SETS

Set 4:

1. If U is the universal set and A is a subset of U, then the complement of A is denoted by:
a) A^c
b) A'
c) Both a and b
d) A - U

2. The complement of a set A contains:
a) All elements of A
b) All elements of U
c) All elements of U that are not in A
d) The empty set

3. If U = {1, 2, 3, 4, 5} and A = {1, 3, 5}, then A' is:
a) {2, 4}
b) {1, 2, 3}
c) {1, 3, 5}
d) { }

4. For any set A, (A')' is equal to:
a) U
b) φ
c) A
d) A'

5. One of De Morgan's Laws states that:
a) (A ∪ B)' = A' ∩ B'
b) (A ∩ B)' = A' ∪ B'
c) Both a and b
d) (A ∪ B)' = A' ∪ B'

6. If U = {a, b, c, d, e}, A = {a, b, c}, B = {b, c, d}, then (A ∩ B)' is:
a) {a, d, e}
b) {b, c}
c) {a, d}
d) {e}

7. For the sets in Q6, A' ∪ B' is:
a) {a, d, e}
b) {b, c}
c) {a, d}
d) {d, e, a} (Same as {a, d, e})

8. The complement of the universal set U is:
a) U itself
b) The set U'
c) The empty set φ
d) Not defined

9. The complement of the empty set φ is:
a) φ itself
b) The set φ'
c) The universal set U
d) Not defined

10. Which law is represented by A ∪ A' = U?
a) De Morgan's Law
b) Complement Law
c) Associative Law
d) Idempotent Law

11. Which law is represented by A ∩ A' = φ?
a) De Morgan's Law
b) Complement Law
c) Associative Law
d) Idempotent Law

12. In a group of 50 people, 30 like tea, and 20 like coffee. How many like both? (This problem requires a Venn diagram and the formula n(A ∪ B) = n(A) + n(B) - n(A ∩ B). The answer cannot be determined from this data alone. A good MCQ would provide the number who like neither, e.g., 5).
a) 10
b) 0
c) 50
d) Cannot be determined

13. In a class, 20 students passed Physics, 25 passed Chemistry, and 15 passed both. How many students passed at least one subject?
a) 30
b) 45

c) 60
d) 15

14. For the data in Q13, how many students passed only Physics?
a) 5
b) 10
c) 15
d) 20

15. If R is the set of real numbers and Q is the set of rational numbers, then R - Q is the set of:
a) Integers
b) Natural Numbers
c) Irrational Numbers
d) Whole Numbers

16. The set (A - B) is also equal to:
a) $A \cap B'$
b) $B \cap A'$
c) $A' \cap B$
d) $(A \cup B)'$

17. The shaded region in this Venn diagram represents:
(Imagine a Venn diagram for two sets A and B inside a universal set U. The area outside both circles is shaded)
a) $A \cap B$
b) $A \cup B$
c) $(A \cup B)'$
d) $(A \cap B)'$

18. If A and B are any two sets, which of the following is TRUE?
a) $A - B = B - A$
b) $A \cup B = B \cup A$
c) $A \cap B' = B \cap A'$
d) $(A - B)' = B - A$

19. The set of elements which are in A or in B but not in both is called the symmetric difference. It is equal to:
a) $(A \cup B) - (A \cap B)$
b) $(A - B) \cup (B - A)$
c) Both a and b
d) $(A \cap B) - (A \cup B)$

20. The number of elements in the power set of a set with n elements is:

a) n
b) n^2
c) 2^n
d) 2n

21. For any set A, A ∪ A' is always equal to:
a) A
b) A'
c) U
d) ∅

22. For any set A, A ∩ A' is always equal to:
a) A
b) A'
c) U
d) ∅

23. The complement of the universal set is the:
a) Universal set itself
b) Empty set
c) Set of all subsets
d) Power set

24. The complement of the empty set is the:
a) Empty set itself
b) Universal set
c) Set {0}
d) Power set

25. If U = {1,2,3,4,5} and A = {1,3,5}, then (A')' is:
a) {2,4}
b) {1,3,5}
c) U
d) ∅

26. De Morgan's Law states that (A ∪ B)' is equal to:
a) A' ∪ B'
b) A' ∩ B'
c) A ∪ B
d) A ∩ B

27. De Morgan's Law states that (A ∩ B)' is equal to:
a) A' ∪ B'
b) A' ∩ B'

c) A ∪ B
d) A ∩ B

28. In a survey of 100 people, 60 read newspaper A, 50 read newspaper B, and 30 read both. How many read neither?
a) 10
b) 20
c) 30
d) 40

29. In the above problem (Q28), how many read only newspaper A?
a) 30
b) 40
c) 20
d) 10

30. In a class of 35 students, 24 like pizza, and 18 like burgers. If 10 like both, how many like neither?
a) 3
b) 5
c) 7
d) 9

31. If A and B are subsets of U, then the set of elements in U that are not in A or B is:
a) A' ∩ B'
b) A' ∪ B'
c) A ∩ B
d) A ∪ B

32. The dual of the statement (A' ∪ B)' = A ∩ B' is:
a) (A' ∩ B)' = A ∪ B'
b) (A ∩ B')' = A' ∪ B
c) (A ∪ B')' = A' ∩ B
d) Both a and b

33. If R is the set of real numbers and Q is the set of rationals, then R - Q is the set of:
a) Integers
b) Irrationals
c) Naturals
d) Wholes

34. The set A - B can be written as:
a) A ∩ B'
b) A' ∩ B

c) (A ∪ B)'
d) B - A

35. The shaded region in the Venn diagram represents:
(Imagine a Venn diagram for two sets A and B. The area outside both circles but inside the rectangle is shaded)
a) A ∩ B
b) A ∪ B
c) (A ∪ B)'
d) (A ∩ B)'

36. In a group of 65 people, 40 like cricket, 25 like football, and 10 like both. How many like only cricket?
a) 30
b) 35
c) 15
d) 25

37. For the data in Q36, how many like at least one game?
a) 55
b) 65
c) 75
d) 50

38. The set (A ∩ B') ∪ (A' ∩ B) represents the:
a) Union of A and B
b) Intersection of A and B
c) Symmetric difference of A and B
d) Difference of A and B

39. If n(U) = 100, n(A) = 50, n(B) = 40, and n(A ∩ B) = 20, then n(A' ∩ B') is:
a) 10
b) 20
c) 30
d) 40

40. The principle of inclusion-exclusion for three sets states: n(A ∪ B ∪ C) = n(A) + n(B) + n(C) - n(A∩B) - n(B∩C) - n(A∩C) + _____
a) n(A ∩ B ∩ C)
b) n(A ∪ B ∪ C)
c) n(A) * n(B) * n(C)
d) 0

41. In a class, 20 students know English, 15 know French, and 10 know both. How many know at least one language?
a) 25
b) 35
c) 45
d) 5

42. The set of all elements that are in U but not in A is called the:
a) Union of A
b) Intersection of A
c) Complement of A
d) Difference of A

43. If A is a subset of U, then which of the following is true?
a) $A \cup A' = U$
b) $A \cap A' = U$
c) $A - A' = U$
d) $A' - A = U$

44. The dual of the set identity $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ is:
a) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
b) $A \cup (B \cup C) = (A \cup B) \cup C$
c) $A \cap (B \cap C) = (A \cap B) \cap C$
d) $A - (B \cap C) = (A - B) \cup (A - C)$

45. In a town of 1000 people, 400 read newspaper A, 500 read B, and 200 read both. How many read neither?
a) 100
b) 200
c) 300
d) 400

46. The absolute complement of set A is defined with respect to the:
a) Set A itself
b) Universal set
c) Empty set
d) Power set

47. If A and B are two sets, then $A \subseteq B$ if and only if:
a) $A' \subseteq B'$
b) $B' \subseteq A'$
c) $A \cap B' = \varnothing$
d) $A' \cap B = \varnothing$

48. The property (A')' = A is known as:
a) Involution law
b) Idempotent law
c) Complement law
d) Identity law

49. In a group of 50 people, 25 like tea, 30 like coffee, and 15 like both. How many like only tea?
a) 10
b) 15
c) 20
d) 25

50. The set of all elements that are in exactly one of the sets A or B is:
a) A ∪ B
b) A ∩ B
c) A Δ B
d) A - B

Set 4: ANSWER

1. c) Both a and b (A^c and A')
2. c) All elements of U that are not in A
3. a) {2, 4}
4. c) A
5. c) Both a and b
6. a) {a, d, e}
7. d) {d, e, a} (Same as {a, d, e})
8. c) The empty set φ
9. c) The universal set U
10. b) Complement Law
11. b) Complement Law
12. *(The question was incomplete. The answer would require the number who like neither, e.g., if 5 like neither, then n(A ∩ B)=5. So the answer is not determinable from the given data alone.)*
13. a) 30 (20 + 25 - 15)
14. a) 5 (20 - 15)
15. c) Irrational Numbers
16. a) A ∩ B'

17. c) $(A \cup B)'$
18. b) $A \cup B = B \cup A$
19. c) Both a and b
20. c) 2^n
21. c) U
22. d) $\varnothing$
23. b) Empty set
24. b) Universal set
25. b) {1,3,5}
26. b) $A' \cap B'$
27. a) $A' \cup B'$
28. b) 20 (100 - (60 + 50 - 30))
29. a) 30 (60 - 30)
30. a) 3 (35 - (24 + 18 - 10))
31. a) $A' \cap B'$
32. c) $(A \cup B')' = A' \cap B$
33. b) Irrationals
34. a) $A \cap B'$
35. c) $(A \cup B)'$
36. a) 30 (40 - 10)
37. a) 55 (40 + 25 - 10)
38. c) Symmetric difference of A and B
39. c) 30 (100 - (50 + 40 - 20))
40. a) $n(A \cap B \cap C)$
41. a) 25 (20 + 15 - 10)
42. c) Complement of A
43. a) $A \cup A' = U$
44. a) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
45. c) 300 (1000 - (400 + 500 - 200))
46. b) Universal set
47. b) $B' \subseteq A'$
48. a) Involution law
49. a) 10 (25 - 15)
50. c) $A \Delta B$