**POPULATION CALCULATION WORKSHEET**

**POPULATION DENSITY**

|  |  |  |  |
| --- | --- | --- | --- |
| ( | population | ) | **= Population Density** |
| area |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **for example:** | ( | 270,000,000 people | ) | = 29 people/ km2 |
| 9,166,605 km2 |

**BIRTH OR DEATH RATES:**

|  |  |  |  |
| --- | --- | --- | --- |
| ( | # of births or deaths per year | ) | **= Birth or Death Rate** |
| total population |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **for example:** | ( | 23,452 births | ) | = 0.025 = 2.5% birth rate |
| 942,721 people |

 25 = Crude Birth Rate (per thousand people)

**FINDING NATURAL INCREASE RATE (NIR):**

***(This does not include immigration or emigration)***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ( | crude birth rate – crude death rate | ) | **= NIR %** |  | births – deaths | X 100 **= NIR %** |
| 10 |  | total population |

 **OR**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **for example:** | ( | 40 - 30 | ) | = 1.0% |  | 28,546 births – 24,389 deaths | X 100 = 0.9% |
| 10 |  | 455,387 total people |

**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 x ln(2). What does that mean? Who cares…the math works!***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ( | 70% | ) | or | ( | 0.7 | ) | **= Doubling Time (DT) in years** |
| NIR (in percent) | NIR (in decimal) |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **for example:** | ( | 70% | ) | or | ( | 0.7 | ) | = 10 years |
| 7% | 0.07 |

**FINDING FUTURE POPULATION FROM NATURAL INCREASE RATE:**

 **(**initial population**)** X **(** natural increase rate **)** years = **Final Population**

 ***NOTE: a NIR of 3% is expressed as 1.03; a NIR of 0.25% is 1.0025***

 **for example:** **(**468,843 people**)** X **(** 1.03 **)**10 years = 630,085 people

**Population Problems – SHOW ALL WORK!!**

**Given the following information, answer questions 1-4**.

*Schuhlsville is an island of 13,000 km2 off the coast of Jabooty. Its population is currently 250,000 people. 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 crude birth and death rates?

3. What is the natural increase rate (NIR)?

4. In how many years will the population of Schuhlsville double?

**Given the following information, answer questions 5-8.**

*The population of Transylvania is 2.3 million people (vampires not included) and covers 2,100,000 km2. 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 crude birth and death rates?

7. What is the natural increase rate (NIR)?

8. In how many years will the population of Transylvaniadouble?

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 natural increase rates and doubling times for the countries listed below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **Crude Birth Rate (2011)** | **Crude 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 natural increase rate of 1.2%. Based on this natural increase rate, what will the population of Cedar Rapids be 5 years later?

 …10 years later?

 …50 years later?

 …100 years later?

13. In April of 2010 the U.S. population was 308,745,538 and it is growing by about 0.97%. Assuming a constant natural increase rate, what will the population be in 2020?

 …in 2050?

 …in 2100?

14. What would happen to the natural increase 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 disasters (with a heavy American bias), along with an approximate death toll. At today’s natural increase 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 |   |