

202211 2000 words report 2

by Charlie Wilkins

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Experimental Data Analysis

Introduction

The task for this assignment is a comparison of data for class test results (marked out of 20) of 40 Year 5 school children who are learning mathematical concepts in a local primary school. The school had been given a maths learning App free of charge by a locally based online learning application development company. The company wish to analyse the use of the app as a learning tool and hope that the findings from the results will help them to decide whether they should proceed with the development. The initial results show the achievements of the children when using traditional materials to help them learn and the second set shows the results achieved when the children use a new online app to help with their studies.

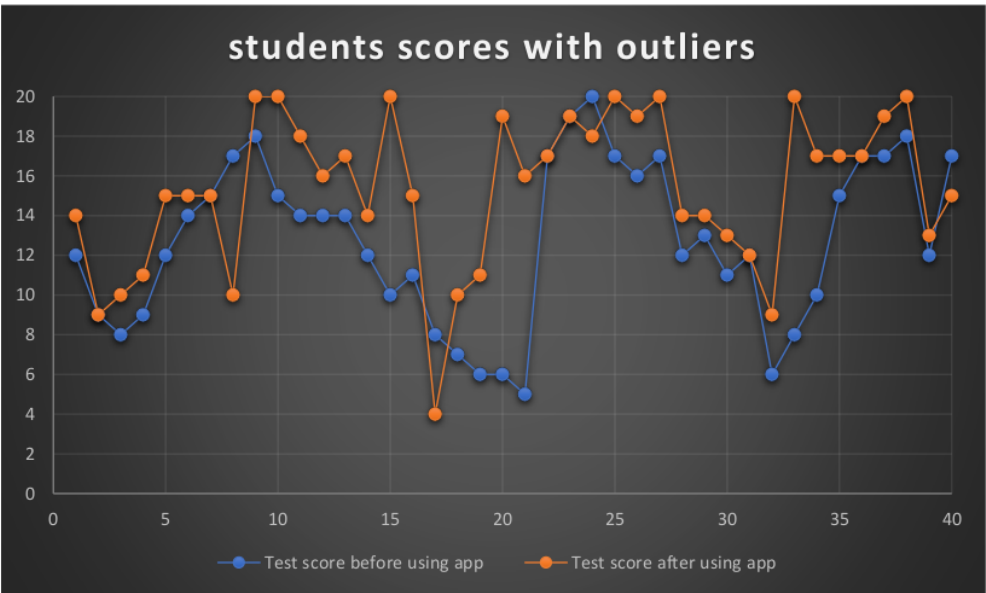
Provide a description of the data including a set of descriptive statistics.

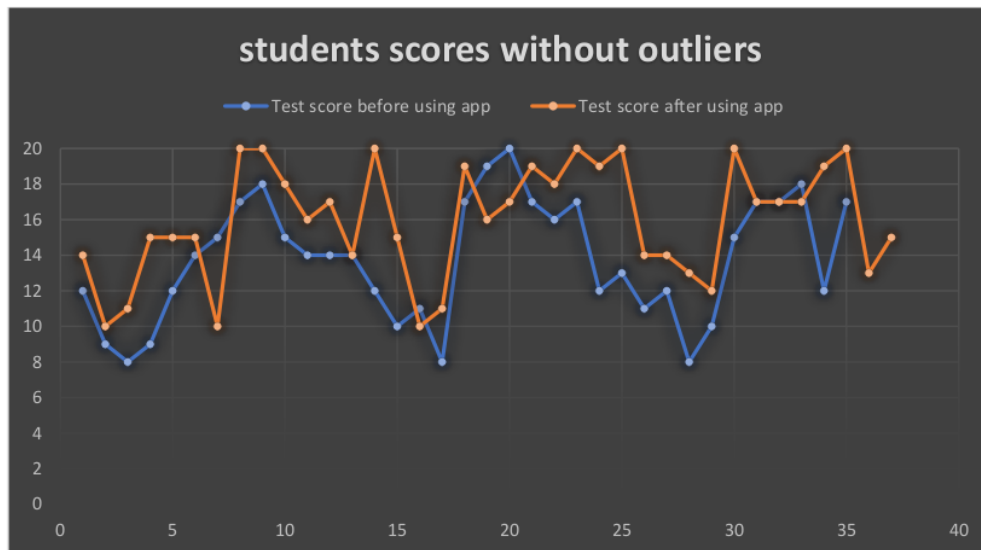
The following table displays the data in multiple different formats which allow an analysis of the App.

For each student I have calculated the change between before using the App and after using app so that it is possible to see if this has benefited the children.

Figure 1. Calculated the average score for before and after app and for overall students.

I have created a series of graphs, the first of which is a line graph based on each student's average scores that show difference in scores before and after use of app.





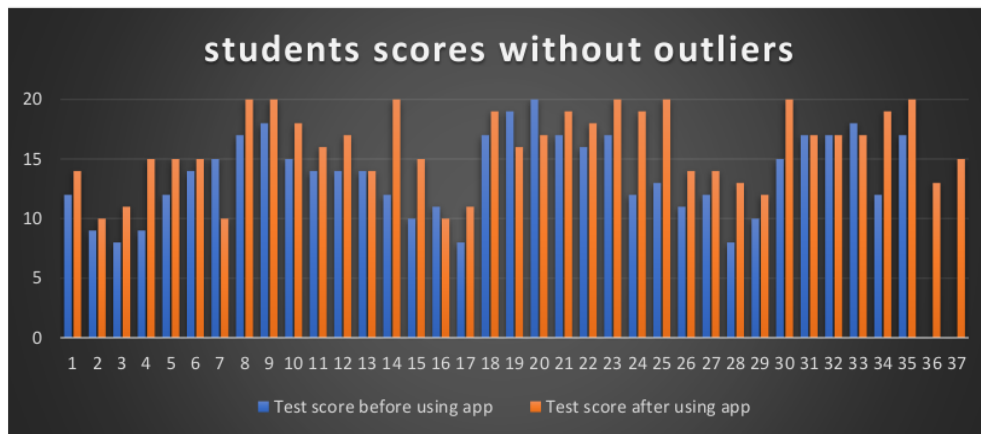
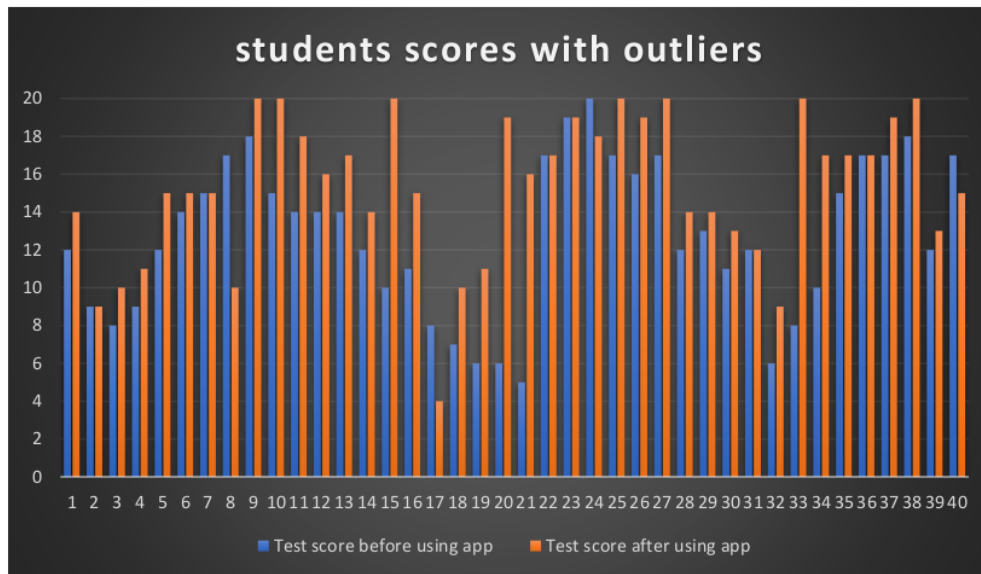
Hypothesis 1. All students will be able to use the App equally and their score will be improved by using the App.

The graph allows a view of each student's results – most had an increased score but there were 4 students with a reduced score, with others with no change for 6 students. This means that 30 students or 75% scored better, but on average only by 2.55 which equates to a 20% increased score which is generally good.

The hypothesis being tested is that the app improved students' results. This hypothesis was proven correct by the data.

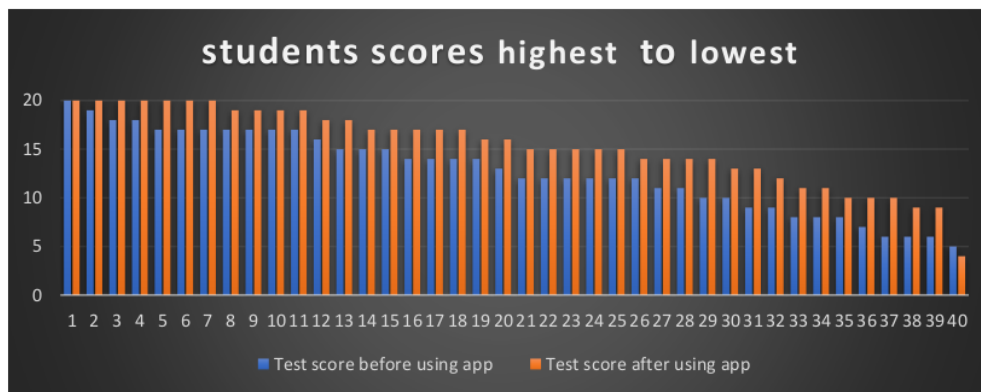
The null hypothesis is that there would be no change to the exam score and that the t- test is to disprove the null hypothesis showing that the original one is true.

The students' scores with and without outliers has been represented in a different format as a bar graph.



Develop a set of testable hypotheses for the experiment.

Two graphs were developed to show the before and after use of App test scores. The first one shows before the App was used and the second one shows the same data but rearranged in highest to lowest scores. The hypothesis is the students will have higher scores after using the App, and the null hypothesis is that the results will be the same depending on the T test values which were calculated to different p values which were 0.1, 0.05, and 0.01. This was done with and without outliers. So, this produced an unbiased view of the data and can be used for comparison.



Select a suitable test to be used to test these hypotheses and justify your choice of test.

The T test was used with the different scales of significance because it uses them in its calculation and works with proving and disproving a hypothesis and null hypotheses. It can be used on paired data, for example boys' heights at a particular age and a later age, or temperature between morning and afternoon in the different months of the year.

Higher values of the t-value, also called t-score, **indicate that a large difference exists between the two sample sets**. The smaller the t-value, the more similarity exists between the two sample sets.¹

Test your hypotheses to significance levels of 0.10, 0.05 and 0.01 and report on which hypothesis is accepted in each case.

With the values from the T test which were completed 6 times, these had different outcomes excluding the outliers in the second set of T test which were calculated.

Confidence levels of 90%, 95% and 99% are widely used in science and in industry:

1. In the first T Test. at 0.10
2. In the first T Test. at 0.01
3. In the first T Test. at 0.05
4. In the first T Test. at 0.10
5. In the first T Test. at 0.01
6. In the first T Test. at 0.05

Investigate whether there are any outliers in the data. If outliers exist then speculate on what might have caused them, and investigate whether removing them makes any difference to the results.

There were outliers within the data.

¹ <https://www.google.com/search?client=safari&rls=en&q=t+test+value+in+assessing+test+scores&ie=UTF-8&oe=UTF-8>

When investigating whether the outliers had affected the data, a scatter graph was created to make it clear where the outliers are. Once removed from the data and recalculated, this shows the difference and allows a clear view of how the outliers had originally affected the data.

T test	Before app	t Critical two-tail	After app	t Critical two-tail
0.05	0.000172403190717714	2.02	0.0000461396634206614	2.03
0.01	0.000172403190717714	2.71	0.0000461396634206614	2.72
0.10	0.000172403190717714	1.68	0.0000461396634206614	1.69

Discuss any other factors that might have affected the results but have not been considered in the stated experimental setup. How might you control these factors?

There are a number of maths learning Apps for children, the most popular of which are The Counting Caterpillar², the Maths Learning Centre³, Splash Maths⁴, Maths Slide⁵ and Reflex Math⁶.

The other factors affecting the results are the ability of the children to use the Apps. This may vary greatly depending on their intellect and application. The aim of education is to make sure that everyone is on an even playing field, so even if they have special needs, then they get the extra time or reading the software if needed.

The trial tried to ensure equal access to the App but there are several environmental factors such as their access to computers, internet, time to complete the homework, support from parents which is variable across the group.

Real world matters affecting the participants include:

Age

Intellect

Access to internet

Time for learning

Parental support

Ethnicity/Race

English language ability (ie English as first language spoken at home and ability)

Private or public educated previous to test

Whether private tutors have been used in support of learning.

The way that these factors could be controlled is to provide the resources in school. This would mean access to the computer, time to use it and teacher support during the working day. This should even the playing field and enable all children to access the App equally.

What time of day It when is because if they are doing this can make them tired and then Less effective use of the app or later in the day after they've done a lot of work already So they will be tired?

² <http://bellamon.com/countingcaterpillar/>

³ <https://www.mathlearningcenter.org/apps>

⁴ <https://uk.splashlearn.com>

⁵ <https://www.mathsadventures.co.nz>

⁶ <https://www.reflexmath.com>

When it comes to that age, they are kids, so they haven't learned a lot of ways to learn or what type of learner they are To help them Learn efficiently.

With parental support different ethnic groups and races Have different methodology and ideas on how to bring up their children So some may be very hands on and some completely hands off Richard have a big impact on the kids if they needed help from parents.

Some parents can afford private tutoring and learning support This could give them more of a edge when it comes to their learning and wouldn't be able to be tested and a test of before and after app use in mathematics.

With Outliers

0.05

t-Test: Paired Two Sample for Means

	<i>Test score before using app</i>	<i>Test score after using app</i>
Mean	12.97297297	15.94594595
Variance	20.8048048	10.38588589
Observations	37	37
Pearson Correlation	0.542243053	
Hypothesized Mean Difference	0	
df	36	
t Stat	-4.630923338	
P(T<=t) one-tail	2.30698E-05	
t Critical one-tail	1.688297714	
P(T<=t) two-tail	4.61397E-05	
t Critical two-tail	2.028094001	

0.01

t-Test: Paired Two Sample for Means

	<i>Test score before using app</i>	<i>Test score after using app</i>
Mean	12.97297297	15.94594595
Variance	20.8048048	10.38588589
Observations	37	37
Pearson Correlation	0.542243053	
Hypothesized Mean Difference	0	
df	36	
t Stat	-4.630923338	
P(T<=t) one-tail	2.30698E-05	
t Critical one-tail	2.434494061	
P(T<=t) two-tail	4.61397E-05	
t Critical two-tail	2.71948463	

0.1

t-Test: Paired Two Sample for Means

	<i>Test score before using app</i>	<i>Test score after using app</i>
Mean	12.97297297	15.94594595
Variance	20.8048048	10.38588589
Observations	37	37
Pearson Correlation	0.542243053	
Hypothesized Mean Difference	0	
df	36	
t Stat	-4.630923338	
P(T<=t) one-tail	2.30698E-05	
t Critical one-tail	1.305513886	
P(T<=t) two-tail	4.61397E-05	
t Critical two-tail	1.688297714	

with outliers

p=0.05

t-Test: Paired Two Sample for Means

Mean	12.75	15.3
Variance	16.80769231	15.29230769
Observations	40	40
Pearson Correlation	0.530985814	
Hypothesized Mean Difference	0	
df	39	
t Stat	-4.153849425	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.684875122	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.02269092	

p=0.01

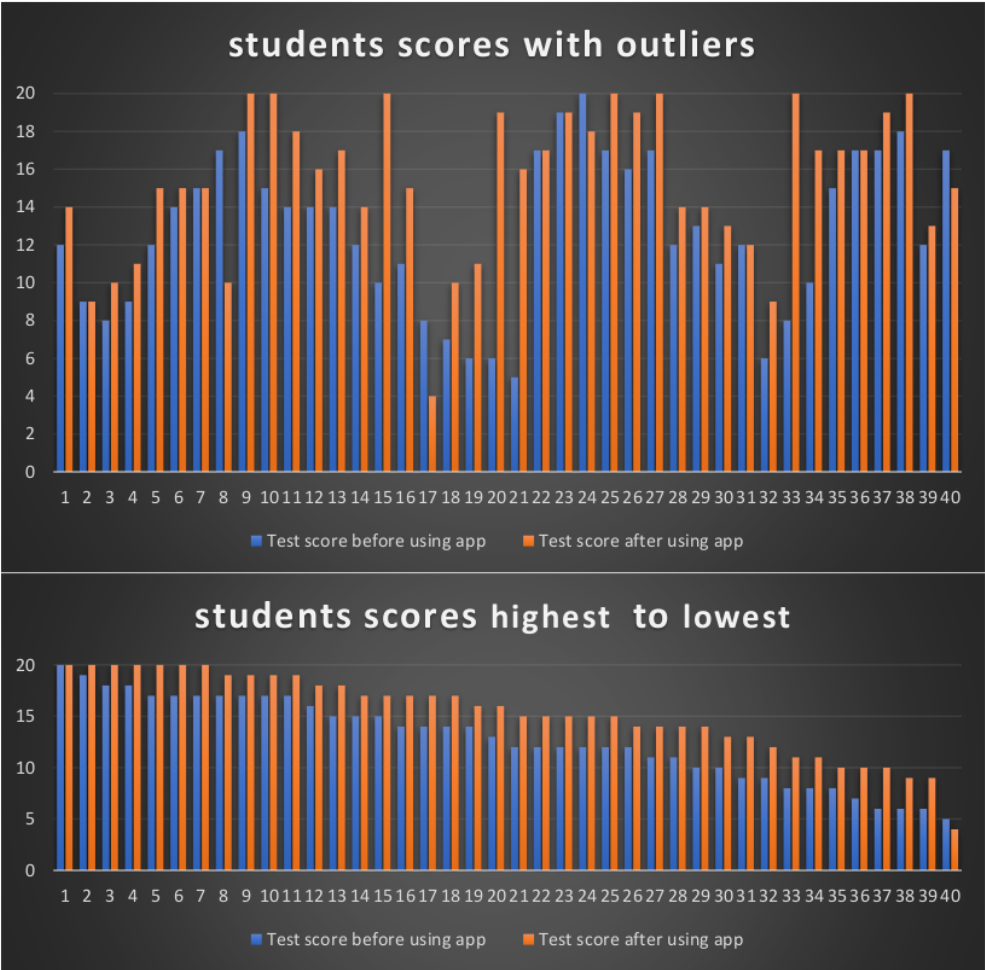
t-Test: Paired Two Sample for Means

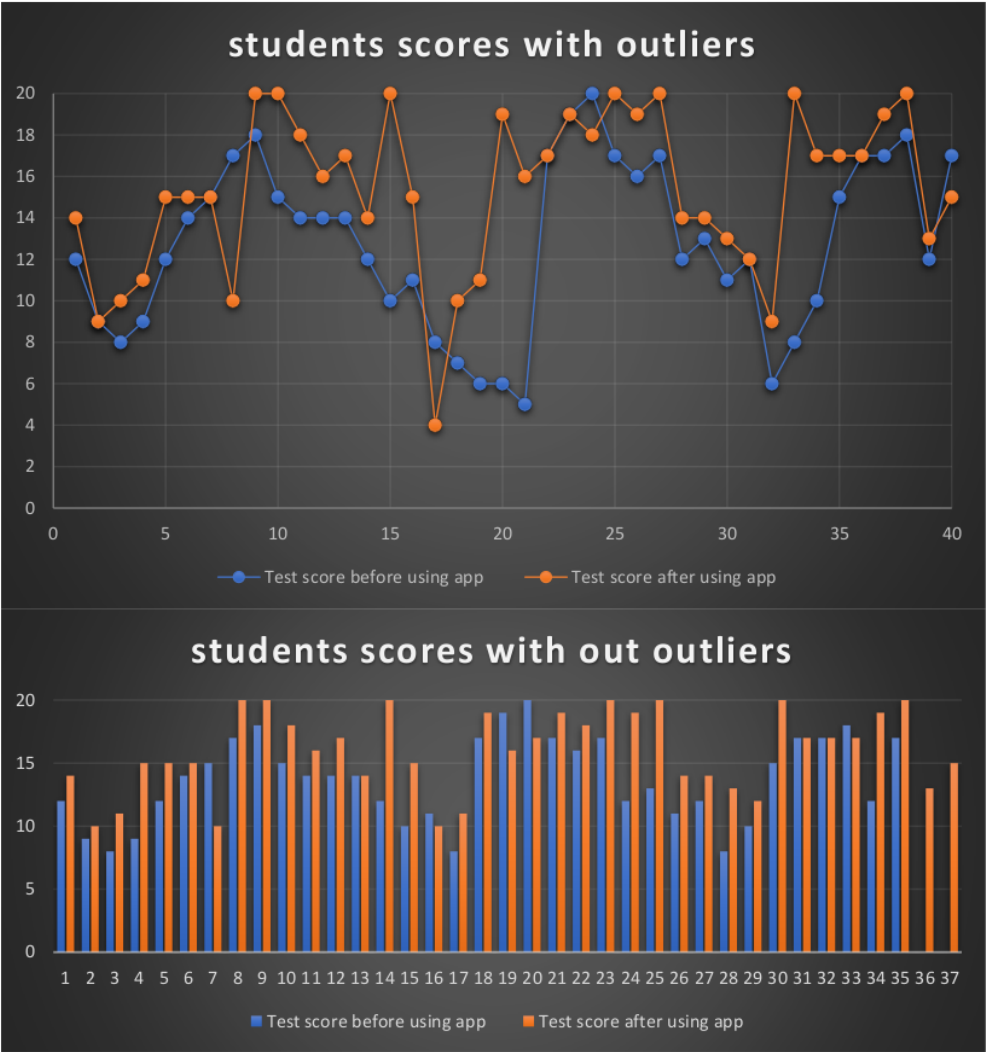
	<i>Test score before using app</i>	<i>Test score after using app</i>
Mean	12.75	15.3
Variance	16.80769231	15.29230769
Observations	40	40
Pearson Correlation	0.530985814	
Hypothesized Mean Difference	0	
df	39	
t Stat	-4.153849425	
P(T<=t) one-tail	0.00	
t Critical one-tail	2.42584141	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.707913184	

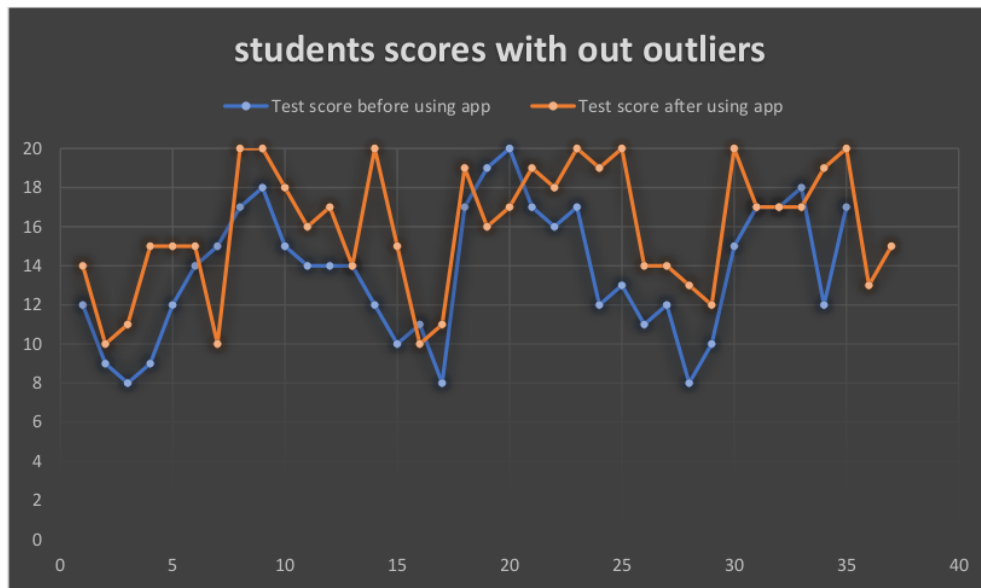
p=0.10

t-Test: Paired Two Sample for Means

	<i>Test score before using app</i>	<i>Test score after using app</i>
Mean	12.75	15.3
Variance	16.80769231	15.29230769
Observations	40	40
Pearson Correlation	0.530985814	
Hypothesized Mean Difference	0	
df	39	
t Stat	-4.153849425	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.303638589	
P(T<=t) two-tail	0.00	
t Critical two-tail	1.684875122	







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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

76/100

Clear presentation of your findings relating to descriptive statistics the graph certainly helped to add visualisation to the data which you have duly discussed. Hypothesis formed and appropriate T test technique used to analyse the data however I'm not sure if you stated anywhere that you were going to accept the alternative hypothesis and reject the null hypothesis in your report although this was most definitely implied.

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