

Name_____

Practice for STA 320 Midterm 1
Probability
October 1st, 2013

There are five questions on this test. DO use calculators if you need them. “And then a miracle occurs” is not a valid answer. There will be no bathroom break allowed. Please keep all prayers silent.

You have 75 minutes to complete this test. Please ask me questions if a question needs clarification.

Each question is worth the same number of points.

Question 1: Sample space and set theory

A card is drawn at random from a deck of 52 cards. Describe the sample space if consideration of suits

(a) is not,

(b) is taken into account.

(c) Let A be an event {king is drawn} (simply {king}) and let B be an event {club is drawn} (simply {club}). Describe the events

(i) $A \cap B$

(ii) $A \cap B^c$

(iii) $A^c \cup B^c$

(iv) $(A \cap B) \cup (A \cap B^c)$

Question 2: Commentary's

Out of 5 mathematicians and 7 physicists, a committee consisting of 2 mathematicians and 3 physicists is to be formed. In how many ways can this be done if

(a) any mathematicians and physicists can be included

(b) one particular physicist must be included

(c) two particular mathematicians cannot be included

(d) one particular physicist must be included and two particular mathematicians cannot be included.

(e) Prove that $P(\emptyset) = 0$.

Question 3: Conditional probability

(a) The probability that it is Friday and that a student is absent is 0.03. Since there are 5 school days in a week, the probability that it is Friday is 0.2. What is the probability that a student is absent given that today is Friday?

(b) At Kennedy Middle School, the probability that a student takes Technology and Spanish is 0.087. The probability that a student takes Technology is 0.58. What is the probability that a student takes Spanish given that the student is taking Technology?

Questions 4: Bayes Theorem

Suppose that Bob can decide to go to work by one of three modes of transportation, car, bus, or commuter train. Because of high traffic, if he decides to go by car, there is a 50% chance he will be late. If he goes by bus, which has special reserved lanes but is sometimes overcrowded, the probability of being late is only 20%. The commuter train is almost never late, with a probability of only 1%, but is more expensive than the bus.

(a) Suppose that Bob is late one day, and his boss wishes to estimate the probability that he drove to work that day by car. Since he does not know which mode of transportation Bob usually uses, he gives a prior probability of $1/3$ to each of the three possibilities. What is the boss' estimate of the probability that Bob drove to work?

(b) Suppose that a coworker of Bobs knows that he almost always takes the commuter train to work, never takes the bus, but sometimes, 10% of the time, takes the car. What is the coworkers probability that Bob drove to work that day, given that he was late?