

Title: How Much Space Do We Have?

Grade Ranges:

 K-4
 X 5-8
 9-12

Subject Tag:

Math: Problem Solving

Math: Algebra I

Synopsis:

Students will work with different mathematical scenarios that involve populations and land area in their city, state, country, and world. The lesson plan provides additional scenarios involving similar equations and including unit conversions (metric and English).

Keywords:

unit conversions, metric units, English units, population density, area

Body:

1. Pose the following situation to students: (Fill in the appropriate names in the brackets.)
[The mayor of your city] has decided to reallocate the ownership of land in [your city]. [His/her] plan is to give every person the same size piece of land. How much land would you get?
2. Students should use the Internet to find the total population of the city and the total land area.
3. Students will then determine the amount of land each person would get if it were divided equally. You may need to remind students to convert to appropriate units (square yards, square feet, square inches, etc.)
4. Then have students further research population and land area data to answer the following scenarios.
 - a. Having seen the brilliant strategy of [your mayor], [your governor] decides to do the same thing all over the state. Under whose policy do you have more land? Explain why mathematically.
 - b. What if this idea were adapted to the United States? To the world? How much land would you have? Would you prefer this situation? Why or why not?
(For each of these scenarios, the students will need access to the populations and areas of the state, USA, and the world. Remind students to look for the areas of land masses — not of oceans and seas.)
5. Other possible extensions of this assignment are:

- a. (Referring to the world area problem above.) A French exchange student is not familiar with English units. Translate your answer into the metric units with which she is familiar.
- b. In an effort to promote school spirit, [your principal] decides that for one day every student will get to be the principal for the same amount of time. How long will you get to be principal? Justify mathematically.
- c. How many gallons of water would it take to fill the Empire State Building?

Note: a conversion table is provided in the accompanying handout.

Related Links:

United Nations Statistics Division

<http://unstats.un.org/unsd/>

Demographic yearbook of capital cities and cities with 100,000 and more inhabitants.

The World Gazetteer

www.world-gazetteer.com

Contains current International population figures.

City Population

www.citypopulation.de

Contains the population and area of all countries of the world.

Fact Monster

www.factmonster.com

Great search engine for students.

New York Public Library: Facts about the Empire State building

<http://www.nypl.org/research/chss/spe/art/photo/hinex/empire/about.html>

Contains basic facts about the Empire State building, including total volume

Oswego City School District Regents Exam Prep Center, Math A

<http://regentsprep.org/Regents/math/math-a.cfm>

Under the Measurement section, this site provides tables to convert from metric to English and visa-versa

Features:

Contains special education tips

Quick Activity (less than 30 minutes; story starter)

Requires Internet access for students to complete

Objectives:

Students will be able to convert units in one, two, and three dimensions.

Standards:

NY: 3.5 Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.

NYC: M2g. Chooses appropriate units of measure and converts with ease between like units, e.g., inches and miles, within a customary or metric system.

CT: 1. Number Sense. Students will use numbers to count, measure, compare, order, scale, locate and label, and use a variety of numerical representations to present, interpret, communicate and connect various kinds of numerical information.

5. Measurement. Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

NJ: 4.5: All Students Will Regularly And Routinely Use Calculators, Computers, Manipulatives, And Other Mathematical Tools To Enhance Mathematical Thinking, Understanding, And Power. **4.9:** All Students Will Develop An Understanding Of And Will Use Measurement To Describe And Analyze Phenomena.

Prerequisite Skills:

Students must be familiar with different systems of measurement.

Time Required:

One to two class periods, depending on access to computers.

Technology and Materials Needed:

Internet access

Assessment Criteria:

1. Check for numerical accuracy.
2. Check for correct units.

Review Date:

Review comments:

Check Web sites.

Handout #74
Unit conversions

English

Length and distance:

12 inches=1 foot
 3 feet=1 yard
 5280 feet=1 mile

Volume and capacity:

8 fl. oz=1 cup
 2 cups=1 pint
 2 pints=1 quart
 4 quarts=1 gallon

Weight and mass:

16 oz=1 pound
 2000 pounds=1 ton

Metric

Length and distance:

10 millimeters=1 centimeter
 100 centimeters=1 meter
 1000 meters=1 kilometer

Volume and capacity:

1000 milliliters=1 liter

Weight and mass:

1000 grams=1 kilogram

Converting between English and Metric

Length and Distance	
1 inch=25 millimeters	1 millimeter=0.04 inches
1 foot=30 centimeters	1 centimeter=0.03 feet
1 yard=0.9 meters	1 meter=1.1 yards
1 mile=1.6 kilometers	1 kilometer=0.6 miles
Volume and Capacity	
1 fl. oz=30 milliliters	1 milliliter=0.034 fl. oz.
1 gallon=3.8 liters	1 liter=0.26 gallons
Weight and Mass	
1 ounce=28 grams	1 gram=0.035 ounces
1 pound=0.45 kilograms	1 kilogram=2.2 pounds

Density

1000 cubic centimeters=1 liter (water)