Name:_____Date:_____

1) Determine whether the type of reasoning used is inductive or deductive reasoning.
   a) I am going to be rich some day. I know this because everyone in my family who graduated from college is rich, and I just graduated from college.
   b) I know I will have to work a double shift today because I have a migraine and every time I have a migraine I get stuck pulling a double.
   c) Since Josie ate a diet of mostly foods in saturated fat, she was not surprised when her doctor said her cholesterol levels were too high.
   d) When the printer runs out of paper, a little light on the LCD display flashes. So when the light was flashing, Frank knew he needed to put more paper into the printer.

2) Write the given sets in roster method.
   a) {x| x is a month starting with the letter M}
   b) {y| y is a counting number divisible by 4 between 10 and 25}

3) Let

$$U = \{p, q, r, s, t, u, v, w, x, y, z\}$$
$$A = \{p, r, t, v, z\}$$
$$B = \{q, s, u, w, y\}$$
$$C = \{p, s, v, y\}$$
$$D = \{z\}$$

Determine the following.
   a) $A \cup D$
   b) $A' \cap C$
   c) $(B \cap C)' \cap D$
   d) $A' - (B \cup D)$
   e) $(D - C) \cap B'$
   f) $n[(D - C) \cap B']$
   g) $(A - D)' - C$
   h) U'
   i) $C \times C$

4) Determine if the following is true or false. If it is false, explain why. For parts h – l, refer to problem number 3.
   a) $\{x|x \text{ is a good driver}\}$ is a well-defined set.
   b) $\{d, o, g\} = \{g, o, d, g\}$
   c) The sets $\{y|y \text{ is an even number between } 5 \text{ and } 12\}$ and $\{6,8,10\}$ are equivalent.
   d) $\{(4, c), (7, y)\} = \{(c, 4), (y, 7)\}$
   e) $5 \notin \{1,3,5,7\}$
   f) $\{8\} \in A$
   g) $0 \in \emptyset$
   h) $B \subseteq U$
   i) $A \subset B$
   j) $\emptyset \subseteq C$
   k) $B \subset B$

l) All subsets of D are $\{z\}$.

5) Draw a Venn diagram and shade the sections representing each set.
   a) $A' \cap (B \cup C)$
   b) $A' \cap B'$
   c) $A \cap B \cap C'$
   d) $A \cup (B \cap C)'$
   e) $A - (B \cup C)$

6) Convert the following to decimal (Base 10).
   a) 1452_{eight}
   b) $7427_{sixteen}$

7) Convert the following from decimal to the given base.
   a) 94 to base 2
   b) 7247 to base sixteen

8) Perform the indicated operations.
   a) $1235_{eight} + 674_{eight}$
   b) $E5B89_{sixteen} - 3FA8_{sixteen}$

9) Way back in 1965, The Beatles, The Kinks, and The Rolling Stones toured the USA. 100 teenagers were surveyed and the following information was obtained:

   33 saw The Kinks
   57 saw The Beatles,
   57 saw The Rolling Stones,
   25 saw The Kinks and The Beatles
   15 saw The Kinks and The Rolling Stones
   22 saw The Beatles and The Rolling Stones
   10 saw all three of them

   a) How many teenagers saw exactly two of these bands?
   b) How many teenagers saw only Rolling Stones?
   c) How many teenagers saw none of these bands?
   d) How many teenagers saw only one of these bands?

10) A researcher was hired to examine the drinking habits of energy drink consumers. He surveyed a total of 40 consumers and the result of this survey is given below:

   23 said they drink Red Bull.
   18 said they drink Monster.
   19 said they drink G2.
   12 said they drink Red Bull and Monster.
   6 said they drink Monster and G2.
   7 said they drink G2 and Red Bull.
   2 said they drink all three of the drinks.

      a) How many consumers drink exactly two of these drinks?
      b) How many consumers drink Red Bull and Monster but nor G2?
      c) How many consumers drink exactly one of these drinks?
      d) How many consumers do not drink Red Bull?
      e) How many consumers do not drink none of these drinks?

11) Use inductive reasoning to determine the most probable next two terms in the sequence.
      a) 2,2,4,6,10,16, … , …
      b) 5,7,10,14,19, … , …

12) Find a counterexample to show that the given statement is incorrect: "The sum of 3 two-digit numbers is a three-digit number."

13) Determine if the following are statements.
      a) Today is Monday.
      b) Do what I tell you!
      c) How do you add two numbers?

14) Write the negation of the following statements.
      a) If I go to the library, then I will study.
      b) You either study or you don't pass your class.
      c) I need to save money and buy a nice car.

15) Let d represent the statement: "I drive my car."
      Let s represent the statement: "It snows."
      Let c represent the statement: "Classes are cancelled."
   Write each statement in symbolic form.
      a) It snows and classes are not cancelled.
      b) If it snows, then classes are canceled and I drive my car.
      c) If classes are canceled, then I drive my car or classes are canceled.
      d) Classes are canceled if and only if it snows.

16) If $p: 2 + 3 = 4$, and $q: 1 < 4$, find the truth value of $\sim (p \lor q) \to (p \land \sim q)$.

17) Let p represent the statement: "Ron lives in New Jersey."
      Let q represent the statement: "Ron is happy."
   Write each statement in words.
      a) $p \lor q$
      b) $q \to \sim p$
      c) $p \land \sim q$
      d) $\sim p \leftrightarrow q$

18) Determine if the following statement is a tautology, self-contradiction or neither.
$$(\sim p \lor q) \to (\sim q \leftrightarrow p)$$

19) Write the converse, inverse, and the contrapositive of "If I buy a car, then I will travel."

20) Determine if the statements $\sim (p \rightarrow q)$ and $\sim p \vee q$ are equivalent.

21) Determine if the following argument is valid or invalid.

    It is snowing and I am going skiing.

    <u>If I am going skiing, then I will wear a coat.</u>

    If it is snowing, then I will wear a coat.

22) What is the ones digit for the number 3^{1325} ?

23) Determine the next probably number in each list of numbers.

   a) 12, 18, 24, 30, 36

   b) 1, 4, 9, 16, 25, 36, 49, 64

   c) $-\dfrac{2}{3}, \ \dfrac{4}{9}, \ -\dfrac{8}{27}, \ \dfrac{16}{81}$

24) How many different ways can you have 1st, 2nd, 3rd and 4th in a race of 10 runners?

25) In how many ways can you order the letters of the word "SUCCESS"?

26) How many different ID cards can be made with 5 characters, using the letters of the alphabet if the letters can be repeated?

27) A spinner has 4 equally likely regions numbered 1, 2, 3, and 4. The arrow is spun three times. What is the probability that the spinner will land on region numbered 1 on the first spin, on an even number on the second spin, and on an odd number on the third spin? Draw a tree diagram to represent your solution.

28) In the lost and found box at the campus security office, there are nine BlackBerry SmartPhones and seven Apple iPhones. If a phone is selected randomly, find the probability that it is
   a) A BlackBerry SmartPhone.
   b) An Apple iPhone.

29) A number from 1 to 5 is chosen at random. What is the probability that the number chosen is not odd?

30) A fair die is rolled.

   a) What are the odds in favor of getting number greater than 4?

   b) What are the odds against getting a number less than 4?

31) In class of 40 students, the distribution on the majors of the students is given in the table below.

	Science	Mathematics	Humanities
Male	12	8	5
Female	4	2	9

   If one student is randomly selected, find the probability of getting someone who is
   a) A male.
   b) A Science major.
   c) A male or a Mathematics major?
   d) A Humanities major or a female?
   e) A male, given that they are Science majors.
   f) A Mathematics major, given that they are female.

   If 2 different students are selected, find the probability that
   g) They are both males.
   h) They are both Humanities major.
   i) They are both Mathematics majors and females.

32) A city council consists of 15 members. 6 are Republicans, 5 are Democrats and 4 are Independent. If a committee of 3 is to be selected, find the probability of selecting
   a) All Democrats.
   b) All Independents.
   c) Two Republicans and one Democrat.
   d) One of each party.
   e) None of the Independents.

33) At an intersection, the light for eastbound traffic is red for 15 seconds, yellow for 5 seconds, and green for 30 seconds. Find the probability that out of the next eight eastbound cars that arrive randomly at the light, exactly three will be stopped by the red light.

34) A box contains 2 black marbles, 5 blue marbles and 4 red marbles. Two marbles are picked randomly one after the other without replacement. What is the probability of selecting
   a) Two black marbles.
   b) Blue marble on the first and a red marble on the second.

35) You have entered your name into a drawing to win one of 25 prizes. There are twelve coupons for a free movie, six $15 gift card, six $25 gift card, and one $100 gift card.
   a) What are the odds of you winning the $100 gift card?
   b) What are the odds of you winning the $15 gift card or the $25 gift card?
   c) What are the odds against you winning a free movie?