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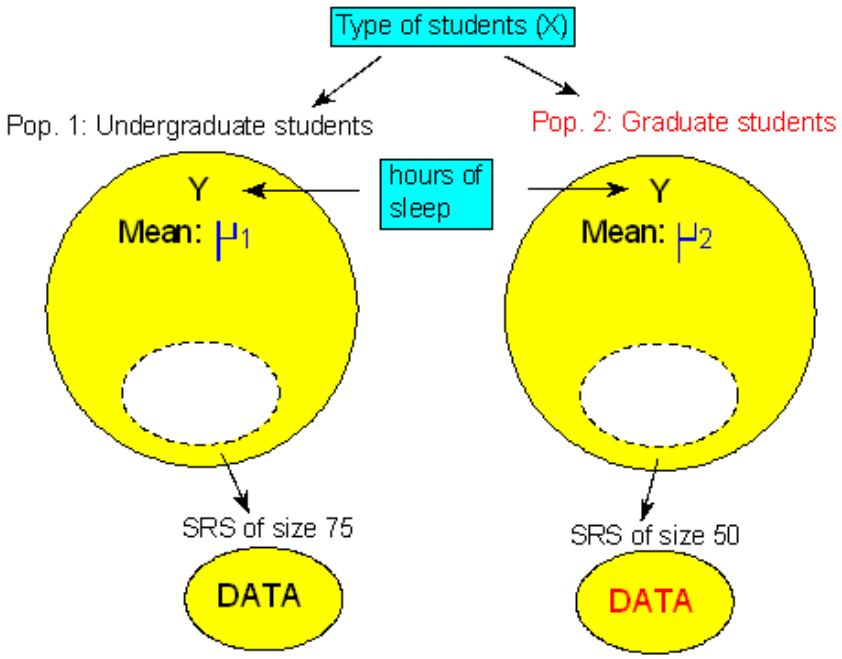
Learn By Doing Activity

Scenario: Sleeping Habits of Undergraduate and Graduate Students

The purpose of this activity is to give you guided practice in carrying out the two-sample t-test, and to show you how to use software to aid in the process.

Background

A study was conducted at a large state university in order to compare the sleeping habits of undergraduate students to those of graduate students. Random samples of 75 undergraduate students and 50 graduate students were chosen and each of the subjects was asked to report the number of hours he or she sleeps in a typical day. The thought was that since undergraduate students are generally younger and party more during their years in school, they sleep less, on average, than graduate students. Do the data support this hypothesis? The following figure summarizes the problem:



Note that we defined:

μ_1—the mean number of hours undergraduate students sleep in a typical day

μ_2—the mean number of hours graduate students sleep in a typical day

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State the null and alternative hypotheses that are being tested here.

Your Answer:

Ho: μ1 - μ2 = 0
Ha: μ1 - μ2 < 0

Our Answer:
Since we want to check whether the data supports the claim that undergraduate students sleep less, on average, than graduate students, we are testing: H0: μ1 − μ2 = 0 Ha: μ1 − μ2 < 0

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Explain why we can safely use the two-sample t-test in this case.

Your Answer:

Both sound independently sampled, and both sample sizes are large enough

Our Answer:
We can safely use the two-sample t-test in this case since: • Both samples are random, and therefore independent. • The sample sizes (75 and 50) are quite large, and therefore we can proceed regardless of whether the populations are normal or not.

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Comment: Before we move on to carry out the test, it is important to realize that in the two-sample problem, the data can be provided in three possible ways:

(i) Sample data in one column, and another column that indicates which sample the observation belongs to. Recall that this is the way the data were given in our leading example (looks vs. personality score and gender):

Score (Y)	Gender (X)
15	Male
13	Female
10	Female
12	Male
14	Female
14	Male
6	Male
17	Male
...	...

Note that essentially, one column contains the explanatory variable, and one contains the response. (ii) Sample data in different columns—data from each of the two samples appear in a column dedicated to that category. As you'll see, this is the way the data are provided in this example:

Undergraduate	Graduate
6	8
5	5
3	6
612	6
...	...

(iii) Summarized data—we are not given the actual data, but just the data summaries: sample sizes, sample means and sample standard deviations of both samples. Recall that in our second example, the data were given in this format.

	n	$\bar{y}$	S
20-29 yrs old	712	83.4	18.7
75+ yrs old	1001	78.5	19.0

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We carry out the two-sample t-test and get the following results: Based on the output, what conclusions would you draw?

Your Answer:

I don't see it :(

But i'll just base on the p-value to accept or reject, essentially

Our Answer:

The p-value is not small (in particular, it is larger than 0.05), indicating that it is still reasonably likely (probability 0.111) to get data like those observed, or even more extreme data, under the null hypothesis (i.e., assuming that undergraduate and graduate students have the same mean sleeping hours). Therefore, the data do not provide evidence to reject Ho, and we cannot conclude that undergraduate students sleep less, on average, than graduate students.

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