



EXAMPLE 2 Find an exponential model

SCOOTERS A store sells motor scooters. The table shows the number y of scooters sold during the x th year that the store has been open.

Year, x	1	2	3	4	5	6	7
Number of scooters sold, y	12	16	25	36	50	67	96

- Draw a scatter plot of the data pairs $(x, \ln y)$. Is an exponential model a good fit for the original data pairs (x, y) ?
- Find an exponential model for the original data.

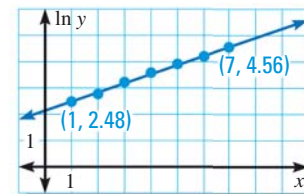


Solution

STEP 1 Use a calculator to create a table of data pairs $(x, \ln y)$.

x	1	2	3	4	5	6	7
$\ln y$	2.48	2.77	3.22	3.58	3.91	4.20	4.56

STEP 2 Plot the new points as shown. The points lie close to a line, so an exponential model should be a good fit for the original data.



STEP 3 Find an exponential model $y = ab^x$ by choosing two points on the line, such as $(1, 2.48)$ and $(7, 4.56)$. Use these points to write an equation of the line. Then solve for y .

$$\ln y - 2.48 = 0.35(x - 1)$$

Equation of line

$$\ln y = 0.35x + 2.13$$

Simplify.

$$y = e^{0.35x + 2.13}$$

Exponentiate each side using base e .

$$y = e^{2.13}(e^{0.35})^x$$

Use properties of exponents.

$$y = 8.41(1.42)^x$$

Exponential model

USE POINT-SLOPE FORM

Because the axes are x and $\ln y$, the point-slope form is rewritten as $\ln y - y_1 = m(x - x_1)$. The slope of the line through $(1, 2.48)$ and $(7, 4.56)$ is:

$$\frac{4.56 - 2.48}{7 - 1} \approx 0.35$$

EXPONENTIAL REGRESSION A graphing calculator that performs exponential regression uses all of the original data to find the best-fitting model.

EXAMPLE 3 Use exponential regression

SCOOTERS Use a graphing calculator to find an exponential model for the data in Example 2. Predict the number of scooters sold in the eighth year.

Solution

Enter the original data into a graphing calculator and perform an exponential regression. The model is $y = 8.46(1.42)^x$.

Substituting $x = 8$ (for year 8) into the model gives $y = 8.46(1.42)^8 \approx 140$ scooters sold.

