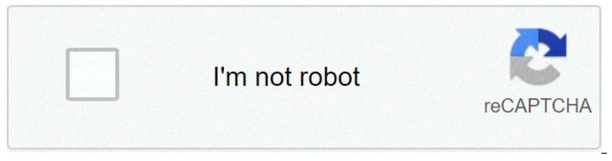

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Analyzing data mouse experiment worksheet answers

scenario: a certain experiment is designed to measure the volume of 1 helium gas to a variety of different temperatures, maintaining constant gas pressure at 758 torrr: temperature (k) helium volume (l) 203 14.3 243 17.2 283 23.1 323 25.9 363 31.5 start the Excel© microsoft program (version 2016, found on all computers in all campus computer centers.) go to the start screen insert the above data in the first two columns in the spreadsheet. book the first row for column labels. x values must be inserted to the left of y values in the spreadsheet. remember that the independent variable (what you, as a tester, have control) goes on the x axis while the dependent variable (measured data) goes on the y axis. highlight the data set (not column labels) you want to track (figure 1.) click Insert > recommended graphs followed by scatter (figure 2.) choose the scatter chart showing only the data points, without link lines – the scattered option labeled with only markers (figure 3.) now you need to see a scatter chart on the excel screen, which provides a preview of the chart (figure 4.) if all time looks good. switch to the design tab and click Add graphic element > chart title > above chart should be givenExplanatory title that starts “Y vs. X followed by a system description. Click on Axis titles (select the title of the primary horizontal axis and the title of the primary vertical axis) to add labels to the x and y axis. Note that it is important to label the axes both with the measure and with the units used. To edit titles, click the text box for each title, highlight the text and type in the new title (Figure 6.) Your next step is to add a trend line to tracked data points. A trend line represents the best possible linear measure for your data. To do this you must first activate the chart. Click any of the data points. When you do, all data points will be highlighted. Click the Chart Elements button next to the top right corner of the chart. Check the Trendline box. Click Other Options. This will display the option indicated in Figure 7. Note that the Linear button is already selected. Now select the Display equation on the Chart box and the R-squared display value on the Chart box. Then click the Close button. The equation that now appears on the chart is the equation of the line of trend mounted. The R2 value provides a measurement of how well data is suitable for equation. The closer the R2 value is to 1, the better the fit. Generally, the R2 values of 0,95 or higher are considered suitable. Note that the program always adapts a trend line to data, no matter how good or terrible data is. It is necessary to judge the quality of fit and suitability oftype of adaptation to the data set. Print a full size copy of the prepared chart and connect it to the report. Then record the following information about your report: the best trend line equation for your data trend line slope trend line y interception of trend line if line measurement for data is good or bad, and why. By designing the five measured values, a relationship between gas volume and temperature is established. The graph contains a visual representation of the relationship (the plot) and a mathematical expression of the relationship (the equation). Now it can be used to make certain predictions. For example, suppose sample 1 helium gas is cooled until its volume is measured to be 10.5 L. It is asked to determine the temperature of the gas. Note that the value 10.5 L falls outside the range of tracked data. How can you find the temperature if it does not fall between the known points? There are two ways to do that. Method (1): Extrapolate the trend line and estimate where the point on the line is. Click the layout tab along the top menu, then Trendline > Other Trendline options. In the section called Forecast enter a number in the box labeled Back, since we want to extend the trend line to the rear x direction. To decide which number to insert, look at the chart to see how far back along the x axis you need to go to cover the area in which volume = 10.5 L. After entering a number, click Close, and the line on the chartnow be extended in the back direction. Now use the chart to estimate the x value by imagining a straight line down from y = 10,5 L to the x axis. Record this value on your report. Method (2): Enter this value for volume in the equation of the trend line and solve for the unknown temperature. Do this and record your response to your report. Note that this method is generally more accurate than extrapolating and "eyeballing" from the chart. Scenario: In a certain experiment, a spectrophotometer is used to measure the absorption of light of different solutions containing different quantities of a red dye. The two data sets collected are presented in the table below: Data A Data B Amount of Dye (very) Absorption (without unit) Quantity of Dye (very) Absorption (without unit) 0.100 0.049 0.800 0.620 0.200 0.168 0.850 0.440 0.300 0.261 0.900 0.485 0.360 0.950 0.125 0.500 0.470 0.600 0.590 0.700 0.700 0.750 0.750 0.750 0.750 Would you like to see how these two data sets refer to each other. To do this you will have to put both data sets, as independent relationships, on the same chart. Note that this process only works when you have the values and magnitudes of the same axis. Enter these new data in a new page (Sheet music 2) in Excel. Make sure to label the A and B data columns once again, remember to insert the x values to the left of the y values. First, track data Only as a XY Scatter chart (the same way you did with data in part 1). Mount a trend line to these data using linear regression and getequation of this line. now you need to add b data to this chart. activate the chart by clicking on one of the tracked data points. right-click the mooe on the chart, and then click Data. the select data source box appears on the worksheet with the chart source data. click on the add tab and type “Data B” for the series name. click on the small icon under the x series values, then highlight the x data axes values b. press Enter, then repeat this procedure for the y series values, highlighting the axes y data values b. for each of these steps, you should see a display similar to what is shown in figure 8. Note that slight differences may appear due to the version of Microsoft Excel© installed on your computer. click ok twice to return to the excel main window. at this point you should see the new data points (called as series 2) as shown in Figure 9. Now you can independently analyze this dataset by inserting a trend line as before. print a full size copy of the prepared chart and connect it to the report. then record the following information about the report: the best trend line equation by date a, the best trend line equation by date b, if these trend lines have been extrapolated, they will intersect. determine x and y values for the intersection point using simultaneous equations. when many independent measurements are made for a variable, there is inevitably some scattering (noise) in data. this is usually the result of random errorsthat the experiment has little control. Scenario: 10 different students to two different colleges each measure the concentration of sulphate ions in a tap water sample: College #1 dataset 35.9 ppm 43.2 ppm 33.5 ppm 35.1 ppm 32.8 ppm 37.6 ppm 31.9 ppm 36.6 ppm 35.0 ppm 32.0 ppm College #2 dataset 45.1 ppm 34.2 ppm 36.8m 31.0m Simple statistical analysis of these data sets could include median and median concentration calculations, and standard deviation. The average (\bar{x} \) is simply the average value, defined as sum (Sigma) of each of the measurements (x_{i}) in a set divided by the number of measurements (N): \[\bar{x=} \frac{\sum x_{i}}{6}\] The median (M) is the average value of a numerically sorted data set, where half of the measurements are above the median and half are below. The median position of measurements (N) can be found using: \[M= \frac{N+1}{2 label{7}] When (N) is an odd number, the formula produces an entire that represents the value corresponding to the median position in an ordered distribution of measurements. For example, in the number set (3 1 5 4 9 8) the median position is (7 + 1) / 2, or the value 4 °. When applied to the order set numerically (1 3 4 5 8 9 9,) the number 5 is 4 ° and is therefore the median – three scores are greater than 5 and three are less than 5. Note that if there were only 6 numbers in the set (1 3 4 5 8the median position is (6 + 1) / 2, or the value 3.5 °. In this case the median is halfway between values 3 and 4 in the ordered distribution, or 4.5. the standard deviation (s) is a measure of the variation in a dataset, and is defined as the square root of the sum of squares divided by the number of measurements minus one: \[s= \sqrt{\frac{\sum (x_{i} - \bar{x})^{2}}{N-1}} \label{8}\] So to find (s,) subtract each measure from the middle, square than the result, add it to the results of each other square difference, divide that sum from the number of measurements minus one, then take the square root of this result. The larger this value, the greater the data change, and the less precision in measurements. While the median and standard deviation can be calculated by hand, it is often more convenient to oate a computer or computer to determine these values. microsoft Excel© is particularly suitable for such statistical analysis, especially on large data sets. enter the data acquired by college students #1 (only) into a single column of cells in a new page (partition 4) in excel. then in any blank cell (usually one close to data cells,) instruct the program to perform the required functions on data. to calculate the average or average of the data inserted in the cells a1 through a10, for example, you need: click the mooe in a blank cell type "=media(a1:a10)" and press the return to get the median you would instead typeTo obtain the standard deviation, you would type =stdev(a1:a10.) The average calculated Excel, median deviation and standard for the College #1 dataset. As further exercise, calculate the standard deviation of this hand dataset, and compare it with the value obtained from the program. Outliers Rejector All sizes in the College #1 dataset seem equally good to you, or are there values that do not seem to fit others? If so, can you refuse these measures? Exhibitors are data points that are well outside the range defined by the rest of the measurements and can reduce the results largely. If an outlier is determined by an obvious experimental error (for example, an instrument is incorrectly read or a solution is prepared,) you can refuse the point without hesitation. If, however, none of these errors is obvious, you must use caution in making your decision to maintain or reject a point. A rough criterion to refuse a data point is if there are over two standard deviations from the average or average. Using the above criteria, determine whether there are outliers in the College #1 dataset. Register these clearer measures (if present) on the report. Then, excluding outliers, recalculate the medium, median and standard deviation of this data set (use Excel.) Refuse data points can not be done only because you want the results to look better. If you choose to refuse an outlier for any reason, you must alwaysIt is not a question of whether or not it is a question of whether or not it is a question of whether or not it is a question of whether or not it is a question of whether or not it is a question of whether or not it is a matter of urgency. Graphics of a Scatter Trama Unlike the linear textures created so far, a shedding plot simply shows the variation in measurements of a single variable in a given dataset, i.e., provides a visual representation of the “noise” in data. The data is drawn in a column, and there is no x dependence here (Figure 10). Note that datasets with a greater degree of dispersion will have a higher standard deviation and consist of less accurate measurements than datasets with a small degree of dispersion. To get such a chart using Excel, all x values for each dataset must be identical. 32.0 1,8 3,8 3,8 3,8 3,8 3,8 3,6 3,6 3,0 3,6 3,0 3,6 3,0 3,6 3,0 3,0 3,0,6 1,6 3,0 1,8 3,6 1,8 3,6 1,1 3,6 3.6 3.6 3.6 3.6 3.6 3.6 4.1 Enter the data as shown above in the first four columns of the sheet It tracks the College #1 dataset as a Plot XY Scatter. Now add the College #2 dataset to this chart by applying the same steps you used to create your previous chart in the “Two overlapping data sets” section (Part 2). Add appropriate axis labels and a title. You arealso want to adjust the x-assi and y-axis scales to improve the final appearance of the chart. Print a full size copy of the prepared chart and connect it to the report. Then record the following information about the report: What data sets (College #1 or College #2) show the least scattering? Major standard deviation? The most precise measures?

♪ No one on this assignment ♪ Date: # Turn the charts you did for ALL the three parts in this assignment For each chart make sure the following components are in the press: Title for the graph Labels for x and y axes (together with the appropriate units when applicable) Line equation and R2 when appropriate. What data set is drawn on the y axis? Which data set is tracked on the x axis? Register the following information: The equation of the line of trend mounted The value of the slope of this line The y-intercept value of this line is the trend line measurement for your good data (circle one)? Yes / No. Explain why you think the line is a good measure for data. Determine the temperature (in K) of the gas in the cold room when it has a measured volume of 10.5 L using a) Extrapolation and “eyeballing” b) Show your calculations for b) below. Part 2: Two Data Sets and Overlay Record the Equations of the Trend Lines Mounted to Perform a calculation of the Simultaneous Equations to determine the xy values for the intersection point between these lines. Show your job down here. For the College #1 set of data, record the following values (determined using Excel): the average \(\ce{SO4^{-2}}\) median concentration \(\ce{SO4^{-2}}\) concentration the standard deviation in the data set Calculates the standard deviation in the College #1 data set by hand. Show all your work down here. Continue your work on a page attached if you need more space. Are there outliers in the College #1 dataset (circle one)? Yes / No If yes, what measures are outliers? Show the calculations you used to identify outliers (or, if nothing else, as you determined that they were not there). Re-calculate the following values (using Excel) excluding outliers: the average \(\ce{SO4^{-2}}\) concentrates the median \(\ce{SO4^{-2}}\) concentrates the standard deviation in the dataset Create a scatter diagram showing both College #1 and College #2 data. Attach a graphic print to this report. Make sure your axes are labeled correctly and your chart has an appropriate title. Examine the tracked data. Which data set: Does the standard deviation bigger? Does it contain the most precise measurements? measurements?