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MODELING UTAH POPULATION DATA

Math 1010 Intermediate Algebra Group 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's living in Utah according to year. In this project, you will use the data in the table to find a linear function $f(x)$ that represents the data, reflecting the change in population in Utah.

Estimates of Utah Resident Population, in 100,000's						
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

1. 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.

2. Use a straight edge to draw on your graph what appears to be the line that "best fits" the data you plotted. You will only have one line drawn, rather than several pieces of lines

3. Estimate the coordinates of two points that fall on your best-fitting line. Write these points below.

$(18, 23), (24, 25.5)$

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

$$m = \frac{25.5 - 23}{24 - 18} = \frac{2.5}{6}$$

$$y - 23 = \frac{2.5}{6}(x - 18)$$

$$y - 23 = \frac{2.5}{6}x - 7.5$$
$$+23 \phantom{= \frac{2.5}{6}x} +23$$

$$y = \frac{2.5}{6}x + 15.5$$

$f(x) = \underline{\frac{2.5}{6}x + 15.5}$

4. What is the slope of your line? m = $\underline{\frac{2.5}{6}}$

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

   Every six years the population increases by 25,000 people. It does makes sense since the line of the data inclines.

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

   $f(45) = \frac{2.5}{6}(45) + 15.5 =$

   $f(45) = \underline{34.25}$

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

   In forty five years from 1980 the population will have increased to 3,425,000 residence in Utah.

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

   $20 = \frac{2.5}{6}x + 15.5$
   $-15.5 \qquad -15.5$
   $4.5 = \frac{2.5}{6} \times \left(\frac{6}{25}\right)$
   $\times \frac{6}{2.5}$

   $10.8 = x$

   $(10.8, 20)$

   It would be about 1991 when the population reaches 2,000,000 in Utah.

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

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

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

No

If they are different, explain why.

My line inclines higher. If that were my equation I would have converted it to decimal form when adding the population the graph started with in 1980 which would have been 12.5

If they are the same, explain why.

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.

Many things effect population growth including economic status of state, health of population, and cultural beliefs or changes within the population. Using such a large scales Rules all those factors out Resulting in bad estimates.