## Math and Society - Math 111

## **Final Exam Review**

The following problems are similar to ones you might see on the midterm exam.

1. (5 points) In 2012, the United States imported 7,450,000 barrels of crude oil per day. The average price of a barrel of oil was \$111.67 per barrel. Estimate the total amount of money the United States spent importing oil during the whole year of 2012.

- 2. (3 points) Most low-income households in the U.S. are small, many only consist of 1 person. The histogram below shows the distribution of household sizes for low-income households. Which of the following best describes this distribution?
  - A. It is skewed left and the mean is lower than the median.
  - B. It is skewed right and the mean is lower than the median.
  - C. It is skewed left and the mean is higher than the median.
  - D. It is skewed right and the mean is higher than the median.
  - E. The mean might be lower or higher than the median. You can't tell.



3. (5 points) My savings account currently pays a ridiculously small interest rate of 0.03% per year. If I left \$100 in that account for 100 years and the interest rate didn't change, how much money would there be in the account at the end of that time?

- 4. (3 points) A very common arithmetic mistake is to ignore the percent symbol and treat numbers like 45% as 45 instead of 0.45. If someone multiplies by 45 when they should have used 0.45, their answer will be off by how many orders of magnitude?
  - A. 1
  - B. 45
  - C. 44.55
  - D. 2
  - E. 0.5

- 5. (6 points) Convert the following percent changes into the corresponding growth factor.
  - (a) A 125% increase is the same as multiplying by \_\_\_\_\_
  - (b) A 3% increase is the same as multiplying by \_\_\_\_\_
  - (c) A 15% decrease is the same as multiplying by \_\_\_\_\_
- 6. (8 points) A large study looked at the birth weights of newborn babies in the United States compared with information about the mother (age, height, weight, and whether she is a smoker). The data was stored in a data table. A total of 1296 babies were included in the study. The first few rows of the data table are shown below.

| Birth weight (ounces) | Age (years) | Height (inches) | Weight (lbs) | Smoker |
|-----------------------|-------------|-----------------|--------------|--------|
| 120                   | 27          | 62              | 100          | no     |
| 113                   | 33          | 64              | 135          | no     |
| 128                   | 28          | 64              | 115          | yes    |
| 108                   | 23          | 67              | 125          | yes    |
| 136                   | 25          | 62              | 93           | no     |
| 138                   | 33          | 62              | 178          | no     |

(a) What are the individuals in this study?

(b) List all of the variables in this study. For each variable, say whether it is categorical or quantitative.

(c) What is the difference between the population and the sample in this study?

7. (6 points) Linda is a sales associate at a large auto dealership. At her commission rate of 25% gross profit on each vehicle, she expects to earn \$350 for each car sold. She motivates herself by using probability estimates of her sales. For a sunny Saturday in April, she estimates her car sales as follows:

| Cars sold   | 0   | 1   | 2   | 3   |
|-------------|-----|-----|-----|-----|
| Probability | 0.3 | 0.4 | 0.2 | 0.1 |

- (a) What is the expected value of the number of cars that Linda will sell on this particular Saturday?
- (b) How much money will Linda earn on average on Saturdays like this (if her probability estimates are correct)?
- 8. (5 points) Suppose that I invest \$200 in the stock market. My investment grows 20% the first year, then declines 10% the next, and then grows 5% in the third year and 5% again in the fourth year. How much money will I have after 4 years?
- 9. (10 points) Here are the projected numbers (in thousands) of earned degrees in the United States in the 2010-2011 academic year, classified by level and the sex of the degree recipient.

|        | Bachelor's | Master's | Professional | Doctorate | Total |
|--------|------------|----------|--------------|-----------|-------|
| Female | 933        | 402      | 51           | 26        | 1412  |
| Male   | 661        | 260      | 44           | 26        | 991   |
| Total  | 1594       | 662      | 95           | 52        | 2403  |

- (a) What percent of bachelor's degrees are earned by women?
- (b) What percent of all degrees are bachelor's degrees?
- (c) How many times more women earn a bachelor's degree than men?
- (d) Is it true that about 41% more women earn bachelor's degrees in the United States than men? Yes or no?

- 10. (6 points) The single-season home run record was broken by Barry Bonds of the San Francisco Giants in 2001, when he hit 73 home runs. Here are Bonds's home run totals from 1986 (his first year) until 2003:

  - (a) Use the space above to draw a box-and-whisker plot for the data.
  - (b) In what percent of seasons did Barry Bonds have less than 30 home runs?
- 11. (9 points) Blood cholesterol levels of men aged 55 to 64 are approximately normally distributed with mean  $\mu = 222 \text{ mg/dL}$  and standard deviation  $\sigma = 37 \text{ mg/dL}$ .
  - (a) Draw a rough sketch of this normal distribution, and label the x-axis with the cholesterol that are 0, 1, or 2 standard deviations away from the mean.

- (b) Approximately what percent of these men have blood cholesterol levels below 185 mg/dL?
- (c) What is the z-value of a man with a cholesterol level of 250 mg/dL?

- 12. (6 points) Suppose that a beach community keeps track of the amount of ice cream sold in a given month and the number of drownings that occur in that month.
  - (a) What should the community expect to find for the correlation between the two variables?
    - A. A positive correlation.
    - B. A negative correlation.
    - C. A correlation close to zero.
  - (b) If the community were to find a strong positive correlation between ice cream sales and drownings, would that mean that ice cream *causes* drownings? If not, suggest an alternative explanation (i.e., a *confounding* variable) for the strong association.

- 13. (6 points) In a random sample of 120 students from one college, 37 had a job while enrolled at school.
  - (a) Use the formula  $\hat{p} \pm 2\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$  to find a 95% confidence interval for the proportion of students at the school with jobs. Express your answer by describing where the interval starts and ends.

- (b) What are we 95% certain will be in this confidence interval?
  - A. The proportion of students at the one college with jobs.
  - B. All students at the college with jobs.
  - C. The proportion of students at all colleges with jobs.
  - D. The proportion of students in a future sample with jobs.

14. (10 points) The Masters is one of the four major golf tournaments. The figure below displays the relationship between golfers' scores on the first and second rounds of the 2010 Masters Tournament.



(a) Sandy Lyle had the highest score in the second round. What was this score?

- (b) What was Sandy Lyle's score in the first round?
- (c) The scatter-plot above has least squares regression line y = 0.288x + 55.34. (i) What is the slope, and (ii) what does the slope tell us about this particular situation in words?

- (d) What does the regression line predict the average 2nd round score will be for someone who scores an 80 in the first round?
- (e) Which of the following is closest to the correlation coefficient for the plot above?
  - A. 0.9B. 0.1C. -0.6

- 15. (6 points) A study was done where men and women wore voice recorders to measure how many words they said each day. In the study, the women spoken an average of 3120 more words per day then the men. The margin of error of the 95% confidence interval for the difference was 5170 words per day.
  - (a) Based on the margin of error, we can be 95% sure that women speak between \_\_\_\_\_\_ and \_\_\_\_\_ more words per day on average than men.
  - (b) Is this statistically significant evidence that women talk more than men? Why or why not?

- 16. (6 points) Suppose a box has 6 balls: 4 red balls and 2 black. Suppose that you take one ball out of the box and then you take out a second ball (without puting either ball back in).
  - (a) Complete the tree diagram for this situation by adding the appropriate weights to the branches.



(b) What is the probability that, after drawing two balls, you have one of each color?