NAME:_____ **CH. 21 CW**

1. A large electric utility company claims that 80% of their customers are very satisfied with the service they receive. A local newspaper surveyed 100 randomly selected customers and found that only 72 were very satisfied. Is this evidence that the company's claim is too high?

(a) Test an appropriate hypothesis with a level of significance of 5%. (assume conditions have been met)

H_0: $p = 0.80$
H_A: $p < 0.80$

All conditions have been met to use the Normal model for a 1 proportion z-test.

$$p = 0.80; n = 100; \hat{p} = \frac{72}{100} = 0.72; \alpha = 0.05$$

$$z = \frac{0.72 - 0.80}{\sqrt{\frac{(0.80)(0.20)}{100}}} = -2$$

P(z < -2) = 0.0228

We reject the null hypothesis because the P-Value of 0.0228 < alpha = 0.05. There is statistically significant evidence that the true proportion of the utility company's customers that are very satisfied is less than 80%.

(b) Explain what the P-Value means in the context of this problem.

There is a 2.28% chance of getting a sample proportion of 72% satisfied customers or less, if the true proportion of very satisfied customers is really 80%.

(c) Create an appropriate confidence interval below:

Conditions have been met to use a Normal Model and a 1 proportion Z Interval

$$0.72 \pm (1.645)\sqrt{\frac{(0.72)(0.28)}{100}} = (0.64615, 0.79385)$$

We are 90% confident that the true percent of satisfied customers for this company is between 64.615% and 79.385%.

(d) If you had used a level of significance of 1% what would your results have been significant?

No, since the p-value is 0.0228, it would not be less than alpha of 0.05, and we would not have rejected the claim. Therefore the results would not have been significant.

(e) What is a Type I error in this context?

Concluding that the true percent of very satisfied customers is less than 80%, when it is not less than 80%.

(f) What is a Type II error in this context?

Concluding that the true percent of very satisfied customers is not less than 80%, when it is less than 80%.

(g) Describe the Power in the context of the problem.

The probability of concluding that the true percent of very satisfied customers is less than 80%, and it is less than 80%

(h) Suppose we increased the sample size to 250 (but keep the same level of significance of 5%). What would happen to Type I Error, Type II, and power? (just say increase, decrease, or same)

TYPE I = Same

TYPE II = Decrease

POWER = Increase

(i) Suppose we change our significance level to 1% (but keep the original sample size). What would happen to the Type I Error, Type II error, and Power? (just say increase, decrease, or same)

TYPE I = Decrease

TYPE II = Increase

POWER = Decrease