**A.P. Statistics Problem for Linear Regression.**

A diver is investigating a wreck under the water and has to come up tot the surface slowly. Following is a chart detailing his depth from the time he starts ascending.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| time  (min) | 0 sec | 30 sec. | 1 min. | 1min.  40 sec | 2 min  20 sec | 3 min | 3 min  30 sec | 4 min  40 sec | 5 min  30 sec | 6 min | 6 min  30 sec |
| depth  (ft) | 240 | 225 | 203 | 189 | 180 | 164 | 155 | 160 | 130 | 125 | 120 |

1. Draw a scatterplot which is suitable for predicting depth based on time. There is one point that lies outside the pattern of the plot. Circle it.
2. Find the equation of the least squares line of the data. Comment on the strength of the association.
3. Eliminate the point you circled and recalculate the equation of the least squares line. Sketch the line on the scatterplot above. Comment on the strength of the association compared to your answer with that circled point included.
4. Using the model above (point removed), explain the meaning of the slope of the line.
5. Describe the relationship between time and depth using *r*2 to make your description more precise.
6. Using the model above (point removed), predict the depth of the diver at the following times. Comment on the confidence of your prediction.
   1. 2 minute, 50 seconds b) 5 minutes c) 7 minutes, 10 seconds
7. Find the difference between the observed depth at 1 min, 40 seconds, and the predicted depth.
8. Explain why a linear model might not be the best to describe this data.
9. In the diagram above, place a square around the point that has the largest residual. Place a triangle around the point that has the second largest residual.
10. Using the linear model, how long would your predict before the diver reaches the surface. In reality, do you believe it is a longer or shorter duration? Explain.
11. What is the exact sum of the residuals?
12. One more piece of data is added. It is found that the diver is at 40 feet, 7 minutes into his ascent. Explain the role of this new point and how it will affect the slope of the LSRL without actually calculating it.
13. New data is added to change the mean time to mean time to 6 minutes and 10 seconds with standard deviation 2 minutes and 5 seconds. The mean depth is now 115.5 feet with standard deviation 31.6 feet. If the association is still negative and *r*2 = .68, find the slope of the regression line of time versus depth.