

POPULATION CALCULATION WORKSHEET

You will need to be familiar with these equations for your Unit 5 Exam and the AP Exam.

POPULATION DENSITY

$$\left(\frac{\text{population}}{\text{area}} \right) = \text{Population Density}$$

for example: $\left(\frac{270,000,000 \text{ people}}{9,166,605 \text{ sq. km.}} \right) = 29 \text{ people per square kilometer}$

BIRTH OR DEATH RATES:

$$\left(\frac{\begin{array}{c} \# \text{ of births or deaths per} \\ \text{year} \end{array}}{\text{total population}} \right) = \text{Birth or Death Rate}$$

NOTE: to find Crude Birth/Death Rates, multiply the rate by 1,000

for example: $\left(\frac{23,452 \text{ births}}{942,721 \text{ people}} \right) = 0.025 = 2.5\% \text{ birth rate}$
25 = Crude Birth Rate

FINDING POPULATION GROWTH RATE (r):

(This does not include immigration or emigration)

$$\left(\frac{\begin{array}{c} \text{crude births} - \text{crude} \\ \text{deaths} \end{array}}{10} \right) = r \%$$

$$\frac{\begin{array}{c} \text{births} - \text{deaths} \\ \text{total population} \end{array}}{\quad} \times 100 = r \%$$

OR

for example: $\left(\frac{40 - 30}{10} \right) = 1.0\%$

$$\frac{28,546 \text{ births} - 24,389 \text{ deaths}}{455,387 \text{ total people}} \times 100 = 0.9\%$$

FINDING THE DOUBLING TIME OF A POPULATION: THE RULE OF 70!!!

(This only applies if the population is growing exponentially)

Why 70? It is $100 \times \ln(2)$. What does that mean? Who cares... the math works!

$$\left(\frac{70\%}{r \text{ (in percent form)}} \right) \text{ or } \left(\frac{0.7}{r \text{ (in decimal form)}} \right) = \text{Doubling Time (dt) in years}$$

for example: $\left(\frac{70\%}{7\%} \right) \text{ or } \left(\frac{0.7}{0.07} \right) = 10 \text{ years}$

FINDING FUTURE POPULATION FROM GROWTH RATE:

$$\left(\text{initial population} \right) \times \left(\text{growth rate} \right)^{\text{years}} = \text{Final Population}$$

NOTE: a growth rate of 3% is expressed as 1.03; a growth rate of 0.25% is 1.0025

for example: $\left(468,843 \text{ people} \right) \times \left(1.03 \right)^{10 \text{ years}} = 630,085 \text{ people}$

Population Problems – SHOW ALL WORK!!

Name: _____

Given the following information, answer questions 1-4.

Schuhlsville is an island of 5000 square miles off the coast of Jabooty. There are currently 250,000 inhabitants of the island. Last year, there were 12,000 new children born and 10,000 people were recorded as deceased.

1. What is the current population density?
2. What are the birth and death rates?
3. What is the population growth rate (r)?
4. In how many years will the population of Schuhlsville double?

Given the following information, answer questions 5-8.

The country of Transylvania contains 2.3 million people (vampires not included) and covers 800,000 square miles. In the year after the last census, there were 109,000 new children born and 111,000 people died.

5. What is the current population density?
6. What are the birth and death rates?
7. What is the population growth rate (r)?
8. In how many years will the population of Transylvania double?

9. Given a 2010 world population growth rate of about 1.3% per year, how long would it take the world's population to double?

How old will you be when this doubling occurs?

10. If a country doubles its population in 56 years, what was its population growth rate during that time?

11. Calculate the growth rates and doubling times for the countries listed below.

Country	Birth Rate (2011)	Death Rate (2011)	Growth Rate (r)	Doubling Time
United States	13	8		
Mexico	19	5		
Japan	8	9		
United Kingdom	13	9		
China	12	7		
India	23	7		
Nigeria	41	16		
South Africa	21	14		
Canada	11	7		
Italy	9	10		

12. According to the 2010 census, Cedar Rapids contained 126,326 people. In 2011, there were an estimated 127,904 people. That translates to a growth rate of 1.2%. Based on this growth rate, what will the population of Cedar Rapids be 5 years from now?

... 10 years from now?

... 50 years from now?

... 100 years from now?

13. In April of 2010 the U.S. population was 308,745,538 and it is growing by about .97%. Assuming a constant growth rate, what will the population be in 2020?

...in 2050?

...in 2100?

14. What would happen to the population growth rate of a country that maintains a high crude birth rate of 32 but was able to reduce their crude death rate from 28 to 12?

What would happen to the doubling time of this country?

15. We are currently adding 84 million people to the world's population each year. That is about 229,000 each day. Below is a listing of some of the world's worst disaster, along with an approximate death toll. At today's growth rate, determine how many minutes, hours, days, weeks, or months it would take to replace those lost.

Past disasters	Approximate # of deaths	Present world population growth replaces this # in what time span?
Hurricane Katrina	1836	
September 11, 2001 attacks	2996	
U.S. accidental deaths in 2007	123,700	
Sumatra tsunami on 12/26/04	225,000	
American deaths in all wars as of 2010	655,000	
Total U.S. auto deaths through 2007	3,000,000	
Influenza epidemic, 1918	21,000,000	
Total AID's deaths through 2005	25,000,000	
The Black Plague, 1347-51	75,000,000	