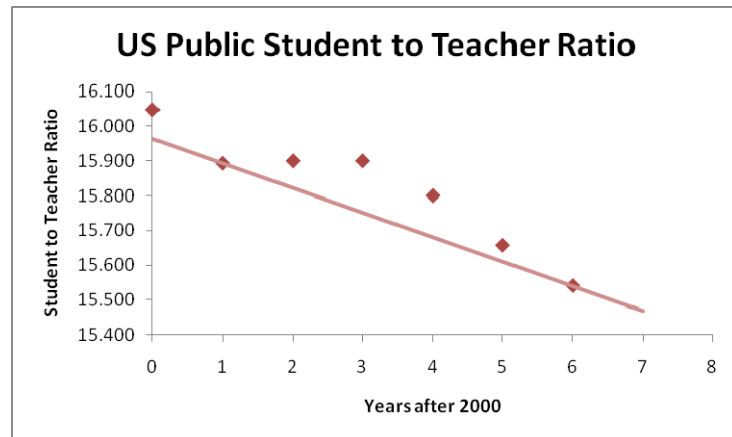


In an earlier technology assignment, you created a scatter plot of the US Student to Teacher Ratio for public schools from the table below. The scatter plot is shown to the right of the table and includes a line that approximates the data in the table.

Years after 2000	US Student to Teacher Ratio
0	16.048
1	15.893
2	15.900
3	15.900
4	15.800
5	15.657
6	15.540

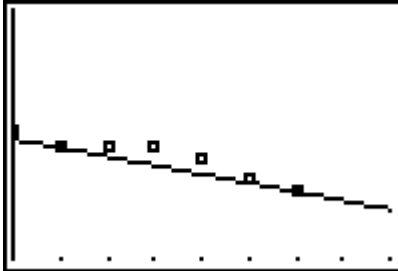
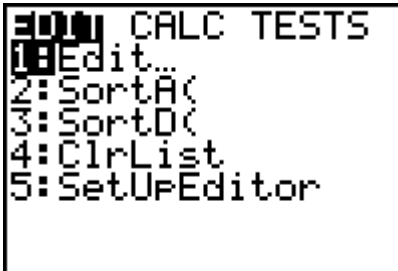
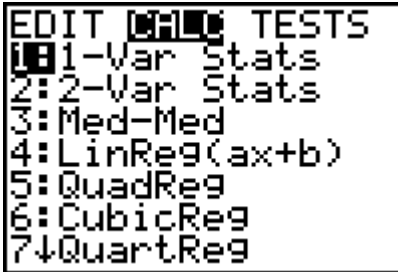
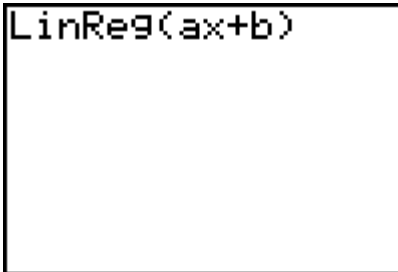
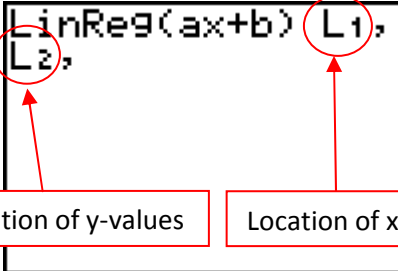


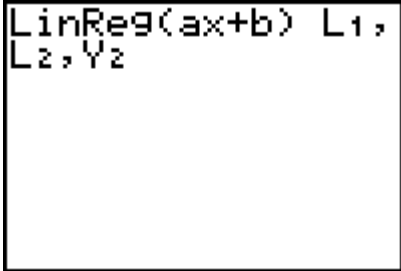
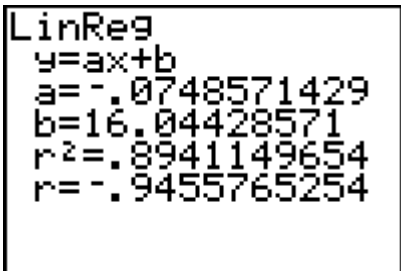
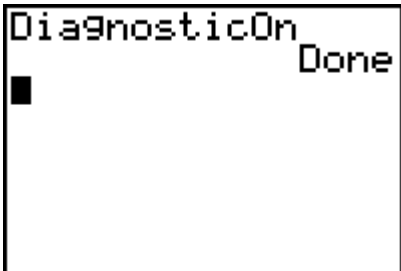
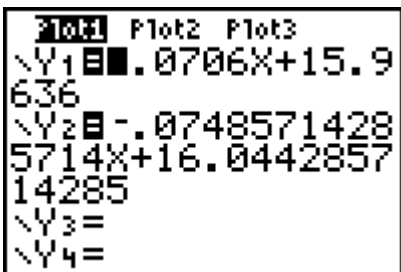
We found the line by finding the equation of a line that passes through the second and last data point. The line follows the trend of the data fairly closely, but misses the data points in the middle of the scatter plot. We could have picked any two points from the scatter plot to make the line with, but the corresponding lines would probably not be the line that passes closest to the data overall.

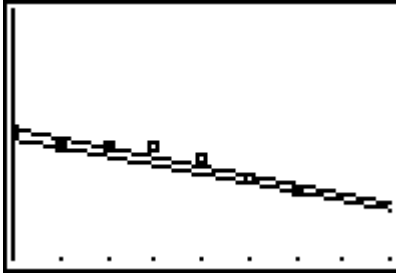
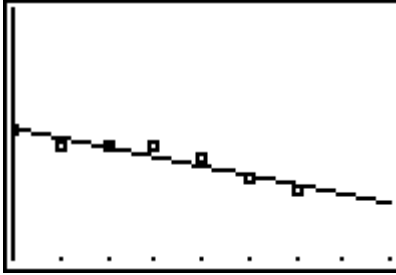
The best line for the trend in this data will probably not pass through *any* of the points. To find this line, we'll use the linear regression feature on your calculator and in Excel. In this technology assignment you'll add the best line found through linear regression to the scatter plot you created in earlier technology assignments.

Use Linear Regression to Find the Best Line on a Graphing Calculator

In an earlier technology assignment, you used your calculator to make a scatter plot of some data and a line passing through two of the data points. We'll start from that scatter plot and add a line of best fit.

<p>1. Press GRAPH to see your scatter plot. If your data and the corresponding line does not appear, refer to the earlier technology assignments to recreate them.</p>	
<p>2. Linear regression is performed using the LinReg command on a TI graphing calculator. Start by getting back to the home screen by pressing 2ndMODE.</p> <p>3. Clear the home screen by pressing CLEAR.</p> <p>4. Press STAT.</p>	
<p>5. Press ▸ to move to the CALC menu.</p>	
<p>6. Use ▾ to highlight LinReg(ax+b) and press ENTER or press 4. This pastes the LinReg command to the home screen.</p>	
<p>7. The LinReg command needs to know where the data is stored and where to paste the equation corresponding to the linear model. Press 2nd1,2nd2,. This places L_1 and L_2 separated by commas immediately after the command.</p>	

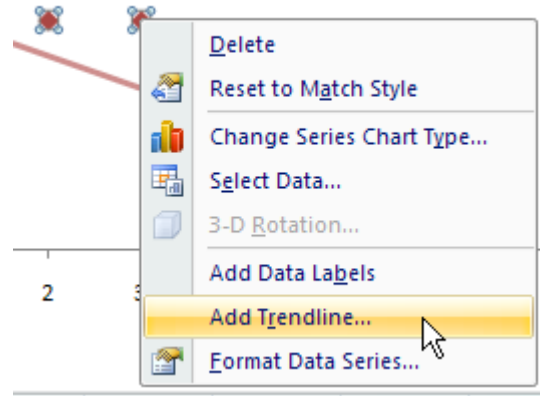
<p>8. To tell the calculator where to paste the equation, press VAR ▶ ENTER ▼ ENTER. This pastes Y_2 at the end of the command meaning that the equation will be pasted into Y_2 in the equation editor.</p>	
<p>9. Press ENTER to execute the LinReg command. This screen tells you that the best line through this data is $y = -0.0748571429x + 16.04428571$.</p>	
<p>10. If you do not see the correlation coefficient (the value for r), press 2nd 0 to access the calculators catalog of commands.</p> <p>11. Use the ▼ button to find DiagnosticOn.</p> <p>12. Press ENTER ENTER. When you use the LinReg command again (steps 6 through 8), the correlation coefficient will be shown.</p>	
<p>13. Press Y= to see the contents of the equation editor. Notice that Plot 1 is highlighted indicating that your scatter plot will appear. Y_1 contains the equation of the line passing through the two points and Y_2 is the equation of the best fit line.</p>	

<p>14. Press [GRAPH] to see the scatter plot and lines. The upper line is the best fit line and appears to pass closer to the data points than the other line.</p>	
<p>15. You can turn off the line passing through the points by pressing [Y=]. Move the cursor over the = sign next to $\backslash Y_1$ and press [ENTER].</p> <p>16. Press [GRAPH]. Notice that the lower line no longer appears on the graph.</p>	<div style="border: 1px solid black; padding: 5px;"> <pre> 2041 Plot2 Plot3 \Y1=■.0706X+15.9 636 \Y2=■-.0748571428 5714X+16.0442857 14285 \Y3= \Y4= </pre> </div> 

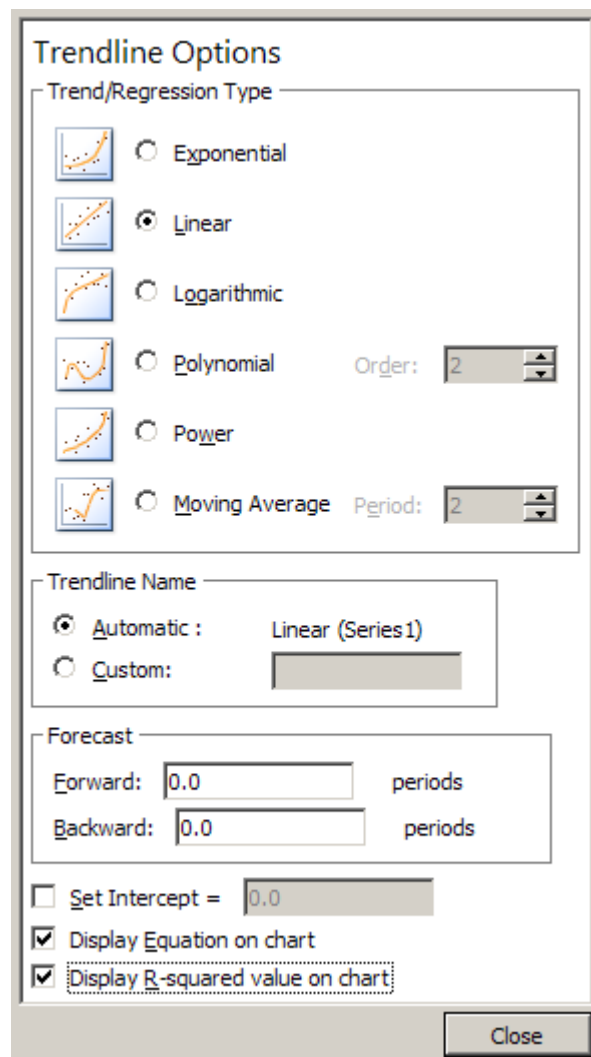
Use Linear Regression to Find the Best Line in Excel

In an earlier technology assignment, you used Excel to make a scatter plot of some data and a line passing through two of the data points. We'll start from that scatter plot and add a line of best fit using Excel. Excel refers to the line of best fit found through linear regression as a linear trendline.

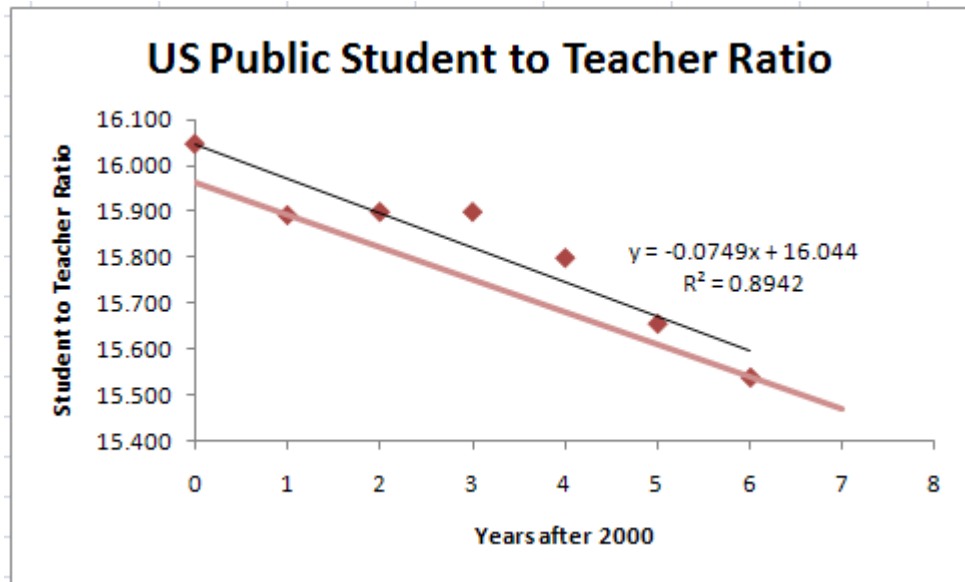
1. Open the worksheet containing the scatter plot and line from the previous technology assignment.
2. Right mouse click on one of the data points in the scatter plot. You may have to right click more than once to make the menu shown to the right appear.
3. Use your mouse to select Add Trendline...



4. The Format Trendline box will appear in your worksheet. Click on the Linear option to insure linear regression is performed on the data.
5. At the bottom of the worksheet, check Display Equation on chart and Display R-squared value on chart.
6. Select Close.



7. The line of best fit is added to the graph as shown below. You can use your mouse to select and drag the equations formula to a more convenient location.



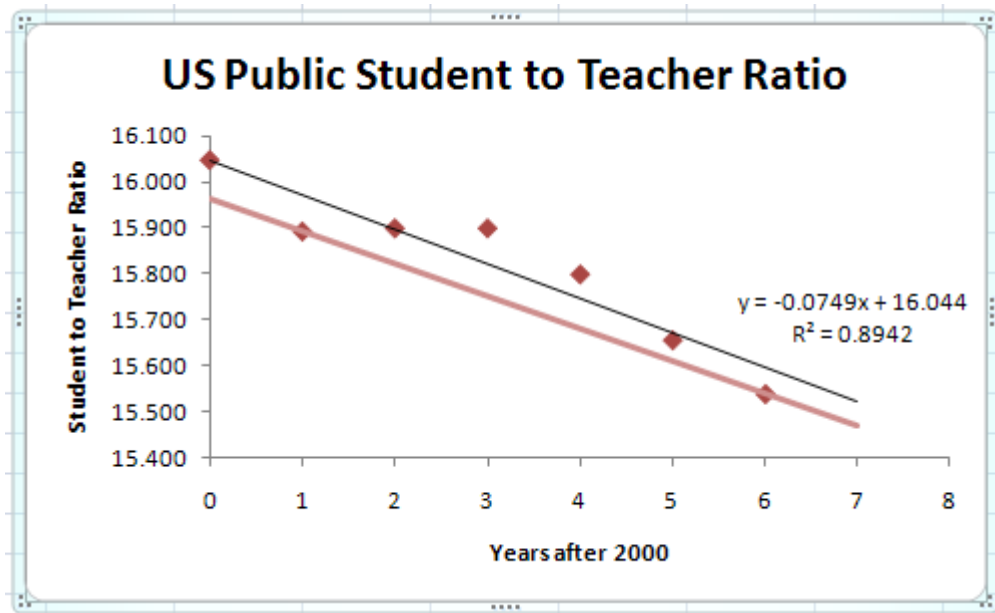
8. Notice that the line of best fit stops abruptly at $x = 6$. You can force the line to extend farther by right mouse clicking on the line.

9. Select Format Trendline.

10. By default, the line of best fit is only plotted between the lowest and highest x -values. You can extend it forward or backwards from the data points by changing the values in the Forecast section of the Format Trendline box. Change the entry next to 1 as shown to the right.

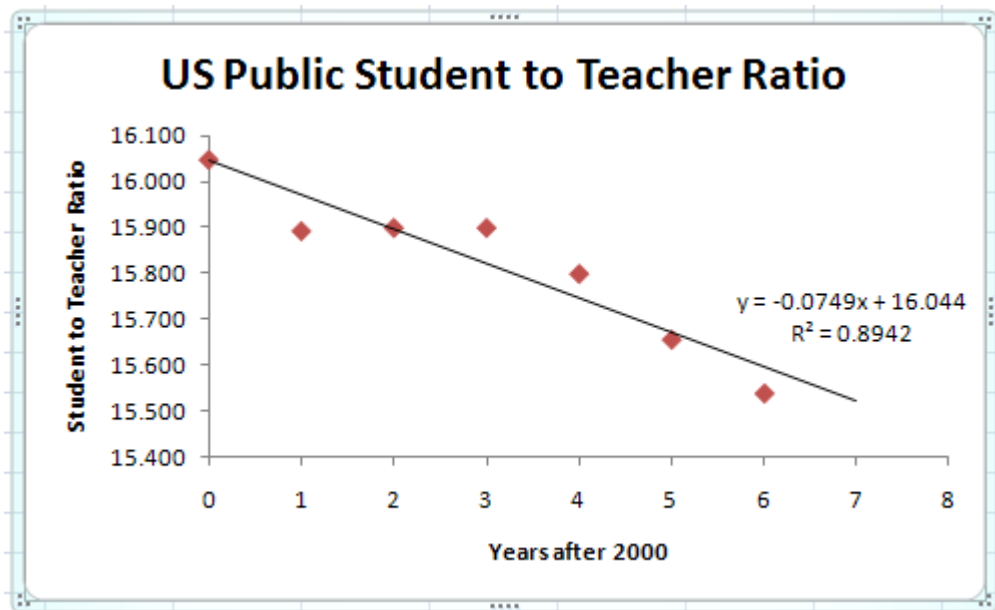
Forecast	
Forward:	<input type="text" value="1"/> periods
Backward:	<input type="text" value="0.0"/> periods

11. Select Close to update the graph.



Notice that the line now extends 1 unit beyond the last data point. By modifying the entry next to Forward or Backward, you can make the line extend as many units from the data as needed.

- It is fairly obvious that the line of best fit passes closer to the data points as expected. To remove the other line from the scatter plot, left mouse click on that line (you may need to click twice) and press the Delete key on your keyboard. The line between the two points should be removed from your scatter plot.



13. Save your Excel worksheet.

14. To complete the assignment, copy the graph and paste it into a Word document along with your name, class and the date. Make sure you save the Word document.