

Complete Examples

1. Is a soda-dispensing machine performing according to specification? Pepsi's dispensing machine is designed to fill bottles with exactly 2 liters of their product. To test if the machine is performing according to specification, we collect a sample of 100 "2-liter" bottles. The average quantity contained in the sample bottles is $\bar{x} = 1.985$ liters. The sample standard deviation of the fill is $s = 0.05$. Test whether the machine is in control, at the 5% level of significance.

(a) What are the population and the sample?

(b) What are the null and alternative hypotheses?

(c) What is the test statistic?

(d) Approximately what is the p -value?

(e) What assumptions are you making?

(f) What is α ? What is the result of the test?

2. Before Facebook's recent redesign, the mean number of ad clicks per day was 100K. In the 49 days after the redesign, the mean number of ad clicks per day was 105K and the standard deviation was 35K. Is there significant evidence that the redesign affected the expected number of ad clicks? Perform a test at the 5% level.

(a) What is the sample? What is the population?

(b) What are the null and alternative hypotheses?

(c) What is the test statistic?

(d) Approximately what is the p -value?

(e) What assumptions are you making?

(f) What is α ? What is the result of the test?

Types of Errors

3. In a hypothesis test, our decision will either be “reject H_0 ” or “do not reject H_0 ”. Under what situations will each of these decisions be in error?

4. We reject H_0 when the p -value is below α .
 - (a) If H_0 is true, what is the probability of making a Type I error?

 - (b) If H_0 is false, what is the probability of *not* making a Type II error?

More p -values

5. Suppose we perform a hypothesis test and we observe a p -value of $p = .02$. True or false: There is a 2% chance that the null hypothesis is true.

6. Suppose we perform a hypothesis test and we observe a p -value of $p = .02$. True or false: If we reject the null hypothesis, then there is a 2% chance of making a type I error.

7. Suppose we perform a hypothesis test and we observe a T test statistic $t = -2.02$, corresponding to a p -value of $p = .02$. True or false: If we were to repeat the experiment and the null hypothesis were actually true, then there would be a 2% chance of observing a test statistic at least as extreme as $t = -2.02$.