

## 26.1 Population—More Is Less: Background Information

What is the most pressing environmental issue of our time? Is it acid rain? Air pollution? Deforestation? While some authorities might answer differently, most would agree that the problem of human **population** growth is of major importance.

To see why this is so, we need to consider two aspects of human population growth: the **quantity** of human life and the **quality** of human life. First, let us consider the quantity of human life.

Population growth occurs when the number of organisms entering a population exceeds the number of organisms leaving it. The population of a city, for example, grows if the people moving into it (**immigration**) plus the number of people born in it is greater than the sum of the number of people moving out (**emigration**) and the number of deaths. When considering the Earth, we need to consider the **birth rate** (number of live births per 1,000 people in a year) as compared to the **death rate** (number of deaths per 1,000 people per year).

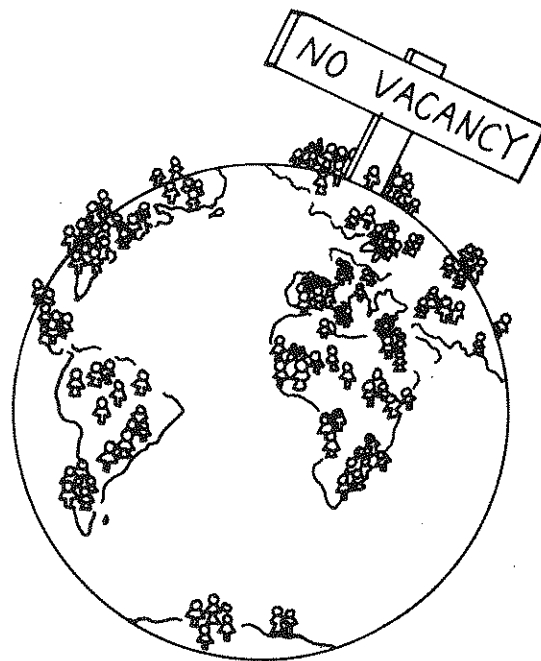
For most of human existence, the death rate nearly equalled the birth rate, and the population grew very slowly. It took perhaps 2 billion years for the human population to reach 1 billion, about the year 1810. It took only 117 more years to add the second billion (1927), only 33 years to add the third billion (1960), 14 years to add the fourth billion (1974), and only 13 more years to reach 5 billion in 1987. It is predicted that the Earth's population will reach 6 billion people by 1998. This type of growth is called "**exponential growth**." Part I of this activity will allow you to investigate exponential growth.

As you do Part I, keep the following growth rates in mind:

<u>The World:</u>	1.8% per year	<u>Africa:</u>	2.9% per year
<u>Latin America:</u>	2.1% per year	<u>Asia:</u>	1.9% per year
<u>United States:</u>	0.7% per year	<u>Europe:</u>	0.3% per year

Those who study populations, **demographers**, often consider the **doubling time** for a population. We can see that the population of Earth is expected to double between 1960 and 1998, a doubling time of less than 40 years! Compare this to the 117 years that it took to double from 1 billion in 1810 to 2 billion in 1927, and the 47 years that it took to double again to 4 billion!

Any place on earth can support only a certain number of any type of organism. That is its **carrying capacity**. We do not know what the Earth's carrying capacity for people is. Some demographers feel that we have already exceeded it. Others think that our ability to manipulate our environment will enable us to support even more people. Regardless of how many people can possibly subsist on Earth, how many of us should there be? Is our goal to have as many people as possible existing on Earth, or is our goal for people to have happy, healthy, fulfilling lives? The United States has about 4.3 percent of the world's population but uses about 30 percent of the resources that are consumed each year. Is it possible for *all* people to achieve the standard of living that we in the United States now enjoy?



Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## 26.2 Population—More Is Less: Instructions

### Part I: Exponential Growth

Your team will be assigned a population growth rate, stated as a percentage. Note that a negative population growth rate means simply that the population is getting smaller.

Use a calculator to determine the population each year for a population that starts at 100. Round off decimals to the nearest whole number. As you do your calculations, record your data on the table below.

For example, if you were assigned a growth rate of 7 percent, the first part of the table would look like this: [calculations:  $100 \times 1.07 = 107$      $107 \times 1.07 = 114.49$ ]

year #	population	year #	population
0	100	11	_____
1	107	12	_____
2	114	13	_____

As you do your calculations, one team member should graph the population change. Before beginning your graph, your team should:

- decide which axis should represent the year and which should represent the population
- decide what the units should be on the population axis
- graph a population growth of 0 percent

population growth rate assigned: \_\_\_\_\_

year #	population	year #	population
0	100	11	_____
1	_____	12	_____
2	_____	13	_____
3	_____	14	_____
4	_____	15	_____
5	_____	16	_____
6	_____	17	_____
7	_____	18	_____
8	_____	19	_____
9	_____	20	_____
10	_____		

## 26.2 Population—More Is Less: Instructions

### Part II: Quality or Quantity?

1. As a team, discuss the items listed below. Decide whether each item is generally “good” for people and the environment or is generally “harmful.”
  - If it is “good,” place a green “+” in the space beside the item.
  - If it is “harmful,” place a red “-” in the space.
  - If your team really can’t decide, place a black check in the space.

<input type="checkbox"/> clean water	<input type="checkbox"/> polluted air	<input type="checkbox"/> food	<input type="checkbox"/> opportunities for solitude
<input type="checkbox"/> energy	<input type="checkbox"/> minerals	<input type="checkbox"/> wildlife	<input type="checkbox"/> endangered species
<input type="checkbox"/> noise	<input type="checkbox"/> space to live	<input type="checkbox"/> acid rain	<input type="checkbox"/> contagious disease
<input type="checkbox"/> buildings	<input type="checkbox"/> cars and roads	<input type="checkbox"/> garbage	<input type="checkbox"/> traffic congestion
<input type="checkbox"/> overgrazing	<input type="checkbox"/> unemployment	<input type="checkbox"/> poverty	<input type="checkbox"/> available housing
<input type="checkbox"/> hunger	<input type="checkbox"/> soil erosion	<input type="checkbox"/> oil spills	<input type="checkbox"/> international conflicts
<input type="checkbox"/> material luxuries	<input type="checkbox"/> forests	<input type="checkbox"/> crowded cities	<input type="checkbox"/> recreational space

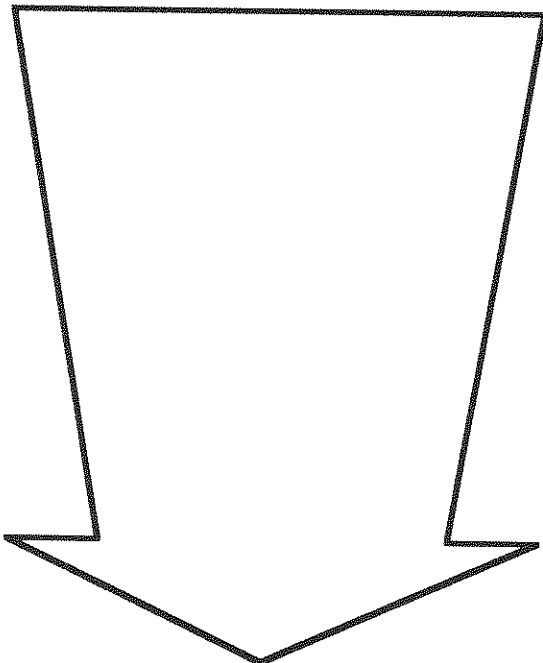
2. Now consider the effect of a significantly increased human population on each item. If increasing the human population would tend to increase the item, write the item inside the arrow pointing upward. If increasing the human population would tend to decrease it, write the item inside the arrow pointing downward.

- Use a red writing tool for the “harmful” things.
- Use a green writing tool for the “good” things.

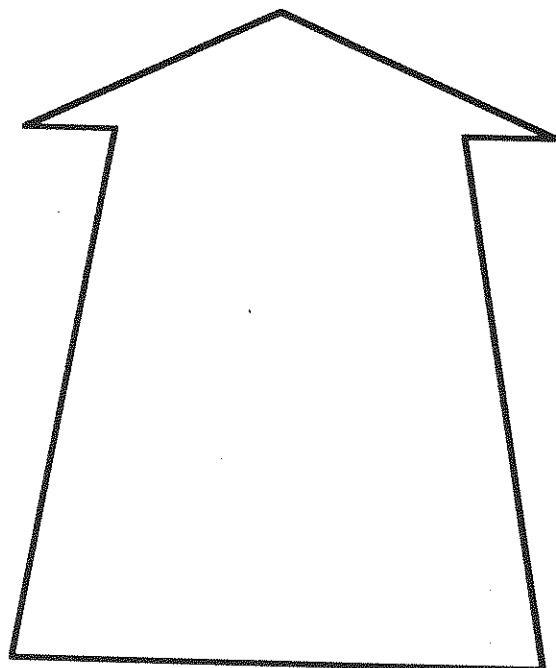
Increased human population tends to

Increased human population tends to:

**DECREASE:**



**INCREASE:**



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## 26.2 Population—More Is Less: Instructions

### Part III: Dear Grandchild

If the current trends continue, the population of the world will be about twice as large 40 years from now. What do you think your life will be like in 40 years? Will you have children? Grandchildren? What will their lives be like? What will the environment be like in the area where you now live?

Write a letter to your grandchild, who is 10 years old. In your letter, discuss:

- what you do for a living
- what you do for recreation
- how the world has changed
- what you eat
- your energy source
- what you would have done differently
- your hopes and dreams for your grandchild
- offer one simple piece of advice to your grandchild

date: \_\_\_\_\_

Dear \_\_\_\_\_

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page.

(Continue on the back of this paper or on a separate paper.)

## 26.3 Population—More Is Less: Questions

1. Summarize the effect of exponential growth on a population.

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2. In Part II of this activity, you saw some relationships between population and some parts of the environment. What sorts of things tend to increase with population increases? What sorts of things tend to decrease?

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3. The United States has about 4.3 percent of the Earth's human population and is responsible for about 30 percent of the annual resource use and pollution. What does this tell us about the lifestyle that is possible for the world's population?

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4. Which is more important, to halt population growth in the rapidly growing less-developed areas such as Africa or in the more slowly growing developed areas such as the United States? Discuss your answer.

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5. List some advantages of a reduced human population.

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6. Discuss the relative importance of quantity of life vs. quality of life.

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26.3 continued

7. How does human population growth affect the following?

a. extinction of other species

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b. quality of air and water

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c. space available for recreation

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d. food available for people

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e. stress and conflict

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f. energy resources available per person

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g. competition for jobs and housing

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h. the spread of contagious diseases

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i. your lifestyle in the next 40 years

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j. your descendants' lifestyles

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8. Should governments enact and enforce laws to limit population? Explain your answer.

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9. Should governments encourage population control through such measures as education, tax incentives for smaller families, and making birth control more available? Explain your answer.

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10. What can you do, personally, to help with the overpopulation problem?

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