

Problem Set 5: Probability  
SOC 512/ CSSS 505  
Due: February 10, 2021

1. Suppose we have three groups.

$A = \{ \text{Warren, Sarah Beth, Shane, Leah, Seth} \}$

$B = \{ \text{Michael, Elizabeth, Seth, Shane, David} \}$

$C = \{ \text{Emily, Megan, Ian, Leah} \}$

$$A \cup B =$$

$$A \cap B =$$

$$B \cap C =$$

What do we call events B and C?

2. Suppose there is an urn with 1 blue, 1 green, 1 red, and 1 purple ball. I draw two out randomly. What is the sample space of this experiment? (i.e. what are the possible outcomes)

Let R be the event that one of yours balls was red.  $P(R) =$

Let  $B$  be the event that one of yours balls was blue.  $P(B) =$

$$P(B^C) =$$

$$P(R \cap B) =$$

$$P(R \cup B) =$$

$$P(R|B) =$$

Are the events  $R$  and  $B$  independent?

3. Let  $A$  be the event that a student passes her qualifying exams for graduate school on the first try and  $B$  be the event that the student attends Math Camp. Suppose  $P(A) = 0.90$  and  $P(A|B) = 0.95$ . Are  $A$  and  $B$  independent? What does this say about the effectiveness of Math Camp?
  
4. A social worker observed that people in a drug addiction treatment program who exercise regularly are less likely to relapse than those who don't. Suppose the probability of relapse during the first year after quitting is 0.50, and the probability of relapse among those who exercise regularly is 0.20, and half of the subjects exercise regularly.

Define the two elementary events.

$$E =$$

$$R =$$

Write down the probability of these events.

$$P(E) =$$

$$P(E^C) =$$

$$P(R) =$$

$$P(R^C) =$$

Write down other probability information you are given.

$$P(\quad) =$$

What is the probability of relapse among those who don't exercise regularly?

5. The probability of infecting another household member with a certain strain of influenza during one day is 0.10. Suppose that in a household of four people, three of them are sick.
  - (a) What is the probability that the fourth person becomes infected during a single day of exposure to the three sick household members?

- (b) What is the probability that the fourth person becomes infected during two days of exposure to the sick household members?