Now that we know how to find an exponential model of the form $f(x) = a \cdot b^x$ when given two ordered pairs, we want to be able to find a *best-fit* exponential model when we have more than two ordered pairs.

Consider the following: the infant mortality rate is the number of infant deaths per 1000 births. The table below shows the infant mortality rate (in deaths per 1000 births) for various years since 1900. Let $f(t)$ be the infant mortality rate (in deaths per 1000 births) at t years since 1900.

Year	1915	1920	1930	1940	1950	1960	1970	1980	1990	2000	2005
Rate	99.9	85.8	64.6	47.0	29.2	26.0	20.0	12.6	9.2	6.9	6.5

Note that we could proceed by choosing just two of the data points, but we want to include all of the available data. Including more data will give us a better model of the situation.

Step 1: Enter the Data

First, we need to enter the data into our calculator's memory. Press STAT to bring up the menus shown in Figure 1. Press ENTER to open up your calculator's lists, shown in Figure 2. Enter the data for the year in the first column (L1, or List 1), then enter the data for the mortality rate in the second column (L2, or List 2), as shown in Figure 3. (Note that the screen isn't big enough to show the entire table of values.) The data is now stored in your calculator's memory.

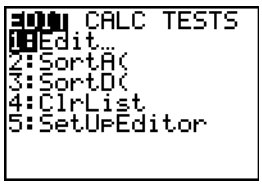

Figure 1

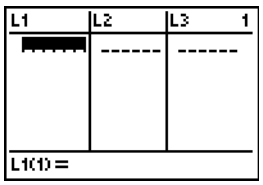

Figure 2

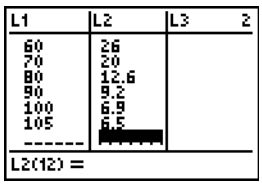

Figure 3

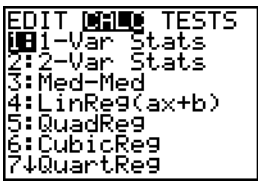

Figure 4

Step 2: Find the Model

Now we can find the model. Press STAT and then press the right arrow key to bring up the CALC menu shown in Figure 4. Scroll down to 0:ExpReg as shown in Figure 5. Press ENTER (or just press 0) to bring the ExpReg command to the home screen, as shown in Figure 6. Since the inputs are in List 1 (L1) and the outputs are in List 2 (L2), just press ENTER to find the model, as shown in Figure 7. The model we seek is given by $f(t) = 159.203(0.969)^t$.

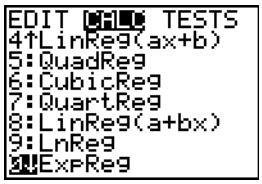

Figure 5

Figure 6

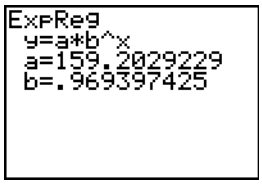

Figure 7

Figure 8

(Figure 8 shows the full syntax for the ExpReg command.)

Step 3: Define a Window

First, we need to tell our calculator where to look by defining a window. Press WINDOW to bring up the screen shown in Figure 9. (Note that you may have different values. Don't worry, we're going to change them.) You can change these values by entering a new value and pressing ENTER. Change the values to those shown in Figure 10. Note that the Xmin and Xmax indicate the years 1900 to 2020 and that the Ymin and Ymax indicate rates between 0 and 110 deaths per 1000 infants.

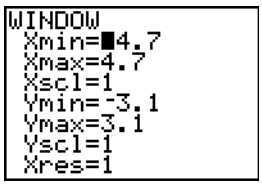

Figure 9

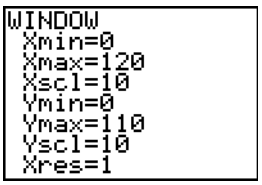

Figure 10

Step 4: Display the Scattergram

Next, we need to display the scattergram of the data. Press Y= to bring up the function entry screen. Press the up arrow and then ENTER to highlight Plot1 as shown in Figure 11. Press GRAPH to display the scattergram of the data shown in Figure 12.

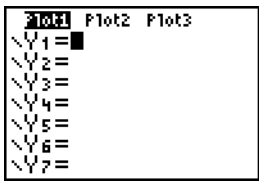

Figure 11

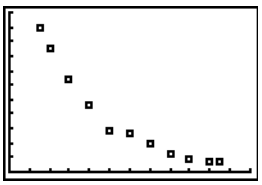
Figure 12

Step 5: Display the Model

Finally, we can draw the model over the scattergram to check its fit. Press Y= to bring up the function entry screen again. Enter the function as shown in Figure 13. Press GRAPH to display the model and the scattergram together, as shown in Figure 14. Looks like a pretty good fit!

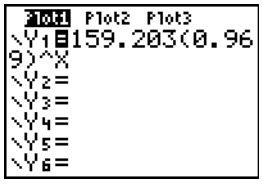

Figure 13

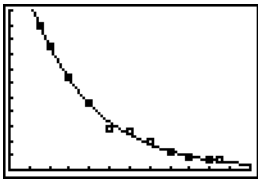
Figure 14