1.4 Writing Exponential Functions

FOCUSING QUESTION What are the characteristics of an exponential function?

LEARNING OUTCOMES

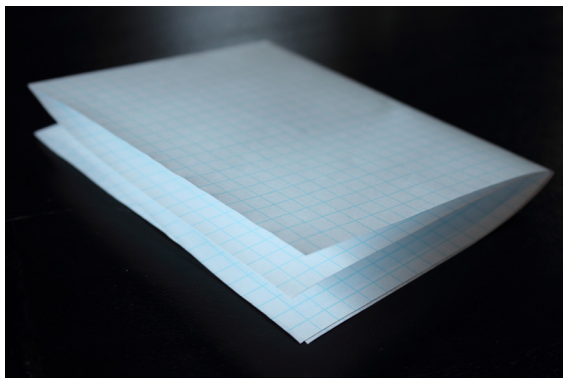
- I can determine patterns that identify an exponential function from its related common ratios.
- I can classify a function as linear or exponential when I am given a table.
- I can determine the exponential function from a table using common ratios, including any restrictions on the domain and range.
- I can analyze patterns to connect the table to a function rule and communicate the exponential pattern as a function rule.

ENGAGE

Miranda shared a cookie recipe on social media with three friends. Each of Miranda's friends shared the cookie recipe with three of their friends. If this trend continues, how many people will receive a cookie recipe in the fifth round?

EXPLORE

Begin with a sheet of paper. Fold it in half and record the number of layers of paper after the fold in a table like the one shown.



NUMBER OF FOLDS	NUMBER OF LAYERS
0	1
1	
2	
3	
4	
5	
6	

1. What is the difference between the numbers of folds in consecutive rows in the table?

2. What is the difference between the numbers of layers in consecutive rows in the table?

NUMBER OF FOLDS	NUMBER OF LAYERS
0	1
1	
2	
3	
4	
5	
6	

3. Are the finite differences between the number of layers and the number of folds constant? How can you tell?

4. What patterns do you observe in the differences in the table?

5. Is this a linear relationship? How do you know?

6. What is the ratio between successive numbers of layers?

7. How many layers would there be after the 7^{th} fold? 10^{th} fold?

8. What type of function best describes this relationship? Explain your reasoning.

9. Write an equation that could be used to determine y, the number of layers, if you know x, the number of folds.

Begin with a new sheet of paper.

10. What is area of the sheet of paper without any folds?

11. Fold the paper in half and record the area of the region showing after the fold in a table like the one shown. If necessary, round to the nearest tenth of a square inch.

NUMBER OF FOLDS	AREA OF REGION
0	
1	
2	
3	
4	
5	
6	

12. What is the difference between the numbers of folds in consecutive rows in the table?

13. What is the difference between the areas of regions in consecutive rows in the table?

NUMBER OF FOLDS	AREA OF REGION
0	
1	
2	
3	
4	
5	
6	

14. Are the finite differences between the area of the regions and the number of folds constant? How can you tell?

15. What patterns do you observe in the differences in the table?

16. Is this a linear relationship? How do you know?

17. What is the ratio between successive areas of regions?

18. What would be the area of the region present after the 7^{th} fold?

19. What type of function best describes this relationship? Explain your reasoning.

20. Write an equation that could be used to determine y, the area of the region, if you know x, the number of folds.

REFLECT

- **What do you notice about the successive ratios in each relationship?**
- **What relationship exists between the successive ratios in the dependent variable and the equations that you have written?**

NOTES