MATHEMATICS

Chapter 1: SETS

Important Questions

Multiple Choice questions-

Question 1. If $f(x) = \log[(1 + x)/(1 – x)$, then $f(2x)/(1 + x^2)$ is equal to

(a) $2f(x)$

(b) $\{f(x)\}^2$

(c) $\{f(x)\}^3$

(d) $3f(x)$

Question 2. The smallest set a such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is

(a) $\{3, 5, 9\}$

(b) $\{2, 3, 5\}$

(c) $\{1, 2, 5, 9\}$

(d) None of these

Question 3. Let $R= \{(x, y): x, y$ belong to N, $2x + y = 41\}$. The range is of the relation R is

(a) $\{(2n – 1) : n$ belongs to N, $1 \le n \le 20\}$

(b) $\{(2n + 2) : n$ belongs to N, $1 < n < 20\}$

(c) $\{2n : n$ belongs to N, $1 < n < 20\}$

(d) $\{(2n + 1) : n$ belongs to N , $1 \le n \le 20\}$

Question 4. Empty set is a?

(a) Finite Set

(b) Invalid Set

(c) None of the above

(d) Infinite Set

Question 5. Two finite sets have M and N elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of M and N are respectively.

(a) 6, 3

(b) 8, 5

(c) None of these

(d) 4, 1

Question 6. If the number of elements in a set S are 5. Then the number of elements of the power set P(S) are?

(a) 5

(b) 6

(c) 16

(d) 32

Question 7. Every set is a _____ of itself

(a) None of the above

(b) Improper subset

(c) Compliment

(d) Proper subset

Question 8. If x ≠ 1, and f(x) = x + 1 / x − 1 is a real function, then f(f(f(2))) is

(a) 2

(b) 1

(c) 4

(d) 3

Question 9. In 3rd Quadrant?

(a) X < 0, Y < 0 (b) X > 0, Y < 0

(c) X < 0, Y > 0

(d) X < 0, Y > 0

Question 10. IF A ∪ B = A ∪ C and A ∩ B = A ∩ C, THEN

(a) none of these

(b) B = C only when A I C

(c) B = C only when A ? B

(d) B = C

Very Short Questions:

1. The collection of all the months of a year beginning with letter M

2. The collection of difficult topics in Mathematics.

    Let A = {1,3,5,7,9}. Insert the appropriate symbol Î or Ï in blank spaces: – (Question- 3,4)

3. 2 ------- A

4. 5 -------- A

5. Write the set A = {x: x is an integer, −1 ≤ x < 4} in roster form

6. List all the elements of the set,

A = {x: x ∈ Z, $-\frac{1}{2} < x < \frac{11}{2}$ }

7. Write the set B = {3,9,27,81} in set-builder form

8. A = {x : x ∈ N and 3 <x <4}

9. B = {x : x ∈ N and x^2 = x}

Short Questions:

1. In a group of 800 people, 500 can speak Hindi and 320 can speak English. Find

(i) How many can speak both Hindi and English?

(ii) How many can speak Hindi only?

2. A survey shows that 84% of the Indians like grapes, whereas 45% like pineapple. What percenta of Indians like both grapes and pineapple?

3. In a survey of 450 people, it was found that 110 play crickets, 160 play tennis and 70 play both cricket as well as tennis. How many play neither cricket nor tennis?

4. In a group of students, 225 students know French, 100 know Spanish and 45 know both. Each student knows either French or Spanish. How many students are there in the group?

5. If A = - 3, 5), B = (0, 6 then find (i) A – B, (ii) A ∪ B

6. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

Long Questions:

1. In a survey it is found that 21 people like product A, 26 people like product B and 29 like product C. If 14 people like product A and B, 15 people like product B and C, 12 people like product C and A, and 8 people like all the three products. Find

(i) How many people are surveyed in all?

(ii) How many like product C only?

2. A college awarded 38 medals in football, 15 in basket ball and 20 in cricket. If these medals went to a total of 50 men and only five men got medals in all the three sports, how many received medals in exactly two of the three sports?

3. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2, and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to

(1) chemical C_1 but not chemical C_2

(2) chemical C_2 but not chemical C_1

(3) chemical C_1 or chemical C_2

4. In a survey it was found that 21 peoples liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people like C and A, 15 people like B and C and 8 liked all the three products. Find now many liked product C only

5. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medal in all the three sports, how many received medals in exactly two of the three sports?

Assertion Reason Questions:

1. In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as.

   Assertion (A) : 'The collection of all natural numbers less than 100' is a set.

   Reason (R) : A set is a well-defined collection of the distinct objects.

   (i) Both assertion and reason are true and reason is the correct explanation of assertion.

   (ii) Both assertion and reason are true but reason is not the correct explanation of assertion.

   (iii) Assertion is true but reason is false.

   (iv) Assertion is false but reason is true.

2. In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as.

   Assertion (A) : The set D = {x : x is a prime number which is a divisor of 60} in roster form is {1, 2, 3, 4, 5}.

   Reason (R) : The set E = the set of all letters in the word 'TRIGONOMETRY', in the roster form is {T, R, I, G, O, N, M, E, Y}.

   (i) Both assertion and reason are true and reason is the correct explanation of assertion.

   (ii) Both assertion and reason are true but reason is not the correct explanation of assertion.

   (iii) Assertion is true but reason is false.

   (iv) Assertion is false but reason is true.

Answer Key:

MCQ

1. (a) 2f(x)

2. (a) {3, 5, 9}

3. (a) {(2n – 1) : n belongs to N, 1 ≤ n ≤ 20}

4. (a) Finite Set

5. (a) 6, 3

6. (d) 32

7. (b) Improper subset

8. (d) 3

9. (a) X < 0, Y < 0

10. (d) B = C

Very Short Answer:

1. Set

2. 2. Not a set

3. 3. $\notin$

4. 4. $\in$

5. 5. A = {−1, 0, 1, 2, 3}

6. 6. A = {0,1,2,3,4,5}

7. 7. B = {x: x = 3n, n $\in$ N and 1 ≤ n ≤ 4}

8. 8. Empty set

9. 9. Non-empty set

Short Answer:

Ans: 1. (i) 20 people can speak both Hindi and English

(ii) 480 people can speak Hindi only

Ans: 2. 29% of the Indians like both grapes and pineapple.

Ans: 3. ∪ – set of people surveyed

A – set of people who play cricket

B – set of people who play tennis

Number of people who play neither cricket nor tennis

= n (A ∪ B)″= n(U) − n(A ∪ B)

= 450 − 200

= 250

Ans: 4. (i) -3, 0; (ii) -3,6

Ans: 5. Let A denote the set of students taking apple juice and B denote the set of students taking orange juice

n(U) = 400, n(A) = 100, n (B) = 150 n(AB) =75
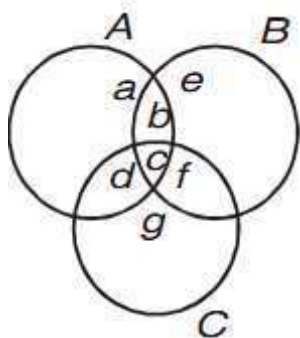
$n ((A' \cap B')) = n(A \cup B)'$

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

$= n(U) - [n(A) + n(B) - n(A \cap B)]$

=400 – 100 – 150 + 75 = 225

Long Answer:

Ans: 1. Let A, B, C denote respectively the set of people who like product
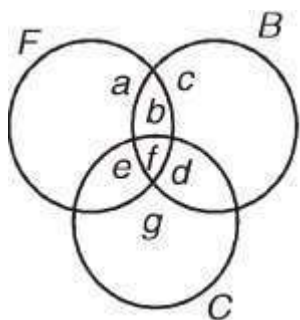
A, B, C.

a, b, c, d, e, f, g – Number of elements in bounded region

(i) Total number of Surveyed people = a + b + c + d + e + f + g = 43

(ii) Number of people who like product C only = g = 10

Ans: 2. people got medals in exactly two of the three sports.

f = 5

a + b + f + e = 38

b + c + d + f = 15

e + d + f + g = 20

a + b + c + d + e + f + g = 50

we have to find b + d + e

Ans: 3. A denote the set of individuals exposed to the chemical C_1 and B denote the set of individuals exposed to the chemical C_2

n(U) = 200, n(A) = 120, n(B) = 50, n(AB) = 30

(i) n(A-B) = n(A) – n(AB)

=120-30=90
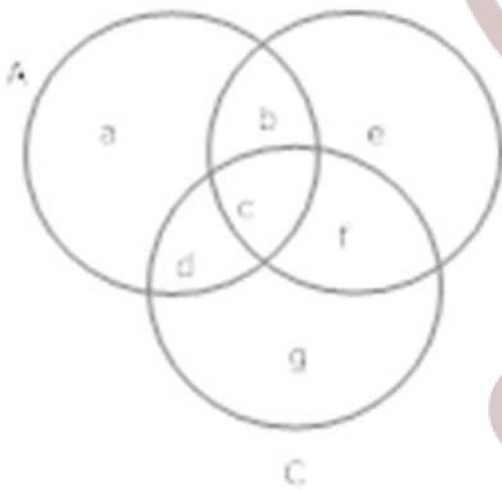
(ii) n(B-A) = n(B) – n(AB)

=50-30 = 20

(iii) n(A∪B) =n(A)+ n(B)-n(AB)

=120+50-30

=140

Ans: 4. a + b + c + d = 21

  b + c + e + f = 26

  c + d + f + g = 29

b + c = 14, c + f =15, c + d = 12

c = 8

d = 4, c = 8, f = 7, b = 6, g = 10, e = 5, a = 3
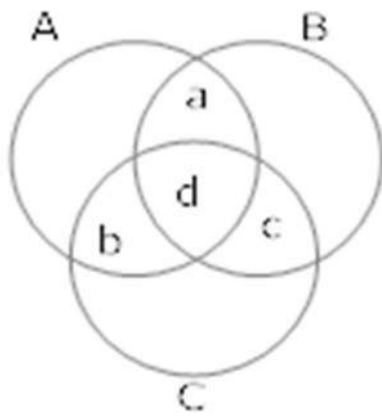
like product c only = g = 10

Ans: 5. Let A, B and C denotes the set of men who received medals in football, basketball and cricket respectively.

n (A) = 38, n (B) = 15, n (C) = 20

n (A B C) = 58 and n (A ∩ B ∩ C) = 3

n (A B C) = n (A) + n (B) + n(C) − n (A ∩ B) − n (B ∩ C) − n (C ∩ A) + n (A ∩ B ∩ C)

58 = 38 + 15 + 20 − (a + d) − (d + c) − (b + d) + 3

18 = a + d + c + b + d

18 = a + b + c + 3d

18 = a + b + c + 3 3

9 = a + b + c

Assertion Reason Answer:

1. (i) Both assertion and reason are true and reason is the correct explanation of assertion.

2. (iv) Assertion is false but reason is true.