Due: Thursday, September 17th
Problem to be turned in: 3,5.

1. Suppose there are only thirteen teams with a non-zero chance of winning the next World Cup. Suppose those teams are Spain (with a 14% chance), the Netherlands (with a 11% chance), Germany (with a 11% chance), Italy (with a 10% chance), Brazil (with a 10% chance), England (with a 9% chance), Argentina (with a 9% chance), Russia (with a 7% chance), France (with an 6% chance), Turkey (with a 4% chance), Paraguay (with a 4% chance), Croatia (with a 4% chance) and Portugal (with a 1% chance).

   (a) What is the probability that the next World Cup will be won by a South American country?

   (b) What is the probability that the next World Cup will be won by a country that is not from South America?

2. A biologist is modeling the size of a frog population in a series of ponds. She is concerned with both the number of egg masses laid by the frogs during breeding season and the annual precipitation into the ponds. She knows that in a given year there is an 86% chance that there will be over 150 egg masses deposited by the frogs (event E) and that there is a 64% chance that the annual precipitation will be over 17 inches (event F).

   (a) In terms of E and F, what is the event "there will be over 150 egg masses and an annual precipitation of over 17 inches"?

   (b) In terms of E and F, what is the event "there will be 150 or fewer egg masses and the annual precipitation will be over 17 inches"?

   (c) Suppose the probability of the event from (a) is 59%. What is the probability of the event from 2b?

3. (a) Suppose we roll a die and so $S = \{1, 2, 3, 4, 5, 6\}$. Each outcome separately $\{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \{6\}$ is an event. Suppose each of these events is equally likely. What must the probability of each event be? What axioms or properties are you using to come to your conclusion?

   (b) With the same assumptions as in (a), how would you determine the probability of an event like $E = \{1, 3, 4, 6\}$? What axioms or properties are you using to come to your conclusion?

   (c) If $S = \{1, 2, 3, ..., n\}$ and each single-outcome event was equally likely, what would be the probability of each of these events?

   (d) Suppose $E \subset S$ is an event. Explain how you could determine $P(E)$.

4. Suppose E and F are events in a sample space S. Suppose that $P(E) = 0.7$ and $P(F) = 0.5$.

   (a) What is the largest possible value of $P(E \cap F)$? Explain.

   (b) What is the smallest possible value of $P(E \cap F)$? Explain.

5. Please answer the following questions:

   (a) Have you been able to install package R on a device and tested it like a calculator ?

   (b) Would you like to learn how to do latex and R together ?

   (c) Would you like to learn some statistics-connected with basic probability in this course ?

   (d) Would you like to learn/work on COVID-19 related probability models ?