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Task D

I have studied the question carefully. I will give a prediction on what I feel about it. I will investigate, find evidence, give my results and write up a conclusion stating whether I have proved the statement true or false.

Debbie's statement reads:

"The hours of sunshine decreases as the heights above sea level increase."

Prediction

I predict that Debbie's statement is false because I believe altitude does not have an effect on the hours of sunshine that any part of the earth sees per day. But that answer is based solely on common knowledge, the statistics may prove differently.

Plan

I will analyse each set of data and show them in the form of graphs using mean, mode, median and standard deviation. I will compare the data and after choosing the set of data that I feel shows whether the statement is true or false the clearest, I will present it as neatly as possible in my conclusion without lacking any detail.

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Investigation

I will begin my task by finding the average hours of sunshine for each place.
I will use the formula: $\frac{X+Y}{N}$ (X+Y being the data)
(N being the amounts of data)

Place	Height Above Sea Level	$\frac{(X+Y)}{N}$	Av. Hrs Of Sunshine Per Day
Alice Springs	580m	113 ÷ 12 = 9.416	9.42 (3sf)
Johannesburg	1692m	105 ÷ 12 = 8.75	8.75 (3sf)
Lusaka	1154m	95 ÷ 12 = 7.916	7.92 (3sf)
Mexico City	2309m	85 ÷ 12 = 7.083	7.08 (3sf)
Quito	2875m	67 ÷ 12 = 5.583	5.58 (3sf)
San Jose	1145m	67 ÷ 12 = 5.583	5.58 (3sf)
Windhoek	1728m	117 ÷ 12 = 9.75	9.75 (3sf)

Now that I have the average hours of sunshine (HS*) and the heights above sea level (HASL*) I am capable to use those sets of data on a graph. **GRAPH A** shows the average HS against the HASL.

It shows that Debbie's statement is not **entirely** accurate. If Debbie's statement were to be perfectly accurate there would be visible **negative** correlation. Closer inspection proves that there **is** negative correlation between points at 580m and 1145m, also between points 1728m through to 2875m. However, through points between 1154m and 1728 all we see is **positive** correlation.

In order to investigate further I have looked into the use of Standard Deviation with my data.

I used the equation: $\mathbf{SD= \frac{\sum X}{X} \_ \frac{\sum X}{X}}$

EX1 Using Alice Springs

$$\mathbf{SD= \frac{1071}{12} \_ \frac{113}{12}} \qquad 0.7592 \text{ (5sf)}$$

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*= Abbreviation. HS= Hours of Sunshine per day HASL= Height Above Sea Level
My results were as follows: -
(All to five significant figures and in numerical order of HASL highest first)

Quito= 2.1316 Lusaka= 1.7540
Mexico City= 6.6332 Alice Springs= 0.7592
Windhoek= 9.2646 San Jose= 5.2757
Johannesburg= 0.7217
(This data is plotted on **GRAPH B**)
By studying the set of data above, I have found no pattern to emerge. I have used the data to be plotted on a graph (**GRAPH B**) and still I can see no pattern. This time Standard Deviation has been of no use to me but I have still put it forward nonetheless to add to my different types of data forms.

Now I will list the HS with the HASL ranking the HASL in numerical order starting with the highest: -

Height Above Sea Level (Numerical)	Av. Hours Of Sunshine	Place
2875m	5.58	Quito
2309m	7.08	Mexico City
1728m	9.75	Windhoek
1692m	8.75	Johannesburg
1154m	7.92	Lusaka
1145m	5.58	San Jose
580m	9.42	Alice Springs

There are some interesting points that are distinct by plotting the data in this form. Noticeably in Quito, with the highest HASL it shows the lowest average HS, this factor backs up Debbie's statement. Also that at Alice Springs, with the lowest HASL has the second highest average HS. At first glance this shows Debbie's statement to be correct, but as we see at San Jose, with one of the lowest HASL the average HS is the same amount as in Quito, this defies Debbie's statement completely.

If you look at **GRAPH C,** you will notice it has many different data points on it. I have used the mean, mode and median HS and the highest point of HS and lowest point of HS from every places data. Each line on the graph mainly follows the pattern of the other and some are almost parallel. However, after closer review of the graph and on comparison to **GRAPH A** you can almost make out that it follows the exact same pattern.

EX2 To find the median HS of each set of data (using Alice Springs): -

List every data point from your set of data in numerical order and in a line.

8 8 9 9 9 10 10 10 10 10 10 10

Count the number of the data points you have, Alice Springs= 12

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If it is an odd number you half that number and add 0.5, e.g. 13 ÷ 2 = 6.5
Then count across that many times on your data points. + 0.5 = **7**

If the number is even, you simply get the two middle numbers in your list of data points, and you find the mean of them, divide by two!

Conclusion

My results show that there is lots of changing correlation between the sets of data and the data itself. This provides a hard decision for any mathematician to make whether Debbie's statement is correct or incorrect.

In my opinion, it is a mix between the two. No naturally gathered data can be in perfect correlation when drawn on a graph and this data most certainly is not a perfect correlation. I think that Debbie took the highest HASL and the lowest HASL and looked at the HS they seen per day. She will have noticed that as the hours of sunshine decrease the heights above sea level increase and without further ado, she will have made that statement. The results I have ascertained vary quite a bit and are inconclusive.

My results have proved my prediction to be just like Debbie's statement, it is only half right and half wrong. You could say that logically Debbie's statement is incorrect. This is because her statement does not work with some data, and since she has not wrote of any exceptions to her statement, then I will assume it is a false one.

My methods, on the whole, worked quite fine. I am pleased with the methods I choose to display my data and I am happy with the accurate results they gave me. The Standard Deviation that I chose to use was useless this time round, but until you use it you do not know if it could have helped you in any way so I am still glad that I used it.

I think that I could have improved my methods by displaying some of them in different forms of graphs etc. Like maybe a bar chart or pie chart if the data was compatible to that type of graph.

There is no practical use for the method I have found because with the data I was given I was unable to come up with an accurate enough formula or piece of information that could

help someone if they wished to try and make a link between height above sea level and hours of sunshine per day.