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**Doubling Time Lab**

**AIM:** How do scientists calculate annual population increase and doubling time?

**OBJECTIVES:**

 • Calculate annual population increase and doubling time

**Birth and Death Rates**

Birth and death rates determine the rate of population growth. If the birth and death rates are similar, a population experiences little or no growth. When the birth rate far exceeds the death rate, the population soars. These rates are expressed as the number of births or deaths for every 1,000 people in a given year. For instance, in 1998 the world’s birth rate was 23 per 1,000 and the death rate was 9 per 1,000. Using the formulas below we can determine the world’s annual growth rate.

Values for the % annual increase = birth rate – death rate

 10

Values for the % annual increase = 23 – 9 = 1.4 %

 10

**Doubling Time**

The doubling time refers to the length of time (in years) it takes for a population to double in size, assuming its natural growth rate remains constant. Using the data from 1998, we can calculate the doubling time

Approximate values for doubling time = \_\_\_\_\_70\_\_\_\_\_\_

 annual increase

Doubling time = \_70\_ = 50 years

 1.4

Part 1.

Fill in Student Worksheet 1 and answer the discussion questions. Show ONE sample calculation for % annual increase and ONE sample calculation for doubling time.

Student Worksheet 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country | Birth Rate 2011 (per 1,000 people) | Death Rate 2011 (per 1,000 people) | % Annual Increase | Doubling Time (in years) |
| China | 12 | 7 | EX: 12 – 7 = 1% 10 | EX: 70 = 70 1 |
| India | 21 | 7 |  |  |
| Iraq | 29 | 5 |  |  |
| Italy | 9 | 9 |  |  |
| Japan | 10 | 7 |  |  |
| Kenya | 33 | 7 |  |  |
| Mexico | 23 | 4 |  |  |
| Russia | 9 | 14 |  |  |
| South Africa | 26 | 15 |  |  |
| United Kingdom | 13 | 11 |  |  |
| United States | 14 | 8 |  |  |

Discussion Questions.

1) Why do you think some countries are doubling much more rapidly than others?

2) Why do you think some countries, such as Italy, have reached zero population growth?

3) Which figures differ most greatly between countries, the birth rates or death rates?

 (a) How would you explain the wide disparity in birth rates among different countries?

4) Why are death rates relatively low in many countries with high birth rates?

5) If you were a national leader in Kenya or Iraq, would you be concerned about the rapid population growth? Why or why not? Similarly, if you were national leader in Italy, would you be concerned that your country has reached ZPG? Why or why not?

6) The population of the U.S. is actually growth at the rate of approximately 1% each year, more than its rate of natural increase. Where is the additional population growth coming from?

Part 2.

Conveying the importance of population figures can be difficult since the numbers are so large they lose their meaning. Below is a listing of some of the world’s worst disasters, along with an approximate death toll. At today’s present growth rate (84 million people/year = **229,000 people/day**), determine how many days, weeks, or months it would take to replace those lost. Round your numbers to the nearest tenth.

|  |  |  |
| --- | --- | --- |
| Past Disaster | Approximate # of Deaths | Present World Population Growth Replaces This # In Approximately What Time Span?? |
| All US accident deaths, 1995 | 93,300 | Calculation Example: \_\_93,300\_\_ = 0.4 = less than ½ a day 229, 000 |
| Bangadeshi cyclone, 1991 | 140,000 |  |
| Asian Tsunamin, Dec 2004 | 300,000 |  |
| Total American deaths in all wars | 600,000 |  |
| Great Flood, Hwand Ho River, 1887 | 900,000 |  |
| Total US automobile deaths through 1995 | 2,600,000 |  |
| India famine, 1760-70 | 3,000,000 |  |
| Total AIDS deaths through 1996 | 6,400,000 |  |
| China famin, 1877-78 | 9,500,000 |  |
| Influenza epidemic, 1918 | 21,000,000 |  |
| Global deaths in all wars in the past 500 years | 35,000,000 |  |
| Bubonic plague, 1347-51 | 75,000,000 |  |