Determining hypotheses

Experiments on learning in animals sometimes measure how long it takes a mouse to find its way through a maze. The mean time is 20 seconds for one particular maze. A researcher thinks that playing music will affect the time it takes the mice to complete the maze. She measures how long each of 12 mice takes with music as a stimulus.

1. State the appropriate null hypothesis H_0 and alternative hypothesis H_A.

Understanding levels of significance

1. Explain in plain language why a significance test that is significant at the 5% level must always be significant at the 10% level. Draw a picture!

2. You are told that a significance test is significant at the 5% level. From this information can you determine whether or not it is significant at the 1% level.

3. Explain whether a test of significance can answer each of the following questions.
   a. Is the sample or experiment properly designed?

   b. Is the observed effect compatible with the null hypothesis?

   c. Is the observed effect important?

4. Justify whether or not you agree with each of the following statements.
   a. If the p-value is larger than 0.05, the null hypothesis is true.

   b. Practical significance is not the same as statistical significance.

   c. We can perform a statistical analysis using any set of data.

   d. If you find an interesting pattern in a set of data, it is appropriate to then use a significance test to determine its significance.

Alcohol Awareness

A study of alcohol awareness among college students reported a higher awareness for students enrolled in a health and safety class than for those enrolled in a statistics class. The difference is described as being statistically significant. Explain what this means in simple terms and offer an explanation for why the health and safety students had a higher mean score.

What's Wrong?

Here are several situations where there is an incorrect application of the ideas presented in this section. Write a short paragraph explaining what is wrong in each situation and why it is wrong.

1. A researcher tests the following null hypothesis: $H_0 : \bar{x} = 23$

2. A study with $\bar{x} = 45$ reports statistical significance for $H_a : \mu > 50$.

3. A researcher tests the hypothesis $H_0 : \mu = 350$ and concludes that the population mean is equal to 350.

4. A test preparation company wants to test that the average score of their students on the ACT is better than the national average score of 21.1. They state their null hypothesis to be $H_0 : \mu > 21.2$.

5. A study summary says that the results are statistically significant and the p-value is 0.98.