

Discussion 5.1

[Science](#), [Statistics](#)



Discussion 5 Discussion 5 Example A manufacturer measured the hardness of 25 pieces of an alloy of steel that were sub-critically manufactured, and attained the following data; 167, 163, 179, 187, 167, 174, 156, 174, 179, 159, 179, 156, 170, 174, 179, 170, 156, 183, 156, 187. The manufacturer sets a hypothesis that the mean hardness of all such pieces is greater than 170.

Null hypothesis, $H_0: \mu = 170$

Alternative hypothesis, $H_1: \mu > 170$

The mean hardness = 172.5

Standard deviation can be evaluated to be 10.31

= 2.06

The Test statistic t

t = 1.22

The manufacturer sets a significance level = 0.05 and uses the critical value approach; he would reject the null hypothesis if test statistic is greater than 1.70109 using t table.

Since the manufacturer's test statistic $t = 1.22$ is not greater than 1.7109, the operator fails to reject the null hypothesis. Thus the value of the test statistic does not fall in the critical regions.

There is insufficient evidence at = 0.05 level to conclude that the average hardness is greater than 170.

Example 2

A Phillips bulb manufacturing company claims that a particular model of light bulbs have a lifespan of 850 hours with a standard deviation of 50. A student

thinks that the manufactures have overestimated the lifespan of the bulbs 40 hours higher. How many bulbs should the student test to prove his hypothesis with reasonable confidence.

Solution

We test the lifespan of the light bulb

Null hypothesis

$H_0: \mu = 850$

$H_1: \mu = 810$

Taking type I error $\alpha = 0.05$

The probability that the test rejects the null hypothesis = 0.90

Applying strata sampsi statistical analysis package

Sampsi 850 810, SD (50) power (0.9) one sampsi

$H_0: m = 850$ where m is the population mean

$\alpha = 0.05$

Power = 0.90

$H_1: m = 810$

SD = 50

The result from the command gives a sample of $n = 17$

From the above, it implies that at least 17 light bulbs ought to be tested to reject the null hypothesis under the given hypothesis H_1

Example 3

A butter manufacturing industry is concerned about the fat content of a certain grade of butter. The manager submits 12 butter samples in the lab for analysis. The percentage of fat in each of the samples was given as 15, 21, 19, 18, 18, 14, 22, 24, 19, 24, 18 and 16. The manufacturer claims that

the average fat content of this butter should not exceed 20%. Given that the standard deviation is 3.0 use t-hypothesis testing to advise the consumers based on the validity of the industrys claim.

Solution

$H_0: \mu = 20\%$

$H_1: \mu < 20\%$ of course 1 tailed

Significance level, $\alpha = 0.05$

Degrees of freedom, $v = n - 1 = 11$

Critical region, $t < -1.796$

The average of the 12 samples gives 19.0

The standard deviation= 10.545

Test statistic=-1.07

The value of the test statistic does not lie in the critical region, therefore, there is no enough evidence to support the manufacturers claim.