4.4 review

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Select the most appropriate answer.

1) A Type I error occurs by 1) _____
   A) rejecting the null hypothesis when the null hypothesis is false.
   B) not rejecting the null hypothesis when the null hypothesis is false.
   C) not rejecting the null hypothesis when the null hypothesis is true.
   D) rejecting the null hypothesis when the null hypothesis is true.

2) A Type II error occurs by 2) _____
   A) not rejecting the null hypothesis when the null hypothesis is true.
   B) rejecting the null hypothesis when the null hypothesis is false.
   C) not rejecting the null hypothesis when the null hypothesis is false.
   D) rejecting the null hypothesis when the null hypothesis is true.

Solve the problem.

3) The level of significance, α, is the probability of making a 3) _____
   A) Type β error
   B) Type I error
   C) Correct decision
   D) Type II error

Classify the conclusion of the significance test as a Type I error, a Type II error, or No error.

4) A manufacturer claims that the mean amount of juice in its 16 ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a significance test to determine whether the mean amount is actually less than this. The hypotheses are: 4) _____

   H_0: $\mu = 16.1$ ounces

   H_a: $\mu < 16.1$ ounces

   Suppose that the results of the sample lead to rejection of the null hypothesis. Classify that conclusion as a Type I error, a Type II error, or a correct decision, if in fact the mean amount of juice, μ, is less than 16.1 ounces.

   A) Type II error
   B) Type I error
   C) No error

5) In the past, the mean lifetime for a certain type of flashlight battery has been 9.5 hours. The manufacturer has introduced a change in the production method and wants to perform a significance test to determine whether the mean lifetime has increased as a result. The hypotheses are: 5) _____

   H_0: $\mu = 9.5$ hours

   H_a: $\mu > 9.5$ hours

   Suppose that the results of the sample lead to rejection of the null hypothesis. Classify that conclusion as a Type I error, a Type II error, or a correct decision, if in fact the mean running time has not increased.

   A) Type II error
   B) No error
   C) Type I error

6) In the past, the mean lifetime for a certain type of flashlight battery has been 9.6 hours. The manufacturer has introduced a change in the production method and wants to perform a significance test to determine whether the mean lifetime has increased as a result. The hypotheses are: 6) _____

H_0: $\mu = 9.6$ hours

H_a: $\mu > 9.6$ hours

Suppose that the results of the sample lead to nonrejection of the null hypothesis. Classify that conclusion as a Type I error, a Type II error, or a correct decision, if in fact the mean running time has increased.

A) No error B) Type II error C) Type I error

For the given significance test, explain the meaning of a Type I error, a Type II error, or a correct decision as specified.

7) A health insurer has determined that the "reasonable and customary" fee for a certain medical procedure is $1200. They suspect that the average fee charged by one particular clinic for this procedure is higher than $1200. The insurer performs a significance test to determine whether their suspicion is correct using $\alpha = 0.05$. The hypotheses are: 7) _____

H_0: $\mu = \$1200$

H_a: $\mu > \$1200$

If the P-value is 0.09 and a decision error is made, what type of error is it? Explain.

A) Type II error. We conclude that the average fee charged for the procedure is not higher than $1200 when it actually is higher.

B) Type I error. We conclude that the average fee charged for the procedure is not higher than $1200 when it actually is higher.

C) Type I error. We conclude that the average fee charged for the procedure is higher than $1200 when it actually is not higher.

D) Type II error. We conclude that the average fee charged for the procedure is higher than $1200 when it actually is not higher.

8) At one school, the average amount of time tenth-graders spend watching television each week is 21.6 hours. The principal introduces a campaign to encourage the students to watch less television. One year later, the principal performs a significance test using $\alpha = 0.05$ to determine whether the average amount of time spent watching television per week has decreased. The hypotheses are: 8) _____

H_0: $\mu = 21.6$ hours

H_a: $\mu < 21.6$ hours

If the P-value = 0.04 and a decision error is made, what type of error is it? Explain.

A) Type I error. We conclude that the average amount of time spent watching television each week is less than 21.6 hours when it in fact is not.

B) Type II error. We conclude that the average amount of time spent watching television each week is 21.6 hours when it is in fact less.

C) Type I error. We conclude that the average amount of time spent watching television each week is 21.6 hours when it is in fact less.

D) Type II error. We conclude that the average amount of time spent watching television each week is less than 21.6 hours when it in fact is not.

Provide an appropriate response.

9) Suppose 1000 tests are run to test a null hypothesis using α =0.05. If the null hypothesis is true, about how many of these tests would you expect to show statistically significant results? 9) _____

A) 0
B) 50
C) 1000
D) cannot be determined from the information given
E) 5

In the situation below, indicate whether it makes more sense to use a relatively large significance level (such as α=0.10) or a relatively small significance level (such as α=0.01)..

10) Testing a new drug with potentially dangerous side effects to see if it is significantly better than the drug currently in use. If it is found to be more effective, it will be prescribed to millions of people. 10) _____

A) Large B) Small

11) Testing to see whether taking a vitamin supplement each day has significant health benefits. There are no (known) harmful side effects of the supplement. 11) _____

A) Small B) Large

A pharmaceutical company is testing to see whether its new drug is significantly better than the existing drug on the market. It is more expensive than the existing drug.

12) Which makes more sense to use, a relatively large significance level (such as α=0.10) or a relatively small significance level (such as α=0.01), for the company? 12) _____

A) Small B) Large

13) Which makes more sense to use, a relatively large significance level (such as α=0.10) or a relatively small significance level (such as α=0.01), for the consumers? 13) _____

A) Small B) Large

In the situation below,describe what it means in that context to make a Type I and Type II error. Testing a new drug with potentially dangerous side effects to see if it is significantly better than the drug currently in use. If it is found to be more effective, it will be prescribed to millions of people.

14) Making a Type I error means: 14) _____

A) We do not find any difference between the drugs.
B) We do not find enough evidence that the new drug is more effective but it really is more effective.
C) We find evidence that the new drug is more effective but it is really not any better.
D) none of these
E) We find evidence that the new drug is more effective..

15) Making a Type II error means: 15) _____

A) We do not find any difference between the drugs.
B) We find evidence that the new drug is more effective..
C) We do not find enough evidence that the new drug is more effective but it really is more effective.
D) none of these
E) We find evidence that the new drug is more effective but it is really not any better

Select the most appropriate answer.

16) By replicating a study and finding significant results again, we can be more confident that the results are indeed significant. 16) _____

A) False B) True

17) Smaller sample sizes make it easier to achieve statistical significance if the alternative hypothesis is true. 17) _____

A) True B) False

18) For a given level of significance, increasing the sample size will _____ the probability of committing a Type II error if the alternative hypothesis is true. 18) _____

A) not affect
B) always increase
C) sometimes increase
D) sometimes decrease
E) decrease

19) For a given level of significance, increasing the sample size will _____ the probability of committing a Type I error if the alternative hypothesis is true. 19) _____

A) sometimes decrease
B) always decrease
C) sometimes increase
D) always increase
E) not affect