Practice Problems 3E

Directions: Answer the following questions.

1. Which error is often called a "false negative"?

2. Which error is often called a "false positive"?

3. What is the probability of a type 2 error occurring called?

4. What is the probability of a type 1 error occurring called?

5. What is the complement of the alpha level called?

6. What is the complement of the beta level called?

7. What could we do to decrease the probability that a type 2 error occurs?

8. What could we do to decrease the probability that a type 1 error occurs?

9. If we increase the significance level from 5% to 10% and keep the sample size the same, what will happen to the probabilities for type 1 and type 2 errors?

10. If we decrease the significance level from 5% to 1% and keep the sample size the same, what will happen to the probabilities for type 1 and type 2 errors?

11. What significance level achieves keeps both type 1 and type 2 errors relatively low?

12. Why do type 1 and type 2 errors sometimes occur?

13. If random sample data yielded a high P-value, what kind of error might occur?

14. If random sample data yielded a low P-value, what kind of error might occur?

15. A car company is debating whether to recall its vehicles because of a malfunction in its airbags. Executives think that the defect rate is probably low, but if the airbags malfunction and do not open in 2% or more of crashes, then they will need to put out a general recall. If there are relatively few defective airbags then the company prefers to fix them as needed and not put out a general recall. A random sample of vehicles have their airbags checked for defaults. (The study is currently using a 5% significance level.)

H_0 : p ≥ 0.02 (Large amount of malfunctioning airbags resulting in recalling all of the vehicles for replacement airbags.)

H_A: p < 0.02 (Relatively few malfunctioning airbags resulting in not recalling all of the vehicles for replacement airbags.)

   a) Write a description of a type 1 error and possible consequences of that error in the context of the problem.

   b) Write a description of a type 2 error and possible consequences of that error in the context of the problem.

   c) Would you recommend any changes to the significance level or sample size based on what you know about the type 1 and type 2 errors in this problem? Explain.

16.   Mike and his advertisement team have created an advertisement plan for a new flavor of soda. Right now, approximately 16% of soda drinkers are purchasing this flavor. Mike needs to show his bosses that his advertisement plan will increase the percentage of soda drinkers purchasing this new flavor. If Mike's advertising team succeeds in increasing the percentage of customers that prefer this new flavor, then the company will increase supply and make more of the soda to meet demand. If not, then the company will keep the supply as it currently is. After the advertising changes, Mike takes a random sample of customers to determine if the percentage of soda drinkers that like the new flavor has increased. (They are currently using a 5% significance level).

H_0: p = 0.16 (The company will not increase production of the new flavor of soda.)
H_A: p > 0.16 (The company needs to increase production of the new flavor of soda to meet the increased demand.)

a) Write a description of a type 1 error and possible consequences of that error in the context of the problem.

b) Write a description of a type 2 error and possible consequences of that error in the context of the problem.

c) Would you recommend any changes to the significance level or sample size based on what you know about the type 1 and type 2 errors in this problem? Explain.

17. Trisha is studying trends in a particular stock to determine if the price of the stock per week will increase or decrease. If the population slope (β_1) in dollars per week is negative, the stock price may decrease and she will recommend selling the stock. If the population slope (β_1) is zero or positive, the stock price may not decrease and she will recommend holding onto the stock.

H_0: $\beta_1 \geq 0$ (Trisha recommends keeping the stock.)
H_A: $\beta_1 < 0$ (Trisha recommends selling the stock.)

a) Write a description of a type 1 error and possible consequences of that error in the context of the problem.

b) Write a description of a type 2 error and possible consequences of that error in the context of the problem.

c) Would you recommend any changes to the significance level or sample size based on what you know about the type 1 and type 2 errors in this problem? Explain.

18. A global sportswear company is contemplating contributing money to a political candidate in the next election. The managers of the company do not want to contribute unless they are sure the candidate will get the majority of the population vote and win the election. Otherwise, the company will not contribute to the candidates' campaign.

H_0: p ≤ 0.5 (The company will not contribute to the political candidates' campaign.)
H_A: p > 0.5 (The company will contribute to the political candidates' campaign.)

a) Write a description of a type 1 error and possible consequences of that error in the context of the problem.

b) Write a description of a type 2 error and possible consequences of that error in the context of the problem.

c) Would you recommend any changes to the significance level or sample size based on what you know about the type 1 and type 2 errors in this problem? Explain.

19. A professional basketball team wants to determine whether they should spend millions of dollars to sign a player to a new contract. The team determines that they will sign the player if the population mean average number of points scored per game by the player will be at least twenty. If not, then they will not sign the player.

H_0: $\mu \geq 20$ (The team will sign the player to a new contract.)
H_A: $\mu < 20$ (The team will not sign the player to a new contract.)

a) Write a description of a type 1 error and possible consequences of that error in the context of the problem.

b) Write a description of a type 2 error and possible consequences of that error in the context of the problem.

c) Would you recommend any changes to the significance level or sample size based on what you know about the type 1 and type 2 errors in this problem? Explain.