An Example of Inference   **Math 121 - Workshop**

The herbal supplement Garcinia Cambogia is advocated by Dr. Mehmet Oz (a celebrity doctor) as an effective weight loss aid. A 1998 study of 135 people found that it was not significantly better than a placebo. Here is the abstract from the study.

A total of 135 subjects were randomized to either active hydroxycitric acid [The active ingredient in G. Cambogia] ($n = 66$) or placebo ($n = 69$); 42 (64%) in the active hydroxycitric acid group and 42 (61%) in the placebo group completed 12 weeks of treatment. Patients in both groups lost a significant amount of weight during the 12-week treatment period; however, between-group weight loss differences were not statistically significant (mean [SD], 3.2 [3.3] kg vs 4.1 [3.9] kg; $P = 0.14$).

This table summarizes the data described above:

Group	N	$\bar{x}$	s
Treatment	42	4.1	3.9
Control	42	3.2	3.3

1. This is an example of a randomized controlled experiment. Why is it important to use a randomized experiment in this situation instead of an observational study?

2. What are the explanatory and response variables?

3. According to the study, "patients in both groups lost a significant amount of weight". It is a little surprising that patients in the placebo group lost a significant amount of weight! Do a one-sample t-test to see if this is correct. What are the hypotheses? What is the t-value, and what is the p-value? You can use the interactive formula sheet and t-distribution app to speed up your calculations.

4. While both groups lost a significant amount of weight, the important question is whether the people taking Garcinia Cambogia lost significantly more weight than people taking a placebo. Do a two-sample t-test to find out. What are the correct hypotheses, what is the t-value, and what is the p-value? Do you get a p-value that is close to what the researchers reported ($P = 0.14$)?

5. According to the researchers, the effect of Garcinia Cambogia is not statistically significant. Which of the following options best describes what this means?

   A. Garcinia Cambogia definitely does not increase weight loss.

   B. Garcinia Cambogia is no different than a placebo, on average.

   C. The observed difference between the Garcinia Cambogia group and the placebo group might have been random chance.

   D. The observed difference between the Garcinia Cambogia group and the placebo group was not very large.

6. One big advantage of confidence intervals over hypothesis tests is that confidence intervals let you estimate the **effect size** of a treatment. Make a 95% confidence interval for the difference in mean weight loss between the two groups.