MATH 302 **Sample midterm**

1. (a) Define carefully: A probability P on a given sample space S.
   (b) events A, B, C are independent.
   (c) Define carefully: The conditional probability of an event A given an event B of positive probability.
   (d) State the law of total probability.

2. (a) Find the probability that a five card poker hand contains exactly 3 Aces.
   (b) Find the probability that a five card poker hand contains at least 3 Aces.
   (c) A and B are events such that $P(A) = .6$, $P(B) = .3$ and $P(A \cup B) = .8$. Find $P(A \cap B^c)$.

3. There are 12 buses in the 100 Mile House bus fleet each with a capacity of 30 people. Currently 6 of the buses are running full, 3 of them have 15 passengers and 3 of them have 5 passengers.
   (a) If a bus is chosen at random what is the probability that the bus is full?
   (b) If a bus rider is chosen at random what is the probability they are on a full bus?
   (c) If a bus rider is chosen at random and Y is the number of people on the rider's bus, find $E(Y)$. (You may leave your answer as a sum of explicit fractions.)

4. A fair die is tossed. If the outcome is n then n fair dice are tossed and Y is the sum of these n dice.
   (a) Find $P(Y = 3)$.
   (b) If we are given that $Y = 3$ find the probability that Y is the sum of 2 dice.

5. New drugs against agoraphobia are tested on 300 people. 100 get drug A, which is effective 50% of the time. 100 get B which is effective 20% of the time, and 100 getthe placebo, which is effective 30% of the time. Individuals are not told which group they are in.

   (a) If a person in the study gets better, what is the probability that he was getting drug A?

   (b) If a person in the study does not get better, what is the probability that he was getting the plcebo?

6. Two players toss one 6-sided die each. The winner is the player with the larger result, with a tie in case of equal tosses.

   (a) What is the probability of player 1 winning if they toss a 4?

   (b) What is the probability that player 1 threw a 4 if they won?