

Worksheet B

Imagine that you are studying whether a new drug called Memofil improves memory by giving participants a list of words to remember and then measuring how many words they can recall two hours later. Using this scenario, determine what would constitute the null hypothesis, the alternative hypothesis, Type I error, and Type II errors.

H₀: _____
 H₁: _____

	<i>Accept H₀</i>	<i>Reject H₀</i>
<i>Null Hypo. (H₀) is True</i>	Correct Decision	
<i>Alt. Hypo. (H₁) is True</i>		Correct Decision

The Excel worksheet given to you by lab instructor contains the data obtained in that experiment. Every time you press Apple key and = simultaneously, Excel recalculates the dataset simulating replication of the experiment.

CASE 1. We will start with simulation in which there is no difference between two means (in other words, Memofil has no effect on memory). Before you begin collecting the results of replications, answer the following questions:

1. What kinds of p-values do you expect to obtain when you conduct your replications?

2. Do you think that you will be able to reject the null hypothesis for any replication? (Assume that we reject null hypothesis if $p < 0.05$) _____
3. In your own words, how would you interpret $p = 0.01$? _____

Conduct 10 replications and record your results.

	Placebo mean	Experimental mean	p	Placebo mean	Experimental mean	p
1						6
2						7
3						8
4						9
5						10

4. Can you reject null hypothesis for any of your replications? _____
5. Do you think that any of your classmates rejected null hypothesis for any of their replications?

Worksheet B

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- Instructor will now share how many replications resulted in rejection of the null hypothesis. Record this proportion here: _____
 - Given that the two samples were truly identical, the proportion above should be equal to zero. In your own words, explain why this is not the case:

CASE 2. Now, let's assume that Memofil enhances memory a little bit, and the average enhancement is equal to 5%. Before you begin a new set of replications, answer the following questions:

- What kinds of p-values do you expect to obtain when you conduct your replications?

- Do you think you that you will be able to reject the null hypothesis for all replications?

Type 5 into TRUE DIFFERENCE field and conduct another 10 replications, recording your results below:

	Placebo mean	Experimental mean	p		Placebo mean	Experimental mean	p
1				6			
2				7			
3				8			
4				9			
5				10			

- Can you reject null hypothesis for all of your replications? _____
- Do you think that all of your classmates rejected null hypothesis for all of their replications?

- Instructor will now share how many replications resulted in rejection of the null hypothesis. Record this proportion here: _____

- Given that the two samples were truly different, the proportion above should be equal to one. If it is not, then explain why this is not the case:

Worksheet B

CASE 3. Finally, let's consider the case in which Memofil substantially enhances memory, and the participants' performance is improved by an average of 15%. Before you begin a new set of replications, answer the following questions:

14. What kinds of p-values do you expect to obtain when you conduct your replications?

15. Do you think you that you will be able to reject the null hypothesis for all replications?

Type 5 into TRUE DIFFERENCE field and conduct another 10 replications:

	Placebo mean	Experimental mean	p		Placebo mean	Experimental mean	p
1				6			
2				7			
3				8			
4				9			
5				10			

16. Can you reject null hypothesis for all of your replications? _____

17. Do you think that all of your classmates rejected null hypothesis for all of their replications?

18. Instructor will now share how many replications resulted in rejection of the null hypothesis.

Record this proportion here: _____

FINAL OBSERVATIONS. Given the results of your simulations, do you think that p-value represents a probability of replicating the results? Why (or why not)?

Do you think that p-value represents a probability of obtaining true result (i.e., the probability that the alternative hypothesis is true)? Why (or why not)?

Check your answer to (3). How would you interpret $p = 0.01$ now?
