Finding Population Growth of a Country

1. Use the equation below to predict the population of your country every 10 years from 2000 to 2050

$$A = A_0 (1+r)^t$$

Where A = amount
A_0 = starting amount
r = growth rate as a decimal
t = time

2. Make a data table:

Time in Years	Population in Millions
0	
10	
20	
30	
40	
50	

3. Plot a graph of population vs. time. Draw the curve of best fit.

4. What is the population density of your country? (1 km^2 = .3861 mi^2) ______________

5. Compare your graph to those of your classmates. Write down one observation about the population growth.

6. Compare your population density to those of your classmates. Write down one observation about the population densities.

7. What factors could cause the population to increase faster or slower? Explain.

Country Population Data 2000

Country	Population in Millions 2000	Population in Millions 2050	Percent Growth Rate	Area in mi^2	Population Density in people/mi^2
United States	284		.6	3717736	
Congo	53		3	132046	
Mexico	99		1.9	756062	
Guatamala	13		2.9	42042	
Pakistan	145		2.8	307375	
Germany	82		-.1	137830	
Indonesia	206		1.7	735355	
Russia	144		-.7	6592819	
Nigeria	126		2.8	356668	
Canada	31		.3	3849670	
Ethiopea	65		2.9	426371	
Australia	19		.6	2988888	
Brazil	171		1.5	3300154	
Bangladesh	133		2	55598	

Country ______________________ Population _______________________
Growth Rate ________________ Area _________________________

Earth’s Population

Date	Population (Millions)
1500	460
1600	579
1700	679
1750	770
1800	954
1900	1633
1920	1862
1940	2295
1960	3019
1980	4450
2000	6000

1. Graph. Use the chart above to make a graph for Earth’s population since 1500. Is the growth linear or nonlinear? Explain.

2. Prediction. Use your graph to predict the population of Earth in 2050. Compare the current value with your prediction. Explain any differences.

3. Doubling Time. One way to express the rate of change is to tell how long it is before the population doubles. Use your graph to predict the time it took Earth's population to double in 1500 and the current length of time for Earth’s population to double. If the doubling time is shorter today than in the past, what does this indicate about the rate of population growth? Explain.

Measuring a Building

1. Measure your pace in centimeters. _____________
2. Sketch the building.
3. Pace the distances around the building.
4. Change distances from paces to meters.
5. Using graph paper, make a scale drawing of the building.
6. Include the scale factor and dimensions in meters.
7. Find the area of the building in square meters. ______________

Show examples of your calculations

Radioactive Elements Used for Dating

The following is a group of rocks and materials that have been dated by various atomic clock methods:*

Sample	Approximate Age in Years
Cloth wrappings from a mummified bull(Samples taken from a pyramid in Dashur, Egypt)	2050
Charcoal. (Sample recovered from bed of ash near Crater Lake, Oregon, is from a tree burned in the violent eruption of Mount Mazama which created Crater Lake. This eruption blanketed several States with ash, providing geologists with an excellent time zone.)	6640
Charcoal. (Sample collected from the "Marmes Man" site in southeastern Washington. This rock shelter is believed to be among the oldest know inhabited sites in North America)	10,130
Spruce Wood. (Sample from the Two Creeks forest bed near Milwaukee, Wisconsin, dates one of the last advances of the continental ice sheet into the United States)	11,640
Bishop Tuff. (Samples collected from volcanic ash and pumice that overlie glacial debris in Owens Valley, California. This volcanic episode provides an important reference datum in the glacial history of North America)	700,000
Volcanic ash. (Samples collected from strata in Olduvai Gorge, East Africa, which sandwich the fossil remains of Zinjanthropus and Homo habilis, possible precursors of modern man.)	1,750,000
Monzonite. (Samples of copper-bearing rock from vast open-pit mine at Bingham Canyon, Utah.)	37,500,000
Quartz monzonite. (Samples collected from Half Dome, Yosemite National Park, California.)	80,000
Conway Granite (Samples collected from Redstone Quarry in the White Mountains of New Hampshire.)	180,000,000
Rhyolite. (Samples collected from Mount Rogers, the highest point in Virginia.)	820,000,000
Pikes Peak Granite. (Samples colleced on top of Pikes Peak, Colorado.)	1,030,000,000
Gneiss. (Samples from outcrops in the Karelian rea of easter Finland are believed to represent the oldest rocks in the Baltic Region.	2,700,000,000
The Old Granite (Samples from outcrops in the Transvaal, South Africa. These rocks intrude even older rocks that have not been dated.)	3,200,000,000
Morton Gneiss. (Samples from outcrops in southwestern Minnesota are believed to represent some of the oldest rocks in North America.)	3,600,000,000

*Data is from USGS

Parent	Daughter	Half Life
Carbon-14	Nitrogen-14	5730 years
Uranium-235	Lead-207	704 million years
Uranium-238	Lead-206	4470 million years
Potassium-40	Argon-40	1280 million years
Thorium-232	Lead-208	14010 million years
Rubidium-87	Strontium-87	48800 million years

Using the information above, answer the following questions:

1. Which radioactive element was used to date each of these samples?

2. What was the half life of the radioactive element used?

3. What percent of the element remained in the sample when it was tested?

$$\frac{A}{A_0} = \left(\frac{1}{2}\right)^{\frac{t}{T}}$$

A = Amount of element remaining
A_0 = Starting amount of element (The ratio A/A_0 = percent remaining as a decimal)
t = time in years
T = half life of element

Material	Approximate Age in Years	Radioactive Element	Half Life	% of element in sample
Bull Mummy Remains				
Charcoal from Crater Lake				
Spruce Wood from Two Creeks				
Volcanic Ash from Africa				
Pikes Peak Granite				
Gneiss from Finland				
Old Granite from Africa				

Hohokam Mystery

One of the villages established by the Hohokam in the Tucson Basin is known as the Hardy Site. Dating the finds at the Hohokam site helps archaeologists to discover the history of the ancient Hohokam people, who disappeared suddenly from the area for reasons unknown.

Carbon 14 is a radioactive element that decays with a half life of 5730 years into nitrogen-14. It can be used to find the age of ancient artifacts. All living things absorb carbon from their environment and when the organisms die they no longer take in new carbon. At death, the carbon-14 in the organism begins to decay, and by the amount of decay, we can determine how long the organism has been dead according to the following formula:

$$t = T\left(\frac{\log(A/A_0)}{\log(1/2)}\right)$$

where T = half life in years
A/A_0 = ratio of carbon left to original amount of carbon (percent as a decimal)
t = years since the death of the organism

The table below shows some Hohokam features and artifacts that were dated in the year 2000 by examining the carbon in the remains of organisms found in the same area. Use the percent of C-14 left to determine the age and date of the findings.

Finding	**% C-14 Left**	**Age (yrs)**	**Date**
Most Recent House	91.3		
Sacaton Red-on Buff Pottery	88.6		
Flowered Bowl Pottery	84.4		
Earliest House	82.4		

For more information about the Hardy Site go to
http://www.uapress.arizona.edu/online.bks/hohokam/chap3.htm

Recording an Archaeology Site

1. Select a site for your survey.

2. Measure your pace. With a long tape measure, mark off two points exactly 30 meters apart. Starting at one point, walk in a direct line toward the other point, counting the number of steps you take to get there. Your steps should be your normal pace. Divide 30 meters by the number of steps you took. This number is your normal pace size. For more accuracy you should repeat the measurement four times and average your results.

   Your pace length ______________________

3. Starting at one corner of the site, walk slowly across the site in a systematic pattern. The best way is to cross back and forth at a regular interval of spacing. Look for anything that appears out of the ordinary. Each time you encounter an artifact, describe it fully in your notes and measure its distance and direction from one of the site corners:

Find Number	Distance	Direction	Description

4. Once you have completed your survey, plot your data on a scale map of the site. With your protractor, measure the compass direction from north and, with your ruler, measure off a scale distance.

Site Transformation

Instructions:

1. Each group will stake out a 2 m by 2m square site.

2. Record each Archaeology find within your square and classify it as an artifact, ecofact, feature, or natural object.

3. Select one corner of your square as the datum reference point. Measure in centimeters the horizontal and vertical distance of each find from the reference point. Record each location as a set of coordinates.

4. Graph your data.

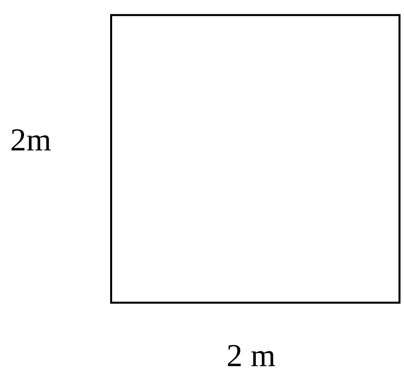
5. Visit your site on three different days, and record any changes.

6. Enter your results in an Excel database.

7. Make an Excel chart of your data showing changes to the site.

8. Write a report on your findings. Include the following:
   a. A list of artifacts, ecofacts and features.
   b. What changed.
   c. Your interpretation regarding possible cultural transformational processes and natural transformational processes.

9. Be prepared to present your findings to the class.



Site Transformation Activity

On the graph, plot by Find Number the artifacts, features and ecofacts, plus “natural objects. Plot according to measurements in centimeters in the horizontal and vertical directions from the datum reference point.