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MODELING UTAH POPULATION DATA

50/50

Math 1010 Intermediate Algebra Group Project

For all problems, please show your work and answer all questions using complete sentences.

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.

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 (i.e., don't connect the dots).***

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.

$m = \frac{25-19}{25-13}$

$m = \frac{6}{12}$

$m = \frac{1}{2}$

$y - 25 = \frac{1}{2}(x - 25)$

$y - 25 = \frac{1}{2}x - 12.5$

$+25 \qquad +25$

$y = \frac{1}{2}x + 12.5$

$f(x) = \frac{1}{2}x + 12.5$

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 $\frac{1}{2}$. This means that the population would increase by 100,000 every 2 years. It does make sense. Population is increasing at approximately that rate for the points plotted on the line. The graph reflects that.

5. Find the value of f(45). Write a sentence interpreting its meaning in context.

$f(45) = \frac{1}{2}(45) + 12.5$

$f(45) = 35$

In the year 2025, the population will be 3.5 million.

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6. Use your function to approximate in what year the residential population of Utah reached 2,000,000.

$20 = \frac{1}{2}x + 12.5$

$-12.5 \quad -12.5$

$2(7.5) = (\frac{1}{2}x)2$

$x = 15$

The year 1995, or 15 years from 1980.

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7. Compare your linear function with that of another student or group. Are they different? If so, explain why.

It's possible that others function could be different depending on how they drew their line and which points on the line they used in their calculations to create their function.

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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.

The linear model would not be able to predict sudden changes in the population. There could be a sudden increase in the population due to migration or just the population's desire to have a higher birthrate. There could also be a sudden decrease in population related to migration, natural disasters, wars, etc.

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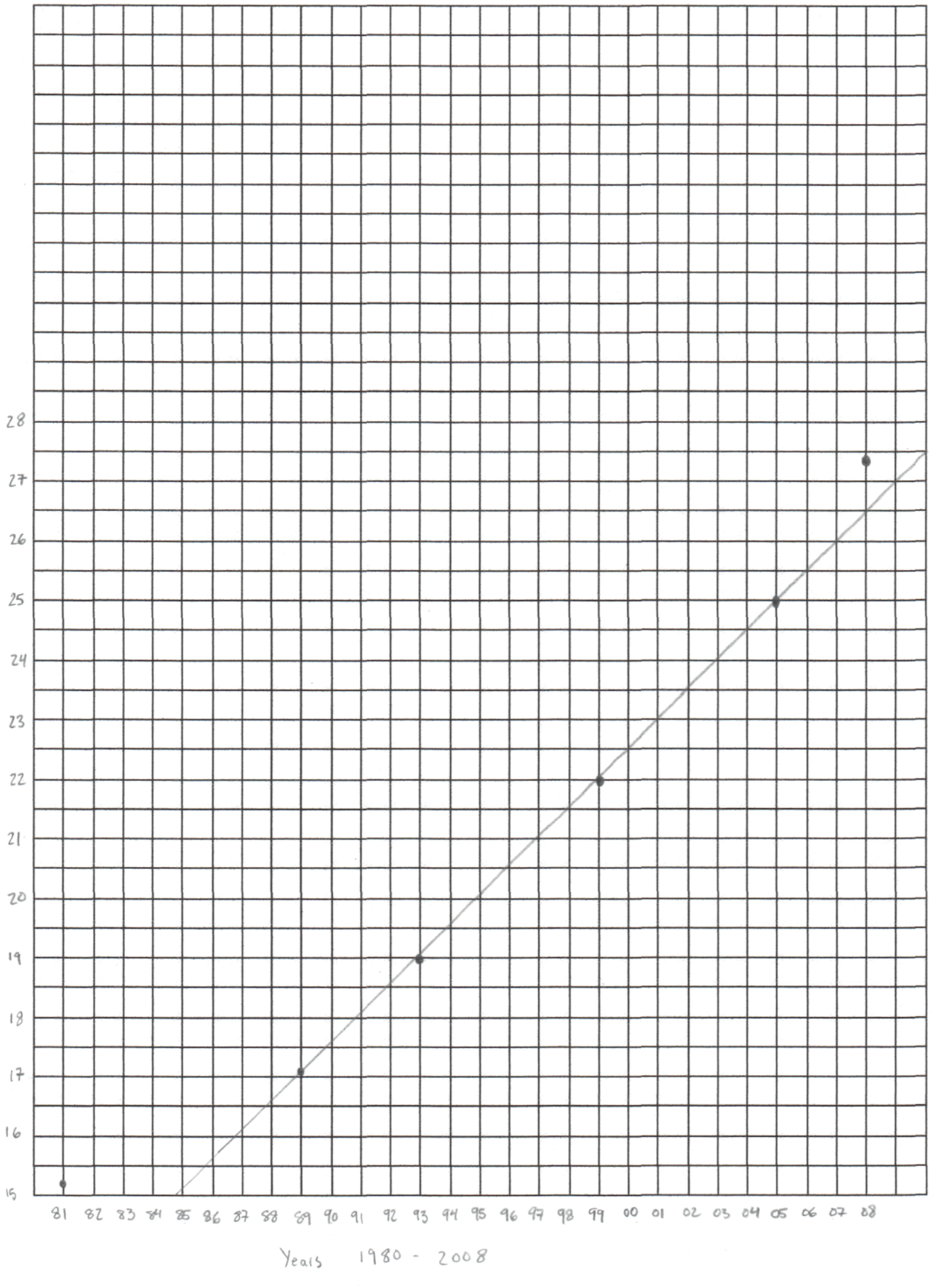
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Population in 100,000's.
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08
Years 1980 - 2008