PROBLEM SOLVING WORKSHOP
LESSON 11.5

Using ALTERNATIVE METHODS

Extending Example 2, page 776

TEKS a.5, a.6, 2A.1.B

MULTIPLE REPRESENTATIONS In Example 2 on page 776, you used a graphing calculator to find an exponential model of the form $y = ab^x$ for a data set. You can extend this method to find exponential models of the form $y = ab^x + c$.

PROBLEM

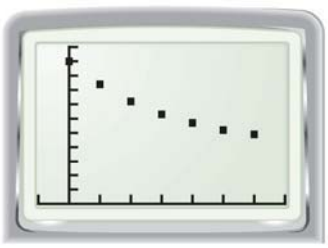
COOLING RATES You are storing leftover chili in a refrigerator. The table shows the chili's temperature y (in degrees Fahrenheit) after x minutes in the refrigerator. Use a graphing calculator to find a model for the data.

x	0	10	20	30	40	50	60
y	100	84	72	63	57	52	49

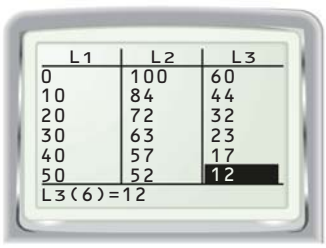
METHOD

Transforming Data One approach to solving the problem is to perform a transformation on the data and then find a model for the transformed data.

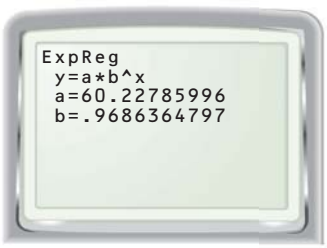
STEP 1 **Enter** the data in lists L_1 and L_2. Then make a scatter plot. The temperature appears to decay exponentially to 40°F. So the model has the form $y = ab^x + 40$, or $y - 40 = ab^x$.



STEP 2 **Define** a new variable $y_1 = y - 40$. Then the data pairs (x, y_1) are modeled by a function of the form $y_1 = ab^x$. Make a list of the values of y_1 by defining L_3 as $L_2 - 40$.



STEP 3 **Use** exponential regression to find a model for the data in lists L_1 and L_3. The model is $y_1 = 60.2(0.969)^x$. So, a model for the original data is $y = 60.2(0.969)^x + 40$.



▶ A model for the original data is $y = 60.2(0.969)^x + 40$. Graph the model along with the original data to verify that the model fits the data well.

PRACTICE

1. The data pairs (x, y) below give the temperature y (in degrees Fahrenheit) of a hot cup of soup after it sits for x minutes at room temperature. Estimate the temperature of the room. Then find a model for the data.

(0, 132.8), (10, 105.8), (30, 92.3), (50, 84.2), (70, 79.2), (90, 76.1), (110, 75), (120, 74.7), (130, 74.2)

2. The data pairs (x, y) below give the temperature y (in degrees Celsius) of a cold glass of water after it sits x minutes at room temperature. Estimate the temperature of the room. Then find a model for the data.

(0, 3.5), (20, 8.1), (40, 12.2), (60, 15.4), (80, 17), (100, 18.2), (110, 18.6), (120, 18.9)