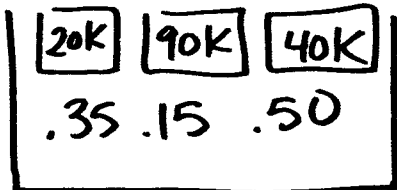


1. You know that every UCLA student will definitely get a job after graduation. The only uncertainty is the salary. Suppose this is what you know about the job prospects of UCLA students after graduation:

There is a 35% chance that the salary will be \$20,000 per year; a 15% chance that it will be \$90,000 per year; and a 50% 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)



- b. Find the Expected Value of the total (sum) salary for the 16 UCLA students. (6 points)

$$E.V. = 16 * 40,500 = 648,000$$

- c. What is the Standard Deviation of the "box" you drew? (9 points)

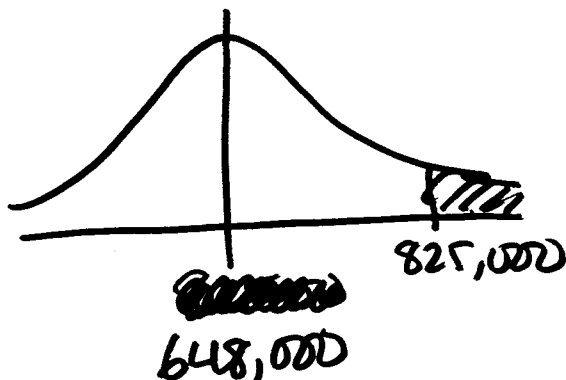
$$S.D. = \sqrt{.35(20K - 40.5K)^2 + .15(90 - 40.5K)^2 + .50(40 - 40.5K)^2}$$

$$= 22688.1$$

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

$$SE = \sqrt{16} * 22688.1 = 90,752.4$$

- 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 \$825,000. What is the chance that you could have gotten a total salary this large or larger? (10 points)



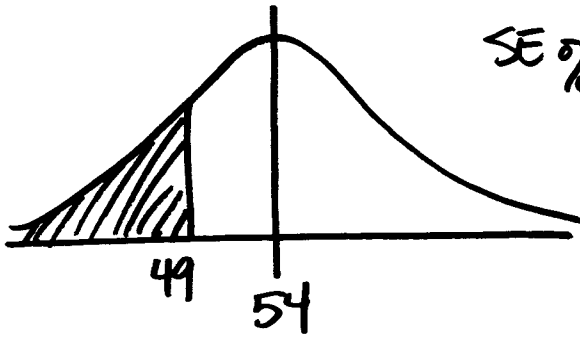
$$z = \frac{825000 - 648000}{90,752.4}$$

$$\approx 1.95$$

$$\frac{100 - 94.88}{2} = 2.56\%$$

2. Suppose we are psychics and we know that Antonio Villaraigosa will be the next Mayor of Los Angeles with a final winning percentage of 54% 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 54% of the vote in June. In fact, he is spending a lot of money right now on surveys of size 225 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 54%? (6 points)



$$SE\% = \frac{\sqrt{225} \cdot \sqrt{.54 \times .46}}{225} \times 100 = 3.323\%$$

$$z = \frac{49 - 54}{3.323} = -1.50$$

$$\frac{100 - 86.64}{2} = 6.68\%$$

- b. Suppose Mr. Villaraigosa (who does not know he will get 54%) would like to be 68% confident that the interval given to him will be no more than $\pm 1\%$ 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 $\% \pm 1\%$ is what he wants
with 68% confidence

so set

$$1\% = 1 * \left(\frac{\sqrt{n} * \sqrt{.54 \times .46}}{n} \times 100 \right)$$

Solve for n

$$n = 2,484 \text{ exact}$$

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. There were a total of 226,324 deaths in California in 1999. A random sample of 378 deaths was selected. Detailed research determined that the deceased was cremated in 170 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)

$$\frac{170}{378} \approx .45 \approx 45\% \quad \text{so} \quad 45\% \pm 3 * \left(\frac{\sqrt{378} \cdot \sqrt{.45 \times .55}}{378} \times 100 \right)$$

$$45\% \pm 7.676\%$$

- b. The confidence interval is too wide, identify 2 things you can do to make the interval narrower. (6 points)

1) decrease confidence level

2) increase sample size

- c. 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 intervals which vary from sample to sample

It is wrong to talk of the true parameter as having a probability of being in an interval

99% refers to the percentage OF INTERVALS OVER THE LONG RUN that will contain the parameter.

- d. (fill in the blanks with a choice) The number 226,324 is a _____ and the 170 is a _____? (5 points)

- a) parameter, statistic
b) statistic, sample
c) population, sample
d) population, parameter
e) parameter, sample

↓
number which describes the population

number describing the sample

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