Avoiding the Crowd: Understanding Population Density of Earth’s Continents

Students will use a variety of methods to learn how the density of population varies from continent to continent throughout the world.

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Grade Level
3

Duration
2 class periods

National Geography Standards
ELEMENT ONE: The World in Spatial Terms 3. How to analyze the spatial organization of people, places, and environments on Earth’s surface.

Arizona Geography Strand
CONCEPT 1 World in Spatial Terms
PO 5 Construct charts and graphs to display geographic information

Other Arizona Standards
Mathematics Common Core Standards
Operations and Algebraic Thinking
3.OA.5. Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) Examples: If 6 x 4 = 24 is known, then 4 x 6 = 24 is also known. (Commutative property of multiplication.) 3 x 5 x 2 can be found by 3 x 5 = 15, then 15 x 2 = 30, or by 5 x 2 = 10, then 3 x 10 = 30. (Associative property of multiplication.)

Measurement and Data
3.MD.6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

Standards for Mathematical Practice
3.MP.2. Reason abstractly and quantitatively.

Overview
One of the ways to analyze the places and regions of the world is through population density. Which continents are the most densely populated? How does Arizona compare to other regions in terms of population density?

Purpose
In this lesson students will gain a better understanding of the population density of the world’s continents and of Arizona by creating models using mathematical operations.

Materials
• The Continents of the World map, one per student
• Table of World Population Density, one per student
• Crayons, pencils
• Seven 5’x5’ squares of butcher paper in colors that correspond to the continent colors listed in the Table of World Population Density
• Interlocking cubes, unifix cubes, or rainbow cubes
• Overhead transparency of the Population Density Recording Sheet
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- Student Assessment Materials:
  - Table of Population Density for Arizona
  - Geography Component
  - Math Component
  - Answer Keys

Objectives
The student will be able to:

1. Identify the continents and label them on The Continents of the World map.
2. Recognize that population density is a characteristic of how humans interact with their environment.
3. Construct three-dimensional representations to represent the density when given information about the population density of a place.

Procedures

SESSION ONE
1. Distribute a World Map and a Table of World Population Density to each student. Discuss what population density means. Be prepared to give examples of a square mile from the neighborhood. Have students name and color the seven continents consistent with the information presented in the table.

2. Push the desks aside (or go outside) and lay out the pieces of butcher paper on the floor in a configuration similar to where the continents are found on the world map. Explain to the students that the paper represents one square mile of each country and that the number of students standing on the paper will represent the population density of each and every square mile on the entire continent.

3. Explain to the students that for the purpose of the activity, one student will stand for 10 people. Have students stand on the continents, starting with Antarctica. Discuss the reasons why Antarctica has a population density of 0 (extreme cold, long periods of dark, inability to grow food, inaccessibility to trade). Continue with continents with higher density. A typical classroom will not have enough students to represent the density of all of the continents at the same time. Just move students to different continents as necessary. The number of students on each continent should be as follows:

<table>
<thead>
<tr>
<th>Continent</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>3</td>
</tr>
<tr>
<td>South America</td>
<td>7</td>
</tr>
<tr>
<td>Europe</td>
<td>13</td>
</tr>
<tr>
<td>Asia</td>
<td>20</td>
</tr>
<tr>
<td>Australia</td>
<td>1</td>
</tr>
<tr>
<td>Africa</td>
<td>6</td>
</tr>
<tr>
<td>Antarctica</td>
<td>0</td>
</tr>
</tbody>
</table>

4. End Session One with a discussion of the differences in population density of the various continents.

SESSION TWO
1. Divide the class into groups of three or four and provide each group with approximately 100 cubes and the Table of World Population Density By Continent handout.

2. Demonstrate how the cubes can be organized into a rectangular prism to represent the population density of Africa. Have one cube stand for 5 people in the same manner as one person stood for 10 people in the previous session. Using Africa as an example, you would need 12 cubes to represent the 60 people per square mile. It would be possible to construct rectangular prisms of 1x1x12, 1x2x6, 1x3x4, or 2x2x3.

3. Use an overhead of the Population Density Recording Sheet to record the dimensions of the rectangular prisms that the class discovers.

4. Allow the groups to experiment with their cubes to discover possible rectangular prisms.
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that can be used to represent the population density for each of the remaining continents. When a group comes up with a rectangular prism, have the other groups check it and then record it on the overhead.

5. Discuss each continent and have the various groups present configurations that they selected. Have students compare the different rectangular prisms and state reasons for which they prefer. Attach the selected array to a class map for display.

Assessment

The assessment for this lesson is based on a Table of Population Density for Arizona By County. The Geography Component asks students to draw conclusions about the population density of Arizona counties compared to that of the continents studied during the lesson. The Math Component requires students to create rectangular prisms to represent the population density of Arizona counties. Mastery for each of these components is four out of five or 80%.

Extensions

1. Students can use the information in the Table of World Population Density to make a graph of the data. Students can represent the data in different forms including pictographs and bar graphs.


3. A table called, “Population Density – Persons Per Square Kilometer,” can be viewed at: www.photius.com/wfb1999/rankings/population_density_0.html. This table lists all of the nations of the world and their population density. To convert this information to persons per square mile, just multiply by 0.386102. Conversions are also available online at: www.convert-me.com/en/. Students can be challenged to categorize countries within the continents that have densities close to the continent average or are significantly above or below the average.

4. The U.S. Census Bureau provides information on population density for each state and each county within each state at: www.census.gov/population/censusdata/90den_stco.txt. Students can be challenged to recreate this lesson using information from selected U.S. states.

5. The Table of Population Density can be used to review fractions. Students can be asked questions such as: What fraction of the counties in Arizona have a population density greater than Australia but less than North America? (Answer: 5/15 or 1/3)

Sources

A Geography page on About.com provides good background information at: www.geography.about.com/library/weekly/aa012599.htm