

Introduction to Demographic Methods

Session 11 Exercise

1. Suppose $P_0 = 1$. Given the level of r in the table, find P_t (for $t = 10$ years) using the exponential formula. Then using the other equations from the class notes, complete the following table.

		Growth rates (in percent)		
r	P_t	rg	ri	rm
0.01				
0.03				

2. Given that the enumerated population of the USA in 1900 was 76.21 million and in 1930 it was 123.20 million.

- Find r , rg , and b
- Estimate the population in 1990 by the linear, geometric and exponential formulas

3. The Mexican population estimate for mid-1975 was 60,150,000 and for mid-1980 was 71,910,000.

a) Calculate average annual growth rates assuming linear growth

0.39% 1.45% 3.91%

b) Calculate average annual growth rates assuming geometric growth

1.64% 3.64% 3.91%

c) Calculate average annual growth rates assuming exponential growth

0.345% 3.57% 3.91%

d) Extrapolate the Mexico population to 1990 assuming linear growth

100,026,810 100,294,005 105,528,721

e) Extrapolate the Mexico population to 1990 assuming geometric growth

95,430,000 100,940,000 102,816,620

f) Extrapolate the Mexico population to 1990 assuming exponential growth

97,240,000 102,761,970 107,294,000

g) Assuming Mexico's population is growing exponentially, what is its doubling time?

15.3 19.4 23.1 years

h) In what year will the mid-1975 population have tripled?

2006 2010 2012

4. Based on censuses taken in Kenya in 1979 and 1989, the ratio of the counted mid-year population in 1989 to that in the 1979 was 1.4. Assuming exponential growth, what was the annual growth rate during this period?

1.89 2.57 3.36 per cent

5. Which of the following are true [T] and which are false [F]?

	T	F
The U.S. population size is fit well by the linear growth model between 1790 and 1990		
The U.S. population size is fit well by the exponential growth model between 1790 and 1990		
Exponential growth cannot continue in the long term		

6. The world's current growth rate is 1.5% and the population in 1996 is 5.77 billion. If the current rate continues, in what year will the population reach 10 billion?

2023 2030 2033

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Session 11 Answers

1.

		Growth rates (in percent)		
r	Pt	rg	ri	rm
0.01	1.105	0.010	0.011	0.010
0.03	1.350	0.030	0.035	0.030

2.

a.

r	rg	ri	b
0.016	0.016	0.021	1.566 millions

b.

Linear	278.43 (millions)
Geometric	321.96 (millions)
Exponential	321.96 (millions)

3.

- a) 3.91%
- b) 3.64%
- c) 3.57%
- d) 100 026 810
- e) 102 816 620
- f) 102 761 970
- g) 19.4
- h) 2006

4. 3.36%

5. F, T, T

6. 2033