

5.6 Fit a Line to Data

Goal • Make scatter plots and write equations to model data.

VOCABULARY

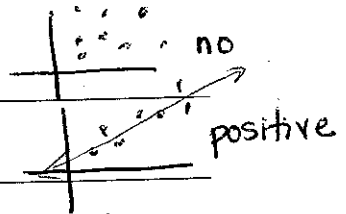
Scatter plot

- a graph with paired data plotted as points
- used to find relationship b/t the data sets

Correlation

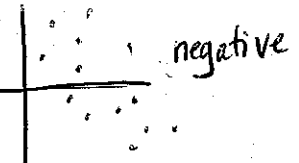
- the relationship b/t the paired data

+ / - / no



Line of fit

- a linear model (equation) used to represent the trend in the data



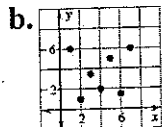
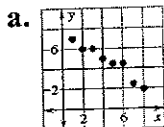
CORRELATION

- If y tends to increase as x increases, the paired data are said to have a positive correlation.
- If y tends to decrease as x increases, the paired data are said to have a negative correlation.
- If x and y have no apparent relationship, the paired data are said to have no correlation.

Example 1

Describe the correlation of data

Describe the correlation of data graphed in the scatter plot.



Solution

a negative
correlation

b no
correlation

Example 2

Make a scatter plot

(1,3) (1.5,1)

- a. Make a scatter plot of the data in the table.

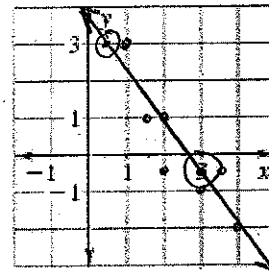
x	1	1.5	2	2	3	3.5	4
y	3	1	1	-0.5	-1	-0.5	-2

- b. Describe the correlation of the data.

Solution

a. Treat the data as ordered pairs. Plot the ordered pairs as points in a coordinate plane.

b. The scatter plot shows a negative correlation.



(.5, 3)

(3, -.5)

USING A LINE OF FIT TO MODEL DATA

Step 1 Make a scatter plot of the data.

Step 2 Decide whether the data can be modeled by a line +/- correlation?

Step 3 Draw a line that appears to fit the data

closely. There should be approximately as many points above the line as below it. points should be evenly spaced along line

Step 4 Write an equation using 2 points on the line. The points do not have to represent actual data pairs, but they must lie on the line of fit.

$$\begin{matrix} (.5, 3) & (3, -.5) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-.5 - 3}{3 - .5} = \frac{-3.5}{2.5}$$

$$= -1.4$$

$$\begin{aligned} y &= mx + b \\ 3 &= -1.4(.5) + b \\ 3 &= -.7 + b \\ 3.7 &= b \end{aligned}$$

$$y = -1.4x + 3.7$$

Example 3

Write an equation to model data

$$y = mx + b \quad Ax + By = C$$

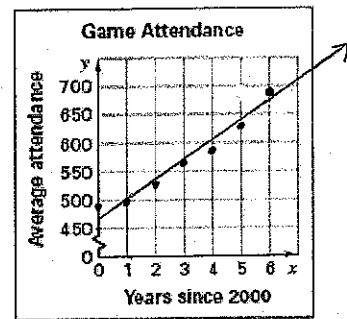
Game Attendance The table shows the average attendance at a school's varsity basketball games for various years. Write an equation that models the average attendance at varsity basketball games as a function of the number of years since 2000.

Year	2000 ₀	2001 ₁	2002 ₂	2003 ₃	2004 ₄	2005 ₅	2006 ₆
Avg. Game Attendance	488	497	525	567	583	621	688

Solution

Step 1 Make a scatter plot of the data. Let x represent the number of years since 2000. Let y represent average game attendance.

Step 2 Decide whether the data can be modeled by a line. Because the scatter plot shows a positive correlation, you can fit a line to the data.



Step 3 Draw a line that appears to fit the points in the scatter plot closely.

Step 4 Write an equation using two points on the line. Use $(1, 493)$ and $(5, 621)$.

Find the slope of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{621 - 493}{5 - 1}$$

$$= \frac{128}{4} = 32 = m$$

Find the y-intercept.

$$y - y_1 = m(x - x_1)$$

$$y - 493 = 32(x - 1)$$

$$y - 493 = 32x - 32$$

$$\begin{array}{r} y - 493 = 32x - 32 \\ +493 \qquad \qquad +493 \\ \hline y = 32x + 461 \end{array}$$

$$y = mx + b$$

$$493 = 32(1) + b$$

$$493 = 32 + b$$

$$\begin{array}{r} 493 = 32 + b \\ -32 \quad -32 \\ \hline 461 = b \end{array}$$

$$y = 32x + 461$$