Math 365 Exam 1 Review Problems

• Exam 1 is an in-class exam given on Friday February 4, 2011.
• Exam 1 covers Chapter 1 and Chapter 2 Sections $1-3$.
• During the exam you may use one $3x5$ notecard with notes on both sides and your calculator; cell phones must be turned off.
• Disclaimer: The following is just a sampling of problems and is not meant to be representative of all types of problems that may show up on your test. Look over old homework, class handouts and do other problems from the end of each section.
• Answers to the questions below will be posted on our class website within a few days.

1. Suppose you have the following information: A, B, C are subsets of S and

   - $P(A) = .3$
   - $P(B') = .375$
   - $P(A \cap B) = .1875$
   - $P(B \cap C) = .1$
   - $P(C) = .2$

   Find the following probabilities:

   (a) $P(A \cup B)$
   (b) $P(C \mid B)$
   (c) $P(C' \mid B)$
   (d) Are C and B independent? Explain.
   (e) Are A and B independent? Explain.
   (f) Are A and B mutually exclusive? Explain.

2. A display case contains 35 gems, of which 10 are real diamonds and 25 are fake diamonds. Four burglars come in one at a time and randomly steal one gem each (without replacement, of course).

   (a) What is the probability that the second burglar steals a real diamond?
   (b) What is the probability that at least one real diamond is stolen?
   (c) What is the probability that the fourth burglar steals a fake diamond given that the first three burglars each took one real diamond?

3. A random $5-$card poker hand is dealt from a standard 52 card deck. What is the probability that the hand contains exactly 1 club and a three of a kind? (Hint: the club can be part of the three of a kind, but we DON'T want a 4 of a kind or a full house (which is a 3 of a kind and a pair).

4. Don't do this one.

5. In the Early Learners Pre-School, 67% of the children have been vaccinated for chicken pox. Suppose that the probability that a vaccinated child gets the chicken pox if 0.05 and the probability that an unvaccinated child gets the chickex pox is 0.55. Suppose that one of the children in the Pre-School has the chicken pox. What is the probability that this child was vaccinated?

6. Suppose that A and B are independent events. Then prove that A' and B are also independent.

7. Using only the properties of probability (p. 16 in your book), Prove that if $A \subset B$, then $P(A) \leq P(B)$.

8. Burger City is having a promotion where it passes out scratch tickets. Each ticket has a 10% chance of a win. Suppose you get 4 tickets and X is the number of winning tickets.

   (a) What is $E[X]$?

   (b) What is the probability that you will get at least one winning ticket?

   (c) What is $P(X \leq 3)$?

9. In a pile of 100 scratch tickets from Burger Planet, 10 of them are winners. Select a handful of 25 of these tickets at random and let X be the number of winning tickets.

   (a) What is the distribution of X?

   (b) What is $E[X]$?

   (c) What is $P(X = 3)$?

   (d) What is $P(X = 11)$?

10. An urn contains red and blue balls. There are 50 balls total. If five balls are selected at random, how many of the 50 balls should be blue so that the expected number of blue balls in this experiment is 3.5?

11. Suppose X has p.m.f. $f(x) = c(x+1)^3$ for $x = 0, 1, 2, 3$

    (a) Whas is the value of c that makes this a valid p.m.f. for X?

    (b) Find μ and σ^2.

12. An ice cream store has 6 types of ice cream and 4 types of toppings.

    (a) How many ways can you make a 2-scoop sundae with 2 toppings if you are allowed to repeat flavors of ice cream and toppings?

    (b) How many ways can you make a 2-scoop sundae with 2 toppings if you are NOT allowed to repeat flavors of ice cream and toppings?

13. A small state has a license plate with 2 letters and 3 numbers on each plate. How many different plates can be made if the two letters must be next to each other?

14. How many distinct arrangements are there for the letters in the word MISSISSIPPI?

15. What is the probability of dealing a 7−card hand from a standard 52−card deck so that it has exactly 2 pairs and one ace (no three of a kind, 4 of a kind, etc)?