

5.7 Predict with Linear Models

Goal • Make predictions using best-fitting lines.

Best-fitting line - line that most closely fits the trend in the data.
- only one of these -

types of prediction }
 Interpolation - using a line to approximate a value b/w 2 known values. } accurate
 9. inside known x's.
 Extrapolation - using a line to approximate a value outside known values.
 outside x's

Example 1 NFL Salaries The table shows the average National Football League (NFL) player's salary (in thousands of dollars) from 1997 to 2001.

Year	1997	1999	2000	2001
x Years since 1997	0	2	3	4
y Average Player's Salary (in thousands of dollars)	585	708	787	986

$$986 - 585 = 401$$

$$\frac{401}{16} = 25.06$$

- a. Make a scatter plot, letting the number of years since 1997 be the independent variable

(0, 2, 3, 4) and the average player's salary be the dependent variable. Do one by hand and one using a graphing utility.



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{835 - 640}{3 - 1}$$

$$\frac{195}{2} = 97.5$$

$$\begin{array}{l} x_1 \ y_1 \\ (1, 640) \\ (3, 835) \\ x_2 \ y_2 \end{array}$$

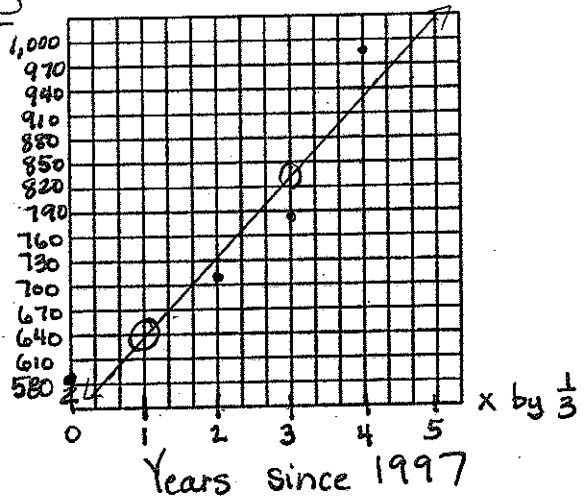
Avg. Salary (thousands of dollars)

$$y = mx + b$$

$$640 = 97.5(1) + b$$

$$\begin{array}{l} 640 = 97.5 + b \\ -97.5 - 97.5 \\ \hline 542.5 = b \end{array}$$

$$542.5 = b$$



$$y = 97.5x + 542.5$$

b. Find the **LINE OF BEST FIT** that models the average NFL player's salary (in thousands of dollars) as a function of the number of years since 1997.

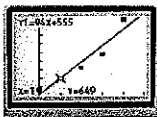
Perform _____ using the paired data. The equation of the
the

best-fitting line is $y = 94x + 555$.

c. Approximate the average NFL player's salary in 1998.

Graph the line of best fit as accurately as you can on your hand drawn scatter plot.
Also graph the line on the graphing utility's scatter plot.

Using the equation for the line of best, approximate the 1998 salary by
substituting in 1 for x.



$$y = 94(1) + 555$$
$$y = 649$$

The average NFL player's salary in 1998 was \$649,000.

Is this interpolation or extrapolation? This is interpolation.

Example 2 NFL Salaries Look back at Example 1.

a. Use the equation from Example 1 to approximate the average NFL player's salary in 2002 and 2003.

Evaluate the equation of the best-fitting line from Example 1 for $x = 5$ and $x =$

6.

$$y = 94(5) + 555$$
$$y = 1,025$$

$$y = 94(6) + 555$$
$$y = 1,119$$

The model predicts the average NFL player's salary as \$1,025,000 in
2002

and \$1,119,000 in 2003. Is this interpolation or extrapolation?