1. Does it pay to sue for damages for work related injuries? Suppose this is what is known about people who have taken their employers to court: 20% have won \$120,000, 50% have won \$20,000 and the rest have won nothing. And suppose it costs \$20,000 in legal fees to take a case to court regardless of whether a person wins or loses.

a. The net award (money won minus legal fees) for work related damages can be represented by a box model. Please construct a reasonable model in the space below. (6 points)

100,000	0	-20,000
.2	.5	.3

✓

b. Suppose a large employer gets sued for work related injuries 144 times per year. The 144 lawsuits can be treated like a random sample of size 144. Find the expected value of the total net award. (4 points)

$E.V = 144 \times 14{,}000$

$\boxed{E.V. = \$2{,}016{,}000}$ ✓

$Box_{average} = (.2)(100{,}000) + (.5)(0) + (.3)(-20{,}000)$ -6000

$= 14{,}000$

c. Find the standard error of the net award for the 144 lawsuits. (4 points)

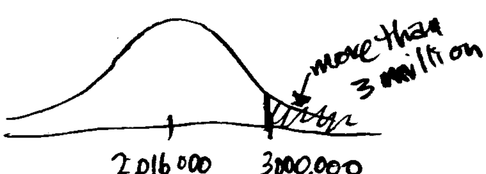
$SD_{box} = \sqrt{(.2)(100{,}000-14{,}000)^2 + (.5)(0-14{,}000)^2 + (.3)(-20{,}000-14{,}000)^2}$

$SD_{box} = \$43{,}863$

$SE = \sqrt{144} \cdot 43{,}863$

$\boxed{SE = \$526{,}361}$ ✓

d. Suppose a large employer knows it will get sued 144 times and has set aside \$3,000,000 to pay potential awards. Calculate the chance that the employer has not set aside enough money to pay for the awards. (6 points)



$z = \dfrac{3{,}000{,}000 - 2{,}016{,}000}{526{,}361}$

$= 1.87 \approx 1.85$

$\dfrac{100 - 93.57}{2} = \boxed{3.215\%}$

2. In 2001, a survey organization takes a simple random sample of 900 adults in Los Angeles, California, a large American city. Among this sample of adults, it was found that 525 support the death penalty, 350 support life imprisonment with no parole and the rest did not believe in penalties for homicide. It was noted that support for the death penalty had changed from a survey taken in 1991 when approximately 75% of adults in Los Angeles supported the death penalty.

increase draws → decrease SE (spread)

a. If the sample size were 1600 instead of 900 it would (circle one to fill in the blank) the width of any confidence interval constructed from the sample information (4 points)

Increase   Decrease   ~~Not Affect~~

$\boxed{1}$ $\boxed{0}$

$\frac{525}{900}$ $\frac{375}{900}$

↓ .58 ↓ .42

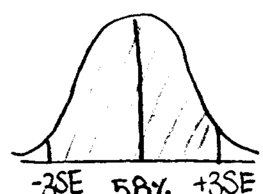
b. Is it possible to construct a 99% confidence interval for the population percentage of Los Angeles adults who support the death penalty in 2001. (circle one) (7 points)

YES   NO

$EV_{\%} = 58\%$

If you circled YES, please construct a 99% confidence interval in the space below. If you circled NO, please use the space to explain why it is not possible to construct a 99% confidence interval.

$SE_{\%} = \frac{\sqrt{.58 \times .42}}{\sqrt{900}} \times 100 = 1.65\%$



$\boxed{58\% \pm 4.95\%}$

$\to 3 \times 1.65\% = 4.95\%$

c. If the level of confidence were 90% instead of 99% it would (circle one to fill in the blank) the width of any confidence interval from the sample information (4 points)

Increase   Decrease   ~~Not Affect~~

$\boxed{1}$ $\boxed{0}$

.6 .4

d. Suppose it was known that actually 60% of all adults in Los Angeles support the death penalty. So if a simple random sample of 625 adults were to be taken, the SE for the sample percentage of death penalty supporters is calculated to be about 2%. You should assume these numbers are correct.

draw 625

Box Avg = .6

$EV_{\%} = 60\%$

A student, looking at the numbers in part d, interprets them as follows: this means that there is about a 95% chance for the percentage of death penalty supporters in the sample to be in the range 60% ± 4%. (circle one)

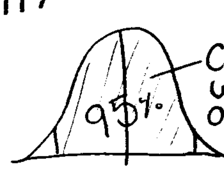
The student is correct   ~~The student is not correct~~

$SE_{\%} = \frac{\sqrt{.6 \times .4} \times 100}{\sqrt{625}} = 1.95\%$

Please explain your choice below: (5 points)

95% chance → $2SE_{\%} = 2(1.95) = 3.91\%$

60% ± 3.91%



* He is correct because 2SE% is about 4%. 2SE% covers a chance area of 95/100 → 95%. If 100 samples were taken, 95 of them should fall within the range 60% ± 4%. Therefore, there is a 95% chance for the sample % to fall within that range.

/20

3. The most recent census of Los Angeles, California revealed that 61% of the residents in the city identified their race/ethnic background as "Hispanic", 16% identified their race/ethnic background as "Non-Hispanic White", 11% as "Asian", 9% as "Black" or "African American and 3% as "Other". Next month, a research group at the UCLA Medical School plans to take a simple random sample of 400 residents in Los Angeles

a. What is the chance that between 59% and 64% of residents the UCLA Medical School sample will identify themselves as "Hispanic"? (9 points)

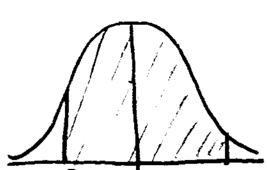
1	0
.61	.39

draws 400

Box Avg = .61

$EV\% = 61\%$

$SE\% = \frac{\sqrt{.61 \times .39}}{\sqrt{400}} \times 100 = 2.44\%$



59% 61% 64%

$\frac{59-61}{2.44} = -0.82 \rightarrow 57.63\%$

$\frac{64-61}{2.44} = 1.23 \rightarrow 78.87\%$

$\frac{57.63\% + 78.87\%}{2} = 68.25\%$

400 draws

1	0
.16	.84

Box Avg = .16

b. Can you calculate the standard error for the total number of residents in the sample identifying themselves as "Non-Hispanic White"? If it is possible please write "possible" below and justify your response. If it is not possible, please write "not possible below" and justify your response. (3 points)

$EV = 400 \times .16 = 64$

$SE = \sqrt{400} \times \sqrt{.16 \times .84}$
$= 7.33$

"Possible" all the #s needed for the calculation (Box frequencies, Sample size) are given. It just requires SE be calculated for the sum rather than the percent.

c. What is the chance that in a sample of 400 residents, 44 or more will identify themselves as "Black" or "African American"? If this is calculable, please show how to calculate the chance below, if it is not, please write "not calculable" and justify your response (5 points).

400 draws

1	0
.09	.91

Box Avg = .09

$EV = 400 \times .09 = 36$

$SE = \sqrt{400} \times \sqrt{.09 \times .91} = 5.72$

$\frac{44-36}{5.72} = 1.398 \rightarrow 83.85\%$

36 44

$\frac{100\% - 83.85\%}{2} = 8.075\%$

d. If the UCLA Medical School increases the sample size to 1600, the expected percentage of residents in the sample identifying themselves as "Other" is expected to: (3 points)

(a) Increase
(b) Decrease
(c) Stay the same
(d) Double
(e) Quadruple

$EV\% = Pop\%$
(independant of draws)

Please indicate whether each statement is true or false (3 points each)

	True	False	Statement
4A	✓		The purpose of the standard error is to estimate the variability of a probability histogram.
4B		✓	For a population that is not normally distributed, the distribution of sample percentages will have the same shape as the population even when the sample is reasonably large.
4C		✓	The Central Limit Theorem only applies when the number of draws (sample size) is reasonably large and the population is normal. not necessary
4D		✓	The Central Limit Theorem suggests that all populations are normally distributed
4E		✓	The Central Limit Theorem implies that as the number of draws (sample size) decreases, the probability histogram for a sum becomes more and more normal in its appearance

less & less