

AP Environmental Science- Human Population Dynamics- Notes & Sample Problem Set

1. 1,200 deer are living on an island that is 800 square kilometers in size. What is the population density of the deer per square kilometer?
2. In 1950, the population of a suburb in Denver, Colorado, was 20,000. The crude birth rate was measured at 25 per 1,000 per year, while the crude death rate was measured at 7 per 1,000 per year. Immigration was measured at 600 per year, while emigration was measured at 200 per year. By how much did the population increase (or decrease) in that year?
3. A city with 55,000 people has 825 births. What is the birth rate percentage?
4. A village of 25,000 people has 2,500 births and 500 deaths. What is the growth rate percentage for this village?
5. In 1950 the country of Industria recorded a crude birth rate of 22 per 1,000 and a crude death rate of 12 per 1,000. What was the annual growth rate (%) of Industria in 1950?
6. In 1895 Industria's population was 2.5 million and its annual growth rate was 2.5% (assume the growth rate stays the same).
 - a. How many years will it take for Industria's population to double?
 - b. What year will it be at that time?
 - c. What will the population be at that time?
 - d. How many years will it take the population to double twice?
 - e. What year will it be at that time?
 - f. What will the population be at that time?
7. If a country were doubling its population every 35 years, what would its growth rate be?

Population Density

$$\text{Population density} = \frac{\text{population}}{\text{area}}$$

Population Change & Rate of Population Change

Birth Rate or crude birth rate is equal to the number of live births per 1,000 members of the population in one year. Death rate or crude death rate is equal to the number of deaths per 1,000 members of the population in one year. Immigration refers to the number of individuals that enter the population while emigration refers to the number of individuals that leave the population.

Population change can be calculated using the following formula:

$$\text{Population change} = (\text{birth rate} + \text{immigration}) - (\text{death rate} + \text{emigration})$$

The actual rate of population change can be determined by using the following formula:

$$\text{population growth rate}(\%) = \frac{\text{crude birth rate} - \text{crude death rate}}{10}$$

or (if using actual population figures, rather than crude rates)

$$\text{population growth rate}(\%) = \left(\frac{\text{births} - \text{deaths}}{\text{total population}} \right) \times 100$$

Birth Rate Percentage (or death rate)

$$\% \text{ Birth Rate} = \left(\frac{\# \text{ of births or deaths per year}}{\text{total population}} \right) \times 100$$

The rule of 70

The rule of 70 is a useful tool for estimating the doubling time of a population that grows exponentially. To use the rule divide 70 by the annual growth rate of the population expressed as percent. The result will be the time (in years) required for the population to double.

$$\text{doubling time} = \frac{70}{\% \text{ growth rate}}$$

The growth rate of an exponentially growing population may also be estimated from the doubling time by using the same formula in reverse.

$$\% \text{ growth rate} = \frac{70}{\text{doubling time}}$$