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 graph paper, plot the data given in the table as ordered pairs.* **(See Graph)**

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.* **(See Graph)**

3. *Estimate the coordinates of two points that fall on your best-fitting line. Use these points to find a linear function f (x) for the line.* **(7,17) and (14,20); (20-17)/(14-7)=3/7 m=3/7; Therefore, in using y=mx+b, we see that y=3/7x+b. In using the points to create a functional equation, we proceed: y-17=3/7(x-7) which translates to y=3/7x+14; so, f(x)=3/7x+14.**

4. *What is the slope of your line? Interpret its meaning. Does it make sense in the context of this situation?* **The slope of the line is 3/7. This means that, according to the graph, the population of Utah rises 300,000 every 7 years.**

5. *Find the value of f(45). Write a sentence interpreting its meaning in context.* **f(45)= 3/7(45)+14; y=3/7(45)+14; 7y=3(45)+98; 7y=135+98; 7y=233; y=33.285... This indicates that at the 45th year – or 2025, the population should increase to roughly 3,328,500. This corresponds to a rough estimate using the 3/7 slope and adding the correct population per amount of years.**

6. *Use your function to approximate in what year the residential population of Utah reached 2,000,000.* **In year 14 (1994), the population reached 2,000,000. This is shown not only by my point (14,20), but in the equation 20=3/7x+14; 6=3/7x; 42=3x; x=14.**

7. *Compare your linear function with that of another student or group. Are they different? If so, explain why.* **The numbers are surprisingly similar, but the use of the term "Best-fitting line" makes for a slightly ambiguous interpretation that can alter the values significantly.**

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.* **In using a linear growth model, we can see a population growth that doesn't correspond to the real numbers. Exponential models detail things like population growth much more accurately. It's simple when considering biological reproduction and so forth. The linear growth model makes it seem like 300,000 people move to Utah over the course of every seven years, whereas the actual population growth is a continual process involving human reproduction and so forth.**

9. *Reflective Writing. Did this project change the way you think about how math can be applied to the real world? Write one paragraph stating what ideas changed and why. If this project did not change the way you think, write how this project gave further evidence to support your existing opinion about applying math. Be specific.*

This project further illustrated what I already believe about mathematics. I think that it is an incredibly important tool that many people do not utilize in today's world. It can be used to create a picture based upon scattered numbers and bits of data that most will not understand in the first place. I was, however, surprised to learn that using a linear model could make such completely different indications as using an exponential growth model. I'm always suspicious of a person's statistics until I see proper documentation, but what surprised me was the fact that in using the same data but just a different formulaic process that the end result could be altered so greatly.