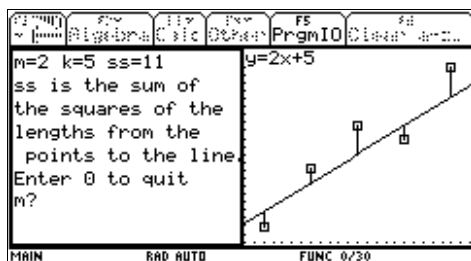


# APPENDIX A

## A Program for a Classroom Activity



This program, **BestFit()**, allows you to explore a linear regression problem by interactively fitting a line to data points. The program works with any set of data points as long as you have defined two lists for the  $x$ - and  $y$ -coordinates of the points.

The figure to the left shows a sample of program BestFit() using the data  $x$ s and  $y$ s from Activity 5.

After you have typed the program into one Voyage™ 200 PLT, you can share it with others by using the cable that comes with the Voyage 200 PLT. If you have the optional accessory TI Connect™, you can save the program on a PC or Macintosh® computer disk. You should do this step if you plan to use or create programs for the Voyage 200 PLT.

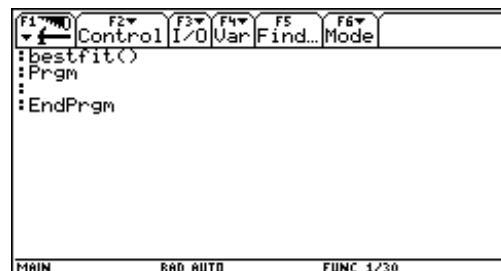
With the Voyage 200 PLT Program Editor, you can type all commands letter by letter or paste them from one of three sources: the pull-down screen menus accessed by the Function keys, the Math menu accessed by the  $\boxed{2nd}$  [MATH] keys, or the alphabetical menu accessed by the  $\boxed{2nd}$  [CATALOG] keys.

## A Program for a Classroom Activity *(Continued)*

### Creating the Program

- To create a new program called BestFit, press **[APPS]** and select Program Editor. Then select 3:New. Press  $\downarrow \downarrow$  to move to Variable: and press **BESTFIT** **[ENTER]** **[ENTER]**.

You should see the screen to the right.



- Move the cursor between the parentheses after the name bestfit and type **XS** **[ ]** **YS**. Then copy the commands from the left column of the table below. (The right column contains explanations of the commands.) Keep the following points in mind:
  - Pressing **[ENTER]** starts a new command line preceded with a colon.
  - Pressing **[←]** deletes a command colon.
  - Pressing **[2nd] h** enters the **&**.
  - Holding down the up-shift key (**[↑]**) while moving the cursor highlights whole sections of text which may be copied (**[♦] C**) or pasted (**[♦] V**).

command	explanation
<b>:BestFit(XS,YS)</b>	Name of program must be followed by a set of parentheses. The two arguments L1 and L2 are the names of the two lists of data points.
<b>:Prgm</b>	<b>Prgm</b> is always the first line.
<b>:L1&gt;xs:L2&gt;ys</b>	Because parameters L1 and L2 are local to the program, their values are transferred to global variables <i>xs</i> and <i>ys</i> to be displayed later as data plots.
<b>:Local answer, showgraf</b>	Local variables <i>answer</i> and <i>showgraf</i> are understood only within program BestFit.
<b>:Define Showgraf)=Prgm</b>	The subroutine Showgraf will be executed by the main program BestFit whenever the command <b>Showgraf()</b> is encountered.
<b>: Local i</b>	Local variable <i>i</i> is understood only within program ShowGraf. It is used to count the number of executions of the <b>For</b> loop, beginning three lines down.

## A Program for a Classroom Activity *(Continued)*

command <i>(continued)</i>	explanation <i>(continued)</i>
: DispG	The current graph is displayed.
: PxlText "y="&string(m)&"x+"& string(k),0,0	A string is placed on the graph screen, starting with the pixel in row 0, column 0, which is, the upper left-hand corner. Strings are concatenated with & (accessed with $\boxed{2nd}$ H). The <b>string()</b> command converts an expression to a string. The equation of the current line will be displayed.
: For i,1,dim(xs)	The beginning of a <b>For</b> loop. The variable $i$ assumes values of 1,2,..up to the number of elements in the list xs in successive executions of the loop.
: Line xs[i],y1(xs[i]),xs[i],ys[i]	A line segment is drawn from the point on the fitted line to the data point, according to each value of $x$ in xs.
: EndFor	End of <b>For</b> loop. When $i$ exceeds the number of data points, dim(xs), the loop terminates.
: Disp "m="&string(m)&" k="&string(k)," ss="&string(ss)	On the Input/Output screen, the current values of slope, $y$ -intercept, and ss will be displayed on one line.
: Disp "ss = sum of squares", "of lengths from", "points to the line."	The string is broken into parts, separated by commas, so that each part will be displayed on a new line.
:EndPrgm	Defines the end of the subroutine Showgraf.
:©Main Program	© denotes a comment. What follows on the command line is ignored. (Accessed with $\boxed{2nd}$ X or $\boxed{F2}$ 9.)
:DelVar m,k,ss	Values of these variables are deleted.
:FnOff	All defined $y=$ functions in the Y= Editor are turned off so they will not be graphed.
:PlotsOff	All defined plots in the Y= Editor are turned off so they will not be graphed.
:NewPlot 1,1,xs,ys	Plot1 is defined as a scatter plot, using the xs list and the ys list.

## A Program for a Classroom Activity *(Continued)*

command <i>(continued)</i>	explanation <i>(continued)</i>
:Define $ss = \sum((y_s - y_1(x_s))^2)$	The variable $ss$ is defined as the sum of the squares of the distances from the data points to the fitted line. The values of $m$ and $k$ , which minimize it, produce the linear regression line.
:setMode("Split Screen","Left-Right")	Splits screen into two parts, left and right. Defaults are Home screen on the left and Graph screen on the right.
:ZoomData	Sets the graph window to a size to show all the data points.
:Define $y_1(x) = m \cdot x + k$	Standard form for a linear equation is defined as a function in the Y= Editor. This equation and the data points will be graphed with each execution of <b>DispG</b> .
:ClrIO	The program Input/Output screen is cleared.
:Disp "Enter a slope m and","a y-intercept k of ","a line to 'best fit',"the data points."	Displays an instruction. So the string is not cut off, it is broken into four parts to be displayed on four lines of the Input/Output screen.
:Loop	Begins a loop ending with <b>EndLoop</b> .
: Disp "Enter 0 to quit."	Displays instruction of how to get out of loop.
: Prompt m,k	Prompts for a value of $m$ to be entered and a value of $k$ to be entered.
: If m=0:Exit	If 0 is entered for the slope, program execution jumps to <b>EndLoop</b> ; otherwise, <b>Exit</b> command is ignored and Showgraf() is executed.
: showgraf()	This subroutine, defined before the beginning of the main program, is executed.
:EndLoop	Ends the loop beginning with <b>Loop</b> .
:InputStr "See best fit? (y/n) ",answer	A prompt for a string $y$ or $n$ to be stored in the variable $answer$ . Press <input type="button" value="2nd"/> <b>Q</b> for "?".
:If answer="n":Stop	If $n$ was entered, <b>Stop</b> is executed and the program terminates; otherwise, this command is ignored. (If more than one command is to be executed conditionally, they must be bracketed between <b>Then</b> and <b>EndIf</b> commands.)

## A Program for a Classroom Activity *(Continued)*

Command <i>(continued)</i>	Explanation <i>(continued)</i>
<b>:LinReg xs,ys</b>	The best-fit linear regression line is calculated.
<b>:regCoef[1]→m:regCoef[2]→k</b>	RegCoef is a list of coefficients of the regression equation. The first one is the slope, the second, the <i>y</i> -intercept.
<b>:Showgraf()</b>	Subprogram is executed. The linear regression equation and the data points with vertical line segments between them are displayed.
<b>:EndPrgm</b>	This command ends the program.

### Running the Program

To run the program with the lists from the demonstration problem in *Activity 5*, from the Editor on the Home screen, press **BESTFIT** ( [ ] **XS** [ ] **YS** [ ] **ENTER** ).

The program will work with any lists that have been defined with a variable name. For example, if you have stored the data from the “Extra Practice” problem in *Activity 5* into lists hours and scores, you could run the program with those lists by pressing **BESTFIT** ( [ ] **HOURS** [ ] **SCORES** [ ] **ENTER** ).

