Modeling Data with Functions

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Effective Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

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Use the scenario below for questions 11 – 16.

Source: Wikimedia Commons

Buffalo, New York, was first settled in 1789 on the eastern shore of Lake Erie. The Erie Canal opened in 1820, connecting the Great Lakes with the Atlantic Ocean through New York City. In 1957, the St. Lawrence Seaway was opened, allowing shipping traffic to bypass the Erie Canal and sail to the Atlantic Ocean through Canada. The table shows the population of Buffalo in each U.S. Census from 1810 to 2010.

YEAR	DECADE SINCE 1810	POPULATION
1810	0	1,508
1820	1	2,095
1830	2	8,668
1840	3	18,213
1850	4	42,261
1860	5	81,129
1870	6	117,714
1880	7	155,134
1890	8	255,664
1900	9	352,387
1910	10	423,715
1920	11	506,775
1930	12	573,076
1940	13	575,901
1950	14	580,132
1960	15	532,759
1970	16	462,768
1980	17	357,870
1990	18	328,123
2000	19	292,648
2010	20	261,310

source: Wikipedia, U.S. Census Bureau

11. Make a scatterplot of the population versus the decade since 1810.

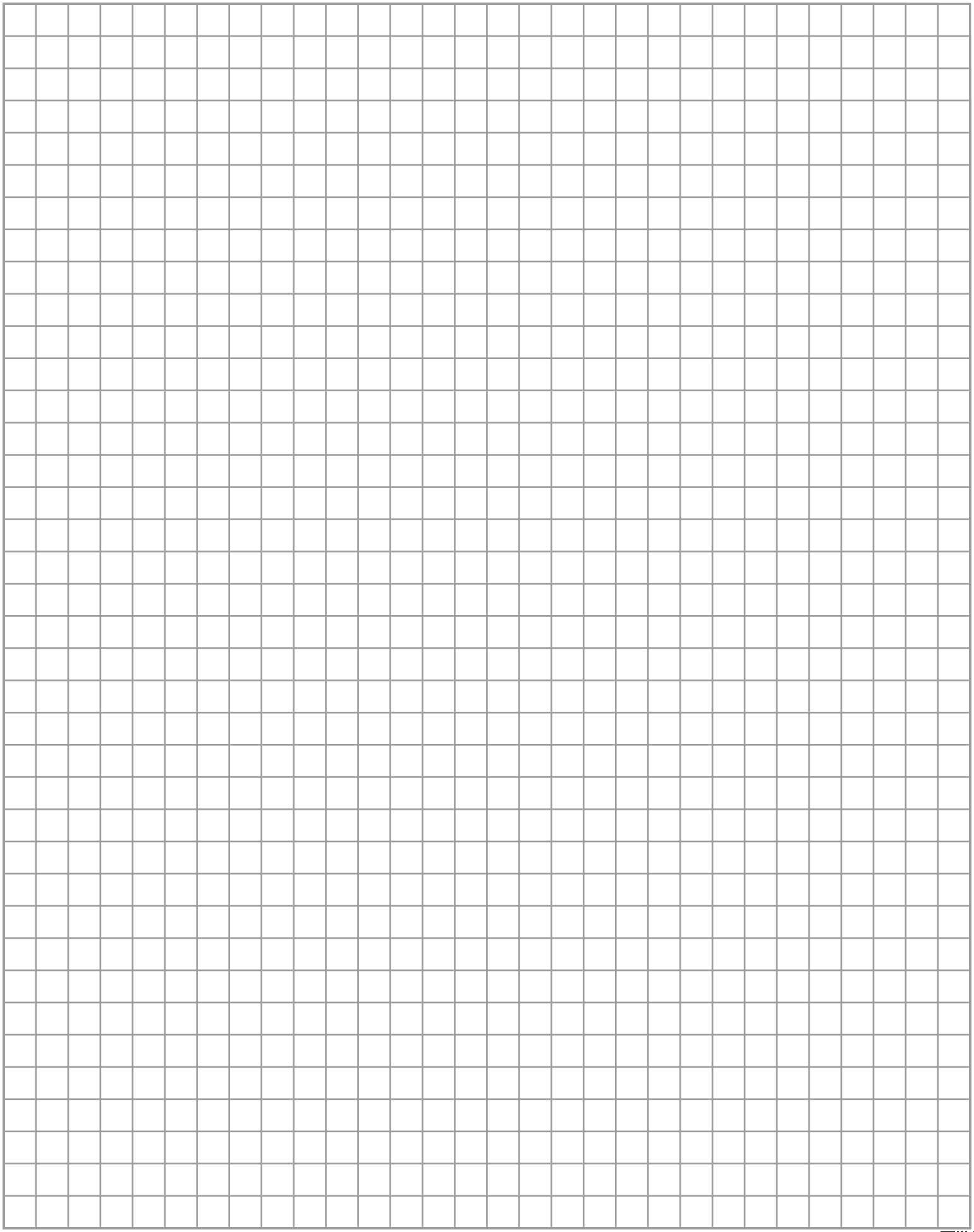
12. Use patterns in the table and trends in the scatterplot to determine which type(s) of function best model the data set over different intervals. Specify the interval for which that function type best models the data set.

13. Use the data to write a function, $p(x)$, that best models the data over one the interval [17, 20]. State the domain for which the function is a reasonable model for the data set.

14. How does the domain and range of the function, $p(x)$, compare to the reasonable domain and range for which $p(x)$ is a useful model for the data?

15. Use your function model to predict the population of Buffalo in 2014. *Hint: if x = 20 represents the year 2010 and x = 21 represents the year 2020, what decimal number could you use for 2014?*

16. The population of Buffalo in 2014 was actually 258,703. How does your prediction compare to the actual population? If the prediction is different, explain why.



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