

**1** A statistical test aids a researcher in deciding whether an experimental effect is due to chance. What does this mean? Is it possible to know for sure that an effect was not due to chance? Explain your answer.

Compare and contrast:

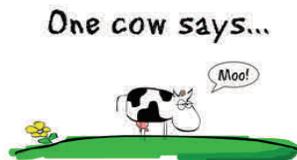
- 2** ✱ Standard error of mean versus standard deviation
- ✱ Normal curve distribution versus a sampling distribution of means

Stormy, a skiing coach, wants to help her skiers, ages 8 – 12, be faster on the slalom course. She uses a new, fancy, wax on their skis at the next race. The 32 skiers have a mean speed of 51.5 seconds. The population for the age group has  $\mu = 52.8$  sec. Suppose that a one-sample t test reveals that this difference is significant. **In four or five sentences**, objectively discuss these findings—what they mean, how they can be used, what this means for the team, etc. Be careful to avoid subjective terminology while still emphasizing the importance of these findings. Just get comfortable talking about statistical findings and going beyond the numbers. **3**



What happens to the boundaries for the critical region when the alpha level is lowered – from .05 to .01? What happens to the probability of a Type I error when the alpha level is lowered? **4**

The Russel Caddle Beef Company wants to estimate the average weight of a steer in its current herd. A random sample of 51 cows showed the mean weight to be 400 lbs. The sample standard deviation is  $s = 141.42$  lbs. **5**



Find the 99% confidence interval for the population mean.

Interpret this result (explain your findings in terms a non-science person could understand).



For each of the following, indicate whether it is an example of Type I or Type II error:

- ✱ Telling someone that he has a disease when he does not.
- ✱ Telling someone to go home and take an aspirin when in fact he needs immediate treatment.
- ✱ Convicting an innocent woman of a crime.
- ✱ Letting a guilty woman go free.
- ✱ Failing a drug test when you do not use drugs.

Unethical researchers know that one can

cheat with hypothesis testing. That is, they know that a researcher can stack the deck in his or her favor, making it easier to reject the null hypothesis. (The best researchers always stack the deck against themselves, knowing that their results are more reputable if they reject the null hypothesis even under conservative conditions).

- ✱ If you wanted to make it easier to reject the null hypothesis, what are two specific things you could do?
- ✱ Would it change the actual mean difference between your samples?
- ✱ Why is this a potential problem with hypothesis testing? **7**

For each of the following situations, write the null and alternative hypotheses in words and symbols.

- The average respiration rate is 8. Do smokers have an average rate significantly different (statistically) from 8?
- The average score on the Beck Depression Inventory is 12. Does the average depression score of mothers with young children deviate significantly from the population mean? **8**
- The average miles per gallon (mpg) of American cars is 20. Is the observed mpg of a sample of Corvettes significantly different from that of the average American car?

Bjorn Talooz, a Norwegian exchange student, would like to estimate the amount of money he spends daily. A sample of 10 days shows the average expenditure to be \$6.24 per day. Use  $s = \$2.28$  for your calculations.

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Please help Bjorn find a 95% confidence interval estimate for his average expenditures.



Explain what this confidence interval means, in practical terms.



All other things being equal, what would happen to the confidence interval if Bjorn took a larger sample?



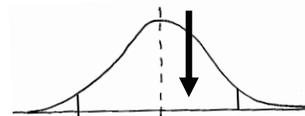
What would happen to the confidence interval if Bjorn used a 99% interval?

"IT HAS NOW BEEN PROVEN BEYOND A DOUBT THAT SMOKING IS THE MAJOR CAUSE OF STATISTICS."

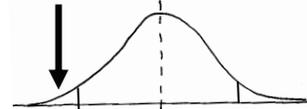
-AUTHOR UNKNOWN

For each statement, match either " $p < .05$ " or " $p > .05$ ," given  $\alpha = .05$ .

- A. The computed t did not exceed the critical t value.
- B. The computed t fell in the critical region.
- C. The probability of Type I error was less than 5%.
- D. The test statistic did not fall in the critical region.
- E. The probability of Type I error was greater than 5%.
- F. The study failed to reject the null hypothesis.
- G. The null hypothesis was rejected.
- H. Computed  $t = .84$



- I. Computed  $t = -2.7$



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