AP STATISTICS
CHAPTER 20-21 QUIZ

/10

NAME Key
PER _____

1. In an automobile factory, an auto worker's union spokesperson claims that 75% of union members will support a strike if their basic demands are not met. A company negotiator believes the true percentage is lower. He conducts a random sample of 125 union members and finds that 87 say they will strike. Perform a hypothesis test to determine whether this evidence supports the negotiator's belief at the 5% significance level.

p = the proportion of union members who will support a strike

$H_0: p = .75$
$H_a: p < .75$

one proportion z-test, $\alpha = .05$

$\hat{p} = \frac{87}{125} = .696$

condition	check
Random sample	stated
$n < 10\% N$	assume 125 is <10% of all union members
$np \geq 10$	$125(.75) \geq 10$ ✓
$n(1-p) \geq 10$	$125(.25) \geq 10$ ✓

$$z = \frac{.696 - .75}{\sqrt{\frac{.75(.25)}{125}}} = -1.39$$

$p = .0816$

Since $p > \alpha$, fail to reject H_0. There is not enough evidence to support the negotiator's belief (that the proportion of union members who will support a strike is lower than 75%).

2. Would your conclusion in #1 have been the same at the 1% significance level? What about 10%? Explain.

It would have been the same at 1% since $p > .01$, but at 10% we would have rejected H_0 based on the fact that $p < .10$.

3. The board of directors for Procter & Gamble is concerned after learning that several recent studies showed only 19.5% of people who use toothpaste buy Crest toothpaste. A marketing director suggests that the company invest in a new marketing campaign which will include advertisements and new labeling for the toothpaste. The research department conducts product trials in test markets for one month to determine if the market share (the percent of toothpaste users who buy Crest) ***increases*** with the new campaign. If it does, they will fully invest in the campaign and use it in all of their national markets.

(2) a) Define the parameter of interest and write the company's null and alternative hypotheses.

p = the proportion of toothpaste users who buy Crest

H_0: $p = .195$

H_a: $p > .195$

(2) b) In this context, describe a Type I error and the impact such an error would have on the company.

(Reject H_0 when it's really true)

The company decides that their market share has increased when it really hasn't. They waste $ investing in a campaign that doesn't work.

(2) c) In this context, describe a Type II error and the impact such an error would have on the company.

(Fail to reject H_0 when it's really false)

The company decides that the market share has not increased when it really has. They don't invest in the campaign + miss the opportunity to get more customers.

(2) d) The company has decided to use an alpha level of 0.01. Why (in the context of this situation) would they choose this level of significance? What are they risking by choosing this value? (Hint: the answers to these questions are related to parts (b) and (c)).

They are most concerned about a Type I error - they don't want to waste $ on a campaign that doesn't work. They are risking a higher chance of Type II error, missing the opportunity to get more customers.

(1) e) Based on the data they collected during the trial, the research department found that a 98% confidence interval for the proportion of all consumers who might buy Crest toothpaste was (0.16, 0.28). Can the company conclude that the new marketing campaign has been effective in the test markets? Explain.

No - since 19.5% is in the interval they can't conclude that market share increased.