Treatment	Endurance	Treatment	Endurance
Placebo	417	Vitamin	145
Placebo	279	Vitamin	185
Placebo	678	Vitamin	387
Placebo	636	Vitamin	593
Placebo	170	Vitamin	248
Placebo	699	Vitamin	245
Placebo	372	Vitamin	349
Placebo	582	Vitamin	902
Placebo	363	Vitamin	159
Placebo	258	Vitamin	122
Placebo	288	Vitamin	264
Placebo	526	Vitamin	1052
Placebo	180	Vitamin	218
Placebo	172	Vitamin	117
Placebo	278	Vitamin	185

Example 1:

The effect of a single 600 mg dose of vitamin C versus a sugar placebo on the muscular endurance of fifteen male volunteers (19-23 years old) was evaluated. Three initial maximal contractions were performed for each subject, with the greatest value indicating maximal grip strength.

H_o = There is no statistically significant difference between vitamin C and a sugar placebo on muscular endurance.
H_a = There is a statistically significant difference between vitamin C and a sugar placebo on muscular endurance.

A. A Is the data continuous? Yes
B. Amount of data? 30 data points
C. Looking for differences or correlations? Differences (you only have two categories - Vitamin C or not)
D. So, a t-test would be best

Results:

Calculations and Result

	x_1		x_2
Mean	393.20	**Mean**	344.73
$\sum x_1$	5898.00	$\sum x_2$	5171.00
$\sum x_1^2$	2807740.00	$\sum x_2^2$	2925605.00
s_1 =	34903.3143	s_2 =	81642.0667
n_1 =	15	n_2 =	15
t =	0.550		
D.F.	28		

t-value – this is calculated from your data

Compare the test statistic (t or z) against the critical value for (n1 + n2 -2) Degrees of Freedom at the p = 0.05 significance level. If t is greater than the critical value reject the Null Hypothesis and accept that there is a significant difference between the two sets of data. If t is greater than the critical value at p = 0.01 then we can say there is a highly significant difference between the two sets of data.

Critical values

p = 0.05	2.048
p = 0.01	2.763

Critical value at p=0.05. This will change depending on your data

Final Result

Not Significant
Not Significant

What you would put in your lab report:

Stat Test Used	Stat value	Critical value at p=0.05	Significance
t-test	0.550	2.048	None

The results of the t-test show that the results of this experiment are not significantly significant because the t-value was well below the critical value at p=0.05. The suggests that vitamin C does not affect muscle endurance and we accept the null hypothesis…..(here you would tie it into other pieces of evidence - graphs, averages, SD)

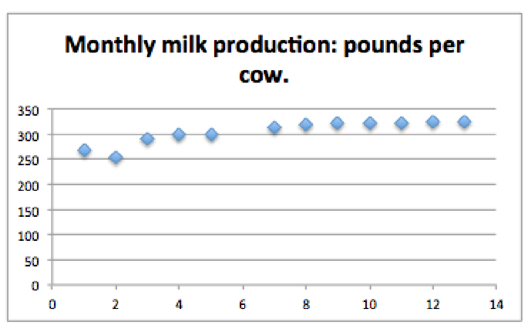
Example 2:

A farmer wanted to see if there was was a change in milk production over 13 months. The farmer had changed the diet of his cows.

H_o = There is no significant correlation between milk production and the diet of of the cows.
H_a = There is a significant correlation between milk production and the diet of of the cows.

Month	Monthly milk production: pounds per cov
1	268
2	255
3	291
4	298
5	300
7	314
8	320
9	321
10	322
11	321
12	324
13	325

1. Is the data continuous? Yes
2. Amount of data? 13 data points
3. Looking for differences or correlations? Correlations (does the food affect milk production?)
4. So, Spearman's rank would be best, but we need to check if it is monotonic data:



Yes, it is. The data shows an upward positive trend.

Results:

Calculations and Results

Sum (∑D) =	0
$\sum D^2$=	5.5
Count (n) =	12
$n(n^2-1)$ =	1716
r_s =	0.98076923

Critical Values

p = 0.05	0.5874
p = 0.01	0.7273

Compare the test statistic (rs) against the critical value for n Degrees of Freedom. If rs is greater (ignore the sign) than the critical value at p = 0.05 then reject the Null Hypothesis and accept that there is a significant correlation between the two variables. Results can be highly significant if rs is greater than the critical value at p = 0.01

Final Result

Significant $p < 0.05$

Highly Significant $p < 0.01$

Stat Test Used	Stat value	Critical value	Significance
Spearman's Rank	0.981	p=0.05 - 0.587 p=0.01 - 0.727	Highly significant

The Spearman's rank test was used because the farmer was looking at how the diet would affect the amount of milk produced. Graph 1 shows that the data is monotonic, also supporting the use of Spearman's rank. The results of the Spearman's rank test show that the data was highly significant at p=0.1 as the r_s value (0.981)was higher than the critical value at p=0.01 (0.727). So, the null hypothesis is rejected and we accept the alternative hypothesis…..(here you would tie it into other pieces of evidence - graphs, averages, SD)

Example:

Research Question: How do different body positions, (standing, sitting, lying flat on front/back, crouching) affect the decrease of heart rate after physical exercise as measured by the percent change in heart rate after 5 minutes?

Statistics:

Stat test used: Mann-Whitney U Test

H_0 = There is no statistical difference between the 2 body positions
H_a = There is a statistical difference between the 2 body positions

Table 6: Statistical Test between 2 Body Positions, With Stat Values, Critical Values, and Significance (If so/not)

Body positions	Stat value	Critical value at p=0.05	Significance
Standing and Sitting	8	5	No
Standing and flat on back	0	5	Yes
Standing and flat on front	6	6	Yes
Standing and crouching	0	5	Yes
Flat on back and Flat on front	10	5	No

✓ If the statistical value is greater than the critical value, there is no statistical difference (null hypothesis is accepted), however if it is the same or less than the critical value, there is a statistical difference (alternative hypothesis is accepted).

In Table 5, it can be seen that the decrease in heart rate was highest at 44.3 bpm for the flat on front position. Then, the second greatest decrease was the flat on front position, being that of 44.3 bpm. This does make sense, as the positions of lying flat does not require your heart to pump blood against gravity and the body is on a leveled position. Lying on the front and on the back does not have a significant difference as statistically tested in Table 6. Therefore, there is not a vast difference between the 2 positions; but both compared to the rest do serve to show that a leveled position is more desirable when needing to decrease the heart after physical exercise. However, the statistical analysis (Table 6) does show a statistical difference in standing compared to the other positions, (except for sitting). Standing like mentioned previously, will cause the blood to move against gravity, requiring more energy, and thus requiring a faster heart rate as the heart has to work harder.