Pledge:

10/24/2008 | MATH 171 | Name: Solution
Dr. Lunsford | Quiz 3 | 30 Points Possible

Please show all work on this quiz. Please be sure to show all calculator input.

Problem I. A machine manufactures parts whose diameters vary according to the normal distribution with mean 40.2 centimeters (cm) and standard deviation 0.02 cm. (14 points total)

(a) If an inspector randomly selects a part manufactured by this machine, what is the percent chance that the part will have a diameter less than 40.18 cm? (4 points)

normalcdf(-1E99, 40.18, 40.2, .02) = .1586

$\boxed{16\% \text{ chance}}$

(b) If an inspector randomly selects nine parts manufactured by this machine, what is the percent chance that the nine parts will have an *average* diameter less than 40.18 cm? (4 points)

$$\sigma_{\bar{x}} = \frac{.02}{\sqrt{9}} = \frac{.02}{3} = .0067$$

normalcdf(-1E99, 40.18, 40.2, .0067) = .001417

$\boxed{.14\% \text{ chance}}$

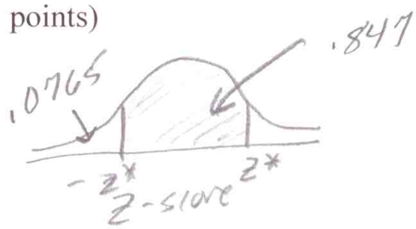
(c) Suppose the inspector conducts a z-test to test the hypothesis $H_0 : \mu = 40.2$ against $H_{alt} : \mu \neq 40.2$ where μ is the mean diameter of the part (in cm) when the machine is working properly. The inspector randomly selects 9 parts off the production line and determines their average diameter to be 40.18 cm. Assume that $\sigma = 0.02$ cm when the machine is working properly. What is the inspector's conclusion? You should compute the indicated items below to justify the conclusion. (6 points)

Test statistic (1 point): -3

p-value (1 point): $.002699 \approx .003 < .01$

Conclusion (in context of the problem, 4 points): Since our p-value is small ($p = .003 < .01$) we reject H_0 in favor of H_a. I.e. we have a significant result at the $\alpha = .01$ level. Thus the mean diameter of the parts produced by the machine is significantly different than 40.2 cm and hence the machine is not working properly.

Problem II. Suppose we want to compute an 84.7% confidence interval for a population mean. What is the critical value (i.e. value of z^*) we would need to use? (4 points)



$.847 + .0765 = .9235$

$\text{invNorm}(.9235) = \boxed{1.429}$

Problem III. It is desired to compute a 92% confidence interval to estimate the mean time (in seconds) to run the 100 yard dash for all college athletes. Please answer the following. (12 points total)

(a) What assumptions must be satisfied in order to compute a <u>z-interval</u> for this mean? Please make sure to state the assumptions <u>in the context of this problem</u>. (4 points)

1. We have a SRS of college athletes.
2. The standard deviation of the times to run the 100 yard dash for all college athletes (ie σ) is known.
3. The times to run the 100 yard dash for all college athletes are normally distributed (or n is very large)

(b) Suppose the 90% confidence interval computed was (12 seconds, 14 seconds). Write a complete English sentence explaining the meaning of the confidence interval <u>in the context of this problem</u>. (~~2~~ 4 points)

We are 90% confident that the mean time to run the 100 yard dash for all college students is between 12 and 14 seconds.

(c) What is the margin of error for the confidence interval given in part (b)? (2 points)

$\frac{14-12}{2} = 1$ $\boxed{\pm 1 \text{ second}}$

(d) How would the margin of error for the confidence interval given in part (b) be affected if a larger sample size was used to compute the confidence interval? (2 points)

The margin of error would decrease (assuming the same confidence level).