

Math 30530 — Introduction to Probability

Quiz 3 – Wednesday September 14, 2011

NAME: _____ *Solutions* _____

1. I select two cards, one after the other (without replacement), from an ordinary deck of 52 cards. Clearly the probability that the first card is a spade is $13/52$ or $1/4$. What is the probability the first card is a spade, given the information that the second card is a heart?

Solution: There are 51×13 ways of choosing two cards in order with the second a heart (there are 13 possibilities for the second card, and for each choice of the second there are 51 choices for the first). There are 13×13 ways of choosing two cards in order with the second a heart and the first a spade. So the required conditional probability is $(13 \times 13)/(51 \times 13) = 13/51$, just a bit above $1/4$.

2. Let E and F be two events in a probability space with $P(E) > 0$, $P(F) > 0$ and $F \subset E$. What is $P(E|F)$? (Express your answer as simply as possible.)

Solution: $P(E|F) = \frac{P(EF)}{P(F)} = \frac{P(F)}{P(F)} = 1$ (the second equality since $F \subset E$).

3. Let A and B be two events in a probability space with $P(A) > 0$ and $P(B) > 0$. Is it possible that $P(A|B) = 0$? Either show that it is not possible, or give an example where it occurs.

Solution: It is possible, if A and B are mutually exclusive, so that $P(A|B) = \frac{P(AB)}{P(B)} = \frac{P(\emptyset)}{P(B)} = 0$.