MATH 110 – 26 SEPTEMBER 2006 – EXAM 1

Answer each of the following questions. Show all work, as partial credit may be given.

1. (10 pts. each) An automobile insurance company classifies applicants by their driving records for the previous three years. Let $S = \{$applicants who have received speeding tickets$\}$, $A = \{$applicants who have caused an accident$\}$, and $D = \{$applicants who have been arrested for drunk driving$\}$.

   (a) Describe the set $X = \{$applicants who have not been arrested for drunk driving but who have received speeding tickets$\}$ in set theoretic notation.

   (b) Describe in words the set $S' \cap (A \cup D)$.

2. (a) (6 pts.) Find $n(S \cap T)$ given that $n(S) = 18$, $n(T) = 10$ and $n(S \cup T) = 25$.

   (b) (6 pts.) Draw a two-circle Venn diagram and shade the region corresponding to the set $S \cap T'$.

   (c) (8 pts.) Draw a three-circle Venn diagram and shade the region corresponding to the set $R \cap (S \cup T)$.

3. A survey at a small New England college showed that out of a total student population of 800, 400 students skied, 300 played ice hockey and 150 did both.

   (a) (8 pts.) Draw a two-circle Venn diagram illustrating this situation and determine the number of elements in each basic region.

   (b) (6 pts.) How many students participated in at least one of these sports?

   (c) (6 pts.) How many students participated in exactly one sport?

4. (8 pts.) A multiple choice quiz consists of 5 questions with 3 choices for each question. In how many ways can the quiz be completed if the student is not required to answer all of the questions?

5. (8 pts. each) A certain club has 50 members.

   (a) In how many ways can a 3-member board of directors be chosen?

   (b) Suppose in addition that the board consists of three officers: a president, a secretary and a treasurer. In how many ways can these three offices be filled?

6. (8 pts. each)

   (a) How many different 12 letter words (that is, sequences of letters) can be formed using 7 A's and 5 B's?

   (b) How many different 12 letter words can be formed using 4 A's, 3 B's and 5 C's?