Name: Key Math 153 Test #2 Fall 2020

Read the sentences below and then identify each underlined (bold) number by labeling it with the proper statistical symbol. (4 pts)

1) Mary wanted to figure out the average number of students per class at a large university in Maryland. She randomly selected **35** classes from the master schedule and went to each one to gather the data. The average number of students that she calculated was **22.8.** She also calculated the standard deviation for those 35 classes and saw that it was **3.4**. In another study, she read that **52%** of all college students nationwide graduate, which she thought was to high.

$n = 35$

$\bar{x} = 22.8$

$s = 3.4$

$p = .52$

2) We take a random sample of 40 students at a very large school and find that 22 of them said they enjoy watching sports on T.V.

   a) Assuming the conditions are met and using the information above, what would be the approximate value of the standard error of our sampling distribution of sample proportions? (3 pts)

$\hat{p} = \frac{22}{40} = .55$ $\sigma_{\hat{p}} = \sqrt{\frac{(.55)(.45)}{40}} \approx .0787$

   b) Is the value calculated in part (a) a statistic or parameter? (EXPLAIN) (2 pts)

statistic (sample)

3) If you are calculating a 1-Proportion Interval, would the critical value be "Z" or "T"? (2 pts)

Z^*

4) Given that it is known that 38% of college students take the ACTs. Find the probability that a poll conducted with 300 randomly selected college students will give a sample proportion between 37% and 40% of students that took the ACT. (Check Conditions) (8pts)

$$\sigma_{\hat{p}} = \sqrt{\frac{(.38)(.62)}{300}} \approx .028$$

$$Z = \frac{.37 - .38}{.028} = -.36$$

(.35942)

$$Z = \frac{.40 - .38}{.028} = .71$$

~~([illegible])~~

~~([illegible])~~

(.76115)

~~[illegible]~~

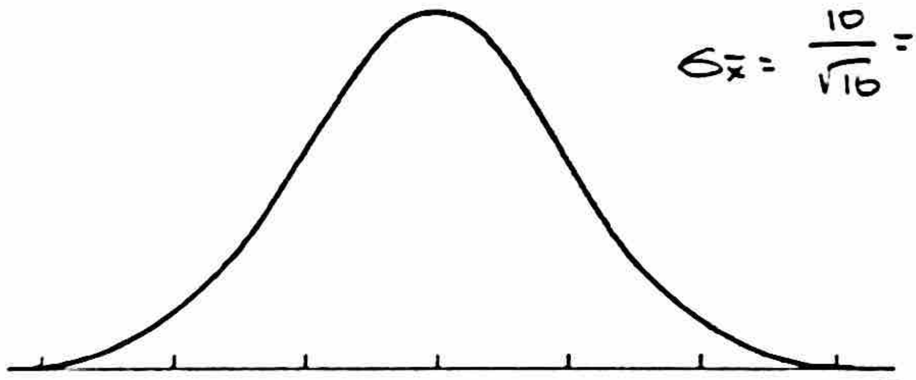
$-$ ~~[illegible]~~

$\boxed{\cancel{[illegible]}}$

$\boxed{.4017}$

5) If the mean of a population that is normally distributed is 50 and the standard deviation of the population is 10. Sketch the sampling distribution of sample means for a sample size of 16. (4 pts)

$$\sigma_{\bar{x}} = \frac{10}{\sqrt{16}} = 2.5$$



6) A population of manufactured products where the random variable X is the weight of the item. Prior experience has shown that the weight has a normal distribution with mean 16.5 ounces and standard deviation of 2.4 ounces.

a. What is the probability that the weight of "one" item randomly selected will weigh more than 20.0 ounces? (4 pts)

$$Z = \frac{20 - 16.5}{2.4} = \frac{3.5}{2.4} = 1.46$$

(.92785)

$$1 - .92785 = \boxed{.07215}$$

b. What is the probability that if the manufacturer takes a random sample of 64 items, that the sample will have a mean weight of more than 17 ounces? (6 pts)

$$Z = \frac{17 - 16.5}{.3} = \frac{.5}{.3} = 1.67 \qquad \sigma_{\bar{x}} = \frac{2.4}{\sqrt{64}} = \frac{2.4}{8} = .3$$

(.95254)

$$1 - .95254 = \boxed{.04746}$$

7) Lie detectors are based on measuring changes in the nervous system. The assumption is that lying will be reflected in physiological changes that are not under the voluntary control of the individual. When a person is telling the truth, the galvanic skin response scores have a distribution that is normal with a mean of 50.2 and a standard deviation of 5. (Assume ALL Conditions are met)

What is the probability that a sample of 25 people will have an average score less than 48.8? (5 pts)

$$Z = \frac{48.8 - 50.2}{1} = \frac{-1.4}{1} = -1.4 \qquad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{25}} = 1$$

(.08076)

$$\boxed{.08076}$$

For Questions #8-9 make sure to show <u>ALL</u> aspects of a confidence interval (15 pts each)

8) A company that produces light bulbs is concerned about the distribution of the life expectancy of their bulbs. The company takes a simple random sample of 100 lightbulbs and computes the sample mean to be 1200 hours per bulb and the standard deviation to be 40 hours. Construct and interpret a 98% confidence interval for the unknown mean life expectancy.

Pop: All light bulbs made by company

Param: Avg life expectancy of bulbs in hours (μ)

1- Sample T Interval, Random Samp ✓, 10n < Pop Size ✓

$n \geq 30$ ✓

$\bar{x} \pm T\left(\frac{s}{\sqrt{n}}\right) = (1190, 1209)$

9) In a simple random sample of 200 adult males in Maryland, 88 of them stated that they enjoyed the show "Breaking Bad". Construct and interpret a 90% confidence interval for the percent of adult males in Maryland who enjoy the show "Breaking Bad".

Pop: All adult males in MD

Param: Proportion who enjoy Breaking Bad

1- Proportion Int, Random Samp ✓, 10n < Pop Size ✓

$n\hat{p} \geq 10$, $n(1-\hat{p}) \geq 10$

$\hat{p} \pm Z\left(\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right) = (.3823, .4977)$

10) The actual time it takes to cook a 22-pound turkey is a normally distributed random variable with a mean of 4.6 hours and a standard deviation of 0.6 hours.

a) What is the probability that the average cooking time of a single 22-pound turkey will take less than 4.4 hours to cook? (4 pts)

$$Z = \frac{4.4-4.6}{.6} = \frac{-.2}{.6} = -.33 \quad (.3707)$$

b) Assuming all conditions are met, what is the probability that the mean cooking time for a random sample of 25 of these 22-pound turkeys would be greater than 4.7 hours? (5 pts)

$$Z = \frac{4.7-4.6}{\left(\frac{.6}{\sqrt{25}}\right)} = .83$$

$(.79673)$

$1-.79673$

$\boxed{.20327}$

c) Given that an average of 4.75 hours was found for the sample of 30 turkeys, calculate and interpret a 95% confidence interval for the average cooking time of a 22-pound turkey. (ONLY calculate and interpret the interval) (5 pts)

(4.535, 4.965) hours

d) Is the parameter that you are trying to estimate in (c) in the interval? What is the parameter? (3 pts)

Yes $\mu = 4.6$

11) It is generally believed that farsightedness affects about 12% of children. A large school district gives vision tests to 121 randomly selected incoming kindergarten children.

a) Can we calculate the mean and standard deviation of the sampling distribution? If so, calculate each one (Show Conditions). (4 pts)

Random Samp ✓

10n < Pop Size ✓

$$\mu_{\hat{p}} = p = .12$$

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(.12)(.88)}{121}} = .0295$$

b) TRUE or FALSE: If we made a confidence interval more narrow we would become more confident in our results if our sample size stayed the same. (2 pts)

FALSE

12. Using the table shown for hours studied and test score, answer the following three questions.

a) What is the equation for the linear regression line to predict test score based on the number of hours studied? (3 pts)

Hours	Score %
0	57
1	68
3	64
5	78
9	90

$$\widehat{Score} = 59.109 + 3.414(Hours)$$

b) What is the value of the correlation coefficient and what type of correlation does the data show? (3 pts)

$r \approx .948$ Strong Positive

c) Using your prediction equation, what would the predicted test score be for someone who studied 6 hours? (3 pts)

$59.109 + 3.414(6)$

$\boxed{79.593}$