7 Billion and Growing

Directions: The following is **part 2** of your Quarter 4 Project. Complete on separate paper or poster and attach **part 1** (classroom statistics assignment). Be sure to include your name.

In 1804, the world population reached 1 billion people. In 1927, it was 2 billion. Although some of the following information may differ from source to source, the United States Census Bureau reported that the next milestones, 3, 4, 5, and 6 billion, occurred in 1959, 1974, 1987, and 1999, respectively.

In 2019, the world population reached 7 billion people! Demographers (people who study human populations) project that Earth will be home to 9 billion people by 2042. In this mathematical exploration, you will consider the implications of the current population growth for your lifetime.

Introductory Question

1. How old will you be in 2045? _____

Sharing Earth's Resources

A foremost concern of those who study population growth is "Where will everyone fit?" Suppose you wanted to gather all 7 billion people on Earth together in one place for a "get to know you" party. Where could you hold your party? Will your party be in a city? County? State? Country?

1. Take a guess: Where would be a reasonable location to hold a party for 7 billion people? Explain in 1-3 sentences.

Guests should not be crowded together. You will want each party guest to have enough "elbow room" to be comfortable. They will no doubt want to talk and joke with one another and maybe even do a little dancing.

2. Determine a reasonable area for a square for each guest. For example, perhaps you'd want each guest to have a 2 square meter amount of space. Explain your choice in 1-3 sentences

3. Using your response from question 2, calculate the total area that would be required to hold a party for 7 billion party guests. Convert the units in your answer to square miles and round to the nearest mile.

4. Use the following websites or other resources to identify a suitable location for your party. (Conversions: 1 km = 0.6214 mile and 1 mile = 1.60934 km)

   Areas by country: https://www.cia.gov/library /publications/the-world-factbook/rankorder /2147rank.html
   Areas by U.S. state: http://www.worldatlas.com/aatlas /populations/usapoptable.htm
   Areas by city: http://www.citymayors.com/statistics /largest-cities-area-125.html

5. No matter where or when you live on Earth, you have essential needs. Generate a list of what you think is absolutely needed for humans to live and discuss in 1-3 sentences why each item on the list is essential for every one of the 7 billion people currently living on Earth.

You probably realize that we will need land to grow crops to feed 7 billion people. You may also have realized the need for every person to have access to clean drinking water. (In fact, each person needs 2–4 liters per day.) But did you ever consider how much water is needed to produce the food that you eat? You might be surprised to learn that producing one person's daily food requires between 2000 to 5000 liters of water!

6. How many liters of water are needed to produce one person's food for one year if producing this food requires 3,500 liters per day?

7. An Olympic-size swimming pool is 50 meters long, 25 meters wide, and 2 meters deep. How many liters of water can an Olympic-size swimming pool hold? (1 cubic meter = 1,000 liters).

8. Approximate what fraction of the pool's water is required to produce your food for one year. Predict how many years' worth of food could be produced using one Olympic-size pool of water.

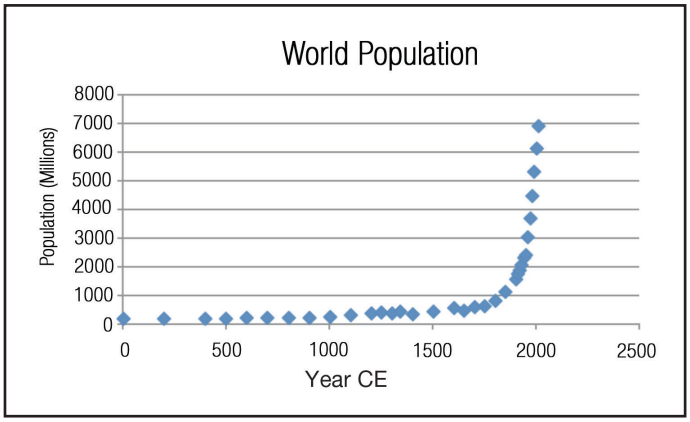
9. One Olympic-size swimming pool would supply enough water to produce food for how many people in one day? Round your answer to the hundreds place.

10. Use the rounded answer to question 9 to estimate how many Olympic-size swimming pools are needed to supply water to produce food for the world's 7 billion people for one day.

11. Why should we care about how much water we consume? What can individuals, communities, and entire countries do to decrease the water amount of water we use? Explain in a brief paragraph. Using outside research is permitted but not required.

Here We Grow!

1. Study the World Population Growth graph below. In 1-3 sentences, describe what is happening to population growth over time. What might explain the drastic growth in recent history?



2. The growth rate of a population for a given time period is defined as the difference between the birth and death rates of the population. Birth and death rates are not the only factors that impact the overall growth of a population of a country. What other factors might impact the overall growth, or decline, in a country's population? Explain in 3-5 sentences.

Mathematical models help us represent real-world phenomena and make predictions about unknown outcomes. Mathematical modeling is used widely across many fields of study, including medicine, computer science, business, social sciences, economics, engineering, biology, chemistry, physics, and more. Mathematical modeling is an important tool in understanding population growth.

3. Population growth since 1950 has been the most dramatic in history. The table on the next page shows the population over this time period. Complete the table for "Years since 1950".

Year	Years since 1950 (x)	World Population (y) In Billions
1950	0	2.531
1955	5	2.773
1960		3.104
1965		3.333
1970		3.702
1975		4.103
1980		4.455
1985		4.864
1990		5.330
1995		5.731
2000		6.121
2005		6.502
2010		6.900
2015		7.286

4. Input columns 2 and 3 into Desmos. Use the $y_1 \sim mx_1 + b$ command to create the "line of best fit", which can be used to predict future population sizes. Fill in the blanks below. The first blank is the "m" value and the second blank is the "b" value. Ignore the other information provided in Desmos.

$$y = \_\_\_\_ x + \_\_\_\_\_$$

5. Use your equation from part 4 to predict the world population in 2045. To do so, substitute the appropriate number into x (HINT: This number is *not* 2045). The y-value will tell you the predicted world population.

6. Why should we care about population growth? What steps do you think we can take as individuals and as a society to make sure that everyone in our world can lead positive, fulfilling lives? Explain in a brief paragraph. Using outside research is permitted but not required.