AP Stats Ch 21 - Required Practice **Name: _____Per: ____**

#1. **Breast Cancer.** A course of treatment for breast cancer has a 5-year survival rate of 0.86. A new treatment has been tested on a sample of 50 volunteers and it was found that the 5-year survival rate for that sample was 0.94.

a) At the 0.05 significance level, do we have evidence that this new treatment is better than the old treatment?

b) What would be a type I error?

c) What is the probability of making a type I error?

d) What would be a type II error?

e) Which error is more serious? Type I or Type II? Explain.

f) In Europe, this new treatment has been used far longer and they have found a 5-year success rate of 0.97. What is the probability of making a type II error? What is the power of the test?

g) The effect size is the difference between p_0 and the TRUE, ACTUAL population proportion (which we will most likely never know). What happens to the power of the test as the effect size increases?

h) We have no control over the effect size. What could we control to decrease P(type II error) and hence increase the power of the test?

13. Testing cars. A clean air standard requires that vehicle exhaust emissions not exceed specified limits for various pollutants. Many states require that cars be tested annually to be sure they meet these standards. Suppose state regulators double check a random sample of cars that a suspect repair shop has certified as okay. They will revoke the shop's license if they find significant evidence that the shop is certifying vehicles that do not meet standards.

a) In this context, what is a Type I error?
b) In this context, what is a Type II error?
c) Which type of error would the shop's owner consider more serious?
d) Which type of error might environmentalists consider more serious?

15. Cars again. As in Exercise 13, state regulators are checking up on repair shops to see if they are certifying vehicles that do not meet pollution standards.

a) In this context, what is meant by the power of the test the regulators are conducting?
b) Will the power be greater if they test 20 or 40 cars? Why?
c) Will the power be greater if they use a 5% or a 10% level of significance? Why?
d) Will the power be greater if the repair shop's inspectors are only a little out of compliance or a lot? Why?

20. Ads. A company is willing to renew its advertising contract with a local radio station only if the station can prove that more than 20% of the residents of the city have heard the ad and recognize the company's product. The radio station conducts a random phone survey of 400 people.

a) What are the hypotheses?

b) The station plans to conduct this test using a 10% level of significance, but the company wants the significance level lowered to 5%. Why?

c) What is meant by the power of this test?

d) For which level of significance will the power of this test be higher? Why?

e) They finally agree to use $\alpha = 0.05$, but the company proposes that the station call 600 people instead of the 400 initially proposed. Will that make the risk of Type II error higher or lower? Explain.

22. Testing the ads. The company in Exercise 20 contacts 600 people selected at random, and only 133 remember the ad.

a) Should the company renew the contract? Support your recommendation with an appropriate test.

b) Explain carefully what your P-value means in this context.

Chapter 21 Practice Quiz

AP Statistics Quiz C – Chapter 21 ***Name*** _____

The owner of a small clothing store is concerned that only 28% of people who enter her store actually buy something. A marketing salesman suggests that she invest in a new line of celebrity mannequins (think Adam Sandler modeling the latest jeans…). He loans her several different "people" to scatter around the store for a two-week trial period. The owner carefully counts how many shoppers enter the store and how many buy something so that at the end of the trial she can decide if she'll purchase the mannequins.

1. Write the owner's null and alternative hypotheses.

2. In this context describe a Type I error and the impact such an error would have on the store.

3. In this context describe a Type II error and the impact such an error would have on the store.

4. Based on data that she collected during the trial period the store's owner found that a 98% confidence interval for the proportion of all shoppers who might buy something was (27%, 35%). What conclusion should she reach about the mannequins? Explain.

5. What alpha level did the store's owner use? _____

6. Describe to the owner an advantage and a disadvantage of using an alpha level of 5% instead.

7. The owner talked the salesman into extending the trial period so that she can base her decision on data for a full month. Will the power of the test increase, decrease, or remain the same?

8. Over the trial month the rate of in-store sales rose to 30% of shoppers. The store's owner decided this increase was statistically significant. Now that she's convinced the mannequins work, why might she still chose not to purchase them?