Teachable MOMENTS

U.S. Population Exceeds 300,000,000

To the Teacher

On October 17, 2006, the United States population topped the 300,000,000 mark. What is the rate of population growth? What fraction is due to immigration? What are the potential effects on our economy and our environment? Take advantage of this "teachable moment" by engaging your middle or high school students with the mathematics, economics, and science related to this milestone.

National Council for Teachers of Mathematics (NCTM) Standards Addressed

Number and Operations

- Work flexibly with fractions, decimals, and percents to solve problems.

- Understand and use ratios and proportions to represent quantitative relationships.

Algebra
- Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships.

Reasoning and Proof
- Make and investigate mathematical conjectures.

- Develop and evaluate mathematical arguments and proofs.

Representation
- Use representations to model and interpret physical, social, and mathematical phenomena.

National Science Education Standards from the National Research Council NSES Standards Addressed

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

Populations, Resources, and Environments

When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.

Suggestions for Using the Student Worksheet

(found on page 2)

- Consider allowing students to work in pairs or small groups.

- Consider assigning students or groups of students different questions and asking them to present their solution(s), reasoning, and proof to the rest of the class.

- Consider making the "optional" question a requirement and modifying it by assigning the various topics to individuals or groups of students.

- Consider developing an interdisciplinary study of population growth with collaboration among mathematics, science, and social studies teachers.

U.S. and World Population Web Sites

The Population Reference Bureau http://www.prb.org/
Population Index http://popindex.princeton.edu/
U.S. Census Bureau http://www.census.gov/
Population Centers Worldwide
http://www.citypopulation.de/
Population Clocks
http://www.census.gov/main/www/popclock.html

Online Links to Articles on Environmental Impact

– AAAS Atlas of Population and Environment

– The environmental load of 300 million: How heavy?

– U.S. population reaches 300 million

– U.S. population consumes its way to 300 million

U.S. Population Exceeds 300,000,000

The population of the United States officially exceeded 300 million on Tuesday, October 17, 2006. The United States is now the world's third largest country by population behind China and India. Answer the following questions about this population milestone and its implications.

1. On October 20, 2006, the U.S. population was 300,024,895, and the world population was 6,551,647,925. At that time, what fraction or proportion of the world's population lived in the United States? Show your work and report your answer in at least two different forms.

2. The population of China is 1.37 billion people. How much larger is the Chinese population than the U.S. population? Show your work and express your solution in at least two different forms.

3. Graph the following data and write a paragraph summarizing your observations about the rate of population growth as illustrated by your representation. Make sure to title and label your graph appropriately.

Year	1800	1900	1967	2006	2043
Approximate U.S. Population	8 million	76 million	200 million	300 million	400 million (estimated)

4. Based on the data in the table and your graph, when did the population in the United States reach 100,000,000? Show your work and justify your strategy and solution.

5. As of October 2006, in the United States there is:
one birth every	7 seconds
one death every	13 seconds
one international migration every	31 seconds

   Use algebra or another strategy to determine how often there is a net gain of one person in the U.S. population. Show and explain your work and your solution.

6. Use mathematics to predict the U.S. population in the year 2100. Explain and defend your prediction.

Optional

List the potential environmental and economic impacts of population growth. Select one and research it. Make a detailed prediction describing a particular result of the current rate of population growth. Support your prediction with information from your research and mathematics.

Suggested Answers

1. Strategies and exact answers may vary but are likely to include a decimal derived by dividing 300,024,895 by 6,551,647,925 and yielding .04579…. probably rounded to .05 or .046 and a fraction derived by simplifying 300024895/6551647925 and yielding 1/22.

2. Strategies and exact answers may vary but are likely to include a difference derived by subtracting 300,000,000 from 1,370,000,000, indicating that 1.07 billion or 1,070,000,000,000 more people live in China than in the United States, and a magnitude derived by dividing 1,370,000,000 by 300,000,000 yielding 4.5666, indicating that the population in China is 4.6 times the U.S. population.

3. Graphing formats and student observations will vary, but key features include the following: selecting standard increments of time and population in order to create the units on the x and y axis; a title referring to U.S. population growth; labels indicating that one axis represents the year and the other represents the U.S. population (and in what units, e.g., millions); a line, bars, etc. showing the increase in the rate of population growth. The paragraph may describe the overall growth and/or point out specific points or periods of time.

4. Student solutions may vary but should include an estimate between 1900 and 1967 with a mathematical explanation to support it.

5. Student strategies may vary, but the correct solution is a net gain of one person every 11 seconds. The solution should include the work/strategy and an explanation.

6. Student predictions will vary but should be between 300 and 400 million and include an explanation and justification to support it.

Responses to optional assignment will vary but may include a prediction and discussion of the impact on air quality, water quality, fuel consumption, amount of open/green space, housing, education, traffic, healthcare, social services, the job market, agriculture, and so forth.