Name_____

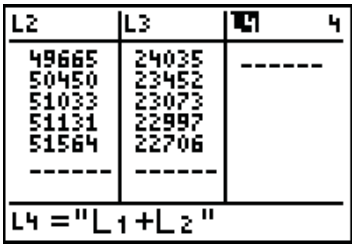
Miles to Go (TI-84+)

The total road length in the state remains fairly constant from year to year. The table provides a historical summary of the relationship between total statewide length statistics for a 5-year period.

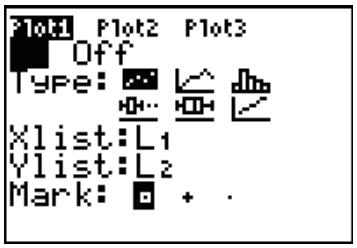
Source: http://gomdot.com (Planning Resources)

	Year	2001	2002	2003	2004	2005
Total Statewide	Paved	49,665.471	50,450.027	51,033.446	51,130.709	51,564.362
	Unpaved	24,035.359	23,451.536	23,072.864	22,997.129	22,705.756
	Total	73,700.830	73,901.563	74,106.310	74,127.838	74,270.118

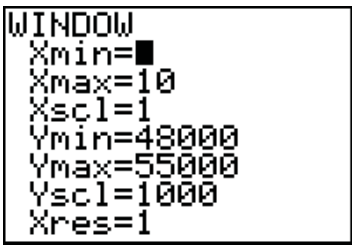
1. Enter the data in your statistics editor. In L_1, let year 2001 correspond to 0, 2002 correspond to 1, and so forth. Let L_2 correspond to the paved miles of road and L_3 the unpaved miles of road. Since the total miles of road is equal to the sum of paved and unpaved miles of road, move your cursor to the name of L_4 and let L_4="L_2+L_3" by typing [ALPHA][+][2nd][2][+][2nd][3][ALPHA][+][.]



2. Set up a scatterplot for graphing paved miles vs. time.
   What is the independent variable?
   What is the dependent variable?
   What is the domain for this plot?
   What is the range?



3. Set up the viewing window to be able to predict the statewide paved miles for the year 2010. A screenshot of a sample window is in the margin.

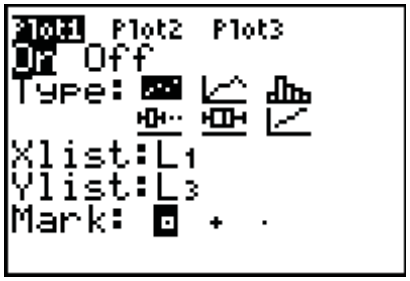


4. Look at the graph of the data. Does there appear to be a basic shape to the data?

5. Complete the following statement: As the years go by, the number of paved miles in Mississippi _____.

6. On the home screen [(][2nd][MODE][)], press [STAT][▶][▲][ENTER][VARS][▶][1][2][ENTER] to create a manual-fit for the data and store the equation in Y_2. Use your arrow keys to press e on two points that lie on the line of best fit. Adjust the slope of the line of best fit by typing in a new number and pressing e. Adjust the y-intercept of the line of best fit by pressing [▶] to select the y-intercept of the equation, typing in a new number, and pressing [ENTER]. A good line of best fit will have about the same number of points above the line as below. Once you are satisfied with the line of best fit, press [2nd][MODE] to save your line. What is the equation for your manual line of best fit?

7. Now use the linear regression handout to let the calculator find the line of best fit. The directions will store the calculator line of best fit in Y_1. What is the line of best fit according to the calculator?
8. What is the correlation coefficient (r)?
9. The closer the absolute value of r is to 1, the better the correlation. Is this line a good fit for your data?
10. Compare your manual-fit line with the calculator's line of regression. Is yours more or less steep?
11. What is the slope of the line of best fit? (Round the answer three places behind the decimal, and include units.)
12. Explain the real-world meaning of this slope. (In discussion, round to the nearest whole number.)
13. On the [Y=] menu, an equation is turned on when [STO▸] is highlighted. You can turn equations on and off by pressing [ENTER] on top of the equal sign. Turn off your manual-fit line. On the graph, press [TRACE] [▲] [3] [ENTER] to determine the calculator's prediction for the number of paved miles in the year 2004. How close is the prediction to the actual number of paved miles according to the MDOT data in the chart?
14. Use the line of best fit to predict the number of paved miles in the state in the year 2010. Press $: and then enter the number that corresponds to the year 2010 on your graph.
15. What does negative correlation look like? Give an example of two variables that are related negatively.
16. What kind of correlation is there between the number of unpaved miles and time?
17. Turn off the plot between paved miles and time, and set up a plot between paved miles and time. What is the manual line of best fit for your data?
18. According to the calculator, what is the line of best fit?



19. What is the correlation coefficient (r)?
20. The closer the absolute value of r is to 1, the better the correlation. Is this line a good fit for your data?
21. What is the slope of the line?
22. Explain the real-world meaning of this slope.
23. Extrapolate to find the number of paved miles in the year 2009.
24. Why is the number of unpaved miles not decreasing at the same rate the number of paved miles is increasing?

Name_____

Miles to Go (TI-Nspire)

The total road length in the state remains fairly constant from year to year. The table provides a historical summary of the relationship between total statewide length statistics for a 5-year period. Source: http://gomdot.com (Planning Resources)

	Year	2001	2002	2003	2004	2005
Total Statewide	Paved	49,665.471	50,450.027	51,033.446	51,130.709	51,564.362
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1. Enter the data in a Spreadsheet page. In the first column, let year 2001 correspond to 0, 2002 correspond to 1, and so forth. Let the second column correspond to the paved miles of road and the third column the unpaved miles of road. Since the total miles of road is equal to the sum of paved and unpaved miles of road, move your cursor to cell D1, and type **=B1+C1**. Drag the formula down to calculate the total for all the years.

2. Set up a scatterplot for graphing paved miles vs. time on a Data and Statistics page.
   What is the independent variable?
   What is the dependent variable?
   What is the domain for this plot?
   What is the range?

3. Change the Window Settings on the Window/Zoom menu so that you will be able to predict the statewide paved miles for the year 2010.

4. Look at the graph of the data. Does there appear to be a basic shape to the data?

5. Complete the following statement: As the years go by, the number of paved miles in our state _____.

6. Add a Moveable Line from the Actions menu, and then change the line so that it best fits the data. The two-directional arrow at either end of the line will change its steepness; the four-directional arrow toward the middle of the line that is shown will move the line up, down, right, and left. A good line of best fit will have about the same number of points above the line as below. Once you are satisfied with the line of best fit, Show Residual Squares from the Actions menu. The Least Squares Regression minimizes the sum of the residual squares. Move your line some more to see if you can make the sum of the residual squares smaller. See the linear regression handout for a more detailed explanation. What is the equation for your manual line of best fit?

7. Use the linear regression handout to let the calculator find the line of best fit. What is the line of best fit according to the calculator?

8. Go back to your spreadsheet, and use the linear regression handout to calculate the Least Squares Regression line on the spreadsheet. What is the correlation coefficient (r)?

Tip: When you calculate the regression on the spreadsheet, change the 1st Result Column to the next column that has not been used, which should be E.

9. The closer the absolute value of r is to 1, the better the correlation. Is this line a good fit for your data?

10. Compare your moveable line with the calculator's line of regression. Is yours more or less steep?

11. What is the slope of the line of best fit? (Round answer three places behind decimal, and include units.)

12. Explain the real-world meaning of this slope. (In discussion round to nearest whole number)

13. Go back to your graph to determine the calculator's prediction for the number of paved miles in the year 2004. You can Plot Value on the Actions menu to help determine the prediction, or you can evaluate f1(3) on a Calculator page. How close is the prediction to the actual number of paved miles according to the MDOT data in the chart?

14. Use the line of best fit to predict the number of paved miles in the state in the year 2010. You can Plot Value on the Actions menu of the Data and Statistics page to help determine the prediction, or you can evaluate f1(9) on a calculator page.

15. What does negative correlation look like? Give an example of two variables that are related negatively.

16. What kind of correlation is there between the number of unpaved miles and time?

17. Insert a new Data and Statistics page, and set up a plot between paved miles and time. What is your moveable line for the data?

18. According to the calculator, what is the Least Squares line of best fit?

19. What is the correlation coefficient (r)?
    Tip: When you calculate the regression on the spreadsheet, change the 1st Result Column to the next column that has not been used.

20. The closer the absolute value of r is to 1, the better the correlation. Is this line a good fit for your data?

21. What is the slope of the line?

22. Explain the real-world meaning of this slope.

23. Extrapolate to find the number of paved miles in the year 2009.
    Tip: You can evaluate f2(8) on a Calculator page.

24. Why is the number of unpaved miles not decreasing at the same rate the number of paved miles is increasing?

Extension: Create and analyze a scatterplot of the total miles of road vs. time. What conclusions can you make?