

**MA 110**  
**Exam 1**

1. Construct a Venn diagram to determine the validity of the given argument. (To receive full credit, you must construct the Venn diagram AND tell whether the argument is valid or invalid.)
  1. All mechanics are engineers.
  2. Bob is an mechanic.Therefore, Bob is an engineer.
  
2. Write a sentence that represents the negation of each statement.
  - a) All doctors are ethical.
  
  - b) It is snowing and classes are cancelled.
  
3. Using the symbolic representations
  - p: The television program is educational.
  - q: The television program is controversial.
  - r: The television program has high ratings.express the following compound statements in symbolic form
  - a) The television program is controversial and it is educational.
  
  - b) If the television program is educational, it doesn't have high ratings.
  
  - c) All controversial television programs have high ratings.
  
4.  $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$   
 $A = \{1, 4, 5, 7\}$   
 $B = \{3, 4, 6, 7\}$   
Find the following:
  - a)
  
  - b)
  
  - c)
  
5. In a recent survey, 500 people were asked to check the appropriate box or boxes on the following form:  
I have a dog  
I have a cat  
The results were tabulated as follows: 287 checked the dog box, 156 checked the cat box, and 75 checked both boxes.
  - a) Construct a Venn diagram illustrating the results of the survey.

- b) What percentage of the people surveyed have only a cat?
6. Construct a truth table to determine whether the following statements are equivalent. (You must show the truth table to receive full credit.)  
The car is unreliable or expensive.  
If the car is reliable, then it is expensive.
7. Find  ${}_{16}C_4$
8. Each employee at a large company has an ID number composed of 2 letters followed by 4 digits. How many ID numbers can be made under the following conditions?
- a) letters and digits can be repeated
  - b) letters can be repeated, but digits cannot
  - c) the letters are non-repeated consonants and the digits can be repeated
9. A road race has 20 participants. How many different rankings of 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place are possible?
10. How many five-card poker hands containing exactly 3 Aces are possible?