

## Problem Set 5: Probability

### CS&SS Math Camp 2021

1. Suppose we have three groups.

$A = \{ \text{Warren, John, Maria, Leah, Mohamed} \}$

$B = \{ \text{Marcus, Elizabeth, Mohamed, John, David} \}$

$C = \{ \text{Ida, Maria, Ian, Leah} \}$

$$A \cup B =$$

$$A \cap B =$$

$$B \cap C =$$

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. 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?