

## Stat 185 - Review problems for midterm exam

Our midterm exam is this coming Friday, July 29. Here are a few problems to get you thinking.

1. A random sample of registered voters from Tampa, FL were asked if they support the DREAM Act, a proposed law which would provide a path to citizenship for people brought illegally to the US as children. The survey also collected information on the political ideology of the respondents. The results of the survey by political ideology are shown below as well as in figure 1.

	<i>Political ideology</i>			Total
	Conservative	Moderate	Liberal	
Support	186	174	114	474
Don't support	151	161	52	364
Not sure	35	28	9	72
Total	372	363	175	910

- (a) What percent of these Tampa, FL voters support the DREAM Act?
  - (b) What percent of these Tampa, FL voters who identify themselves as conservatives are also in support the DREAM Act?
  - (c) Do political ideology and views on immigration appear to be independent? Explain your reasoning.
2. According to <https://goo.gl/DanB3A>, Utah has the lowest percentage of adults who smoke at 9.1%. Turns out this is based on a CDC survey named BRFSS. Let's suppose that there are 120 individuals in that survey.
    - (a) Identify the population.
    - (b) Identify the sample.

- (c) I don't actually believe the 9.1% so I went down to Smokey's Tavern and surveyed 11 customers. As it turned out, 5 of them smoked! Identify any problems that you see with my "study".
3. Suppose we are doing a study on the mercury concentration in adults' hair. We announce the study in Asheville's local newspaper and get 205 people willing to participate in our study. We take a snip of their hair and analyze it for mercury content and ask them to fill out a questionnaire about how many servings of fish they consume on average in a week in order to find out how much eating fish contributes to the amount of mercury in the body.
- (a) What is the population?
- (b) What type of sampling method was used?
- (c) What problems do you see with the sampling method?
- (d) What is the predictor variable and what is the response variable?
4. The boxplot for a data set is shown in figure 2.
- (a) Write down the corresponding five point summary
- (b) Find the inter-quartile range
5. Compute the mean and standard deviation of the set  $\{8, 2, 1, 8, 3\}$ .
6. Suppose that a standardized tests' scores are normally distributed with a mean of 1500 and a standard deviation of 300.
- (a) According to the normal rules of thumb, what percentage of test takers score 2400 or above?
- (b) Use the normal table to compute the proportion of test takers whose scores are between 1400 and 1700.
7. I've got a bunch of 12 sided dice with five sides labeled 1, two sided labeled 2, and five sides labeled 3
- (a) Suppose I roll one such die. What is the probability that I roll a 2 or a 3?
- (b) Suppose I roll two such dice. What is the probability that I roll a 2 and a 3?
- (c) Suppose I roll 1 such die. Write down the computation to show that the expected value of my roll is 3.

- (d) Suppose I roll 100 such dice and add the results. What is the expected value of my sum?
8. Table 1 displays in-state UNCA enrollments for last Fall by region. Suppose we pick a random sample of 50 of those 3281 total students. Use a normal distribution to estimate the probability that more than 28 of those 50 students are *not* from Western NC.

Region	Western NC	Piedmont	Eastern NC	Total
Enrollment	1508	1541	232	3281

Table 1: In state UNCA Enrollment by NC Region

9. Suppose now that we are interested in the proportion of in-state UNCA students who are from outside Western NC *this* year. Since data on the entire student body is not yet available for this year, we draw a simple random sample of 64 in-state UNCA students and find that 34 of them are from outside Western NC. Use this data to write down a 95% confidence interval for the proportion of in-state UNCA students who from outside Western NC.
10. UNCA claims that 90% of it's students are from North Carolina but we suspect that it might be less than that. Suppose we draw a random sample of 50 UNCA students and find that 41 of them are in state. Let's use this to explore the claim that 90% of UNCA students are in-state vs the possibility that fewer than 90% of UNCA students are in-state.
- Construct appropriate null and alternative hypotheses to explore our question.
  - Compute the associated  $p$ -value.
  - Based on a 95% level of confidence, what is the conclusion of our hypothesis test?
11. In planning for an early afternoon, outside wedding ceremony on November 18, I looked up the temperature at 12:54PM for the last nineteen November 18<sup>th</sup>s. I found an average temperature of 52.3 degrees with a standard deviation of 11.8 degrees. Use this data to write down a 95% confidence interval for the temperature.
12. An organic farmer sells bags of Brussels sprouts labeled as one pound each. Let's use a  $t$ -test to investigate the farmer's claim that bags

each contain one pound. I purchased one bag each of 4 weeks during the Summer farmer's market, weighed them at home and recorded the following weights:

1.05	1.15	1.2	1.1
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- (a) Write down the hypothesis statement for the problem.
- (b) Write down the computation showing that the mean is  $\mu = 1.125$
- (c) Write down the computation showing that the standard deviation is  $\sigma = 0.06454972$ .
- (d) Assuming the mean  $\mu_0 = 1$  is correct, compute the  $t$ -score for the observed mean.
- (e) Use a  $t$ -table to determine the outcome of the hypothesis test.

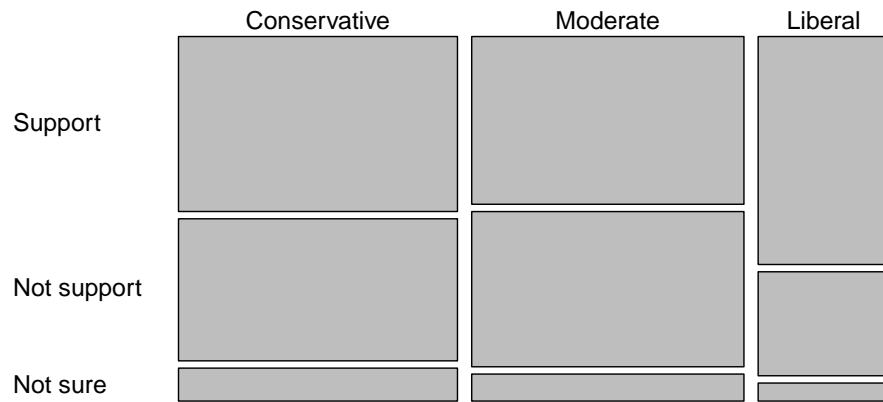


Figure 1: The Mosaic plot for problem 1

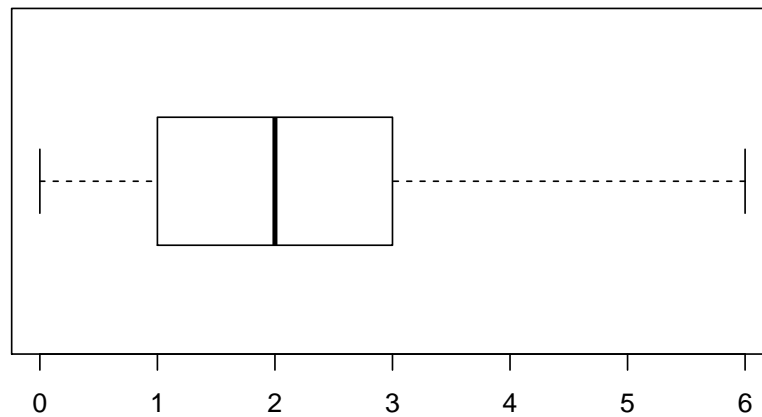


Figure 2: The box plot for problem 4