Make Real-World Connections with TI InterActive!

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TI InterActive! is a dynamic computer software tool that supports the teaching and learning of mathematics and science.

TI InterActive! integrates the following functions used by teachers and students:

- Word processor & Data Editor/Spreadsheet.
- Web Browser.
- TI-83+ Calculator (graphing, statistics).
- Computer Algebra System (like TI-89).
- Graph-link capabilities to calculators & CBL/CBR.

TI InterActive! can be used to:

- Create lesson plans and teacher notes.
- Develop dynamic activities for class demos or student investigations.
- Create tests with answer keys.
- Collect and analyze data from the Internet or CBL/CBR.
- Prepare student homework, projects and reports.

Why use TI InterActive?

- Allows use of several tools in one document.
- Enables connections to other disciplines.
- Dynamically updates graphs and equations based on changes made by user.
- Provides opportunities for exploration and gives students experience with situations that do not have one "right" answer.
- Supports alternative forms of assessment.

Where to get real-world data?

- Data Files available at http://education.ti.com/us/product/software/tii/datasites/category.html and Activities at http://education.ti.com/us/product/software/tii/activities/activities.html

- US Temperatures…http://lib.stat.cmu.edu/DASL/Datafiles/USTemperatures.html
  or look under "environment" in the data files area of the TI web page

- World Population…http://www.census.gov/ipc/www/worldpop.html
  or look under "government" in the data files area of the TI web page

- The Fleet…http://shs.westport.k12.ct.us/campe/CampeMath/TheFleet.htm

Working with Objects in TI-InterActive!

Use the Insert menu or the toolbar to insert objects into the document. Press Enter after inserting to create room to move objects around.

Toolbar: 

You can insert a(n)…	In order to…
Math Box	Perform calculations and evaluate expressions
Graph	Graph rectangular, polar, & parametric functions & plot lists
Table	Perform numerical evaluations of functions
List	Create & edit lists (similar to calculator lists)
Matrix	Create & edit matrices
Spreadsheet	Compute values in a spreadsheet
Statistics Calculation	Calculate a statistics regression for data
Statistics Test	Calculate other statistics tests for data
Slider	Insert a sliding control to change a variable's value
Hyperlink	Insert a hyperlink to a Web address (Insert menu only)
Page Break	Insert a page break (Insert menu only)
Math Section Break	Reset all variables for the section following the break (Insert menu only)
Calculator Screen	Insert a screen snapshot from a TI-83 or 83+ attached via GraphLink
Picture	Insert images (Insert menu only)
Object	Insert an object such as an Excel chart or video clip (Insert menu only)

To move an object, click and drag on it with your mouse to move it to a new location. Be aware that TII objects share data and values and objects below or to the right can "depend" on objects above or to the left. Moving objects can change the order of mathematical evaluation. For example, a data list must appear above or on the same line as the graph that plots the data, otherwise, the graph will have no data to plot.

To precisely place text and objects in the document, consider converting to floating objects. Select the object and then right-click to choose one of the formatting options.

When you are in editing mode (for the graph editor, the list editor, etc.) you are able to make changes to your object. When you are ready to return to your document, you need to save the changes into the main document. Every editing window has a "Save to Document" icon in the upper left of the toolbar, as well as a "Save to Document" choice in the File menu. Or just use CTRL-S. Of course, if you don't want to save your changes, choose "Cancel" from the File menu.

Working with Data in TI-InterActive!

TO ENTER DATA DIRECTLY INTO THE LIST EDITOR:

① In a new TII document, insert a list by clicking on the icon on the toolbar  or choosing List from the Insert menu.

② Type data into the lists.

③ Or, double-click on the "L1" header to type in a formula. For example, "seq(x,x,1,10)" will generate the numbers from 1 to 10 in L1. Then in L2 enter "sqrt(L1)" to generate square roots, or "3*L1+5" to generate y-values for y = 3x + 5, etc.

④ When you are finished, click on the "Save to Document" icon  in the upper left of the List Editor's toolbar.

TO GATHER DATA FROM THE INTERNET:

① In a new TII document, select Web Browser from the Tools menu, or click on the globe icon on the toolbar  , or press CTRL-W.

② If you are online, go to a web page with data.

③ If you are offline, select Open from the File menu and browse to the folder where an HTML file is saved.

④ Use your mouse to select (highlight) the data you want to import to TII, then click the EXTRACT button 

to copy the selected data to the List Editor. The List Editor will open automatically.

⑤ Alternatively, you could have TII search the web page and select data by clicking the SELECT button 

, then the EXTRACT button. Sometimes TII fails to select meaningful data, so be ready to manually select the data with your mouse if the Select button fails after a few tries.

⑥ If your downloaded data has text in the 1st row (instead of numbers), rename the lists by double-clicking on L1, L2 etc., then delete the 1st row.

⑦ When you are finished, click on the "Save to Document" icon  in the upper left of the List Editor's toolbar.

TO IMPORT DATA FROM A TI-83/83+ CALCULATOR: (see the Help menu for more details)

① Connect a calculator with the GraphLink cable. The TI-83 must be ON and the Home screen must be displayed.

② Select Calculator Data Transfer from the Tools menu, or click on the toolbar icon  .

③ The right half of the window will show the available data types on your calculator. Select the desired item (you may need to expanded the hierarchical lists using the ⊞).

④ The left half of the window will show the available folders on the computer. Highlight the destination folder and click on the arrow to transfer the data. Click OK to complete the transfer.

Alternatively,

① Open the List Editor by clicking on the List icon or by selecting List from the Insert menu.

② From the File menu, select Import, then select TI Calculator. A dialog box will appear with all available lists.

③ Select the desired lists, then select the Import button to transfer the lists to the List Editor.

TO IMPORT DATA FROM A CBL, CBL-2 or CBR: (see the Help menu for more details)

① Connect the unit to the computer with the GraphLink cable. Make sure the probe is connected properly and the unit is turned on. With a CBR, TI InterActive! turns the unit on when you begin collecting data.

② Select Quick Data Tool from the Tools menu, or click on the toolbar icon  .

③ On the dialog box, select the connected probe and specify the appropriate settings. Then click Run to begin collecting data.

TO PLOT DATA FROM THE LIST EDITOR:

① If the List Editor is not active, open it by double-clicking in the list.

② Select the columns to be graphed in the scatterplot by holding down the CTRL key and clicking in the gray header area in each list (SHIFT key works if the columns are adjacent).

③ Select Plot Data from the Data menu or click on the scatterplot icon  on the toolbar. The Graph Editor will open on the right side of your screen and show the graph as it currently appears. The left window indicates which lists are plotted and determines colors.

④ Click on the Format button  in the Graph Editor to adjust Window settings and create Labels for the graph. Click Apply to save changes on the graph.

⑤ When you are finished adjusting the plot, click on the "Save to Document" icon  in the upper left of the Graph Editor's toolbar.

TO CALCULATE A REGRESSION EQUATION:

① Open the Stat Calculation tool by choosing it in the Insert menu, or by clicking on the icon  on the toolbar.

② Select the appropriate type of regression in the Calculation Type drop-down list.

③ Enter the names of the desired lists into the X-List and Y-List boxes. [As an alternative to steps 1 & 3, just open the List Editor, select the desired lists with the CTRL key, and choose Stat Calculation from the Data menu or click the icon  . The desired lists will automatically appear in the X-List and Y-List boxes.]

④ Rename the regression equation to "f(x)" or "g(x)" etc.

⑤ Select the Calculate button at the bottom of the window to calculate the regression equation.

⑥ Click on the Calculation Results tab to see the equation. Select the Save Results button. This will paste the regression equation into the document.

TO GRAPH A REGRESSION EQUATION:

① Make sure the regression equation is located on the same line as the graph or above it. Otherwise, the results of the regression will not be available to enter into the functions window of the Graph Editor.

② Open the graph by double-clicking, and select the "f(x)" tab in the left window to see the functions list of the Graph Editor. Type "f(x)" or "g(x)" or whatever you named your regression equation in step ④ above.

③ Click in the checkbox to see the equation graphed on the scatterplot.

④ Make any needed adjustments to the graph, then click on the "Save to Document" icon  in the upper left of the Graph Editor's toolbar.

Algebra 2 Honors

Name _____
Partner _____

THE FLEET

The data in the HTML file "The Fleet" is from the British Airways fleet of airplanes. It gives several measurements for each type of airplane. Several associations exist among the numbers in the data set, and British Airways has hired you to analyze the data for them and report on your findings. Create a TI InterActive document as your report.

First, British Airways is interested in the relationship between an airplane's length and its wingspan. Complete the following steps in your analysis:

A. Identify your independent and dependent variables.

B. Make a scatterplot.

C. Find an equation to model the data. Show the equation on your graph.

D. Imagine some questions that the British Airways engineers might want to answer using your model. Make up at least one question and answer it using your equation.

E. Interpret the slope and y-intercept of your equation. Are they meaningful?

F. Explain anything unusual you notice about this data.

G. Do you think your equation holds true for all real numbers? Why or why not? You will need to report to British Airways an appropriate domain for the linear model, so they can use it wisely.

Next, analyze some of the other data given. Do you find any other relationships that can be modeled using a linear equation? Discuss your findings. Include at least 2 more graphs, and 1 more analysis like parts A, B, C, and D above.

Prepare a full report of your findings to be submitted to the British Airways engineers by the due date _____.

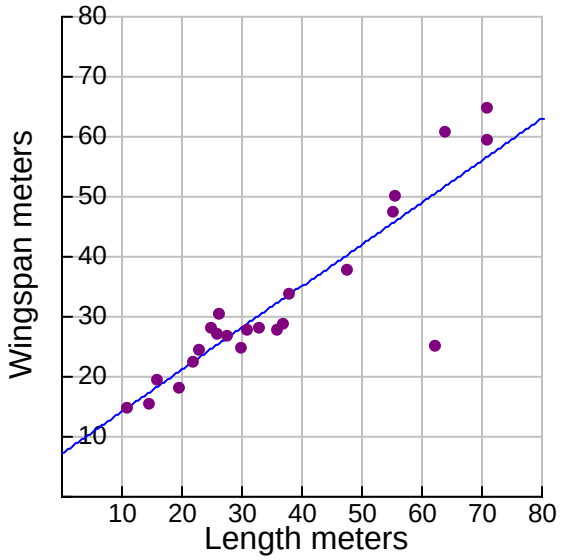
The Fleet

capacity	rangemile	rangek	engine	speedm	speedk	altitu	altitu	Length
100	4053	6523	4	1336	2150	55000	16765	203.75
64	760	1222	2	305	491	18000	5486	85.33
376	6138	9820	4	570	917	35000	10668	231.92
86	1550	2496	2	475	765	29000	18839	107
150	2070	3333	2	507	815	37000	11278	120
46	785	1256	4	270	433	15000	4572	80.67
426	7889	12693	4	575	927	35000	10668	231.92
80	1240	1996	2	414	667	35000	10668	97.17
8	250	403	2	150	242	3500	1066	35.58
229	6230	10026	3	558	898	35000	10668	181.58
18	160	258	2	185	298	15000	4572	51.75
48	621	1000	2	273	440	15000	4572	74.42
149	2426	3907	2	530	853	35000	10668	123.25
50	970	1562	2	322	518	15000	4572	84.25
247	5336	8591	2	542	873	35000	10668	180.25

LENGTH VS. WINGSPAN ANALYSIS

A. Independent variable: length of the plane in meters.
Dependent variable: wingspan in meters.

B. & C. Graph & equation below:



regEQ(x)=.698426*x + 7.2002

D. Questions:

1. If a new plane is to be 100 meters long, how wide will the wingspan be?

$y = .698426 \cdot 100 + 7.2002$

$y = 77.0428$

The plane should have wings about 77.043 meters wide.

2. A plane is known to have 35 meter long wings. Will it fit into a hangar that is 40 meters long?

$35 = .698426 \cdot x + 7.2002$

$35 - 7.2002 = .698426 \cdot x$

$27.7998 = .698426 \cdot x$

$$\frac{27.7998}{.698426} = x$$

$39.8035 = x$

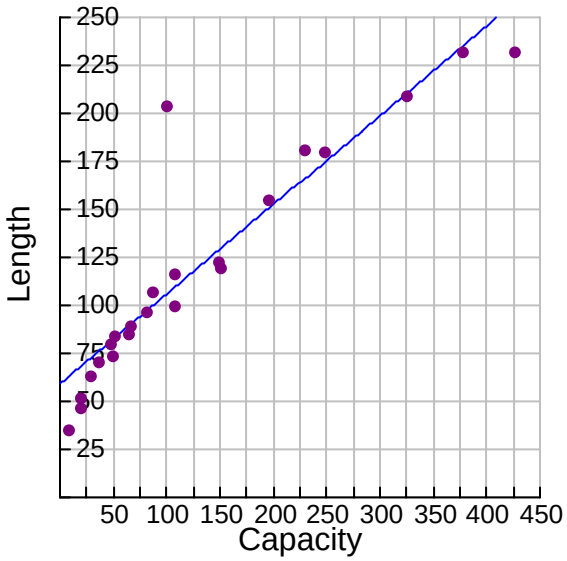
The plane should be about 39.8 meters long, so it will just fit into the hangar.

E. The slope of the equation, m=0.698426 means that for every meter the airplane gets longer, the wingspan increases by about .698 of a meter. The slope is meaningful.
The y-intercept means that an airplane of length 0 meters has a wingspan of 7.2002 meters. This is not meaningful because if it has no length it is not an airplane. Another way to look at this is that the minimum wingspan is 7.2002 meters.

F. The unusual thing I noticed about the data is the plane with coordinates (62.1, 25.5). This is a long plane with a short wingspan.

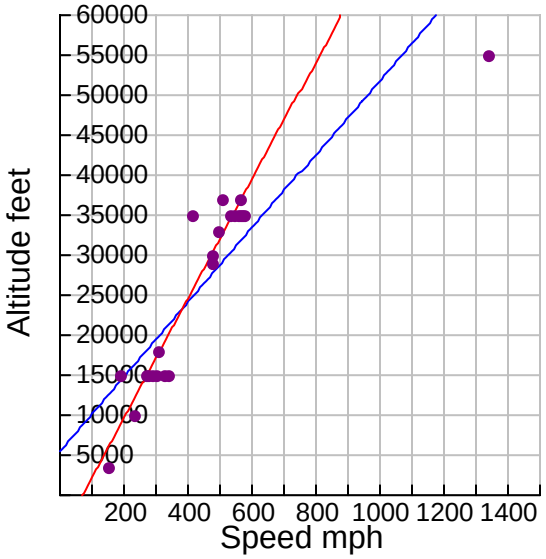
G. The equation doesn't hold true for all real numbers. The domain must be restricted to positive values. Also, maybe if you get a plane too big it won't be able to take off, so there needs to be some upper limit on the domain. So perhaps $0 < x < 150$ meters would be reasonable.

LENGTH VS. CAPACITY



Linear Regression (ax+b)
y1(x) = .466248x + 59.1303

SPEED VS. ALTITUDE



Linear Regression (ax+b)
regEQ(x) = 46.4255x + 5499.99

The blue line is the regression equation on the full data set.
The red line is the regression equation after deleting the Concorde Data point.

Working With Math Boxes in TI InterActive!

Click on the  icon on the toolbar to open a Math Box, or use the Insert Menu. An empty Math Box appears, along with the Math Palette.

You can type numerical and algebraic expressions using the keyboard or using your mouse and the math palette. When your expression is complete, press ENTER on your keyboard or the math palette to see the result. Another empty Math Box appears also; just press ESC or click on a blank part of the document to exit the Math Box editor.

Try these in some Math Boxes:

3^2*18/5

3^2*18/5. with a decimal point after the 5

cos(π)

You can press the  icon on the toolbar to open the Mode Settings box (or use the Edit Menu). This allows you to change several formats: radians/degrees, exact/approximate, real/complex.

The output of your Math Box can be hidden, displayed on the same line, or on the next line. The bottom of the Math Palette allows you to control this for each Math Box, or click on "More" to set your Output preference as a default (for example, if you are typing a quiz, you would want to hide the output for the whole document.)

The  character on the Math Palette defines a variable. Try these in some Math Boxes. The commands can be typed directly or found in the Math:Algebra menu on the Palette (and if you use the Palette, the syntax for each command will appear on the bottom of the Palette).

p:=6

4p–72

f(x):=x^2+2x-8

factor(f(x))

zeros(f(x),x)

solve(f(x)=0,x)

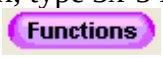
derivative(f(x),x)

expand(p*f(x))

Now go back to the Math Boxes that defined p and f(x) and change the value/expression. Notice how the subsequent Math Boxes recalculate to reflect the change.

Working With Graphs in TI InterActive!

Now press the  icon on the toolbar to insert a graph. A Function Edit box appears on the left side of the screen (much like the Y= button on the TI-83), and the graph appears on the right side.

In the Function Edit box, type f(x) next to y1(x) and press ENTER. The graph of your f(x) function immediately appears. Of course you can type a function directly into the Function Edit box so it will not be dependent on the Math Box; type 3x-5 into y2(x). Once the Function Edit box is closed, it can be accessed again with the 

button.

Use the 

button on the graph screen to make changes to the Window, Axes, Labels, etc. You can also type the window dimensions directly on the graph screen.

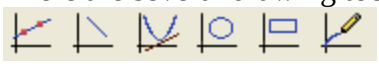
When you have made all desired adjustments, press the  icon to save your graph to the main document, or use the file menu or press CTRL-S on the keyboard. [Every type of editor (graph, list, matrix, etc.) in TI InterActive has a "save to document" icon in the same location.]

The graph of f(x) is dependent on the original Math Box that defined f(x), so see what happens when you change that Math Box.

Go back to the graph by double-clicking on it. In the graph screen, use the items in the Calculate menu just like the items on the TI-83. Or use the toolbar icons: 
Also try the 

button. The 

button will generate a table from the graphed functions.

There are several drawing tools available to enhance your graphs. Use the toolbar icons  to draw lines, line segments, tangents, circles or rectangles on your graph. The pencil icon is for freehand drawing. In addition, the  icon creates a label that can be moved to a desired location on your graph.

Document Management

INSERTING A MATH SECTION BREAK:
Sometimes, it is useful to insert a "Math Section Break" from the Insert menu into the document. This resets all of the variables you have created and "breaks" the interactive link between items. Insert one now, then try the following activity.

1. Use Math Boxes to define p(x):=x+1 and q(x):=x–2 and f(x):= p(x)/q(x).
2. Find the zeros of p(x) and q(x), and find f(0).
3. Graph the 3 functions. To the left of y1(x) there is a graphing styles box and a color box. Click on them to change the line style or color of the graph.
4. Explore the relationships among the 3 functions:
   How do the zeros of p(x) and q(x) affect the graph of f(x)?
   What does f(0) represent on the graph of f(x)?
   What is the relationship of the zeros of p(x) and q(x) on the value of f(0)?
5. Insert a Function Table  and type f(x) into the Function text box. The Function Table automatically uses integer values as a default for the independent variable. From the Edit menu, choose Table Setup, then change the Independent Mode to "Ask".
   Input the values x = 1, 10, 100, 1000, and 10,000 to explore the behavior of f(x) as x approaches positive infinity. Now input values very close to the zero of q(x) to explore vertical asymptotes.

FILE MANAGEMENT:
Files can be saved as TI InterActive documents (with a .tii extension). Or, choose Export from the File menu to save the file as an HTML file, a Word compatible file or a text file.

The document can also be emailed by choosing Send Document from the File menu or clicking the  icon on the toolbar.