

2. Before Facebook's recent redesign, the mean number of ad clicks per day was 100K, and the standard deviation was 35K. In the 49 days after the redesign, the mean number of ad clicks per day was 105K. Is there significant evidence that the redesign affected ad clicks? Perform a test at the 5% level, assuming the redesign did not affect the population standard deviation.

(a) What are the null and alternative hypotheses?

(b) What is the test statistic?

(c) What is the rejection region?

(d) What assumptions are you making?

(e) What is the result of the test?

Tests on the population mean (unknown variance)

3. This is a variation of problem 1. A certain population has unknown mean μ and unknown standard deviation σ . You want test (at significance level 5%) the null hypothesis $H_0 : \mu = 2$ against the alternative $H_a : \mu \neq 2$. To this end, you collect a sample of size $n = 100$. The sample mean is $\bar{x} = 1.985$ and the sample standard deviation is $s = 0.5$.

(a) What is the test statistic?

(b) What is the rejection region?

(c) What assumptions are you making?

(d) What is the result of the test?

(e) How is this problem different from problem ???

One-sided alternatives

4. The average nicotine content of a brand of cigarettes must be less than 0.5 mg for it to qualify as a Low Nicotine brand. The manufacturer of Lucky Strikes Cigarettes claims that it is a Low Nicotine brand. To test this claim, the FDA takes a random sample of 20 cigarettes (one pack) of Lucky Strikes. They find an average nicotine content of 0.4 mg, with a sample standard deviation of 0.2 mg. Test the manufacturer's claim, at the 1% level of significance. Assume that the nicotine measurements are normally distributed.

(a) What are the population and the sample?

(b) What are the null and alternative hypotheses?

(c) What is the test statistic?

(d) What is the rejection region?

(e) What assumptions are you making?

(f) What is the result of the test?