Math TODAY™
Teacher Edition

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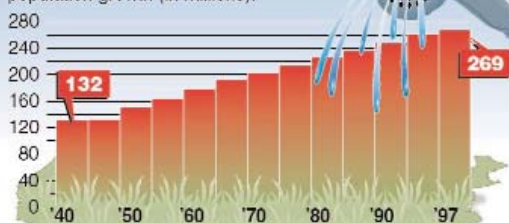
Population on the Move

By: Bob Tower

USA SNAPSHOTS®
A look at statistics that shape the nation

More of U.S.

The nation began 1998 with an estimated population of 269 million, an increase of about 2.4 million in the past year. U.S. population growth (in millions):

132 ... 269

'40 '50 '60 '70 '80 '90 '97

Source: Census Bureau

By Cindy Hall and Marcy E. Mullins, USA TODAY

Activity Overview:

This USA TODAY Snapshot® "More of U.S." will provide students with the opportunity to interpret data presented in a graphical form.

Students will determine the rate of change (slope) and build a linear model ($y = mx + b$) from this data. The model will be used to make a prediction about the future growth of the population of the U.S. if the current trend continues.

Concepts:

- Rate of change (slope)
- Reading and interpreting graphs
- Describing the correlation between independent and dependent variables
- Slope-Intercept form of linear equations
- Modeling data with linear functions
- Evaluating, synthesizing and analyzing real-world data

Activity at a Glance:

- Grade level: 9-12
- Subject: Algebra 1
- Estimated time required: 10-30 minutes

Materials:

- TI-83 Plus or TI-83 Plus Silver Edition
- Overhead view screen handheld for instruction/demonstration
- Student handout
- Transparency
- Science Tools APP (optional)

Prerequisites:

Students should know how to:

- enter data into the List Editor.
- create a linear regression model.
- make a prediction using the linear regression model.
- find rate of change and include appropriate labels.
- use the Science Tools APP.

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Objectives:

- Find the rate of change (slope) for a given set of data.
- Determine a linear regression model from data.
- Use substitution to predict and answer using the linear regression model.
- Use the appropriate labels with numerical values for the rate of change.
- Create a scatter plot of the data.

Background:

In this activity students will determine the rate of growth of the U.S. population and find a linear model from the data to predict the population in the future if these trends continue. Students will have the opportunity to demonstrate their understanding of rate of growth (slope), linear equations, independent/dependent variables, and positive/negative correlation between variables using real data.

Since this is a real-world problem students will have the opportunity to correlate the algebra concepts to topics with meaning. This context illustrates the need for using appropriate labels for the variables and on the rate of change values that will be found.

This is an excellent opportunity to use the Science Tools APP for the graphing and analysis of this data. Students can benefit from using different methods to solve a problem.

Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.
- If using Science Tools, be sure that each handheld has this APP.

Classroom Management Tips:

- Students will have a better understanding of how to read the graphic and retrieve data if you use the transparency for a class discussion before the students start working.

- Remind students to carefully read all parts of the graphic before they start collecting data.

- Let students know at the beginning of the activity if you want the numbers rounded to a specific number of decimal places (provided answers are rounded to two decimal places).

- Students can work individually or in small groups on this activity.

Data Source:

U.S. Census Bureau

National Council of Teachers of Mathematics (NCTM) Standards*:

Algebra Standard

- Understanding patterns, relations and functions.
- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

*Standards are listed with the permission of the National Council of Teachers of mathematics (NCTM), www.nctm.org. NCTM does not endorse the content or validity of these alignments.

Additional Resources:

Student Handout

Transparency

TI Technology Guide, for information on the following:

- TI-83 Plus
- List Editor
- ScienceTools APP

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Classroom Management Tips (continued):

- Students can work individually or in groups to assist each other as they learn the various features of the handheld.

- Allow students to talk about the "how" and "why" approach they use to find the solution. This is a great way to get students talking mathematics. Using this as a group activity gives students the opportunity to communicate with each other about real-world issues and math challenges.

- Technology appeals to almost all students. Encourage all students to handle and use the graphing handhelds. The TI graphing handhelds are designed to be durable for daily classroom use and backpack portability.

- If possible, use an overhead view screen graphic handheld for instruction. It will make it much easier for you to provide instructions and directions if the students can see the display on your graphing handheld.

- This would be an excellent time to discuss significant digits.

- This activity can be used as a review of the concepts or culminating activity with the class.

Activity Extensions:

- Have students find articles in USA TODAY that pertain to, or are impacted by, census data. Related topics include population trends, fastest growing cities and states, housing, and social and economic trends. Look at the Census Bureau website, www.census.gov, and have students write a report on population and economic trends in different regions of the United States. Assign students different states or regions to explore.

- Encourage students to check out the Census section on USA TODAY's Web site at www.usatoday.com for related news stories and interactive national and state demographic data. This section can be found in the News section of USATODAY.com.

- Encourage students to call or visit their local/state government agency and inquire about the population trends in their area.

Curriculum Connections:

CROSS-CURRICULAR

- Social Studies - current events
- Speech and Debate - topics of interest
- History - previous growth trends
- English - research topics

Teacher Notes:

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Assessment and Evaluation:

Q. The population data in the following table comes from the USA TODAY Snapshot More of U.S. and the Census Bureau. Now go back to the USA Today Snapshot "More of U.S." and find the population information about the two missing years.

Year	Population U.S. (millions)
1940	**132**
1950	151
1960	179
1970	203
1980	227
1990	249
1998	**269**
2000	281

Q. What is the correlation between years and population?

A. The relationship shown in the graph represents a positive correlation between years and the population. As the years increase the population increases.

Q. Determine the linear model using the regression capabilities of the handheld.

A. The linear model is: y = 2.45x+-4610 when considering the significant digits rule
The answer from the handheld is y = 2.4450659781985x+-4613.962708.

Q. What is the rate of change in population per year? What would be the appropriate units for this value?

A. Rate of change is 2.4450659781985 million people per year (exact answer from the handheld).
Rate of change is 2.45 million people per year (following the significant digits rules).

Q. Based on the data, what will be the estimated population of the United States in 2010?

A. The estimated population is 315 million if using significant digits rules for the equation. The estimated population is 301 million if using the exact answer from the handheld.