Evaluating the One-Child Policy

Exploring China's One-Child Policy

Quiz

1. Evaluate the following expression. Round your answer to the nearest tenth.

    a) $40(1+0.2)^{23-10}$

    $40(1.02)^{23-10}$

    $40(1.02)^{13}$

    $40(1.29)$

    51.7

Quiz

2. Algebraically solve the following equation for x. Round your answer to the nearest tenth.

    a) $52 = 13(2.05)^x$

$$\left(\frac{52}{13}\right) = \mathbf{2.05}^x$$

$$x = \log_{2.05}\left(\frac{52}{13}\right)$$

$$x = \mathbf{1.9}$$

Quiz

The following three questions are all based on Capital City, USA. The population of Capital City in 2000 was 3,271. The city was growing at a rate of 1.19%.

3. Write an exponential function that models population P as a function of year t.

$$P(t) = 3271(1+0.0119)^{t-2000}$$

Quiz

The following three questions are all based on Capital City, USA. The population of Capital City in 2000 was 3,271. The city was growing at a rate of 1.19%.

4. Use this model to predict the population of Capital City, USA in 2020.

$$P(2020) = 3271(1+0.0119)^{2020-2000}$$
$$P(2020) = 3271(1.0119)^{2020-2000}$$
$$P(2020) = 3271(1.0119)^{20}$$
$$P(2020) = 3271(1.27)$$
$$P(2020) = 4,154$$

Quiz

The following three questions are all based on Capital City, USA. The population of Capital City in 2000 was 3,271. The city was growing at a rate of 1.19%.

4. Use this model to estimate the year in which the population of Capital City, USA will reach 5,000.

$$5,000 = 3,271(1 + 0.0119)^{t-2000}$$

$$5,000 = 3,271(1.0119)^{t-2000}$$

$$\left(\frac{5,000}{3,271}\right) = (1.0119)^{t-2000}$$

During 2035

$$t - 2000 = \log_{1.0119}\left(\frac{5,000}{3,271}\right)$$

$$t = 2000 + \log_{1.0119}\left(\frac{5,000}{3,271}\right)$$

$$t = 2035.9$$

Quiz

6. Explain how you arrived at your answer to #5. (This explanation can include an explanation of your computation as well as any rounding that may have happened.)

   A strict calculation will yield 2035.9. This means that the population will reach 5,000 during the year 2035; you cannot just round to the nearest whole number.

Evaluating the One-Child Policy

14. One of the original goals of the scientists and data analysts was to keep China's population below 1.2 billion. They did not meet this goal. According to the table below, in what year did the Chinese population actually reach 1.2 billion?

Year	Population (total)	Population growth (annual %)	Birth rate, crude (per 1,000 people)	Fertility rate, total (births per woman)	Death rate, crude (per 1,000 people)
1990	1,135,185,000	1.47	21.06	2.31	6.67
1991	1,150,780,000	1.36	19.68	2.14	6.70
1992	1,164,970,000	1.23	18.27	1.98	6.64
1993	1,178,440,000	1.15	18.09	1.84	6.64
1994	1,191,835,000	1.13	17.70	1.73	6.49
1995	1,204,855,000	1.09	17.12	1.66	6.57
1996	1,217,550,000	1.05	16.98	1.62	6.56
1997	1,230,075,000	1.02	16.57	1.61	6.51
1998	1,241,935,000	0.96	15.64	1.60	6.50
1999	1,252,735,000	0.87	14.64	1.60	6.46

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During 1994

Teaching Human Dignity

Evaluating the One-Child Policy

Year	Population growth (annual %)	Year	Population growth (annual %)	Year	Population growth (annual %)	Year	Population growth (annual %)	Year	Population growth (annual %)	Year	Population growth (annual %)
1960	1.83	1970	2.76	1980	1.47	1990	1.25	2000	0.79	2010	0.48
1961	-1.02	1971	2.75	1981	1.36	1991	1.28	2001	0.73	2011	0.48
1962	0.82	1972	2.46	1982	1.23	1992	1.47	2002	0.67	2012	0.49
1963	2.46	1973	2.28	1983	1.15	1993	1.44	2003	0.62	2013	0.49
1964	2.32	1974	2.07	1984	1.13	1994	1.31	2004	0.59	2014	0.51
1965	2.38	1975	1.77	1985	1.09	1995	1.36	2005	0.59	2015	0.51
1966	2.79	1976	1.55	1986	1.05	1996	1.49	2006	0.56	2016	0.54
1967	2.57	1977	1.36	1987	1.02	1997	1.60	2007	0.52	2017	0.56
1968	2.61	1978	1.34	1988	0.96	1998	161	2008	0.51	2018	0.46
1969	2.74	1979	1.33	1989	0.87	1999	1.53	2009	0.51		

15. How close was your prediction in #11 based on the 1978-data-informed model? What does this tell you about the average population growth rate between 1978 and the year in which the population reached 1.2 billion? Confirm this using the data from the table above.

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1964	2.32	1974	2.07	1984	1.13	1994	1.31	2004	0.59	2014	0.51
1965	2.38	1975	1.77	1985	1.09	1995	1.36	2005	0.59	2015	0.51
1966	2.79	1976	1.55	1986	1.05	1996	1.49	2006	0.56	2016	0.54
1967	2.57	1977	1.36	1987	1.02	1997	1.60	2007	0.52	2017	0.56
1968	2.61	1978	1.34	1988	0.96	1998	161	2008	0.51	2018	0.46
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15. How close was your prediction in #11 based on the 1978-data-informed model? What does this tell you about the average population growth rate between 1978 and the year in which the population reached 1.2 billion? Confirm this using the data from the table above.

The prediction was very close. This tells me that the average population growth rate between 1978 and 1994 was very similar to the population growth rate in 1978 (1.34). Finding a mean average of these growth rates confirms this.

Evaluating the One-Child Policy

16. China's population growth rate is in decline.

    a. Using "year" as the x-value and "population growth" as the y-value, create a linear function to model the population growth rate. You will need to use an external tool (Excel, Desmos, graphing calculator, etc.) to find a line of best fit to use for the linear model.

    b. Using this model, estimate the year in which China's growth rate will reach 0%.

Evaluating the One-Child Policy

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   a.   Using "year" as the x-value and "population growth" as the y-value, create a linear function to model the population growth rate. You will need to use an external tool (Excel, Desmos, graphing calculator, etc.) to find a line of best fit to use for the linear model.

$$r(t) = -0.0325t + 65.939$$

   b.   Using this model, estimate the year in which China's growth rate will reach 0%.

   The population growth rate will be zero in 2028. Indeed, most public models estimate that China will reach zero population growth around 2030.

Evaluating the One-Child Policy

17. From what you have learned, did the one-child policy significantly limit the growth of the Chinese population? Why or why not? You may use the table below to inform your response.

Year	Population (total)	Population growth (annual %)	Birth rate, crude (per 1,000 people)	Fertility rate, total (births per woman)	Death rate, crude (per 1,000 people)
1960	667,070,000	1.83	20.86	5.76	25.43
1965	715,185,000	2.38	37.88	6.39	9.50
1970	818,315,000	2.76	33.43	5.73	7.60
1975	916,395,000	1.77	23.01	3.56	7.32
1980	981,235,000	1.25	18.21	2.61	6.34
1985	1,051,040,000	1.36	21.04	2.65	6.78
1990	1,135,185,000	1.47	21.06	2.31	6.67
1995	1,204,855,000	1.09	17.12	1.66	6.57
2000	1,262,645,000	0.79	14.03	1.60	6.45
2005	1,303,720,000	0.59	12.40	1.61	6.51
2010	1,337,705,000	0.48	11.90	1.63	7.11
2015	1,371,220,000	0.51	12.07	1.67	7.11