P-value and α level

How to calculate the example of the presentation in SPSS

Problem Statement

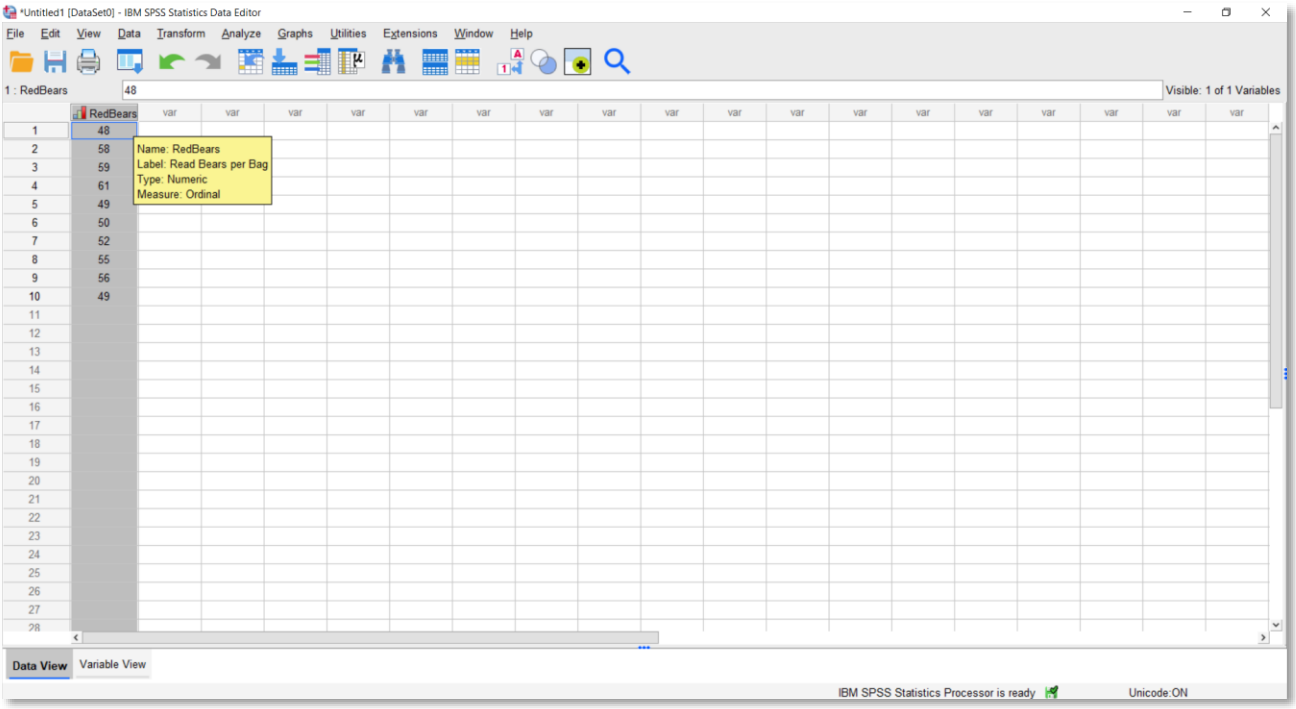
The manufacturer says their gummy bear bags with 100 gummy bears in each have an average of 50 red bears in them. We, as critical scientists, formulate the following hypotheses:

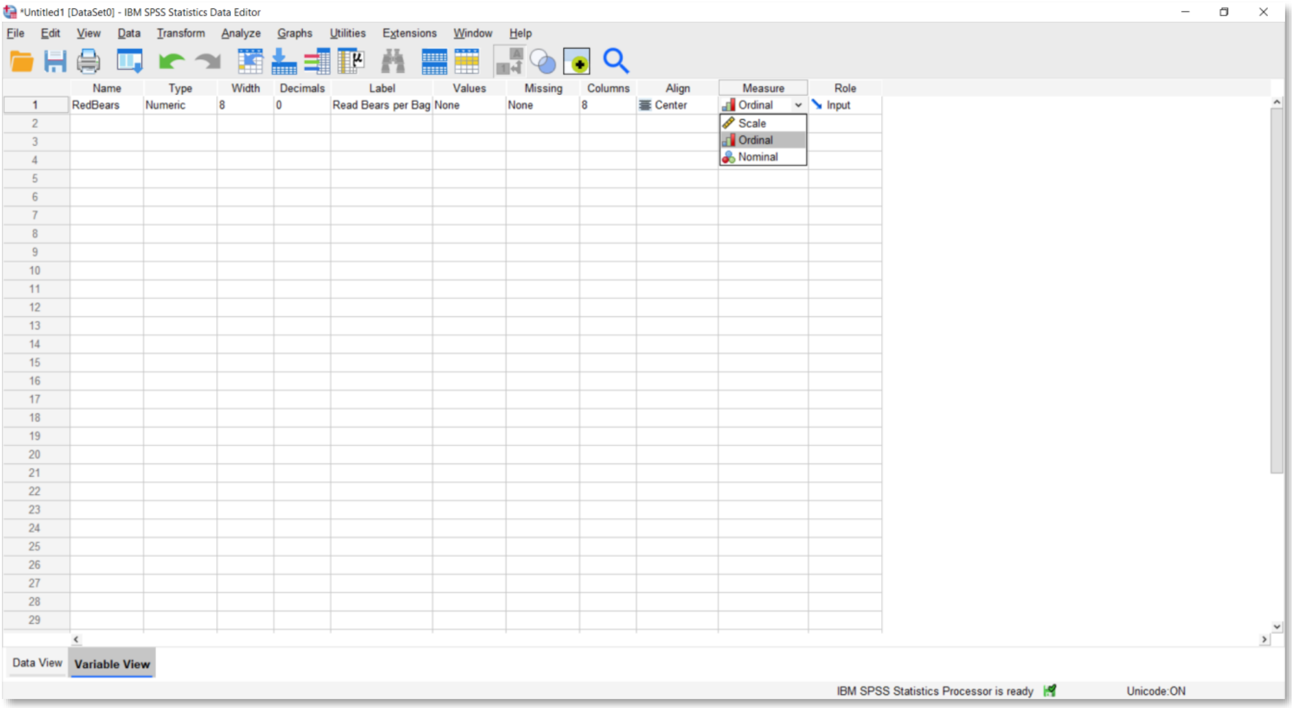
H0: The average of red bears in each bag is 50.
in other words: H0: $\mu = 50$

H1: The average of red bears in each bag is different from 50.
in other words: H1: $\mu \neq 50$

Data collection

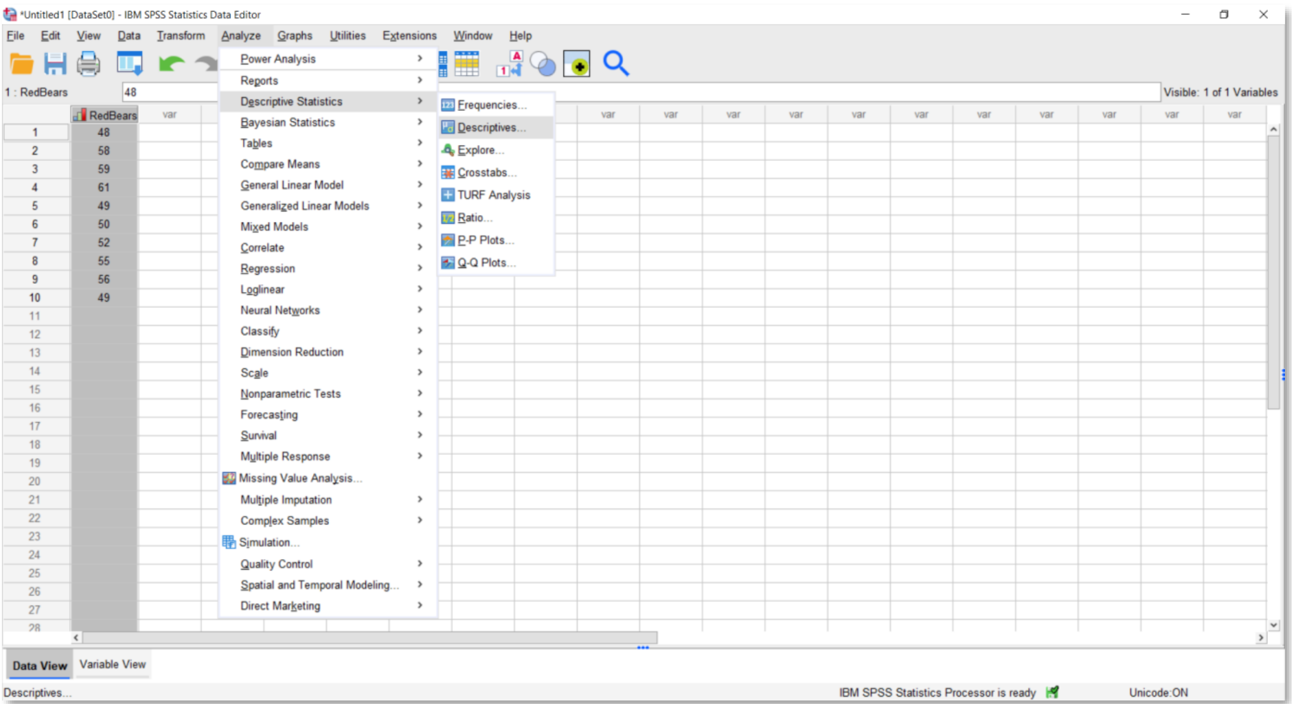
We buy 10 bags and count the red bears of each bag. Now we open SPSS and put the data (the number of red bears per bag) as a variable in and adjust its characteristics.

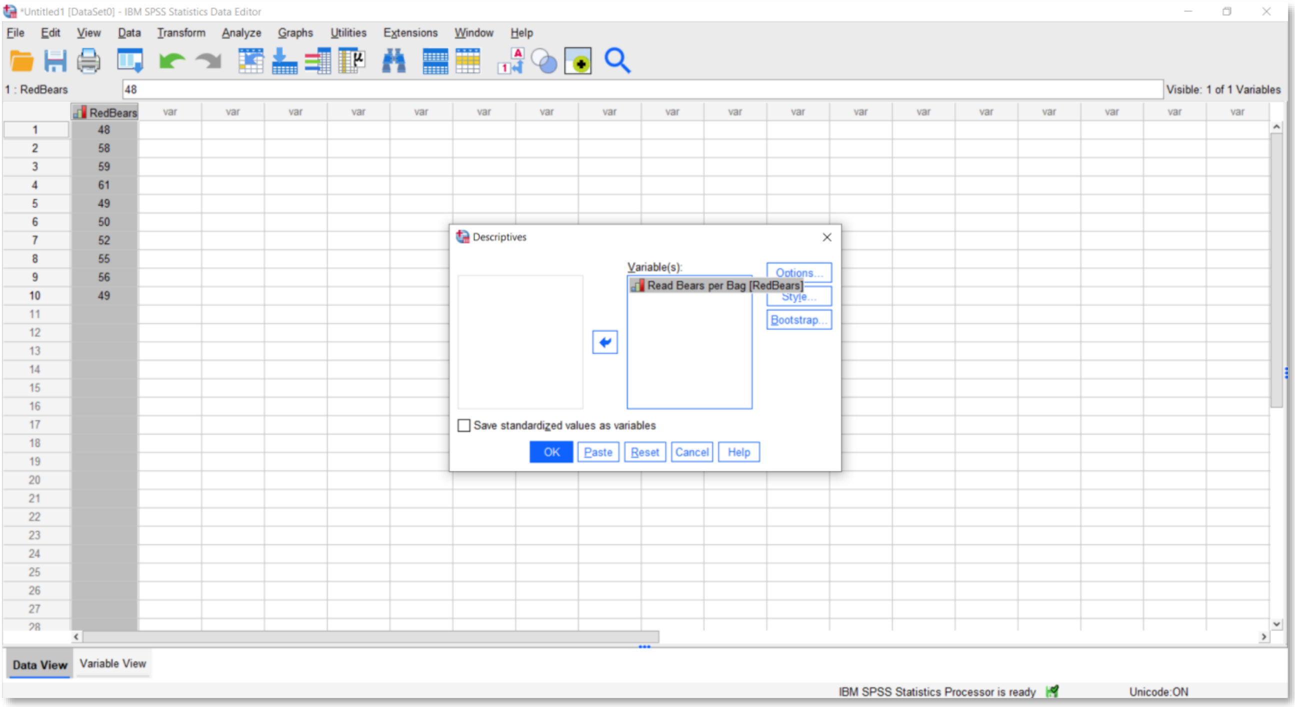


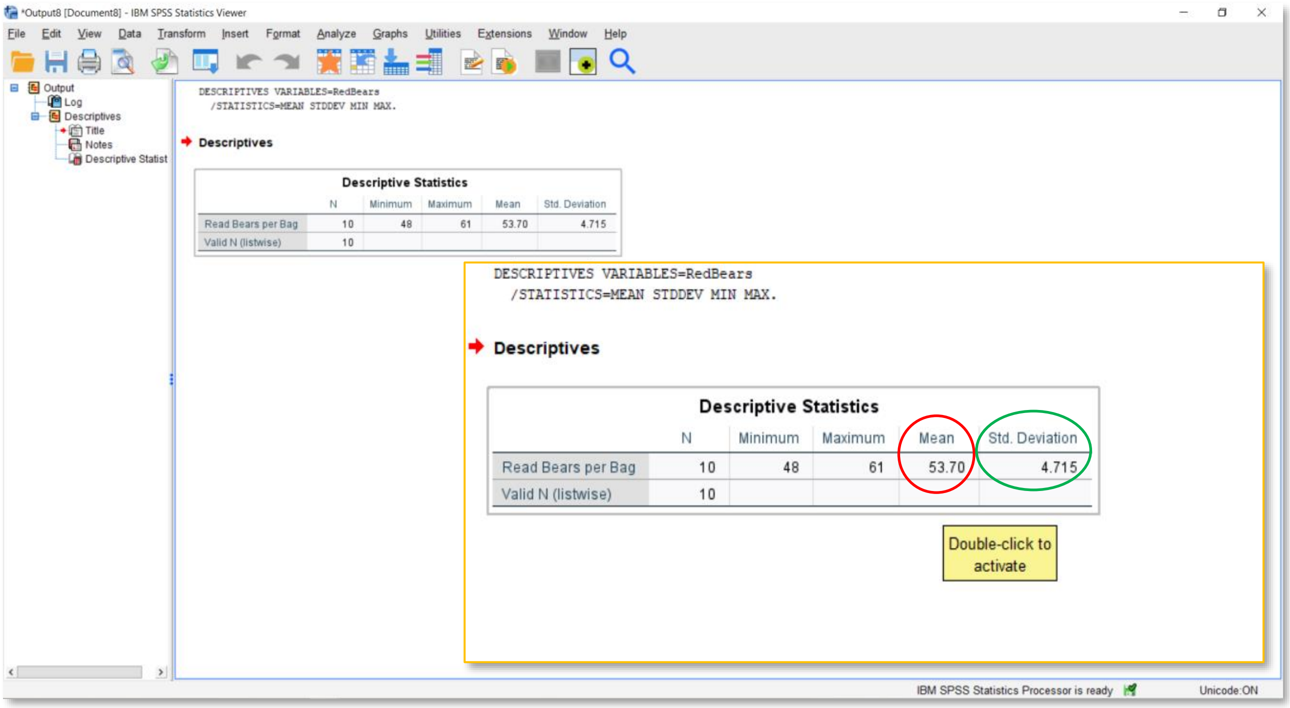


Mean and standard deviation calculation – descriptive statistics

Now we calculate the mean ($\bar{x}$) and the standard deviation (SD) of the red bears per bag.



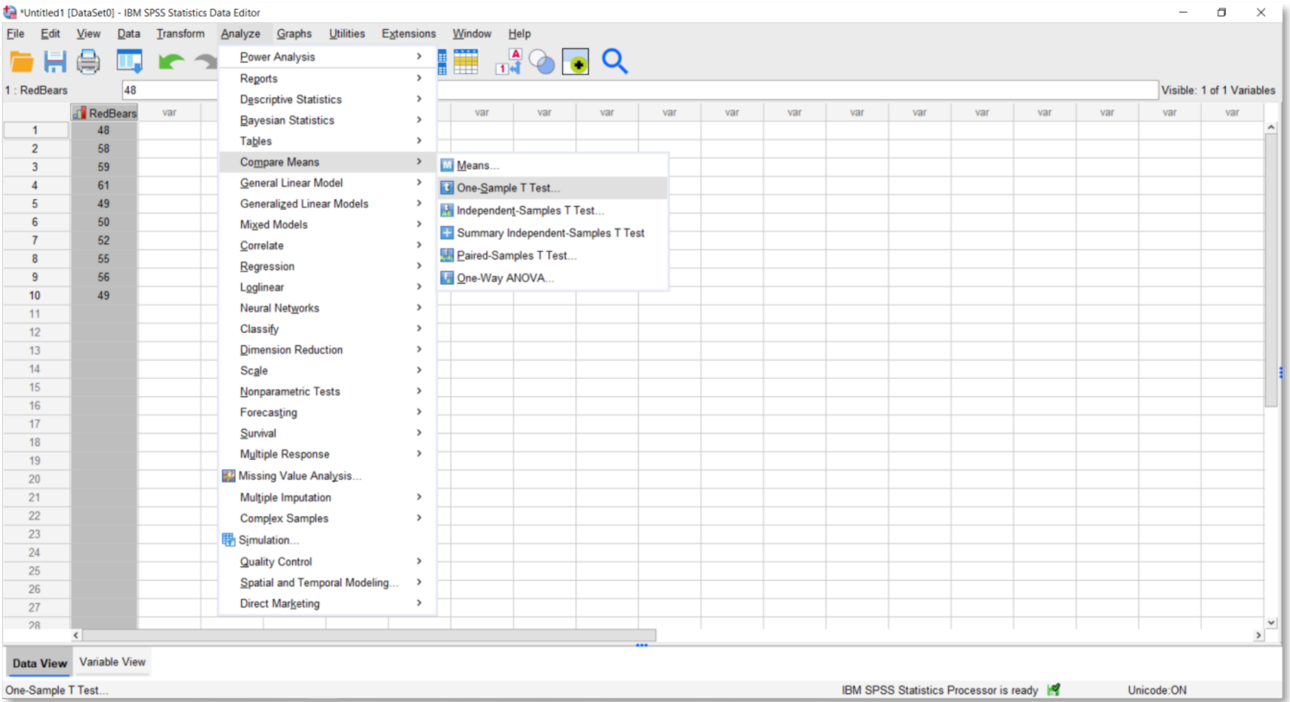


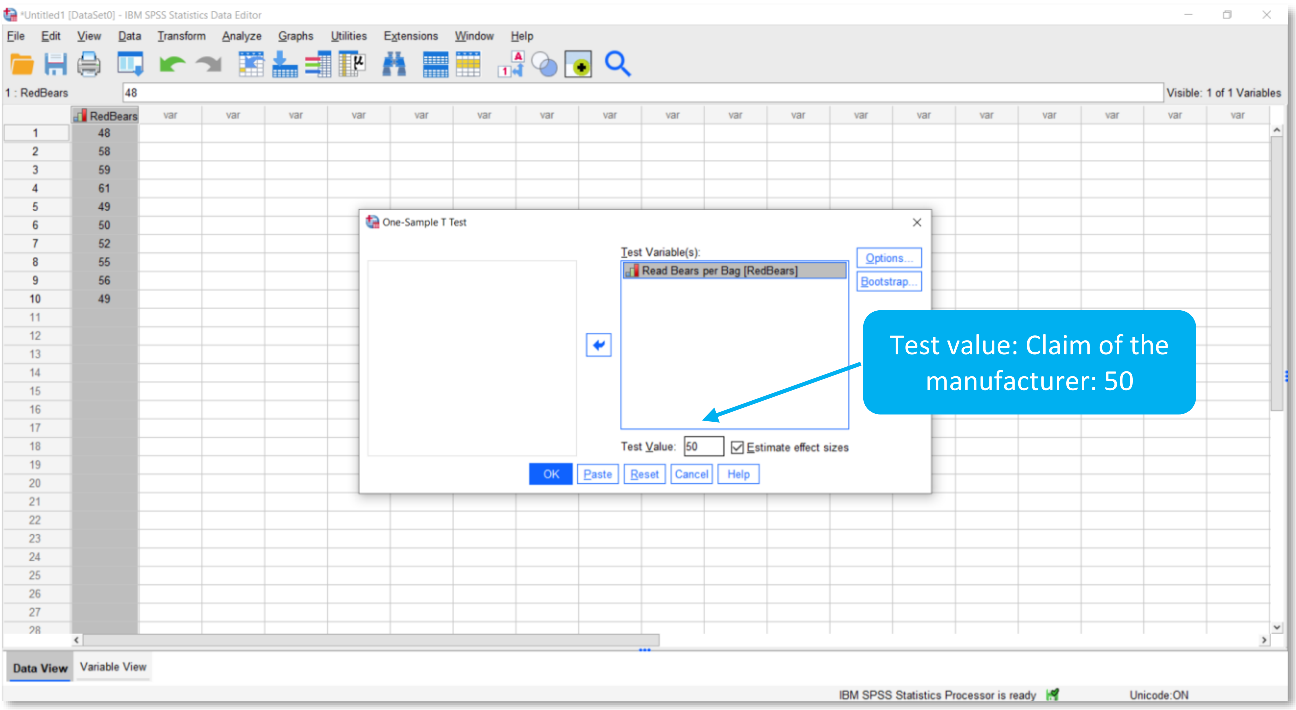


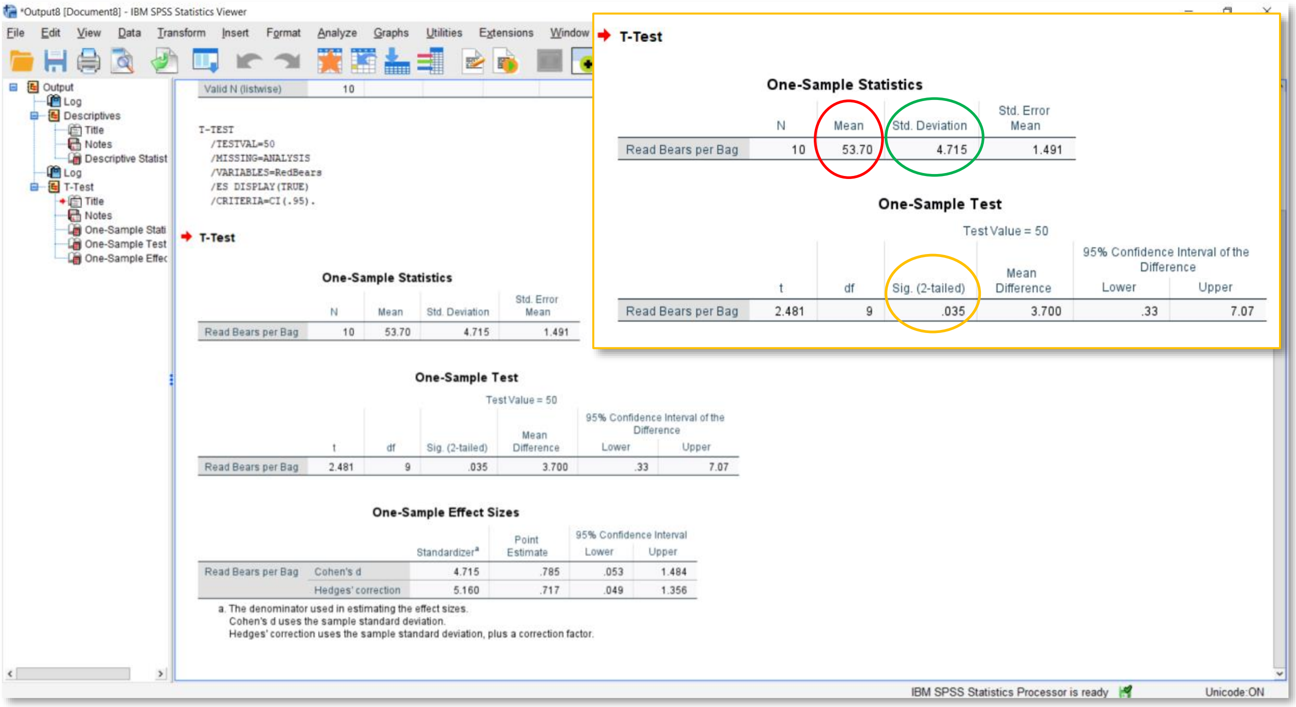
There are on average 53.70 red bears per bag. And the SD for our sample is 4.715. This means, that there are on average **more** than 50 red bears in each bag. Good for us. Nevertheless, the seller seems to be a liar as he claimed to give us **exactly** 50 red bears per bag.

One-sample t-test – inferential statistics

To test our result for statistical significance, we perform a one-sample-t-test. We set the alpha-level (α) as the probability of rejecting the null hypothesis when the null hypothesis is actually true. In other word: It is the probability of making a wrong decision. It is set by the scientist and often at α = 0.05, meaning we tolerate a chance of 5% being wrong when rejecting it.







T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Read Bears per Bag	10	53.70	4.715	1.491

One-Sample Test

	Test Value = 50					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Read Bears per Bag	2.481	9	.035	3.700	.33	7.07

The p-value (yellow circle) is below the set alpha-level of 0.05. We can successfully reject the H_0, thus we can claim, that the manufacturer is **lying to us** and we proved it with statistical significance.