

KEY TO DAVE'S PART

Part II. Dave's section.

II-1. The graph on the next page is the age structure of Pacific County, Washington, in 2003. The population numbers are genuine. The survivorship and fertility data have been artificially invented for this example. For this example, assume that there is no immigration or emigration.

a! How many people in the county were between ages 30 and 45 in 2003?

3,403	Read it from data table or graph
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IF the survival rates remain constant over the next 15 years ...



b! If all of these data were real, and IF \_\_\_\_\_ [give the basic assumption needed to proceed with this calculation], how many people would be between the ages of 30 and 45 in year 2018?

2,870	= 2,929 * 0.98 -- #15-30 year olds in '03 x survival rate – row 2, of table
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c! If all of the data were real, how many children would be born to women who are between ages 30 and 45 during the next 15 years?

1,225	= 3,403 x (1/2) x 0.90 x 0.80 [# folks 30-45 x % women x survival x fertility]
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d! What is the Total Fertility Rate of this population? Does the numerical value of the TFR suggest that this population will grow indefinitely, stabilize, or decline?

2.2084 kids/woman per lifetime	= sum of the products of survival x fertility columns. Value suggests slow growth, indefinitely
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e! A resident of Pacific County characterized that area as "third world." Does the county's age structure resemble that of a "third world" country? Why or why not?

No	In the age structure of a Third World country, the youngest cohort (age group) is biggest, next youngest next biggest, etc to the oldest age group. This is characteristic of a growing population. In Pacific County, there are fewer people in the younger age groups than in the middle-age groups. This is characteristic of a shrinking population.
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II-2. The populations and per cent annual increase rates of Kenya and Italy are shown in this table, in mid-year 2000.

Country	Population (millions)	% annual change (%/yr)
Kenya	30.3	+2.1
Italy	57.8	-0.1

a! In how many years will Kenya's population double? ... will Italy's population decrease to half its present number?

33.3 yrs	Kenya	= 70/2.1
700 yrs	Italy	= 70/0.001 [if they said -70/(-0.001) extra credit!]

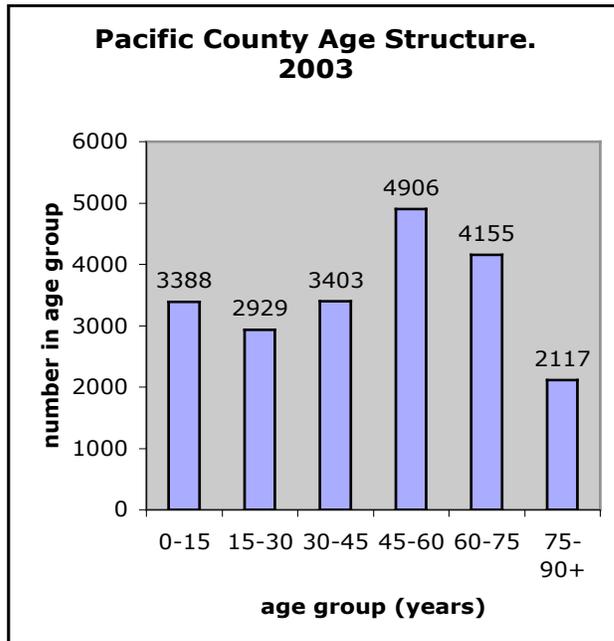
b! Write a formula that would enable you to estimate the future size of Kenya's population in mid-year 2023. Write a comparable formula for estimating the future size of Italy's population 10.8 years after mid-year 2000.

General formula is $N = N_0 e^{pt}$ [ $N_0$ , $p$ , $t$ , are respectively 33.3, .021, 23 for Kenya, 57.8, -0.001, 10.8 for Italy.	
Kenya	$N = 30.3 \times e^{0.021 \times 23}$
Italy	$N = 57.8 \times e^{(-0.001 \times 10.8)}$

c! What did you need to assume, to make the calculations in 2a and 2b?

You must assume that the annual percent change prevailing today will remain constant over the foreseeable future.
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Data for Part II.



Pacific County Demographic Data -- 2003

Age (years)	Numbers (in 2003) (real data)	Survivorship (fraction/15 yrs) (fake data)	Fertility Rate (births/woman per 15 yrs) – fake data
0-15	3388	0.99	0.01
15-30	2929	0.98	1.50
30-45	3403	0.90	0.80
45-60	4906	0.85	0.01
60-75	4155	0.75	0.00
75-90+	2117	0.00	0.00