MATH 10B with Prof. Stankova
DIS 106; TTh 9:30∼11:00
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Quiz 5

Student:
SID:
Tue 2/26/19

True/False - No explanation needed. (2pts)

1. When $A \subseteq B$ and $P(B) > 0$, we have $P(A|B) = P(A)/P(B)$. **True**/False

   sol. Since $A \subseteq B$, we have $A \cap B = A$ and $P(A \cap B) = P(A)$.

2. To find $P(B|A)$, it suffices to know just $P(A|B)$ and how to apply Bayes' Theorem. True/**False**

   sol To apply Bayes' theorem, we also have to know $P(A)$ and $P(B)$, or related quantities.

Problems - Need justification. No justification means **zero**!

1. Suppose that you roll three fair dices. What is the probability that at least one of the dices came up to 3, given that the sum of the dice is 5? (5pts)

   sol. There are 6 cases that sum of three dices is 5: permutations of $(1, 1, 3)$ or permutations of $(1, 2, 2)$. Among these, 3 of them (permutations of $(1, 1, 3)$) has at least one 3, so that the probability is
   $$\frac{3}{6} = \frac{1}{2}.$$

2. Suppose that 10% of the population is taking a certain drug, and 40% of them suffer from migraines as a side effect. Supposing that the rate of migraines in the general population is 20%, what is the probability that a migraine sufferer is taking the drug? (5pts)

   sol. Let D be an event that a person is taking a certain drug, and let M be an event that a person suffer from migraines. Then we want to compute $P(D|M)$. We can represents the given information as
   $$P(D) = 0.1, \quad P(M|D) = 0.4, \quad P(M) = 0.2.$$
   By Bayes' theorem, we have
   $$P(D|M) = \frac{P(M|D)P(D)}{P(M)} = \frac{0.4 \cdot 0.1}{0.2} = 0.2.$$