MODULE 1

Reasoning and Sets

Select the appropriate term to fit with the given definition:

1) To verify that a statement is false, find one case for which the statement is *not* true, called a:
   a. Counter Example
   b. Conjecture
   c. Inductive Reasoning
   d. Deductive Reasoning

2) _____ is the process of reaching a general conclusion by examining specific examples.
   a. Counter Example
   b. Conjecture
   c. Inductive Reasoning
   d. Deductive Reasoning

3) _____ is the process of reaching a conclusion by applying general assumptions, procedures, or principles.
   a. Counter Example
   b. Conjecture
   c. Inductive Reasoning
   d. Deductive Reasoning

Determine whether the given examples are examples of Inductive Reasoning or Deductive Reasoning:

4) The Atlanta Falcons have won six games in a row. Therefore, the Atlanta Falcons will win their next game.
   a. Inductive Reasoning
   b. Deductive Reasoning

5) All men are mortal. Socrates is a man. It follows that Socrates is mortal.
   a. Inductive Reasoning
   b. Deductive Reasoning

6) Sanjay enjoyed watching the British version of *The Office*, so he will enjoy watching the American version of *The Office*.
   a. Inductive Reasoning
   b. Deductive Reasoning

7) Allison enjoyed reading *Alias Grace* by Margaret Atwood, so she will enjoy reading Atwood's next novel.
   a. Inductive Reasoning
   b. Deductive Reasoning

8) All octagons have exactly eight sides. A stop sign is an octagon, therefore it has exactly eight sides.
   a. Inductive Reasoning
   b. Deductive Reasoning

Use Inductive Reasoning to predict the most probable next number in the list:

9) 7, 10, 16, 25, 37, 52, ___
   a. 72
   b. 91
   c. 70
   d. 93

10) $\frac{1}{5}, \frac{5}{9}, \frac{9}{13}, \frac{13}{17}$, ___

   a. $\frac{17}{23}$

   b. $\frac{17}{21}$

   c. $\frac{18}{22}$

   d. $\frac{18}{21}$

11) 64, 32, 16, 8, ___
    a. 6
    b. 2
    c. 4
    d. 0

Complete the definition with the appropriate term(s):

12) Any group or collection of objects is called a:
    a. Set
    b. Null Set
    c. Element
    d. Roster

13) A set A is _____ to set B, denoted _____, if and only if A and B have the same number of elements.
    a. Equal; $A = B$
    b. Equal; $A \sim B$
    c. Equivalent; $A = B$
    d. Equivalent; $A \sim B$

14) The _____ of sets *A* and *B*, denoted _____, is the set that contains all the elements that belong
to both *A* or *B*, or to both.
    a. Intersection; $A \cup B$
    b. Intersection; $A \cap B$
    c. Union; $A \cup B$
    d. Union: $A \cap B$

15) Two sets are _____ if their intersection is the empty set.
    a. Disjoint
    b. Blank
    c. Null
    d. Unsettled

Determine whether the given statement is True or False:

16) $7 \in \{2, 3, 4, 7\}$
    a. True
    b. False

17) $-2 \in N$
    a. True
    b. False

18) The collection of all beautiful flowers in the garden is a well-defined set.
    a. True
    b. False

19) { } represents the Null set.
    a. True
    b. False

20) $U' = \emptyset$
    a. True
    b. False

21) $\emptyset' = 0$
    a. True
    b. False

22) The Whole numbers are a subset of the Natural Numbers.
    a. True
    b. False

23) The Empty set is a subset of any set.
  a. True
  b. False

24) $A \subseteq A$
  a. True
  b. False

Answer the following Set Theory Questions:

25) Which set operation is being used here: "The set of all CSU students who are math majors and computer science majors."
  a. Complement
  b. Intersection
  c. Disjoint sets
  d. Union

26) Which of the following is true regarding the statement "All squares are rectangles":
  a. Some squares are not rectangles
  b. This statement is false
  c. The set of squares is a subset of the set of rectangles
  d. The sets of squares and rectangles are disjoint

27) Which number set includes the number 0?
  a. Whole Numbers (W)
  b. Natural Numbers (N)

28) Which of the following is an element of the set of Integers (Z)
  a. 1001
  b. ¼
  c. π
  d. $\sqrt{2}$

29) Which of the following is an example of De Morgan's Law?
  a. $(A \cap B) \cap C = A \cap (B \cap C)$
  b. $A \cup B = B \cup A$
  c. $(A \cup B)' = A' \cup B'$
  d. $(A \cap B)' = A' \cup B'$

30) Use the roster method to rewrite the set $\{x|x \in Z \text{ and } -2 < x \leq 1\}$
  a. {-2, -1, 0}
  b. {-1, 0}
  c. {-1, 0, 1}
  d. {-2, -1, 0, 1}

31) Let A = {1, 2, 2, 3, 5, 8}. Find n(A).
   a. 6
   b. 2
   c. 5
   d. 8

32) Find the cardinality of the set B = {4, 5, 6, 7, ... , 100}
   a. n(B) = 96
   b. n(B) = 97
   c. n(B) = 16
   d. n(B) = 5

33) What symbol is used to denote the Universal Set, the set of all elements under consideration?
   a. $
   b. N
   c. U
   d. Ø

34) Let U = {1, 2, 3, 4, 5, 6} and A = {1, 3, 5}. Find A'.
   a. {1, 2, 3, 4, 5, 6}
   b. {1, 3, 5}
   c. {2, 4, 6}
   d. { }

35) Let U = {0, 1, 2, 3, 4, 5, 6} and A = { }. Find A'.
   a. {1, 2, 3, 4, 5, 6}
   b. {0}
   c. {0, 1, 2, 3, 4, 5, 6}
   d. {0, 1}

36) Let U = {1, 2, 3, 4, 5, 6, 7, 8} and A = {x |x < 5 and x ∈ N}. Find A'.
   a. {1, 2, 3, 4}
   b. {1, 2, 3, 4, 5}
   c. {6, 7, 8}
   d. {5, 6, 7, 8}

37) Let A = {0, 2, 4, 6} and B = {1, 2, 4, 6}. Show that A ⊄ B.
   a. A ~ B so A ⊄ B
   b. 0 ∈ A but 0 ∉ B
   c. 2 ∈ A and 2 ∈ B
   d. 1 ∈ B but 1 ∉ A

38) Which of the following is *not a proper subset* of {1, 2, 3, 4}?
   a. {4, 3, 2, 1}
   b. { }
   c. {1, 2, 3}
   d. {1}

39) Which of the following statements about the sets A = {a, e, i, o, u} and B = {e, o, a, i, u} is *NOT* true?
   a. $A = B$
   b. $A \sim B$
   c. $A \subseteq B$
   d. $A \subset B$

40) Use the roster method to write the set of positive integers less than or equal to 4.
   a. {0, 1, 2, 3, 4}
   b. {1, 2, 3}
   c. {1, 2, 3, 4}
   d. {0, 1, 2, 3}

41) Use the roster method to write the set of natural numbers x that satisfy $x + 7 = 4$.
   a. { }
   b. {-2}
   c. {2}
   d. None of the above

42) Use set-builder notation to write the set {0, 1, 2, 3, 4, 5, 6, 7, 8}
   a. $\{x \mid x < 8 \text{ and } x \in W\}$
   b. $\{x \mid x \leq 8 \text{ and } x \in N\}$
   c. $\{x \mid x < 8 \text{ and } x \in N\}$
   d. $\{x \mid x \leq 8 \text{ and } x \in W\}$

43) What must be true of the finite sets A and B if $n(A \cup B) = n(A) + n(B)$?
   a. $A \cap B = \emptyset$
   b. $A \sim B$
   c. $A = B$
   d. $n(A) = n(B)$

Let U = {1, 2, 3, 4, 5, 6, 7}, A = {2, 4, 6}, B = {1, 2, 3, 5, 7}, and C = {1, 3, 6, 7}. Answer the following:

44) Find $(A \cup B)'$.
   a. { }
   b. {2}
   c. {1, 2, 3, 4, 5, 6, 7}
   d. {2, 4, 6}

45) Find $(A \cap B)'$.

    a. {2}

    b. {1, 3, 5, 7}

    c. { }

    d. {1, 3, 4, 5, 6, 7}

46) Find $A \cap (B \cap C)$.

    a. {1}

    b. {2}

    c. { }

    d. {3}

47) Find $A \cap \emptyset$.

    a. { }

    b. {1, 2, 3, 4, 5, 6, 7}

    c. {2, 4, 6}

    d. {1, 3, 5, 7}

48) Find $C \cup \emptyset$.

    a. { }

    b. {1, 2, 3, 4, 5, 6, 7}

    c. {2, 4, 5}

    d. {1, 3, 6, 7}

Answer the following application questions:

49) How many subsets does the set T = {salsa, sour cream, queso, guacamole, pico de gallo} have?

    a. 0

    b. 25

    c. 5

    d. 32

50) At one university, it is observed that 76% of its students are pursuing undergrade degrees and 33% of its students are working a full-time job. They know that 18% of their undergraduate students also work a full-time job. Use the Inclusion-Exclusion principle to determine how many of their students are undergraduate students *or* are working a full-time job.

    a. None of them

    b. 76%

    c. 91%

    d. 33%

51) Given $n(A)$ = 288, $n(B)$ = 183, and $n(A \cup B)$ = 434, find $n(A \cap B)$.
   a. 37
   b. 329
   c. 539
   d. None

A Parks and Recreation department in a small city conducts a survey to determine what recreational activities for children it should offer. Of the 1200 respondents,

- 400 parents wanted soccer offered
- 625 parents wanted baseball/softball offered
- 370 parents wanted tennis offered
- 150 parents wanted soccer and tennis offered
- 315 parents wanted soccer and baseball/softball offered
- 230 parents wanted baseball/softball and tennis offered
- 75 parents wanted all three sports offered

Use the given information to answer the following questions:

52) How many parents wanted only *one* sport offered?
   a. 10
   b. 155
   c. 65
   d. 230

53) How many parents didn't want any of these sports offered?
   a. 155
   b. 425
   c. 75
   d. None

54) How many parents *only* wanted soccer and tennis offered (but *not* baseball/softball)?
   a. 75
   b. 155
   c. 240
   d. 65