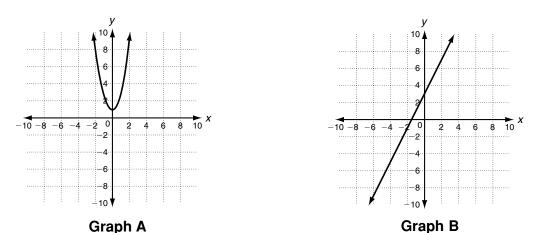
LESSON Reading Strategies

Draw Conclusions 9-6

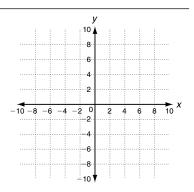
Sometimes there is a pattern in real-world data that describes the relationship. Often we can use the pattern to draw conclusions about the function.

Function	Linear	Quadratic	Exponential	Square Root
Constant	Constant first	Constant second	Constant ratios	Constant second
Differences/	differences	differences	between	differences
Ratios	between y-values	between y-values	<i>y</i> -values	between <i>x</i> -values
	(x-values evenly	(x-values evenly	(<i>x</i> -values	(y-values evenly
	spaced).	spaced).	evenly spaced).	spaced).



Use the graphs above for Exercises 1–2.

- **1. a.** What type of function is represented by Graph A?
 - **b.** What conclusions can you draw about the data set for the function represented by Graph A?
- 2. a. What type of function is represented by Graph B?
 - b. What conclusions can you draw about the data set for the function represented by Graph B?
- **3.** On the coordinate plane at right, sketch the graph of a function that has constant ratios between y-values with evenly spaced x-values.
- **4.** On the coordinate plane at right, sketch the graph of a function that has constant first differences and includes the points (-4, 6) and (0, 0).



State Reteach 9-6 Modeling Real-World Data (continued)	Challenge 9-6 Polynomials by Interpolation					
After determining a parent function to model a data set, use the regression	-	-		he used to		
feature on a graphing calculator to find a function that models the data. Write a function that models the data.	Constant differences of the dependent variables can also be used to determine cubic, quartic, and higher degree polynomial functions.					
x 4 5 6 7 8 x 4 5 6 7 8		lifferences indicate a cate a quartic polyno	cubic polynomial. Co mial, and so on.	onstant fourth		
y 71 93 121 157 204	Once the degree	e of the polynomial i	s determined, polyno	mial interpolation		
Step 1 Find first differences.	$f(x) = ax^3 + bx$		ppropriate. Substitute			
First differences: 22 28 36 47 204 - 157 = 47		et to identify the cons tem of linear equatio	stants <i>a</i> , <i>b</i> , <i>c</i> , and <i>d</i> b ns.	by solving the		
Step 2 Since first differences are not constant, find second differences. Second differences: 6 8 11	For each data.	determine the dear	ee of the polynomia	al that is the best		
Step 3 Since second differences are not constant, analyze ratios. Ratios are all	fit and then fin	d the polynomial b				
$\frac{93}{71} = 1.310, \frac{121}{93} = 1.301, \frac{157}{121} = 1.298, \frac{204}{157} = 1.299$	1. <u>x</u>	-4 -3 -2 21 5 -5		1 2 1 15	3 4 35 61	
Step 4 An exponential model best fits the data since the ratios are		- · ·		I I	35 01	
almost constant. Use a graphing calculator. Perform exponential regression. Select ExpReg from the STAT CALC menu.		Qua	idratic; $y = 3x^2$	+ 5 <i>x</i> - 7		
ExpReg	2. <u>x</u>	-4 -3 -2		1 2 20 –9	3 4	
$y = a^*b^x$ An exponential model	<u>y</u> –	-795 -284 -6			-116 -403	
$a = 24.8379125$ that fits the data is $f(x) = 24.8(1.3^{x})$.		Quartic; y	$= -2x^4 + 3x^3 -$	$-7x^2 + x + 2$	5	
b = 1.301415677 $r^2 = .999953961$	3. x	-4 -3 -2		1 2	3 4	
r = .9999769803	<u>y</u> –	-348 -154 -5	2 -12 -4	2 36	128 308	
Complete to units a function that models the circan data		Cubi	$c; y = 5x^3 - x^2$	+2x - 4		
Complete to write a function that models the given data.	4. <u>x</u>	-4 -3 -2	1 0	1 2	3 4	
x 3 4 5 6 7 y 33 56 86 123 167	y –	1003 -222 -1	1 20 21	22 53	264 1045	
3. Are the x-values evenly spaced? Yes			Quintic; $y = x^5$	+ 21		
4. Are the first differences constant? No	5. x	-4 -3 -2	2 -1 0	1 2	3 4	
5. Are the second differences constant? Yes	y 1	268 442 152	2 98 100	98 152	442 1268	
6. What is an appropriate model for the data? 7. Find a function that models the data. $f(x) = 3.5x^2 - 1.5x + 6$		Qua	rtic; $y = 5x^4 - 7$	$x^{2} + 100$		
7. Find a function that models the data. $7(x) = 3.3x - 1.3x + 0$						
Capyright O by Holt, Rinchart and Winston. 47 Holt Algebra 2	Copyright © by Holt, Rinehar All rights reserved.	rt and Winston.	48		Holt Algebra 2	
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		ding Strate				
9-6 Modeling Real-World Data	9-6 Drav	v Conclusions		es the relationship.		
9-6 Modeling Real-World Data The table shows the population of Lincoln Valley over the last 7 years. The town council is developing long range plans and is	9-6 Drave Sometimes there	v Conclusions				
950 Modeling Real-World Data The table shows the population of Lincoln Valley over the last 7 years. The town council is developing long range plans and is considering how the population might grow in the future if the current trend continues.	9-6 Draw Sometimes there Often we can us Function	e is a pattern in real-weight the pattern to draw	vorld data that describ conclusions about the Quadratic	Exponential	Square Root	
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ESG Modeling Real-World Data The table shows the population of Lincoln Valley over the last 7 years. The town council is developing long range plans and is considering how the population might grow in the future if the current trend continues. $\frac{1 \text{incoln Valley Population 2000-2006}}{\frac{1}{2 \text{ ear } 1} \frac{1}{2 \text{ of } 2} \frac{3}{3 \text{ of } 4} \frac{4}{5 \text{ of } 1542} \frac{1}{1662}}{\frac{1}{2 \text{ of } 1344} \frac{1}{1542} \frac{1}{1662}}$ 1. What is the independent variable? What is the dependent variable? Assign x or y to each variable. The independent variable (x) is the year. The dependent variable (y) is the population. 2. Make a scatter plot of the data. Do the data form a linear pattern? For this to be true, explain what must be true about finite differences. Possible answer: The first few points appear to be linear, but the later points start a curve upward. For the data to be linear, the first differences must be constant. 3. Use the table of data. a. Find the first differences. <u>4, 5, 11, 0, 12</u> c. Find the third differences. <u>1, 6, -11, 12</u> d. Find the traitos between y-values. All ratios round to 1 08	9-6 Draw Sometimes there Often we can us Function Constant Differences/ Ratios	P Conclusions a is a pattern in real-we te the pattern to draw Linear Constant first differences between y-values (x-values evenly spaced).	vorld data that describ conclusions about the Quadratic Constant second differences between y-values (x-values evenly spaced).	Exponential Constant ratios between y-values (x-values (x-values evenly spaced).	Constant second differences between x-values (y-values evenly spaced).	
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 B20 Modeling Real-World Data The table shows the population of Lincoln Valley over the last 7 years. The town council is developing long range plans and is considering how the population might grow in the future if the considering how the population might grow in the future if the considering how the population might grow in the future if the considering how the population 1049 1137 1229 1326 1434 1542 1662 1. What is the independent variable? What is the dependent variable? Assign x or y to each variable. The independent variable (x) is the year. The dependent variable? Assign x or y to each variable. Make a scatter plot of the data. Do the data form a linear pattern? For this to be true, explain what must be true about finite differences. Make a scatter plot of the data. Do the data form a linear pattern? For this to be true, explain what must be true about finite differences. 88, 92, 97, 108, 108, 120 b. Find the first differences. <u>4</u>, 5, 11, 0, 12 c. Find the third differences. <u>1</u>, 6, −11, 12 d. Find the tratios between <i>y</i>-values. <u>All ratios round to 1.08</u>. c. Find the third differences. <u>All ratios round to 1.08</u>. c. What kind of function will best describe the data? Justify your conclusion. Exponential function, because the ratios between <i>y</i>-values are almost constant. Chroose the letter for the best answer. 6. Predict the population of Lincoln Valley in 2012. 	9-6 Draw Sometimes there Often we can us Function Constant Differences/ Ratios Use the graphe 1. a. What typ b. What coo Graph A The 2. a. What typ b. What cool of a function 3. On the cool of a function with evenly 4. On the cool	v Conclusions e is a pattern in real-ve the pattern to draw Linear Constant first differences between y-values (x-values evenly spaced).	vorld data that describ conclusions about the Quadratic Constant second differences between y-values (x-values evenly spaced).	Exponential Constant ratios between y-values (x-values evenly spaced).	Constant second differences between x-values (y-values evenly spaced).	
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