Test 3 (Version 1)

Math 130

Fall 2014

Friday November 14th, 2014

Name (printed): _____

Signature: _____

Section number: _____

Directions:
The test is one hour long. No phone, calculator, electronics, notes, talking to friends, etc. You may use only a pen or pencil. Absolutely no cheating!

No scrap paper! If you need some you may use the back side of this exam or ask someone who is proctoring the exam.

Read carefully. Show your work. Check your work.

Note: You may leave your answers in terms of products and sums of factorials, ${}_nP_k$, ${}_nC_k$ etc. For example, answers of the form 6^5 or ${}_6C_3 \times {}_3C_1$ are acceptable.

Do not turn the page until the professor and/or TA's say so.

Do not write below this line.

	Points		Points
1		5	
2		Total	
3			
4			

(The exam is out of 100 points.)

(25 points)

Problem 1

Someone decides to create a new deck of cards, called a wacky-deck. This deck has all 13 ranks and all 4 suits of a normal deck, plus 2 new ranks, circles and stars, for a total of 15 ranks. (Thus we have 15 x 4 = 60 cards). For all parts, you draw a 5-card hand (a hand is an unordered selection of cards).

(5 points)

(a) How many hands are possible?

(5 points)

(b) How many three-of-a-kind hands are possible? (A three-of-a-kind hand has 3 cards of the same rank, and the other 2 cards are each of a different rank)?

(5 points)

(c) How many flush hands are possible? (A flush is a hand with all 5 cards in the same suit. In this question, straight-flushes are included as flushes.)

(10 points)

(d) What is the probability of drawing either a three-of-a-kind or a flush hand from the wacky-deck?

(20 points)

Problem 2

Godzilla is trying to decide on a password for his new blackberry phone. He decides he will use a random 8-character password. The characters he can use are the lower case letters a-z, the upper case letters A-Z, and the digits 0-9 (note there are 26 letters in the alphabet).

(2 points)

(a) How many passwords can he make using any combination of lower case letters, upper case letters, and digits?

(3 points)

(b) How many passwords begin with 1 lowercase letter and end with two digits?

(5 points)

(c) How many passwords contain no digits?

(5 points)

(d) How many passwords contain more than 1 digit?

(5 points)

(e) How many passwords contain the word "moths" (examples include moths4T3 and fT-moths5).

(25 points: 5 each)

Problem 3

(I) Consider the random experiment of rolling a fair die (numbered 1 through 8) and drawing a card from a standard 52 card deck.

(Ia) Consider the event A: the number on the die is a 2 and the card drawn is red. What is the probability of A?

(Ib) Consider the event B: the number on the die is odd and the card drawn is a 7. What is the probability of B?

(II) Now consider the random experiment of rolling a die and drawing a card, but now we use a weighted die. Rolling a 1, 2, 3, 4, or 5 each have a probability of .05, and rolling a six has a probability of .75. We still use the standard poker deck.

(IIa) Consider the event C: the number on the die is odd, and the card is not a J, Q, or K. What is the probability of C?

(IIb) Consider the event D: the number on the die is a 2 or a 6, and the card is a J. What is the probability of D?

(IIc) What is the probability of C and D occurring at the same time?

(20 points)
Problem 4
Mark Zuckerberg likes to go out in public disguised as random math professors. His disguises aren't very good, so he gets recognized 66 % of the time (consider him being recognized as a failure). One month, he decides to go out every day (30 days).
(5 points)
(a) What is the probability that he does not get recognized at all?

(5 points)
(b) What is the probability that he gets recognized exactly 29 times?

(5 points)
(c) What is the probability that he gets recognized more than 28 times?

(5 points)
(d) What is the probability that he gets recognized 2 or fewer times?

(10 points: 2 each)
Problem 5

True or **False** In a combination, the order does not matter.

True or **False** Suppose you have a random experiment consisting of flipping a coin 500 times. When you add up the probabilities of everything in the sample space, it will add up to less than one.

True or **False** ${}_nC_n = 1$ for every $n > 0$.

True or **False** It is raining and it is cold is an example of disjoint events.

True or **False** You may apply the sum principle when a task can be broken down into a sequence of independent steps.