

World Population

Note: This exercise goes with Chapter 2 of Calculus with Applications.

The following table gives the population of the world at various times over the last two centuries, plus projections for the next century.*

year	population (billions)
1804	1
1927	2
1960	3
1974	4
1987	5
1999	6
2011	7
2025	8
2041	9
2071	10

This exercise requires a TI-83 or TI-86. If you have a TI-83, do parts a through f. If you have a TI-86, do parts g through j.

TI-83 part

- Put the year in the list L_1 and the population in the list L_2 . Then use the command `Logistic L1,L2,Y1` (`Logistic` is item B under `CALC` in the `STAT` menu) to find the logistic function that best fits the data.
- Plot the logistic function found in part a and the original data in the same window. Does the logistic function seem to fit the data from 1927 on? Before 1927?
- To get a better fit, subtract .99 from each value of the population above. (This makes the population in 1804 small, but not 0 or negative.) Find a logistic function that fits the new data.
- Plot the logistic function found in part c and the modified data in the same window. Does the logistic function now seem to be a better fit than in part b?

* *The New York Times*, Nov. 17, 1996, p. 3.

- e. Based on the results from parts c and d, predict the value at which the population of the world will level off. For comparison, the *Times* article predicts a value of 10.73 billion.
- f. Based on the results from parts c and d, predict the limiting value of the world population as you go further and further back in time. Does that seem reasonable?

TI-86 part

- g. Put the year in the list `xStat` and the population in the list `yStat`. Then use the command `LgstR Y1` (`LgstR` under `CALC` in the `STAT` menu) to find the logistic function that best fits the data. Note that the TI-86 logistic equation differs from the one in our text because the constant d is added.
- h. Plot the logistic function found in part g and the original data in the same window. Does the logistic function seem a good fit to the data?
- i. Based on the results from parts g and h, predict the value at which the population of the world will level off. For comparison, the *Times* article predicts a value of 10.73 billion.
- j. Based on the results from parts g and h, predict the limiting value of the world population as you go further and further back in time. Does that seem reasonable?

Answers can be found on the next page.

Answers to **World Population**

- a. $y = 11.74/(1 + 1.423 \times 10^{22}e^{-.02554x})$
- b. yes; no
- c. $y = 9.803/(1 + 2.612 \times 10^{29}e^{-.03391x})$
- d. yes
- e. 10.79 billion
- f. .99 billion; no
- g. $y = 9.681/(1 + 1.012 \times 10^{30}e^{-.03458x}) + 1.063$
- h. yes
- i. 10.74 billion
- j. 1.063 billion; no