Homework 2

(Due at 11 AM on Thursday, February 2)

Question 1. We roll two fair 6-sided dice. Each one of the 36 possible outcomes is assumed to be equally likely.

(a) Find the probability that doubles were rolled.

(b) Given that the roll resulted in a sum of 4 or less, find the conditional probability that doubles were rolled.

(c) Find the probability that at least one die is a 6.

(d) Given that the two dice land on different numbers, find the conditional probability that at least one die is a 6.

Question 2. Let the sample space be the 4×4 square, $\Omega = [0,4]^2$, in the real plane. Let the probability of a set in Ω be $1/16$-th of the area of that set (that is, assume the uniform probability law on Ω). Let A be the set of points $(x, y) \in [0,4]^2$ for which $y \leq x$. Let B be the set of points for which $x \leq 3$. Find $P(A \mid B)$.

Question 3. At a certain stage of a criminal investigation, the inspector in charge is 60 percent convinced of the guilt of a certain suspect. Suppose, however, that a *new* piece of evidence which shows that the criminal has a certain characteristic (such as left-handedness, baldness, or brown hair) is uncovered. If 20 percent of the population possesses this characteristic, how certain of the guilt of the suspect should the inspector now be if it turns out that the suspect has the characteristic?

Question 4. A ball is drawn at random from an urn containing one red and one white ball. If the white ball is drawn, it is put back into the urn. If the red ball is drawn, it is returned to the urn together with two more red balls. Then a second draw is made. What is the probability a red ball was drawn on both the first and the second draws.

Question 5.

(a) Suppose that a shuttle's launch depends on three key devices that operate independently of each other and malfunction with probabilities 0.01, 0.02, and 0.02, respectively. If any of the key devices malfunctions, the launch will be postponed. Compute the probability for the shuttle to be launched on time, according to its schedule.

(b) There's a 1% probability for a hard drive to crash. Therefore, it has two backups, each having a 2% probability to crash, and all three components are independent of each other. The stored information is lost only in an unfortunate situation when all three devices crash. What is the probability that the information is saved?

Question 6. Start your `python` interpreter and answer the following questions. Unlike your answers to the other problems in this assignment, the answers to this question need not be explained - simply write down or circle your final answer.

(a) Use `random.choice` and `range` to generate a random integer from 0-9. Enter your code in your `python` interpreter. What's the result?

(b) What will `random.choice(list([1,2,3,4]))` produce?

(A) `list([1,2,3,4])`

(B) `[1,2,3,4]`

(C) A value from 1-4 , selected at random

(D) This code contains an error.

(c) Which of the following lines of code sums random integers from 0-9?

(A) `sum(random.sample(range(10),10))`

(B) `sum(random.choice(range(10),10))`

(C) `random.sample_sum(range(10),10)`

(D) `sum(random.choice(range(10)) for i in range(10))`