

Utah Population Modeling Project

Year	1981	1989	1993	1999	2005	2008
x	1	9	13	19	25	28
Population, y	15.2	17.1	19	22	25	27.4

Source: U.S. Census Bureau, Population Division

Math 1010 Intermediate Algebra Project

According to data from the U.S. Census Bureau, Population Division, the population of Utah appears to have increased linearly over the years from 1980 to 2008. The following table shows the population in 100,000 $f(x)$ that represents the data, reflecting the change in population in Utah.

- Using the graph paper on the last page, plot the data given in the table as ordered pairs. Label the x and y axes with words to indicate what the variables represent.
- Use a straight edge to draw on your graph what appears to be the line that best fits the data you plotted. Only have one line plotted rather than pieces of lines.
- Estimate the coordinates of two points that fall on your best-fitting line. Write these points below.

(13 , 19), (25 , 25)

Use the points that you wrote down to find a linear function $f(x)$ for the line. Show your work!

$$\frac{19-25}{13-25} = \frac{-6}{-12} = \frac{1}{2}$$

$$13-25 = -12 = 2$$

$$y-19 = \frac{1}{2}(x-13)$$

$$y-19 = \frac{1}{2}x - \frac{13}{2}$$

$$y = \frac{1}{2}x + \frac{25}{2}$$

$$f(x) = \frac{1}{2}x + \frac{25}{2}$$

- What is the slope of your line? $m = \frac{1}{2}$

Interpret its meaning. Does it make sense in the context of this situation? Please use complete sentences to respond to these questions.

Slope is the rate at which a certain amount is increasing.

5. Find the value of $f(45)$ using your function from part 3. Show your work, then write your result in the blank below.

$$f(45) = 1/2(45) + 25/2$$

$$f(45) = 45/2 + 25/2$$

$$f(45) = 70/2$$

$$f(45) = 35$$

$$f(45) = \underline{\quad} 35 \underline{\quad}$$

Write a sentence interpreting the meaning of $f(45)$ in the context of this project.

When we put 45 into the equation we are predicting the population 45 years from 1980, or the year 2025. The answer is a population of 3.5 million people.

6. Use your function from part 3 to approximate in what year the residential population of Utah reached 2,000,000. Show your work.

$$2(20) = (1/2x + 25/2) \quad 40 = x + 25 \quad 15 = x \quad 1980 + 15 = 1995$$

The population of Utah reached 2,000,000 in the year 1995.

7. Compare your linear function with that of another student or group.

Comparison function: $f(x) = \underline{\quad} 1/2x + 25/2 \underline{\quad}$

Is the comparison function the same as the function you wrote down for part 3?

Yes

If they are different, explain why.

If they are the same, explain why.

It is the same because we used the same points to create our equations

8. In actuality, using a linear growth model for population is not common. Most models are exponential models, due to the fact that most populations experience relative growth, i.e. 2% growth per year. Linear models for nonlinear relationships like population work only within a small time frame valid close to the time of the data modeled. Discuss some of the false conclusions you might reach if you use your linear model for times far from 1980-2008.

As it says in this paragraph there is usually a 2% growth per year, this means that as we continue to use this linear function it becomes more and more inaccurate. In actuality the real population would be higher than our estimates.

