1. Suppose we are psychics and we know that Antonio Villaraigosa will be the next Mayor of Los Angeles with a final winning percentage of 55% by pulling support from across lines of class and race through combining substantial support in the Westside and the San Fernando Valley with his base in East Los Angeles. Unfortunately, we don't know Villaraigosa and he doesn't return our phone calls or e-mails so he doesn't know he will get 55% of the vote in June. In fact, he is spending a lot of money right now on surveys of size 81 to help him make decisions about the upcoming election.

   a. What is the chance that his surveys will give a result showing that he will get 49% or less of the vote if it is true that he really has 55%? (6 points)
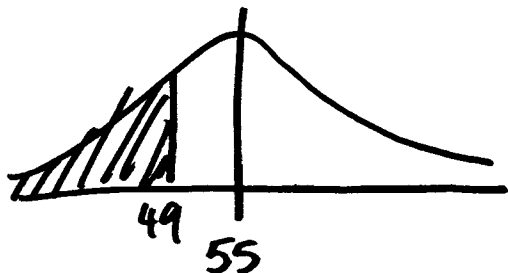
$$SE_{\%} = \frac{\sqrt{81} \cdot \sqrt{.55 \times .45}}{81} * 100 = 5.53\%$$

$$Z = \frac{49-55}{5.53} = -1.08 \ \cup\ -1.10$$

$$\frac{100 - 72.87}{2} \cong 13.57\%$$

   b. Suppose Mr. Villaraigosa (who does not know he will get 55%) would like to be 95% confident that the interval given to him will be no more than ±2% in size. How large does his survey size need to be (i.e. how many people does he need to survey) to accomplish this? (6 points)

Sample% ± 2% is what he wants so...

Set (for 95%)

$$2\% = 2 * \left(\frac{\sqrt{n} \cdot \sqrt{.55 \times .45}}{n} \times 100 \right)$$

Solve for n = 2,475 exactly

2. There were a total of 226,324 deaths in California in 1999. A random sample of 242 deaths was selected. Detailed research determined that the deceased was cremated in 99 of the deaths.

    a. Determine a 99% confidence interval for the proportion (or percentage) of deaths in California in which the deceased is cremated. (6 points)

$$\frac{99}{242} \approx .41 \text{ or } 41\%$$

$$41\% \pm \left(3 * \frac{\sqrt{242} \cdot \sqrt{.41 \times .59}}{242} \times 100\right)$$

$$41\% \pm 9.48\%$$

    b. (fill in the blanks with a choice) The number 99 is a _____ and 226,324 is a _____? (5 points)

E

      a) sample, population
      b) statistic, sample
      ~~d) sample, population~~
      e) statistic, parameter

    c. The confidence interval is too narrow, identify 2 things you can do to make the interval wider. (5 points)

1) increase confidence

2) decrease sample size

    d. A classmate comes up to you and says, this is the interpretation of a 99% confidence interval:

"There is a 99% probability that the true parameter is in the interval you gave in part (a)"

Is your classmate's interpretation correct? (circle one)   YES   **NO**
And justify your choice in the space below. (5 points total)

This statement is FALSE
The parameter is FIXED, it is the intervals which vary from sample to sample. It is WRONG to talk of the true parameter as having a probability 99% refers to the percentage of intervals over the long run that contain the parameter.

3. The Republican Party is interested in finding out about the religious behavior of all American adults. A survey company hired by the Republican Party searches various databases for the home addresses of people who are members of churches. Surveys (about 10,000) are mailed to the people living at these addresses asking various questions about religion. Suppose 1,000 surveys are returned, with 765 saying they are Christians.

   Do you see any possible biases with this survey? Identify two and clearly explain one of them and which direction you think it would bias the survey results. (10 points)

(+1) Agreed to some form of bias

selection bias

or

(response
  non/response bias)

wording of the question disallowed
since we do not know how it was
asked.

explanation

selection - indicate not all americans
            go to church

response/non-response → note low
            return $\frac{1000}{10,000}$ rate.

4. You know that every UCLA student will definitely get a job after graduation. The only uncertainty is the salary. Suppose this is what you know about the job prospects of UCLA students after graduation:

There is a 35% chance that the salary will be $20,000 per year; a 45% chance that it will be $90,000 per year; and a 20% chance that it will be $40,000 per year. Suppose you draw a random sample (with replacement) of 16 UCLA students.

   a. Draw a reasonable box model for this problem (6 points)

$$\boxed{20K} \quad \boxed{90K} \quad \boxed{40K}$$
$$.35 \quad\quad .45 \quad\quad .20$$
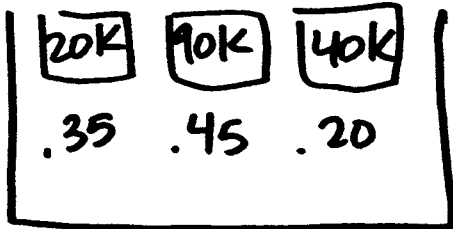
   b. Find the expected value of the total (sum) salary for the 16 UCLA students. (6 points)

$$E.V. = 16 \times 55{,}500 = 888{,}000$$

   c. What is the Standard Deviation of the "box" you drew? (9 points)
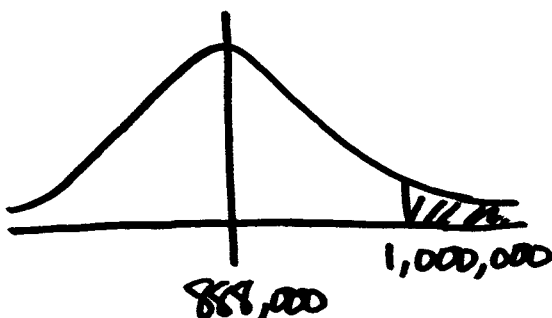
$$SD = \sqrt{.35(20K-55.5K)^2 + .45(90K-55.5K)^2 + .20(40K-55.5K)^2}$$

$$32{,}012$$

   d. What is the Standard Error of the total (sum) salary for 16 students? (5 points)

$$SE = \sqrt{16} * 32{,}012 = 128{,}046.87$$

   e. Suppose you work for me and I tell you to go draw a different random sample of 16 UCLA students and you get a total (sum) salary of $1,000,000. What is the chance that you could have gotten a total salary this large or larger? (10 points)

1,000,000

888,000

$$Z = \frac{1{,}000{,}000 - 888{,}000}{128{,}046.87} = .87$$

$$\frac{100 - 63.19}{2} = 18.41\%$$

5. 10 points just for attending the second midterm ☺☺☺