Modeling Inverse Variation

You can use a graphing calculator or a computer to decide whether quantities vary directly, inversely, or neither.

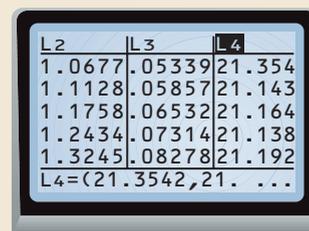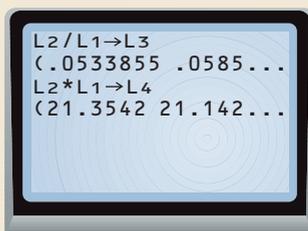## ▶ EXAMPLE

x	y
20	1.06771
19	1.11276
18	1.17583
17	1.24341
16	1.32450
15	1.40559
14	1.51371
13	1.62183
12	1.74347
11	1.90566

During a chemistry experiment, the volume of a fixed mass of air was decreased and the pressure at different volumes was recorded. The data are at the left, where x is the volume (in cubic centimeters) and y is the pressure (in atmospheres). Use a graphing calculator to determine if the data vary directly, inversely, or neither. Then make a scatter plot to check your model.

▶ SOLUTION

1 Let L_1 represent the volume x and L_2 represent the pressure y. Enter the ordered pairs into the graphing calculator. Then create lists L_3 and L_4 as shown to find whether the data vary directly or inversely.

```
L2/L1→L3
(.0533855 .0585...
L2*L1→L4
(21.3542 21.142...
```

2 Notice that the values in L_3 are all different while the values in L_4 are all about 21.1. This means that x and y vary inversely.

```
L2      L3     L4
1.0677 .05339 21.354
1.1128 .05857 21.143
1.1758 .06532 21.164
1.2434 .07314 21.138
1.3245 .08278 21.192
L4=(21.3542,21. ...
```

3 To find the constant of variation k, find the mean of the values in L_4. Use this value to write an inverse variation model in the form $y = \dfrac{k}{x}$.

```
mean(L4)
          21.123503
```

4 Set the viewing rectangle so that $11 \le x \le 20$ and $1 \le y \le 2$. Make a scatter plot of L_1 and L_2. Then graph $y = \dfrac{21.12}{x}$ on the same screen.
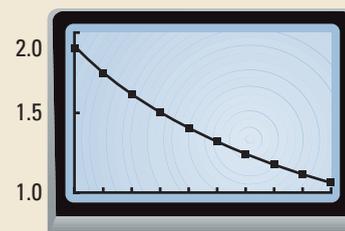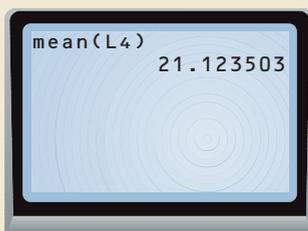
▶ EXERCISES

Use a graphing calculator to decide if the data vary directly or inversely and to find the constant of variation. Then write a model for the data.

1. (10, 8.25), (9, 7.425), (8, 6.6), (7, 5.775), (6, 4.95), (5, 4.125), (4, 3.3)

2. (18, 1.389), (17, 1.471), (16, 1.563), (15, 1.667), (14, 1.786), (13, 1.923)