

Algebra 1A

Lesson 5.7

Predict with Linear Models

Warm-Up

For each function, evaluate $f(-2)$, $f(0)$ and $f(4)$.

(a) $f(x) = 3x + 5$

$f(-2) = -1$

$f(-2) = 3(-2) + 5 = -1$

$f(0) = 3(0) + 5 = 5$ $f(0) = 5$

$f(4) = 3(4) + 5 = 17$
 $f(4) = 17$

(b) $f(x) = -2x - 1$

$f(-2) = 3$

$f(-2) = -2(-2) - 1 = 3$

$f(0) = -2(0) - 1 = -1$ $f(0) = -1$

$f(4) = -2(4) - 1 = -9$
 $f(4) = -9$

(c) $f(x) = -\frac{1}{2}x + 3$

$f(-2) = 4$

$f(-2) = -\frac{1}{2}(-2) + 3 = 4$

$f(0) = -\frac{1}{2}(0) + 3 = 3$ $f(0) = 3$

$f(4) = -\frac{1}{2}(4) + 3 = 1$ $f(4) = 1$

Example 1. Using an Equation to Predict

The table provided shows the median floor area for a new home built in the United States during the years from 1995-1999.

Year	1995	1996	1997	1998	1999
Median Area	1920	1950	1975	2000	2028

(a) Make a scatter plot of the data provided.

(b) Determine an equation for the line of best fit as a function of the number of years after 1995 (let $x = 0$ represent 1995).

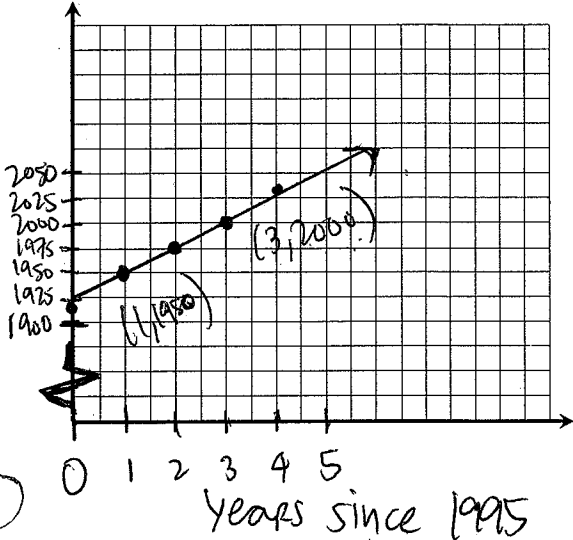
Slope: $\frac{2000 - 1950}{3 - 1} = \frac{50}{2} = 25$

POINT: $(1, 1950)$

$y - 1950 = 25(x - 1)$
 $y - 1950 = 25x - 25$
 $y + 1950 = 25x - 25 + 1950$
 $y = 25x + 1925$

$y = 25x + 1925$

Median Area (ft²)



(c) Use your equation from part (b) to predict the median home value in the year 2000 and the year 2001.

2000 ($x = 5$)

$y = 25(5) + 1925$

$y = 125 + 1925$

$y = 2050$

In 2000, we can predict that the median floor area of new homes built in the US will be 2050 ft².

2001 means $x = 6$

$y = 25(6) + 1925$

$y = 150 + 1925$

$y = 2075$

In 2001, we can predict that the median floor area of new homes built in the US will be 2075 ft².

Example 2. Predict Using an Equation

The table shows the number of rentals at a video store from 1998 to 2002.

Year	1998	1999	2000	2001	2002
Video Rentals (thousands)	2.6	2.3	2.0	1.8	1.4

(a) Make a scatter plot of the data provided.

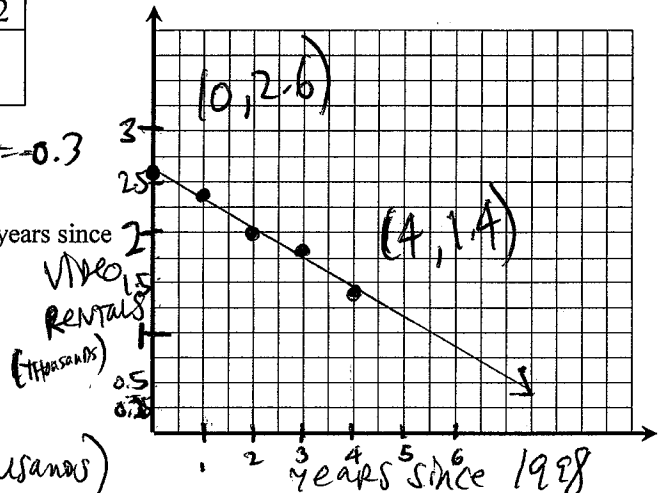
$$\text{slope} = \frac{1.4 - 2.6}{4 - 0} = -0.3$$

(b) Find an equation of the line of best fit as a function of the number of years since 1998 (let $x = 0$ represent 1998).

$$y = -0.3x + 2.6$$

$x = \text{years since 1998}$

$y = \text{VIDEO RENTALS (THOUSANDS)}$



(c) Use your equation from part (b) to approximate the year in which you would expect the number of video rentals to reach 1 thousand.

$$1 = -0.3x + 2.6$$

$$\begin{array}{r} -2.6 \\ \hline -1.6 = -0.3x \end{array}$$

$$\begin{array}{r} -1.6 = -0.3x \\ \hline -0.3 \quad -0.3 \\ \hline x = 5.3 \end{array}$$

$$x = 5.3$$

In April 2003, we predict video rentals would reach 1,000.

Zero of a Function

A zero of a function is the x-value for which the function will equal 0 (or $f(x) = 0$ or $y = 0$).

Example 3. Finding the Zero of a Function

Looking back at your equation from Example 2, find the approximate year that the model predicts there will be no video rentals ($y = 0$).

$$y = -0.3x + 2.6$$

$$0 = -0.3x + 2.6$$

$$\begin{array}{r} -2.6 \\ \hline -2.6 = -0.3x \end{array}$$

$$\begin{array}{r} -2.6 = -0.3x \\ \hline -0.3 \quad -0.3 \\ \hline x = 8.6 \end{array}$$

$$f(x) = -0.3x + 2.6$$

$$0 = -0.3x + 2.6$$

$$x = 8.6$$

In August 2006, video rentals will reach 0.

Assignment

New: