No notes, no books, no calculators, no cell phones, no pagers, no electronic devices of any kind.

Name_____

Circle your TAs name:

Song Sun (Boyd) Chalermpong Worawannotai

Hand in your exam to your TA.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total	100	

Solutions will be posted shortly after the exam:
www.math.wisc.edu/∼miller/m210

1. (10 pts) Suppose

$$A \times B = \{(a, b), (a, x), (b, b), (b, x)\}$$

and

$$C = \{0, 1\}.$$

What are the following sets:

$A =$

$B =$

$A \times C =$

2. (10 pts) Let the universal set be $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and let $A = \{2, 6\}$ and $B = \{1, 2, 4\}$. What are the following sets:

$A' \cap B =$

$A \cup B =$

$A \cap B' =$

3. (10 pts) Construct the truth table for

$$(p \wedge q) \vee ((\sim p) \ \wedge \ (\sim q))$$

4. (10 pts) Sets A, B, and C are subsets of the universal set U. Suppose $n(U) = 80$, $n(A) = 15$, $n(A \cap B) = 5$, $n(C) = 30$, and $n(A \cup B') = 55$, and $(A \cup B) \cap C = \emptyset$.

Find the following numbers:

$n(C') =$

$n(A \cap C) =$

$n(A' \cap B) =$

5. (10 pts) A product code consists of a string of 3 different letters from the set $\{A, B, C, D, E, F\}$. For example, ADE or DEB.

How many different product codes are there which contain the letter E but do not contain the letter F?

6. (10 pts) A club has 3 girls and 5 boys. A group of 3 is to be selected. Assume that each group of 3 is equally likely to be selected. What is the probability that the selected group contains at least one boy and at least one girl?

7. (10 pts) Suppose A, B, C are events in a probability space S. Suppose that $A \cap B$, $B \cap C$, $A \cap C$ is a partition of S. If $Pr[A] = .5$ and $Pr[B] = .6$, then what is $Pr[C]$?

8. (10 pts) Let A and B be events such that $Pr[A] = .3$ and $Pr[B] = .6$.

   What is $Pr[A \cup B]$ if A and B are disjoint?

   What is $Pr[A \cup B]$ if A and B are independent?

9. (10 pts) Tamara has two cell phones, brand A and brand B. She uses brand A 20 percent of the time and brand B 80 percent of time. She notices that she losses the signal with brand A 20 percent of the time and with brand B 10 percent of the time. On a random use of one of her cell phones she losses the signal. What is the probability she was using brand A?

10. (10 pts) A multiple-choice exam consists of 5 questions. Each question has 4 possible answers, only one being correct. A student randomly guesses each answer. Assume this situation is modeled by Bernoulli trials.

What is the probability that the student gets exactly 3 correct answers?

Answers

1. $A = \{a, b\}$, $B = \{b, x\}$, $A \times C = \{(a, 0), (a, 1), (b, 0), (b, 1)\}$
2. $\{1, 4\}$, $\{1, 2, 4, 6\}$, $\{6\}$
3. The TT and FF lines are true.
4. 50, 0, 25
5. 36
6. 45/56
7. .9
8. .9, .72
9. 1/3
10. 45/512