

Midterm 1

Math/Stats 425, Winter 2013
Instructor: Edward Ionides

Name: _____ UMID #: _____

- There are 6 questions, each worth 10 points.
- Points will be awarded for a clearly explained and accurate method, as well as for finding the correct answer.
- You are allowed to bring along to the test a single-sided sheet of notes.
- You are not allowed to use a calculator, or any other electronic device, during the exam. Electronic devices brought into the room should remain in a closed bag on the floor, and penalties will be applied if this rule is violated. For example, no cell phone usage for the duration of the exam, please!

Problem	Points	Your Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
Total	60	

1. While a driver is using a cell phone, he is three times more likely to get into an accident than if he were not using the phone. If he spends $\frac{1}{8}$ of his time in the car using the phone, what is the chance he is using the phone when he has an accident?

2. A person has 8 friends, of whom 5 will be invited to a party. How many choices are there if 2 of the friends are feuding and must not both be invited?

3. (a) What does it mean to say that E , F and G are independent events in a sample space \mathbb{S} ?

(b) Let E , F and G be three independent events in a sample space \mathbb{S} . Prove that E is independent of $F^c \cup G^c$.

4. Anne and Bob decide to have children until they have both a boy and a girl. Supposing each is equally likely, and births are independent, find the chance that they end up with exactly 4 children.

5. In a poker game, a 5 card hand is dealt from a shuffled deck of 52 cards. Any red cards (hearts or diamonds) are then discarded. An equal number of new cards are then dealt from the 47 remaining in the deck, replenishing the hand to 5 cards. Find an expression for the chance that the resulting poker hand consists only of black cards (spades or clubs).

You are not asked to evaluate your expression. Your solution may be written in terms of a summation, such as $\sum_i p_i$ with some suitable expression for p_i and specified range of summation for the index i .

6. Independent trials that result in a success with probability p are successively performed until a total of r successes is obtained. Show that the probability that exactly n trials are required is

$$\binom{n-1}{r-1} p^r (1-p)^{n-r}.$$