Valencia College
Division of Engineering, Computer Programming and Technology
EGS 2440 Probability and Statistics for Engineers
Spring 2015
Instructor: Kwabena Ofosu, Ph.D., P.E.

Name: _____

Quiz 6A

You will receive credit for showing your steps even if your final answers are wrong.

A manufacturer produces bearings used in machine parts. The manufacturer's advertisement states that the bearings have an average service life of 1600 hours. You have been hired by a regulatory agency to investigate this claim after complaints from the public. 100 bearings were tested and the average life was 1615 hours with a standard deviation of 120 hours. The regulatory agency requires that all claims be tested at 95% confidence level.
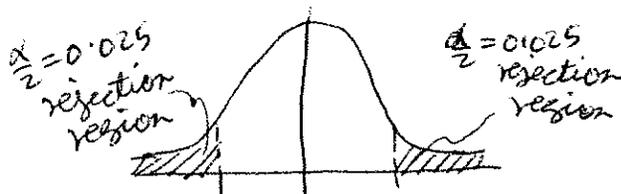
a) Define the null and alternate hypotheses needed to test the manufacturer's claim. (2 points)

$$H_0 : \mu = 1600$$
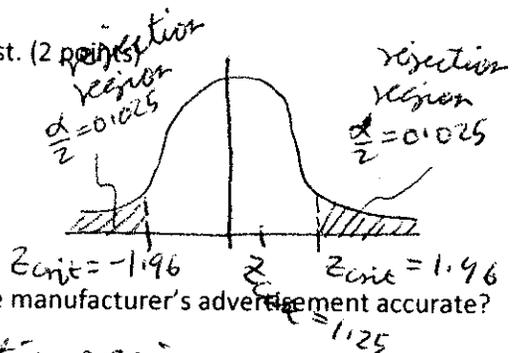$$H_a : \mu \neq 1600$$
$$\alpha = 0.05$$

b) Sketch the rejection region for this test (2 points)

$$n = 100 \longrightarrow Z\text{-tables}$$

c) Calculate the test statistic (or p-value) for this hypothesis test. (2 points)

$$Z_{calc} = \frac{\bar{X} - \mu_0}{S/\sqrt{n}} = \frac{1615 - 1600}{120/\sqrt{100}} = 1.25$$

$$Z_{crit} = -1.96 \qquad Z_{crit} = 1.96$$

d) Based on your sample and hypothesis test procedures, is the manufacturer's advertisement accurate? (2 points)

Z_{calc} does not fall in rejection region.

Fail to Reject H_0! The claim is valid

e) Construct a 95% confidence interval for the average service life of the bearings manufactured at this factory. (2 points)

$$CI = \bar{X} \pm Z_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}} ,$$

$$= \bar{X} \pm Z_{0.025} \frac{S}{\sqrt{n}} = 1615 \pm 1.96 \frac{(120)}{\sqrt{100}} = 1615 \pm 23.52$$

$$= [1591.48, 1638.52]$$

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Quiz 6B

You will receive credit for showing your steps even if your final answers are wrong.

A consumer advocacy group concerned about the fat content of a grade of steakburgher submits to an independent laboratory a random sample of 12 specimens for testing. The test sample had a mean fat content of 19g with a standard deviation of 3.11g. The restaurant menu claims the average fat content of this grade of steakburgher is less than 20g. The laboratory policy is that all claims be tested at 95% confidence level.

a) Define the null and alternate hypotheses needed to test the restaurant's claim. (2 points)
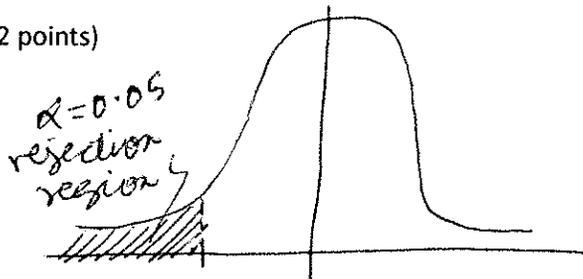
$$H_0 : \mu = 20$$
$$H_a : \mu < 20$$
$$\alpha = 0.05$$

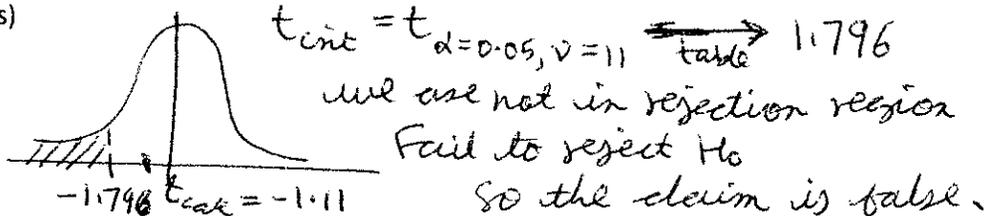b) Sketch the rejection region for this test (2 points)

$$n = 12 \rightarrow t\text{-table}$$

$\alpha = 0.05$
rejection region

c) Calculate the test statistic (or p-value) for this hypothesis test (2 points)

$$t_{calc} = \frac{\bar{X} - \mu_0}{S/\sqrt{n}} = \frac{19 - 20}{3.11/\sqrt{12}} = -1.11$$

d) Based on your sample and hypothesis test procedures, is the restaurant's claim valid? (2 points)

$$t_{crit} = t_{\alpha = 0.05, \nu = 11} \xrightarrow{table} 1.796$$

we are not in rejection region
Fail to reject H_0
So the claim is false.

$-1.796 \quad t_{calc} = -1.11$

e) Construct a 95% confidence interval for the average fat content of this steakburgher. (2 points)

$$CI = \bar{X} \pm t_{\frac{\alpha}{2}, \nu} \frac{S}{\sqrt{n}} \quad , \quad t_{\frac{\alpha}{2}, \nu} = t_{\alpha = 0.025, \nu = 11} \xrightarrow{table} 2.201$$

$$CI = 19 \pm 2.201 \frac{(3.11)}{\sqrt{12}} = 19 \pm 1.97 = \boxed{[17.03, 20.9]}$$