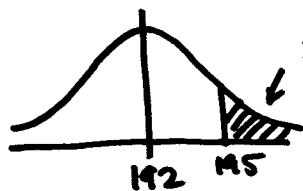5.   A pumpkin farmer produces pumpkins that average 12lbs in weight, with a standard deviation of two pounds. The pumpkins are packed 16 to a crate. What is the chance that a single crate weighs more than 195 pounds?

(a)   Less than 1%
(b)   About 7%
(c)   About 13%
(d)   About 34%
(e)   About 69%

$16 \times 12 = 192$ lbs (expect)

$$\frac{195 - 192}{\sqrt{16 \cdot 2}} = \frac{3}{8} = .375$$

$\approx .40$

look up Z score

The remaining 5 problems are related to each other and use the information below:

There are 20,000 restaurants in the County of Los Angeles, 50% of them received a letter grade of "A" during inspections, 40% received either a B or a C grade and 10% failed their inspections. Restaurant grades are not normally distributed.

My financial adviser, the Oracle, has hired you as a temporary personal assistant. Your job is to schedule his next 16 dinners (Oracle never eats at home). Unfortunately, you didn't know about the rating system and you never eat out because you don't have the money. So you listened to your best friend and picked 16 restaurants at random from an internet database of the 20,000 restaurants in Los Angeles. The Oracle will give you +3 points if you choose "A" restaurants, +1.25 points if you choose "B" or "C" restaurants, and -20 points if you choose a restaurant with a failing grade. Treat your restaurant selections as if they were a random sample of restaurants.

6.   Construct a box model for this problem

suggested

| +3 | 1.25 | -20 |
| .5 | .4 | .1 |

7.   What is the expected value for the total score of the 16 restaurants selected at random?

Box Average $= (3 \times .5) + (1.25 \times .4) + (.1 \times 20) = 0$

or $\dfrac{(3 \times 5) + (1.25 \times 4) + (1 \times -20)}{10} = 0$

Expected Value $= 16 \times 0 = 0$

8.   What is the standard deviation for the total BOX score of the sample of 16 restaurants?

$$SD_{BOX} = \sqrt{\frac{(3-0)^2 + (3-0)^2 + (3-0)^2 + (3-0)^2 + (3-0)^2 + (1.25-0)^2 + (1.25-0)^2 + (1.25-0)^2 + (1.25-0)^2 + (-20-0)^2}{10}}$$

$= 6.7175$

9.   What is the standard error for the total score of a sample of 16 restaurants?

$$\sqrt{16} \cdot SD_{BOX}$$

$$4 \times 6.7175 = \boxed{26.87}$$

10. To convert your temporary job into a permanent job, you must have accumulated a total of at least +25 points from the Oracle after picking 16 restaurants for him. What's your chance of getting a total of at least +25 points after picking 16 restaurants? If it is not possible to calculate the chance, please write "not possible" below and explain why.


+25

0

$$\frac{25-0}{26.87} = .93 \sim .95$$

-.95   .95

from Table A 105
$$= 65.79\% \quad so$$
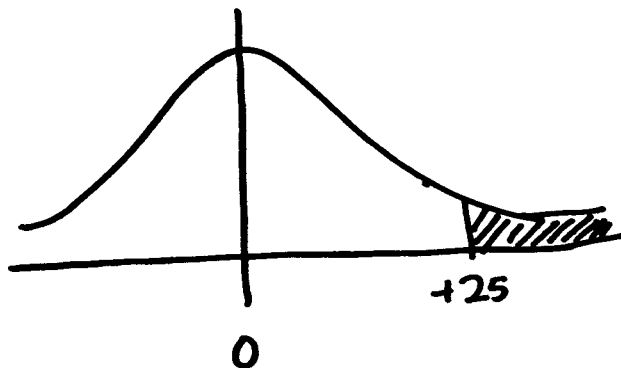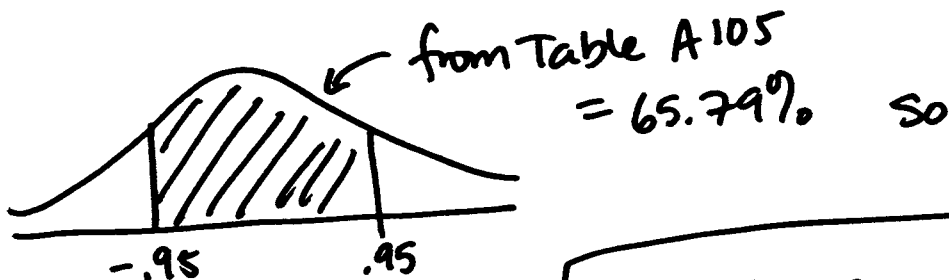
$$\boxed{\frac{100-65.79}{2} = 17.1\%}$$

7

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)
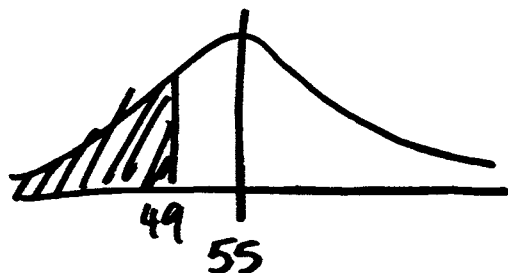
$$SE_{\%} = \frac{\sqrt{81} \cdot \sqrt{.55 \times .45}}{81} \ast 100 = 5.53\%$$

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

$$\frac{100 - 72.87}{2} \text{ u } = 13.57\%$$

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

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

↗ for 95%

Solve for n = 2,475 exactly

8. 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

   the $\frac{?}{}$ _____? (5 points)

      a) sample, population
      b) statistic, sample
      c) parameter, statistic
      d) sample, population
      e) statistic, population ⟵ (circled)

   c. The confidence interval is too narrow, identify 2 things you can do to make the interval wider. (6 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) ⟵ circled

   And justify your choice in the space below. (5 points total)

   This statement is false
   The parameter is fixed, it is the intervals
   which change
   It is wrong to talk of the true parameter
   as having a probability
   99% refers to the % of intervals
   over the long run that contain the parameter

9. 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.

10. 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 of 9 UCLA students.

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

$$\boxed{20}\ \boxed{90}\ \boxed{40} \leftarrow \text{in thousands}$$
.35 .45 .20   ⟶ Box average
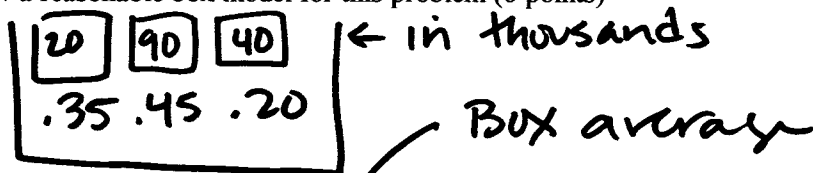
b. Find the expected value of the total (sum) salary for the 9 UCLA students. (6 points)

E.V. $= 9 \times 55,500 = 499,500$

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 9 students? (5 points)

SE $= \sqrt{9} \ast 32,012 \cong 96,036$

e. Suppose you work for me and I tell you to go draw a different random sample of 9 UCLA students and you get a total (sum) salary of $600,000. What is the chance that you could have gotten a total salary this large or larger? (10 points)
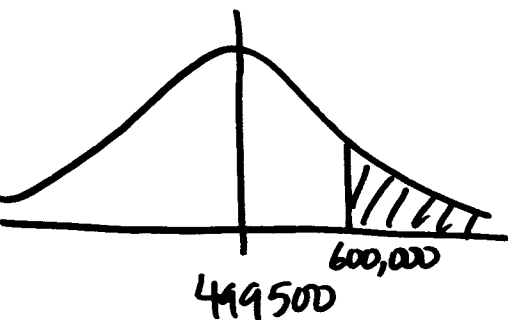
600,000

499500

$$\frac{600,000 - 499500}{96,036} = Z = \overset{+}{-} 1.05$$

$$\frac{100 - 70.63}{2} = \boxed{14.69\%}$$