Name:_____Key_____ Date:_____ Class/Period:_____

Linear Regression Activity

The table below shows the number of small specimen-BMD scanners in the United States from 1998 to 2004.

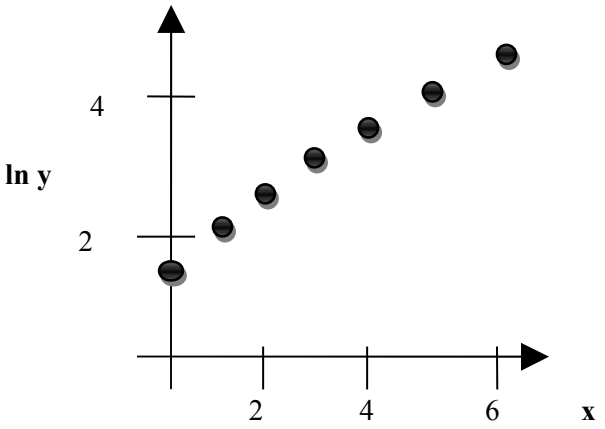
Year	1998	1999	2000	2001	2002	2003	2004
Small Specimen BMD Scanners	5	8	13	21	33	52	80

a. Linearize the data. That is, make a table with *x*- and *y*-values, where *x* is the number of years since 1998 and *y* is the number of BMD scanners. Then make a scatter plot of the linearized data.

Subtract 1998 from each year (your x) and find the natural logarithm of each BMD scanner quantity.

x	0	1	2	3	4	5	6
ln *y*	1.60944	2.07944	2.56495	3.04452	3.49651	3.94124	4.38203

The scatter plot suggests that there may be a linear relationship between *x* and ln *y*. Plot your points here and be sure to label and scale your axis.



b. Find a regression equation for the linearized data.

Use **LinReg(ax+b)** on the **STAT CALC** screen to find the linear regression equation. **LinReg**
y = ax + b

a = 0.464033

b = 1.626204

r^2 = 0.99963

r = 0.99981

Write out linear equation: **ln *y* = 0.4640*x* + 1.6262**

c. Use the linear regression equation to find an exponential model for the original data.

To find a model solve the regression equation in part **b** for y.

$\ln y = 0.4640x + 1.6262$

$e^{\ln y} = e^{0.4640x + 1.6262}$	*Raise e to each side.*
$y = e^{0.4640x + 1.6262}$	$e^{\ln y} = y$
$y = e^{0.4640x} \cdot e^{1.6262}$	*Product Property of Exponents*
$y = 5.0845e^{0.4640x}$	$e^{1.6262} \approx 5.0845$

The number of small-specimen BMD scanners in the United States between 1998 and 2004 can be modeled by the exponential function $\boldsymbol{y = 5.0845e^{0.4640x}}$.

d. Use the exponential model to predict the number of web sites that there will be in 2015.

The year 2015 is 17 years after 1998, so replace x with 17 in the exponential function.

$y = 5.0845e^{0.4640x}$
$y = 5.0845e^{0.4640(17)}$
$y =$ **13,550.74** BMD scanners in 2015.

Yes, this prediction makes sense.