Seven Billion People...and Rising

How can students conceptualize the magnitude of Earth's human population of over 7 billion people?

Math Connections

Common Core Standards

Understand the place value system.

CCSS.Math.Content.5.NBT.A.1
Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

CCSS.Math.Content.5.NBT.A.2
Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Convert like measurement units within a given measurement system.

CCSS.Math.Content.5.MD.A.1
Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Can Students Understand the Scale of Seven Billion+?

How can students conceptualize the idea of the population of our planet being over 7 billion people? That's a REALLY big number! Population estimates project that number to rise to over 9 billion people by 2050. How can students even begin to grasp the magnitude of such a large quantity? Can students find ways to creatively use their understanding of the Base Ten number system to visually represent large numbers? Can students design clear and accurate graphic representations the population growth curve to scale? This lesson can be a one-day activity or can span throughout the unit – it's up to you and your class to decide!

People, People and More People!

How will human population growth strain the Earth's resources? What issues will we all face as more people populate our planet?

Open up a class discussion with students about the challenges created by human population growth. Ask them to share times when having too many people has been an issue (crowds at a beach or swimming pool, waiting in line for a restroom, noise levels in the cafeteria, shortage of materials in class, etc.) Review basic human needs: food, air, water and shelter.

Have students work with partners or in small groups to brainstorm some of the issues they think could arise on a global level, and why. Then come back together as a class and record some of their ideas. Which issues do they think are the most urgent?

Segue over into a discussion about large numbers such as a million or a billion. Do we really have any concept of how big these numbers really are?

"Wants" Versus "Needs"

Connection to Social Studies

Challenge your students to consider their "wants" versus their "needs." Have them create a T-Chart or another graphic organizer to record things they think fit into those categories for themselves.

Share and discuss.

Does everyone around the world have their needs met for nutritious food, clean water, breathable air and adequate shelter? What factors might create inequalities? Should everyone have their survival needs satisfied before anyone's wants are satisfied? Why or why not? What do they consider "fair" and why?

A hundred, a thousand, a million, a billion…?

Challenge your students to create a project to visually represent extremely large numbers like a million, a billion or 7 billion. What ways can they find to communicate the magnitude of such large numbers to others? Encourage the integration of exponents and scientific notation; but don't let it end there…

Idea Starters

Dot Wall

Suggested Materials:

- Sticky Notes
- Pens, Pencils or Markers
- Measuring Tapes or Meter Sticks

Build a wall of dot arrays on sticky notes. Let your students decide on a consistent number for each note (i.e.: a 10 x 10 array = 100 dots) for uniformity. Then have them choose if their goal is to fill up a certain surface area with arrays (16 sq. ft., 25 sq. cm., the entire wall) or to achieve a target number of dots. Have students make predictions about how much area it will take to represent a million, a billion and 7 billion; one wall of the classroom, all of the walls or even more?

Once the first goal has been achieved (either in one session or over the course of several days) have students figure out how to use base ten to scale up and determine how much space a million, a billion and seven billion dots would actually take up.

Take It Outside

Suggested Materials:

- Measuring Wheel (Surveyor's Wheel)
- Safety Cones or other boundary markers
- Meter Sticks
- Clipboards, Graph Paper and Pencils

It's a nice day to be outside – let's imagine we're enjoying the playground with a billion of our closest friends!

Using meter sticks, have students determine how much "personal space" an average-sized student takes up in square centimeters. Have the class lay out how much space they would take up standing in a group in they were all allotted that exact same amount of space, plot out that area and calculate the group's total area measurement at this point. (They may choose to create a single file line, an array, or just an irregular shape. When it's time to scale up from their group's total area, they will figure out an irregular space is not ideal. They may need to add some "phantom" students to create a useable quadrant – but see what they come up with!)

Continued

Have students make predictions on how much area they think a million, a billion or 7 billion people will take up – do they think they could even fit on your school grounds? Next, it's time to scale up the original section by tens using the measuring wheel. Students can take different jobs at this point: taking turns with the wheel, moving the border markers, keeping a running records of progress on graph paper to keep the numbers straight, figuring out how to allow for obstacles, etc.

Have fun!

Do A Little Research…

National Geographic Magazine has published several interesting and informative articles, along documentary videos, on the effects of population growth as part of a year-long series called 7 Billion. Assign students a jigsaw activity to research and report on key elements from various articles.

http://ngm.nationalgeographic.com/7-billion

There are more ways to present research than to just write a paper. Give students options on ways to share what they learn: create a Powerpoint, Prezi or Photopeach presentation, do a Podcast or video, generate a brochure, or even create a play or series of skits! There are more ways to present research than to just write a paper.

Extension Activities for Seven Billion…and Rising

Mapping

Challenge students to create graphic maps showing current and projected population densities around the world. What trends do they notice? (i.e.: populations concentrated near coastlines, countries with higher density populations, etc.)

What regions are expected to experience the greatest population growth over the next 20-50 years? What implications are there in relation to sustainable food production?

Graphing

Have students generate a graph showing population growth over time. What kind(s) of graphs would be appropriate? How will they figure out what scale to use to accommodate large numbers? Are there any historical connections they could notate on their graphs to give the timeline context?

Math Patterns

Can students come up with an algorithm for population growth that holds true across time? Or is there a point where the algorithm changes? Have students play around with exponential growth, doubling, Fibonnaci sequence (the story is that he was originally trying to calculate rabbit population growth) and algebraic equations to see if they can find a pattern and define it mathematically.

Global Population Statistics

Year	Population
1	**200 million**
1000	275 million
1500	450 million
1650	**500 million**
1750	700 million
1804	**1 billion**
1850	1.2 billion
1900	1.6 billion
1927	**2 billion**
1950	2.55 billion
1955	2.8 billion
1960	**3 billion**
1965	3.3 billion
1970	3.7 billion
1975	**4 billion**
1980	4.5 billion
1985	4.85 billion
1987	**5 billion**
1990	5.3 billion
1995	5.7 billion
1999	**6 billion**
2000	6.1 billion
2005	6.45 billion
2010	6.8 billion
2011	**7 billion**

Projected	Population
2020	7.7 billion
2025	**8 billion**
2030	8.3 billion
2040	8.8 billion
2045	**9 billion**
2050	9.2 billion