cup B \cap C$ is equal to:

(A) $A' \cup B \cup C$ (B) $A' \cup B$ (C) $A' \cup C'$ (D) $A' \cap B$.

Ans. :

b. $A' \cup B$.

Solution:

$(A \cup B')' \cup (B \cap C)$

$= [A \cap (B')'] \cup (B \cap C)$ (De Morgen law)

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

$= (A' \cup C) \cup B$ (Distributive law)

Disclimer: The question seems to be incorrect or there is some printing mistake in the question. The options given in the question does not match with the answer.

18. In a class of 50 students, 10 did not opt for math, 15 did not opt for science and 2 did not opt for either. How many students of the class opted for both math and science.

(A) 24 (B) 25 (C) 26 (D) 27

Ans. :

d. 27

Solution:

Total students = 50

Students who did not opt for math = 10

Students who did not opt for Science = 15

Students who did not opt for either maths or science = 2

Total of 40 students in math and 13 did not opt for science but did for math = 40 - 13 = 27

So, students of the class opted for both math and science is 27

19. How many elements has P(A), if A = f ?

(A) Two (B) One (C) Three (D) Zero.

Ans. :

b. One

20. If A = (6, 7, 8, 9), B = (4, 6, 8, 10) and C = {x : x $\in$ N : 2 < x $\leq$ 7} ; find :B − C

(A) {4, 6} (B) {4, 6, 8} (C) {6, 8, 10} (D) {8, 10}

Ans. :

d. {8, 10}

Solution:

C = {3, 4, 5, 6, 7}

B − C = {4, 8, 10}

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