August 2015

# MATH CAMP

## Problem Set 2

1. Assume $q$, $r$, $s$, and $t$ are mutually exclusive and collectively exhaustive with $\Pr(q) = .23$, $\Pr(r) = .15$, $\Pr(s) = .46$. What is the joint probability of $q \cup t$?

2. Assume $e$ and $w$ are independent events. Which of the following are true?

   (a) $\Pr(e \cap w) = \Pr(e)\Pr(w)$
   (b) $\Pr(e \mid w) = \Pr(e) + \Pr(e)\Pr(w)$
   (c) $\Pr(w \mid e) = \Pr(w)$

3. I am sure that you have heard someone say "There's a finite probability of …" What do you think that person means? Can a probability ever not be finite?

4. Let $\Pr(e) = .03$ and $\Pr(e \cup w) = .5$. Find $\Pr(w)$ assuming both events are independent. Be sure to explain whether or not you need indepedence to show this.

5. Prove that $\Pr\{: A\} = 1 - \Pr\{A\}$.

6. Assume that 4 cards are independently drawn from a (52 card) deck with replacement. What is the probability that the ace of spades is drawn exactly once if all four selected cards were spades?

7. In the city of Not-Yet-Polarized, 30% of the citizens are conservatives, 30% are liberals, and 40% are independents. In a recent election, 50% of conservatives voted, 40% of liberals voted, and 30% of independents voted.

   a) What is the probability that a person voted?
   b) If the person voted, what is the probability that voter wasCconservative.
   c) Liberal?
   d) Independent?

8. G 5, p. 115.

9. Suppose there were a test for cancer with the property that 90% of those with cancer reacted positively whereas 5% of those without cancer reacted positively. Assume that 1% of the patients in a hospital have cancer. What is the probability that a patient selected at random who reacts positively to this test actually has cancer?