

# Final Assignment

## Introduction to Statistics (201-922-DW)

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Fall 2015

### Instructions

- This assignment is due at **noon on Wednesday December 23<sup>rd</sup> 2015**
- This assignment is **OPTIONAL** and worth 10% of the final grade for the course
- If the assignment is submitted it will necessarily count towards the final grade
- Solutions to the assignment should be written completely and **INDIVIDUALLY**, assignments with suspiciously similar solutions will be given a mark of zero

1. The American Community Survey is an ongoing survey that provides data every year to give communities the current information they need to plan investments and services. The 2010 American Community Survey estimates that 14.6% of Americans live below the poverty line, 20.7% speak a language other than English at home, and 4.2% fall into both categories.

- (a) Are living below the poverty line and speaking a language other than English at home disjoint
- (b) Draw a Venn diagram summarizing the variables and their associated probabilities.
- (c) What percent of Americans live below the poverty line and only speak English at home?
- (d) What percent of Americans live below the poverty line or speak a language other than English at home?
- (e) What percent of Americans live above the poverty line and only speak English at home?
- (f) Is the event that someone lives below the poverty line independent of the event that the person speaks a language other than English at home?

2. Suppose 80% of people like peanut butter, 89% like jelly, and 78% like both. Given that a randomly sampled person likes peanut butter, what's the probability that he also likes jelly?

3. Imagine you have an urn containing 5 red, 3 blue, and 2 orange marbles in it.

- (a) What is the probability that the first marble you draw is blue?
- (b) Suppose you drew a blue marble in the first draw. If drawing with replacement, what is the probability of drawing a blue marble in the second draw?
- (c) Suppose you instead drew an orange marble in the first draw. If drawing with replacement, what is the probability of drawing a blue marble in the second draw?
- (d) If drawing with replacement, what is the probability of drawing two blue marbles in a row?

4. A 2010 Survey USA poll asked 500 Los Angeles residents, “What is the best hamburger place in Southern California? Five Guys Burgers? In-N-Out Burger? Fat Burger? Tommy’s Hamburgers? Umami Burger? Or somewhere else?” The distribution of responses by gender is shown below.

	Gender		Total
	Male	Female	
Five Guys Burgers	5	6	11
In-N-Out Burger	162	181	343
Fat Burger	10	12	22
Tommy's Hamburgers	27	27	54
Umami Burger	5	1	6
Other	26	20	46
Not Sure	13	5	18
Total	248	252	500

- Are being female and liking Five Guys Burgers mutually exclusive?
- What is the probability that a randomly chosen male likes In-N-Out the best?
- What is the probability that a randomly chosen female likes In-N-Out the best?
- What is the probability that a man and a woman who are dating both like In-N-Out the best?
- What is the probability that a randomly chosen person likes Umami best or that person is female?

5. Heights of 10 year olds, regardless of gender, closely follow a normal distribution with mean 55 inches and standard deviation 6 inches.

- What is the probability that a randomly chosen 10 year old is shorter than 48 inches?
- What is the probability that a randomly chosen 10 year old is between 60 and 65 inches?
- The height requirement for Batman the Ride at Six Flags Magic Mountain is 54 inches. What percent of 10 year olds cannot go on this ride?

6. The distribution of weights of United States pennies is approximately normal with a mean of 2.5 grams and a standard deviation of 0.03 grams.

- What is the probability that a randomly chosen penny weighs less than 2.4 grams?
- Describe the sampling distribution of the mean weight of 10 randomly chosen pennies.
- What is the probability that the mean weight of 10 pennies is less than 2.4 grams?

7. About 70% of 18-20 year olds consumed alcoholic beverages in 2008. We now consider a random sample of fifty 18-20 year olds.

- (a) How many people would you expect to have consumed alcoholic beverages? And with what standard deviation?
- (b) What is the probability that 45 or more people in this sample have consumed alcoholic beverages?

8. It is believed that nearsightedness affects about 8% of all children. In a random sample of 194 children, 21 are nearsighted.

- (a) Construct hypotheses appropriate for the following question: do these data provide evidence that the 8% value is inaccurate?
- (b) What proportion of children in this sample are nearsighted?
- (c) What is the conclusion of the hypothesis test?

9. The 2010 General Social Survey asked 1,259 US residents: “Do you think the use of marijuana should be made legal, or not?” 48% of the respondents said it should be made legal.

- (a) Construct a 95% confidence interval for the proportion of US residents who think marijuana should be made legal.
- (b) A news piece on this survey’s findings states, “Majority of Americans think marijuana should be legalized.” Based on your confidence interval, is this news piece’s statement justified?

10. A national survey conducted in 2011 among a simple random sample of 1,507 adults shows that 56% of Americans think the Civil War is still relevant to American politics and political life.

- (a) Conduct a hypothesis test to determine if these data provide strong evidence that the majority of the Americans think the Civil War is still relevant.
- (b) Calculate a 90% confidence interval for the proportion of Americans who think the Civil War is still relevant. Interpret the interval in this context, and comment on whether or not the confidence interval agrees with the conclusion of the hypothesis test.