CHAPTER-1

SETS

ONE MARK QUESTIONS:

1. Is the collection of all the months of a year beginning with the letter J a set? Justify your answer. (U)

2. Is the collection of ten most talented writers of India a set? Justify your answer. (U)

3. Is the collection of all boys in your class a set? Justify your answer. (U)

4. Is the collection of all natural numbers less than 100 a set? Justify your answer. (U)

5. Is the collection of all even integers a set? Justify your answer. (U)

6. Is the collection of all most dangerous animals of the world a set? Justify your answer. (U)

7. Is the following pairs of sets are equal?Justify your answer.
A = $\{n: n \in \mathbb{Z}, and\ n^2 \leq 4\}$ and B =$\{x: x \in \mathbb{R}\ and\ x^2 - 3x + 2 = 0\}$. (U)

8. State whether the set of lines which are parallel to the x-axis is finite or infinite. (U)

9. State whether A = B or not, where A = $\{2, 4, 6, 8, 10\}$ and B = $\{x: x\ is\ positive\ even\ integer\ and\ x \leq 10\}$. (U)

10. Are the sets $\{1, 2, 3, 4\}$and $\{x: x\ is\ a\ natural\ number\ and\ 4 \leq x \leq 6\}$ disjoint? (U)

11. State whether the following statement is true or false. Justify your answer.
$\{a, e, i\ o, u\}$and$\{a, b, c, d\}$ are disjoint sets. (U)

12. Write the set $\{x: x\ is\ a\ positive\ integer\ and\ x^2 < 40\}$ in roster form. (U)

13. Write the set A = $\{1, 4, 9, 16, 25, \cdots\}$ in the set-builder form. (U)

14. Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set-builder form. (U)

15. Write the set $\{x: x\ is\ an\ integer\ and\ x + 1 = 1\}$ in roster form. (U)

16. Write the set $\{x: x\ is\ a\ positive\ integer\ and\ is\ a\ divisor\ of\ 18\}$ in roster form. (U)

17. Write the set$\{x: x\ is\ an\ integer\ and\ x^2 - 9 = 0\}$ in roster form. (U)

18. Write the set$\{x: x\ is\ a\ integer\ and - 3 < x < 7\}$ in roster form. (U)

19. Write the set$\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$ in roster form. (U)

20. Write the set$\{x: x\ is\ a\ two\ digit\ natural\ number\ such\ that\ the\ sum\ of\ its\ digits\ is\ 8\}$ in roster form. (U)

21. Write the set $\{x: x\ is\ a\ prime\ number\ which\ is\ a\ divisor\ of\ 60\}$ in roster form. (U)

22. Write the set of all letters in the word TRIGONOMETRY in roster form. (U)

23. Write the set of all letters of the word BETTER in roster form. (U)

24. Write the set$\{3, 6, 9, 12\}$ in the set-builder form. (U)

25. Write the set$\{2, 4, 8, 16, 32\}$ in the set-builder form. (U)

26. Write the set$\{5, 25, 125, 625\}$ in the set-builder form. (U)

27. Write the set $\{2, 4, 6, \cdots\}$ in the set-builder form. (U)

28. Write the set$\{1, 4, 9, \cdots, 100\}$ in the set-builder form. (U)

29. Write the set $A = \{x: x\ is\ an\ odd\ natural\ number\}$ in roster form. (U)

30. Write the set A = $\left\{x: x\ is\ an\ integer, -\frac{1}{2} < x < \frac{9}{2}\right\}$ in roster form. (U)

31. Write the set A = $\{x: x\ is\ an\ integer, x^2 \leq 4\ \}$ in roster form. (U)

32. Write the set A = $\{x: x\ is\ a\ letter\ in\ the\ word\ LOYAL\}$ in roster form. (U)

33. Write the set A = $\{x: x\ is\ a\ month\ of\ a\ year\ not\ having\ 31\ days\}$ in roster form. (U)

34. Write the set A = $\{x: x\ is\ a\ consonant\ in\ the\ English\ alphabet\ which\ precedes\ k\}$ in roster form. (U)

35. Write the set A = $\{x: x\ is\ a\ prime\ number\ and\ a\ divisor\ of\ 6\}$ in roster form. (U)

36. Write the set A = $\{x: x\ is\ an\ odd\ natural\ number\ less\ than\ 10\}$ in roster form. (U)

37. Write the set A = $\{x: x\ is\ a\ ntural\ number\ and\ divisor\ of\ 6\}$ in roster form. (U)

38. Write the set A = $\{x: x\ is\ a\ letter\ of\ the\ word\ MATHEMATICS\}$in roster form. (U)

39. Define an empty set. (K)

40. Define a finite set. (K)

41. Define equal sets. (K)

42. Define a subset of a set. (K)

43. Define power set of a set. (K)

44. Write down all the subsets of the set $\{a\}$. (U)

45. Write down all the subsets of the set $\{a, b\}$. (U)

46. Write down all the subsets of the set ∅. (U)

47. How many elements has P(A), if A = ∅ ? (U)

48. Write the set $\{x: x\ \in R, -4 < x \leq 6\ \}$ as an interval. (U)

49. Write the set $\{x: x \in R, -12 < x < -10\}$ as an interval. (U)

50. Write the set$\{x: x \in R, 0 \leq x < 7\}$ as an interval. (U)

51. Write the set$\{x: x \in R, 3 \leq x \leq 4\}$ as an interval. (U)

52. Write the interval (-3, 0) in the set-builder form. (U)

53. Write the interval $[6, 12]$ in the set-builder form. (U)

54. Write the interval$(6, 12]$ in the set-builder form. (U)

55. Write the interval $[-23, 5)$ in the set-builder form. (U)

56. Define union of two sets. (K)

57. Let A = $\{2, 4, 6, 8\}$ and B = $\{6, 8, 10, 12\}$. Find AUB. (U)

58. Let A = $\{a, e, i\ o, u\}$ and B = $\{a, i, u\}$. Find AUB. (U)

59. Let X = $\{Ram, Geeta, Akbar\}$ be the set of students of class XI, who are in school hockey team. Let Y = $\{Geeta, David, Ashok\}$ be the set of students from class XI who are in the school football team. Find XUY. (A)

60. Define intersection of two sets. (K)

61. Let A = $\{2, 4, 6, 8\}$ and B =$\{6, 8, 10, 12\}$. Find A∩B. (U)

62. Let X = $\{Ram, Geeta, Akbar\}$ be the set of students of class XI, who are in school hockey team. Let Y = $\{Geeta, David, Ashok\}$ be the set of students from class XI who are in the school football team. Find X∩Y. (A)

63. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ an\ even\ natural\ number\}$, find $A \cap B$. (U)

64. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ an\ odd\ natural\ number\}$, find $A \cap B$. (U)

65. If A = $\{x: x\ is\ a\ natural\ number\}$ and B = $\{x: x\ is\ prime\ number\}$, find $A \cap B$. (U)

66. If A = $\{x: x\ is\ an\ even\ natural\ number\}$ and B = $\{x: x\ is\ an\ odd\ natural\ number\}$, find $A \cap B$. (U)

67. If A = $\{x: x\ is\ a\ even\ natural\ number\}$ and B = $\{x: x\ is\ a\ prime\ number\}$, find $A \cap B$. (U)

68. If A = $\{x: x\ is\ a\ odd\ natural\ number\}$ and B = $\{x: x\ is\ a\ prime\ number\}$, find $A \cap B$. (U)

69. Find the union of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ multiple\ of\ 3\}$ and

B = $\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$. (U)

70. Find the union of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ 1 < x \leq 6\}$ and

B = $\{x: x\ is\ a\ natural\ number\ and\ 6 < x < 10\}$. (U)

71. Find the intersection of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ multiple\ of\ 3\}$ and

B = $\{x: x\ is\ a\ natural\ number\ less\ than\ 6\}$. (U)

72. Find the intersection of the sets A = $\{x: x\ is\ a\ natural\ number\ and\ 1 < x \leq 6\}$ and

B = $\{x: x\ is\ a\ natural\ number\ and\ 6 < x < 10\}$. (U)

73. Let A = $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and B = $\{2, 3, 5\}$. Find A∩B. (U)

74. Find the union of the sets X = $\{1, 3, 5\}$ and Y = $\{1, 2, 3\}$. (U)

75. Find the union of the sets A = $\{a, e, i, o\ u\}$ and B = $\{a, b, c\}$. (U)

76. Find the union of the sets A = $\{1, 2, 3\}$ and B = ∅. (U)

77. If A and B are two sets such that A⊂B, then what is AUB? (U)

78. If A = $\{1, 2, 3, 4\}$, B = $\{3, 4, 5, 6\}$ and C = $\{5, 6, 7, 8\}$, find AUBUC. (U)

79. If A = $\{1, 2, 3, 4\}$, B = $\{3, 4, 5, 6\}$ and C =$\{7, 8, 9, 10\}$ find AUBUC. (U)

80. Find the intersection of the sets X = $\{1, 3, 5\}$ and Y = $\{1, 2, 3\}$. (U)

81. Find the intersection of the sets A = $\{a, e, i, o\ u\}$ and B = $\{a, b, c\}$. (U)

82. Find the intersection of the sets A = $\{1, 2, 3\}$ and B = ∅. (U)

83. If R is the set of real numbers and Q is the set of rational umbers, then what is R – Q? (U)

84. Define complement of a set. (K)

85. Let U = $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and A = $\{1, 3, 5, 7, 9\}$. Find A'. (U)

86. Let U be the universal set of all students of class XI of a coeducational school and A be the set of all girls in class XI. Find A'. (A)

87. Let U = $\{a, b, c, d, e, f, g, h\}$, find the complement of the set A = $\{a, b, c\}$. (U)

88. Let U = $\{a, b, c, d, e, f, g, h\}$, find the complement of the set A = $\{d, e, f, g\}$. (U)

89. Let U = $\{a, b, c, d, e, f, g, h\}$, find the complement of the set A = $\{a, c, e, g\}$. (U)

90. Let U = $\{a, b, c, d, e, f, g, h\}$, find the complement of the set A = $\{f, g, h, a\}$. (U)

91. 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^o, what is A'? (A)

TWO MARKS QUESTIONS:

1. Write down all the subsets of the set $\{1, 2, 3\}$. (U)

2. Write the solution set of the equation $x^2 + x - 20 = 0$ in roster form. (U)

3. Let A = $\{1, 2, 3, 4, 5, 6\}$, B = $\{2, 4, 6, 8\}$. Find A – B and B – A. (U)

4. Let A = $\{a, b\}$, B = $\{a, b, c\}$. Is A ⊂ B? What is AUB? (U)

5. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$ and C = $\{11, 13, 15\}$, find $A \cap (B \cup C)$. (U)

6. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$ and C = $\{15, 17\}$, find $A \cap (B \cup C)$. (U)

7. If A = $\{3, 6, 9, 12, 15, 18, 21\}$ and B = $\{4, 8, 12, 16, 20\}$, find A – B and B – A. (U)

8. If A = $\{3, 6, 9, 12, 15, 18, 21\}$ and B = $\{2, 4, 6, 8, 10, 12, 14, 16\}$, find A – B and B – A. (U)

9. If A = $\{3, 6, 9, 12, 15, 18, 21\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

10. If A = $\{2, 4, 6, 8, 10, 12, 14, 16\}$ and B = $\{4, 8, 12, 16, 20\}$, find A – B and B – A. (U)

11. If A = $\{4, 8, 12, 16, 20\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

12. If A = $\{2, 4, 6, 8, 10, 12, 14, 16\}$ and B = $\{5, 10, 15, 20\}$, find A – B and B – A. (U)

13. If X = $\{a, b, c, d\}$ and Y = $\{b, d, g, f\}$ find X – Y and Y – X. (U)

14. If X = $\{a, b, c, d\}$ and Y = $\{b, d, g, f\}$ find X – Y and X∩Y. (U)

15. Let U = $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{2, 4, 6, 8\}$, find $(A \cup B)'$. (U)

16. Let U = $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{3, 4, 5, 6\}$, find $(A \cup B)'$. (U)

17. Let U = $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, A = $\{1, 2, 3, 4\}$ and B = $\{3, 4, 5, 6\}$, find $(A - B)'$. (U)

18. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$, C = $\{11, 13, 15\}$ and D = $\{15, 17\}$, find $(A \cap B) \cup (C \cup D)$.(U)

19. If A = $\{3, 5, 7, 9, 11\}$, B = $\{7, 9, 11, 13\}$, C = $\{11, 13, 15\}$ and D = $\{15, 17\}$, find $(A \cup B) \cap (C \cup D)$.(U)

20. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is an even natural number}\}$, ii) $\{x: x \text{ is a positive multiple of } 3\}$. (U)

21. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is an odd natural number}\}$, ii) $\{x: x \text{ is a prime number}\}$. (U)

22. Taking the set of natural numbers as the universal set, write the complements of the following sets:
i) $\{x: x \text{ is a natural number divisible by } 3 \text{ and } 5\}$, ii) $\{x: x \text{ is a perfect square}\}$. (U)

23. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: x \text{ is a perfect cube}\}$, ii) $\{x: x + 5 = 8\}$. (U)

24. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: 2x + 5 = 9\}$, ii) $\{x: x \geq 7\}$. (U)

25. Taking the set of natural numbers as the universal set, write the complement of the following sets:
i) $\{x: x \in N \text{ and } 2x + 1 > 10\}$, ii) $\{x: x \in N \text{ and } x \geq 8\}$ (U)

26. Draw the appropriate Venn diagram for $A' \cap B'$. (U)

27. Draw the appropriate Venn diagram for $(A \cap B)'$. (U)

28. Draw the appropriate Venn diagram for $A' \cup B'$. (U)

29. Draw the appropriate Venn Diagram for $(A \cup B)'$. (U)

30. If A and B are finite sets, then prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$. (S)

31. If X and Y are sets such that XUY has 50 elements, X has 28 elements and Y has 32 elements, how many elements does X ∩Y have? (U)

32. If X and Y are sets such that n(X) = 17, n(Y) = 23 and n(XUY) = 38, find n(X∩Y). (U)

33. If X and Y are sets such that XUY has 18 elements, X has 8 elements and Y has 15 elements, how many elements does X∩Y have? (U)

34. If S and T are two sets such that S has 21 elements, T has 32 elements and S∩T has 11 elements, how many elements does S ∪ T have? (U)

35. If X and Y are sets such that X has 40 elements, XUY has 60 elements and X∩Y has 10 elements, how many elements does Y have? (U)

36. In a school there are 20 teachers who teach mathematics or physics. Of these, 12 teach mathematics and 4 teach physics and mathematics. How many teach physics? (U)

37. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play at least one of the two games. How many students like to play both cricket and football? (U)

38. There are 200 individuals with 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 chemical C_1 but not chemical C_2. (A)

39. There are 200 individuals with 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 chemical C_2 but not chemical C_1. (A)

40. There are 200 individuals with 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 chemical C_1 or chemical C_2. (A)

41. In a group of 400 people, 250 can speak Hindi and 200 can speak English also each person can speak at least one of the languages. How many people can speak both Hindi and English? (U)

42. In a group of 70 people, 37 like coffee, 52 like tea and each person likes at least one of the two drinks. How many people like both coffee and tea? (U)

43. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages? (U)

44. Show that the set of letters to spell "CATARACT" and the set of letters to spell "TRACT" are equal. (U)

45. List all the subsets of the set $\{-1, 0, 1\}$. (U)

46. Show that AUB = $A \cap B$ implies A = B. (S)

47. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false."If $x \in A$and $A \in B$, then $x \in B$" (S)

48. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $B \in C$, then $A \in C$" (S)

49. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $B \subset C$, then $A \subset C$" (S)

50. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \not\subset B$and $B \not\subset C$, then $A \not\subset C$" (S)

51. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $x \in A$and $A \not\subset B$, then $x \in B$" (S)

52. Determine whether the following statement is true or false. If it is true, prove it. If it is false, give an example to prove that it is false.
"If $A \subset B$and $x \notin B$, then $x \notin A$" (S)

53. Using properties of sets, Show that $A \cup (A \cap B) = A$. (S)

54. Using properties of sets, Show that $A \cap (A \cup B) = A$. (S)

55. Show that $A \cap B = A \cap C$ need not imply B = C. (S)

THREE MARKS QUESTIONS:

1. Let U =$\{1,2,3,4,5,6\}$, $A = \{2,3\}$ and B = $\{3,4,5\}$. Show that $(\mathrm{A} \cup \mathrm{B})' = A' \cap B'$. (U)

2. Let U =$\{1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$ and B = $\{2,3,5,7\}$. Show that $(\mathrm{A} \cup \mathrm{B})' = A' \cap B'$.(U)

3. Let U =$\{1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$ and B = $\{2,3,5,7\}$. Show that $(\mathrm{A} \cap \mathrm{B})' = A' \cup B'$.(U)

4. If A, B and C are finite sets, then prove that $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$. (S)

5. 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. (A)

6. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis also each person likes at least one of the games. How many like tennis only and not cricket? How many like tennis? (A)

7. For any two sets A and B, show that P(A∩B) = P(A)∩P(B). (S)

8. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products? (A)

9. Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct? (A)

10. 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 medals in all the three sports, how many received medals in exactly two of the three sports? (A)

11. Let A, B and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that $B = C$. (S)

12. Show that the conditions $A \subset B$ and $A - B = \emptyset$ are equivalent. (S)

13. Show that the conditions $A \subset B$ and $A \cup B = B$ are equivalent. (S)

14. Show that the conditions $A \subset B$ and $A \cap B = A$ are equivalent. (S)

15. Show that if $A \subset B$, then $(C - B) \subset (C - A)$. (S)

16. Assume that P(A) = P(B). Show that A = B. (S)

17. Is it true that for any two sets A and B, P(A) ∪ P(B) = P(AUB)? Justify your answer. (S)

18. Show that for any two sets A and B, $A = (A \cap B) \cup (A - B)$ (S)

19. Show that for any two sets A and B, $A \cup (B - A) = A \cup B$. (S)

20. Let A and B be sets. If $A \cap X = B \cap X = \emptyset$ and $A \cup X = B \cup X$ for sum set X, show that A = B. (S)

21. Find sets A, B and C such that $A \cap B, B \cap C$ and $A \cap C$ are non empty sets and $A \cap B \cap C = \emptyset$. (S)

22. In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students taking neither tea nor coffee? (A)

23. In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group? (A)

24. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find number of people who read at least one of the newspapers. (A)

25. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find number of people who read exactly one newspaper. (A)

26. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only. (A)

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