

4.4

Thank Goodness Descartes Didn't Drink Some Warm Milk!

Graphs of Sequences

LEARNING GOALS

In this lesson, you will:

- Graph arithmetic sequences.
- Graph geometric sequences.
- Recognize graphical behavior of sequences.
- Sort sequences that are represented graphically.

You've worked with coordinate planes before, but you may not know how they were invented. As one story goes, the 16th century French mathematician and philosopher René Descartes (pronounced day-Kart) was suffering through a bout of insomnia. While attempting to fall asleep, he spotted a fly walking on the tiled ceiling above his head. At this sight, his mind began to wander and a question popped in his head: Could he describe the fly's path without tracing the *actual* path?

From that question came the revolutionary invention of the coordinate system—an invention which makes it possible to link algebra and geometry. Where have you seen examples of coordinate planes? How do coordinate planes help you identify the locations of objects?

PROBLEM 1 Sequences as Tables and Graphs

Sometimes writers can have words flow from mind to paper without any struggles. However, that is not usually the case. For the most part, writers need to organize their thoughts, and many times they use outlines to organize these thoughts. Some of the same struggles may arise in mathematics, especially when dealing with sequences. Thus, creating a table to organize values can help you determine the sequence.



1. Consider sequence a represented by the explicit formula shown.

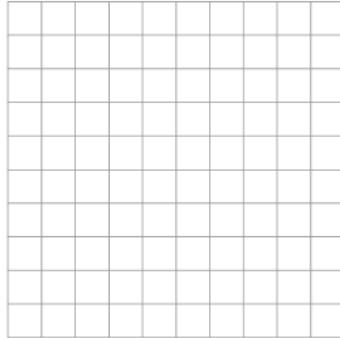
$$a_n = -10 + 4(n - 1)$$

- a. Complete the table for sequence a .

Term Number (n)	Term Value
1	-10
2	
3	
4	
5	
6	
7	
8	
9	
10	

- b. Write each pair of numbers from the table as an ordered pair. Let the independent variable represent the term number, and let the dependent variable represent the term value.

- c. Graph the ordered pairs on the grid shown and label the axes.



- d. Describe the shape of the graph.

- e. Is the graph discrete or continuous? Explain your reasoning.

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- f. Can you use the graph to predict the 20th term? Explain your reasoning.

Hmmm... I wonder if all arithmetic sequences are linear?





2. Consider sequence g represented by the explicit formula shown.

$$g_1 = 1$$
$$g_n = 2^{n-1}$$

- a. Create a table of values using the first ten terms of sequence g .

Term Number (n)	Term Value

- b. Write each pair of numbers from the table as an ordered pair. Let the independent variable represent the term number, and let the dependent variable represent the term value.

- c. Graph the ordered pairs on the grid shown and label the axes.



- d. Describe the shape of the graph.

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- e. Is the graph discrete or continuous? Explain your reasoning.

What about
geometric sequences?
Are they all
exponential?



- f. Can you use the graph to predict the 20th term? Explain your reasoning.



PROBLEM 2 Match Up the Graphs!

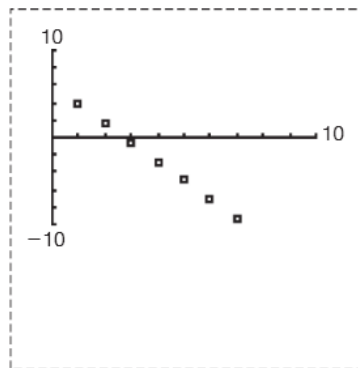
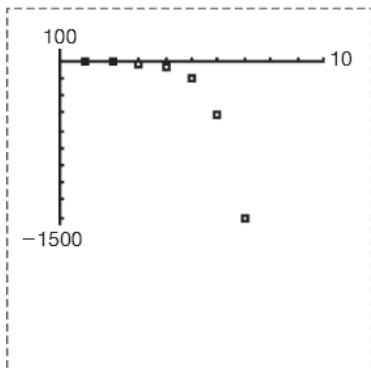
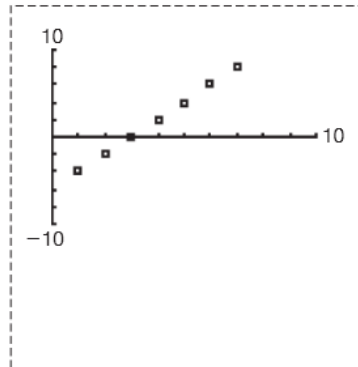
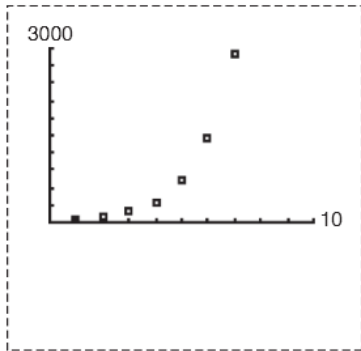
As you have already discovered when studying functions, graphs can help you see trends of a sequence—and at times can help you predict the next term in a sequence.



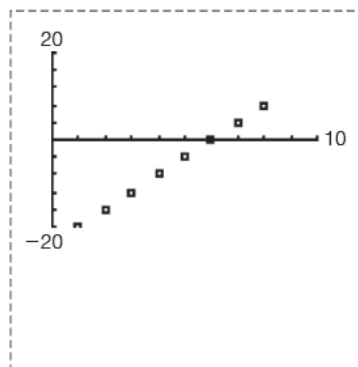
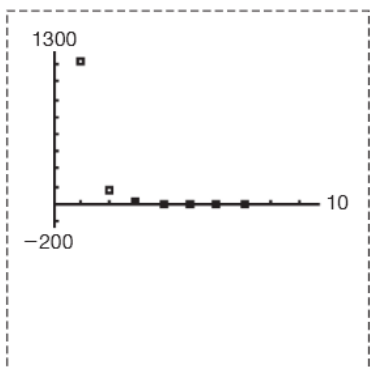
1. Create graphic organizers to identify different arithmetic and geometric sequences.

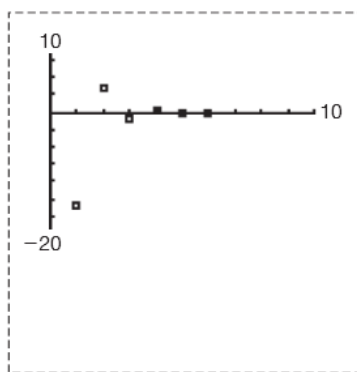
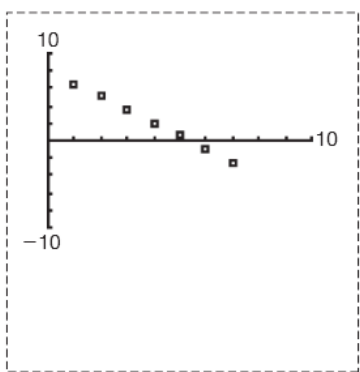
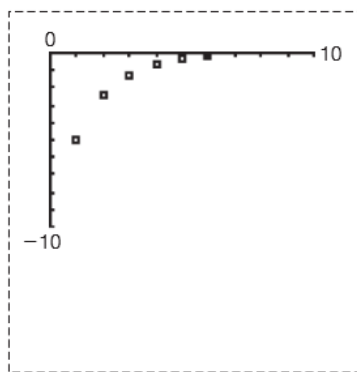
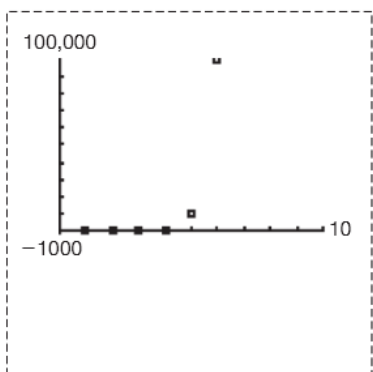
- Carefully remove the 12 graphic organizers at the end of this lesson.
- Gather the arithmetic and geometric sequences from Lesson 4.2, *The Password Is . . . Operations!* Paste one sequence in the “Sequence” section of each graphic organizer.
- Write the explicit formula for the sequence in the “Explicit Formula” section of each graphic organizer.
- Write the recursive formula for the sequence in the “Recursive Formula” section of each graphic organizer.
- The graphs representing the arithmetic and geometric sequences from Lesson 4.2 are located on the following pages. Cut out these graphs. Match each graph to its appropriate sequence and paste it into the “Graph” section of each graphic organizer.
- In the center of each graphic organizer, write the sequence type (arithmetic or geometric).

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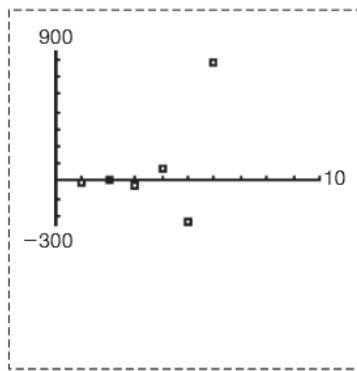
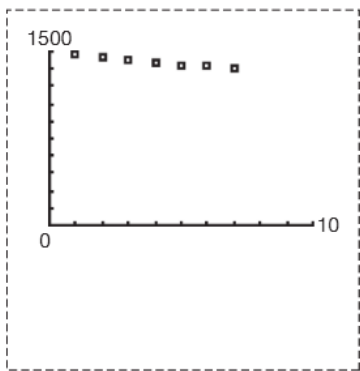


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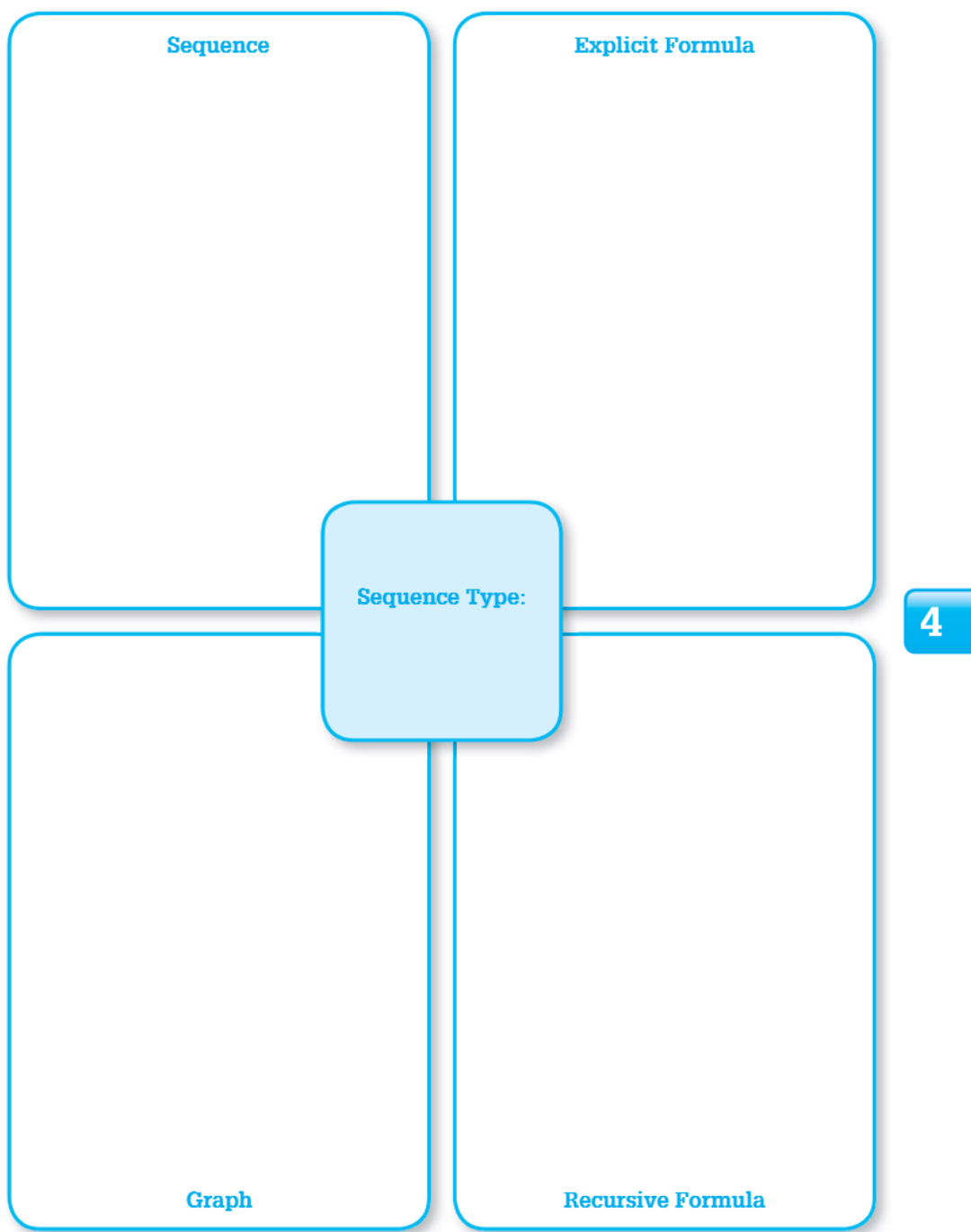


2. Did knowing whether the sequences were increasing or decreasing help you to match the graphs to their corresponding sequences? Explain your reasoning.

3. What other strategies did you use to match the graphs to their corresponding sequences?

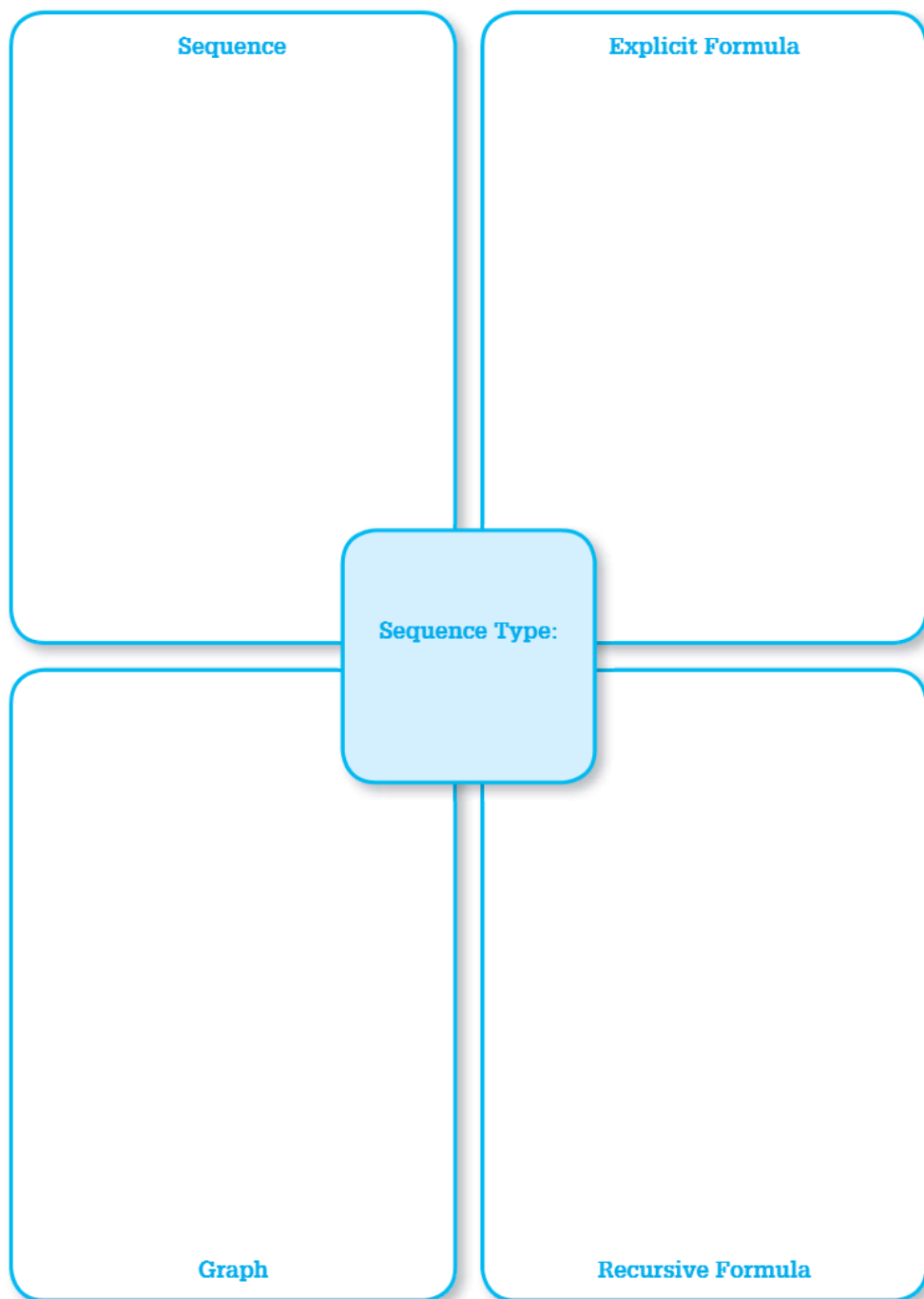


Be prepared to share your solutions and methods.

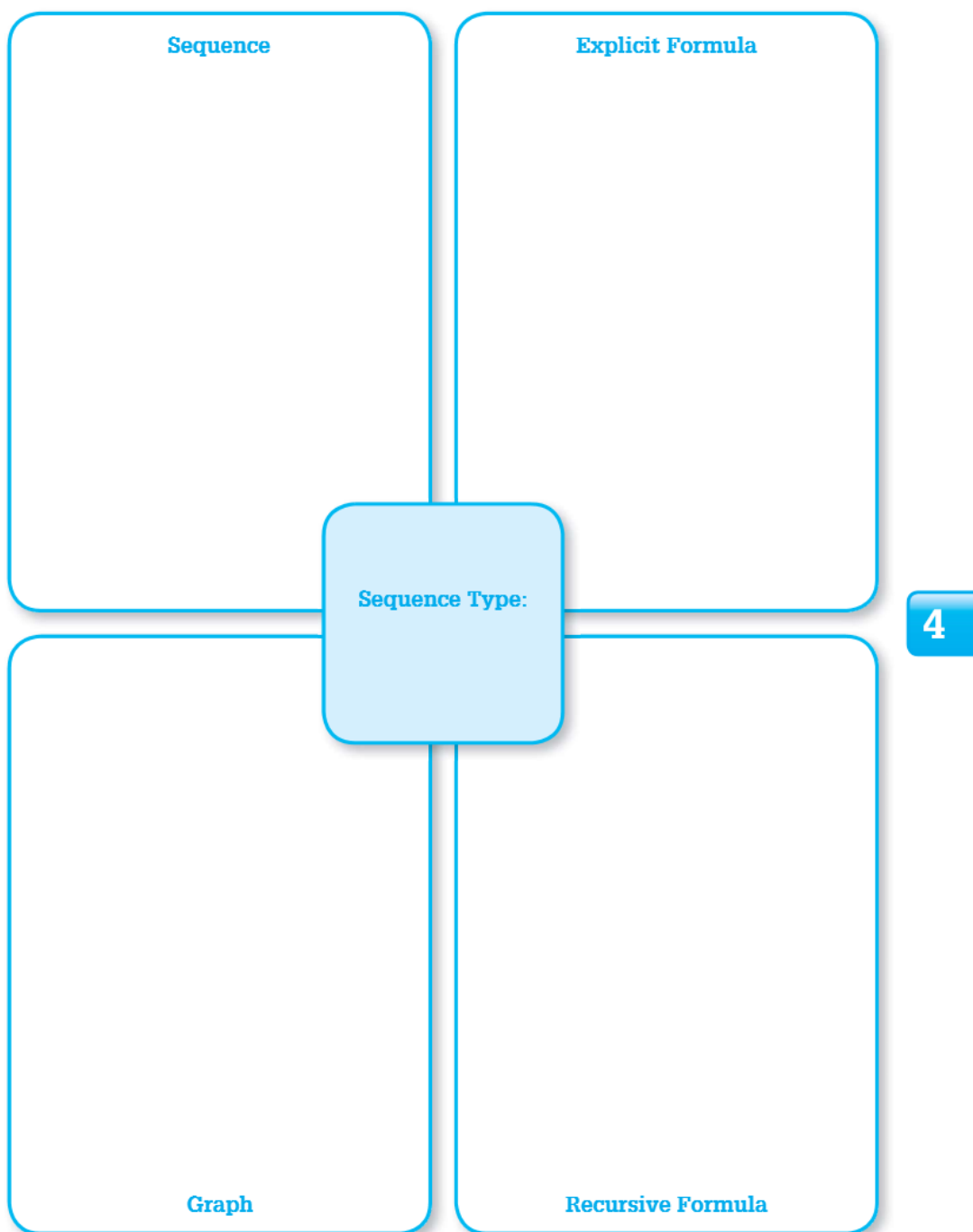


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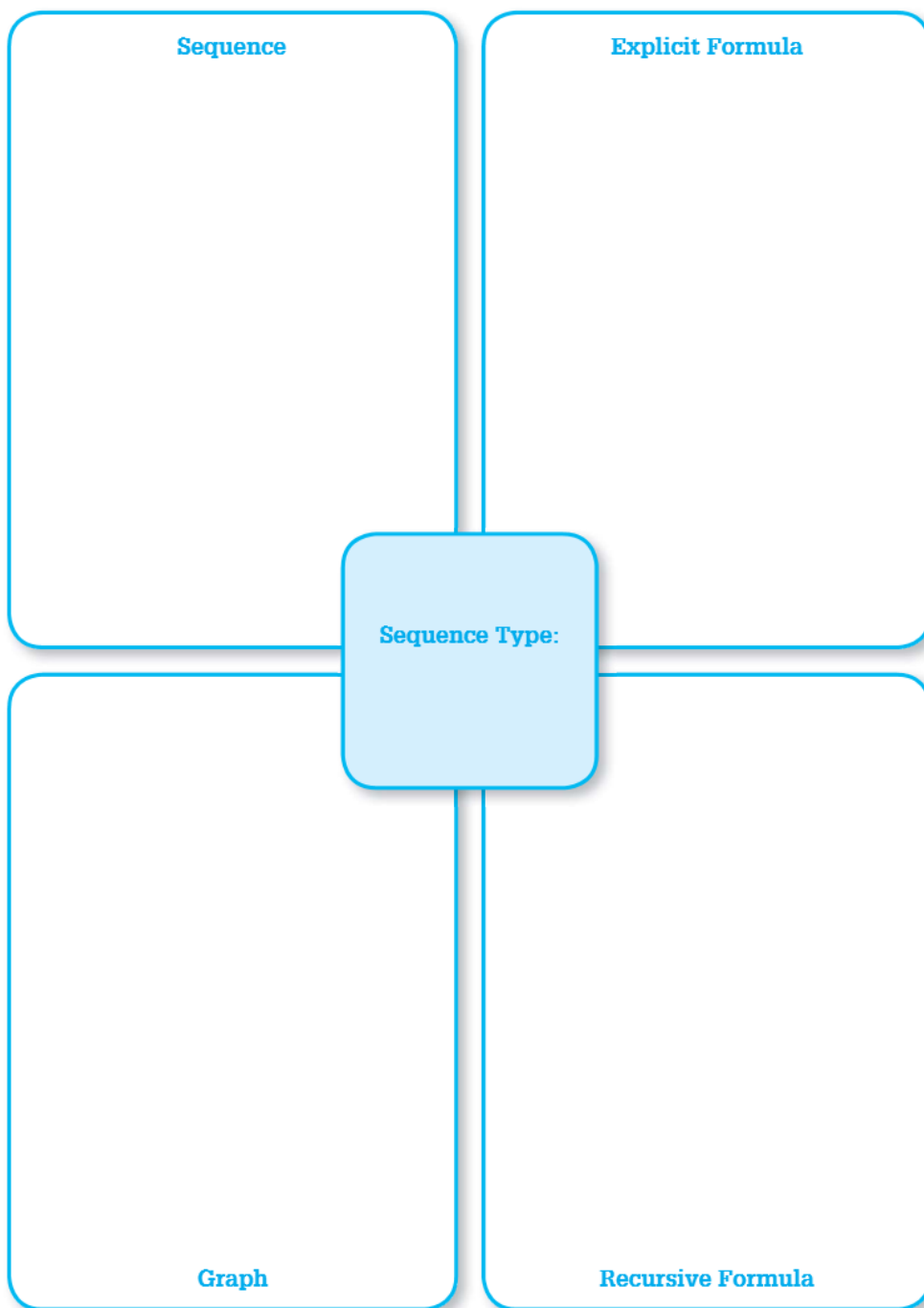


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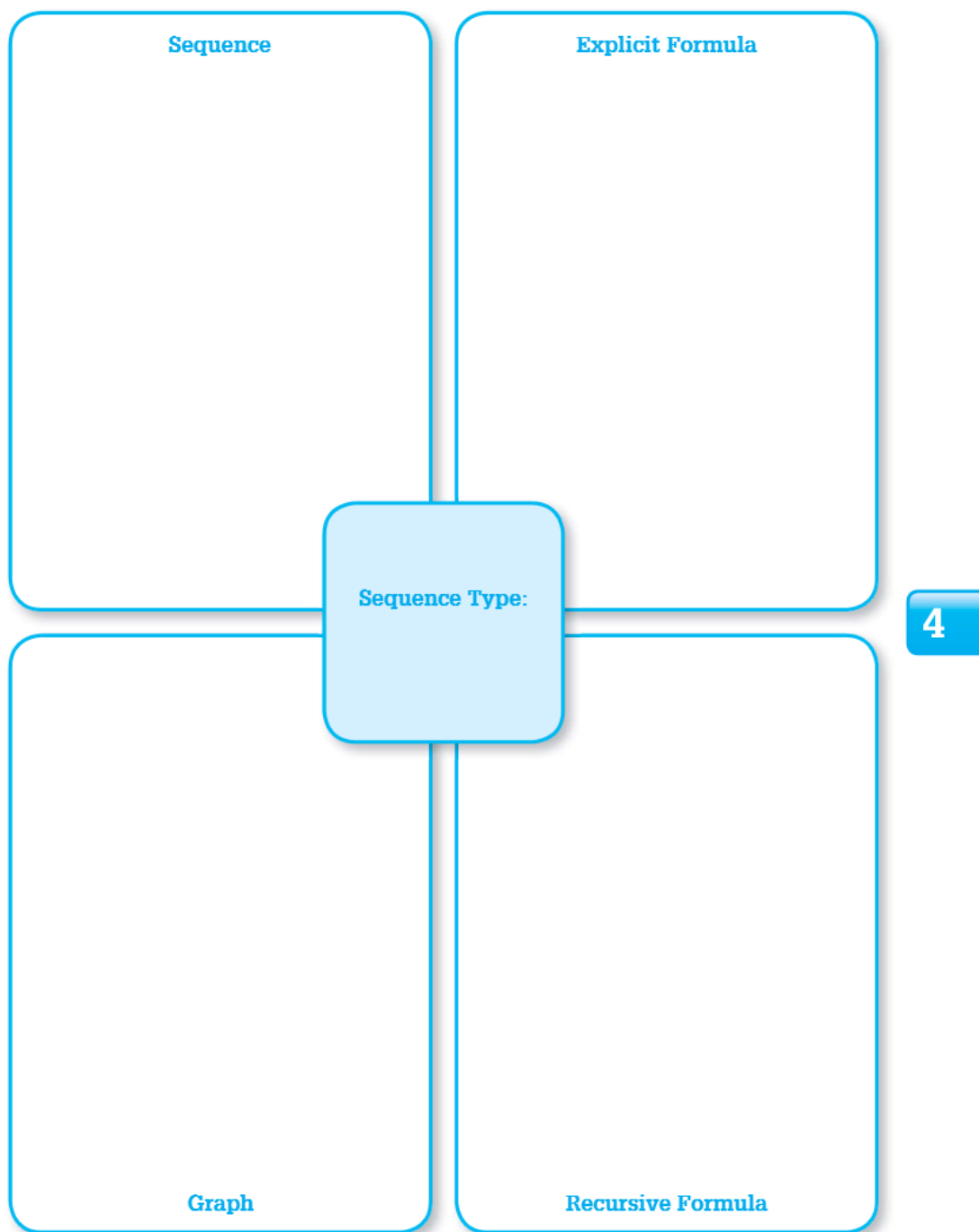


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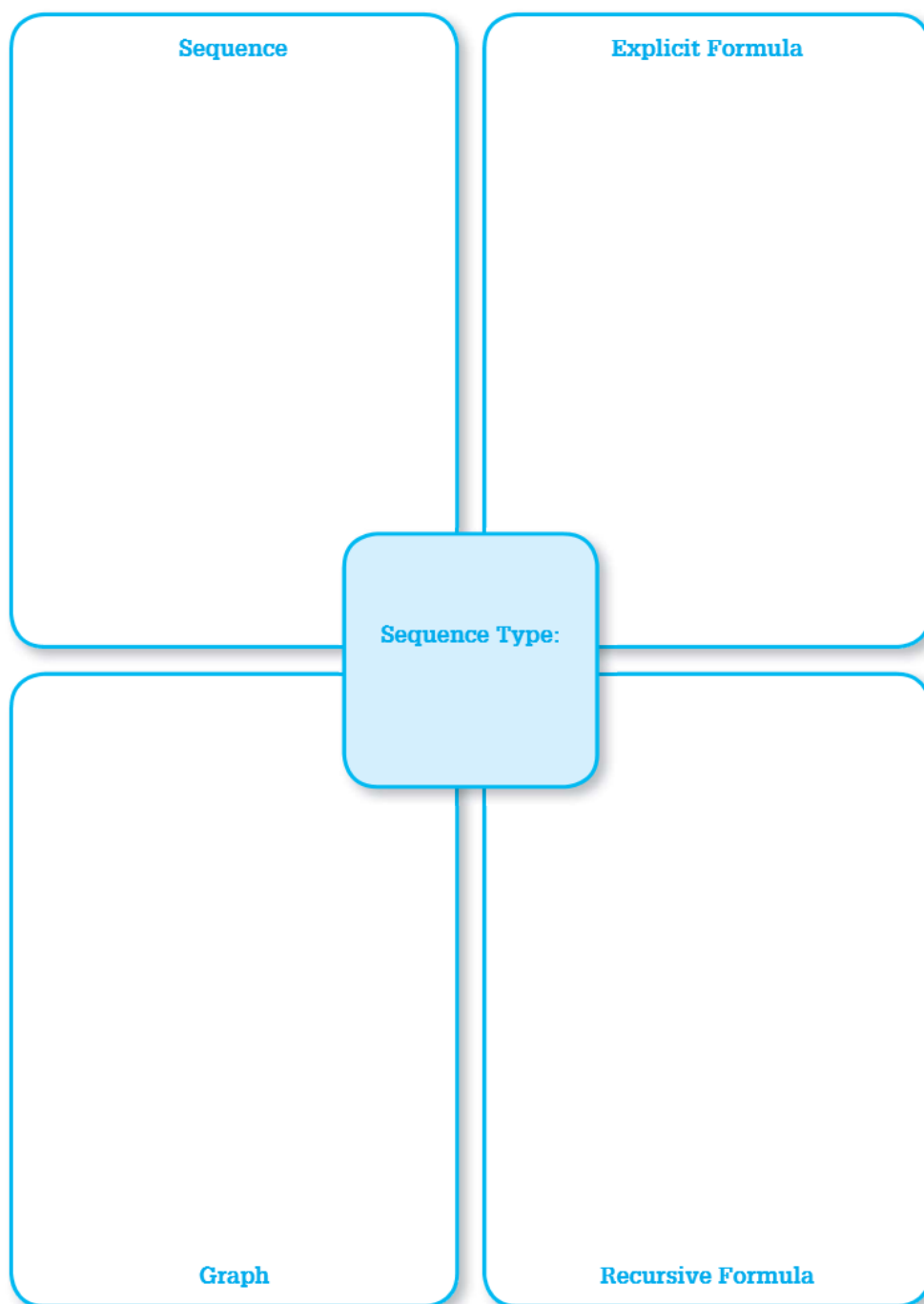
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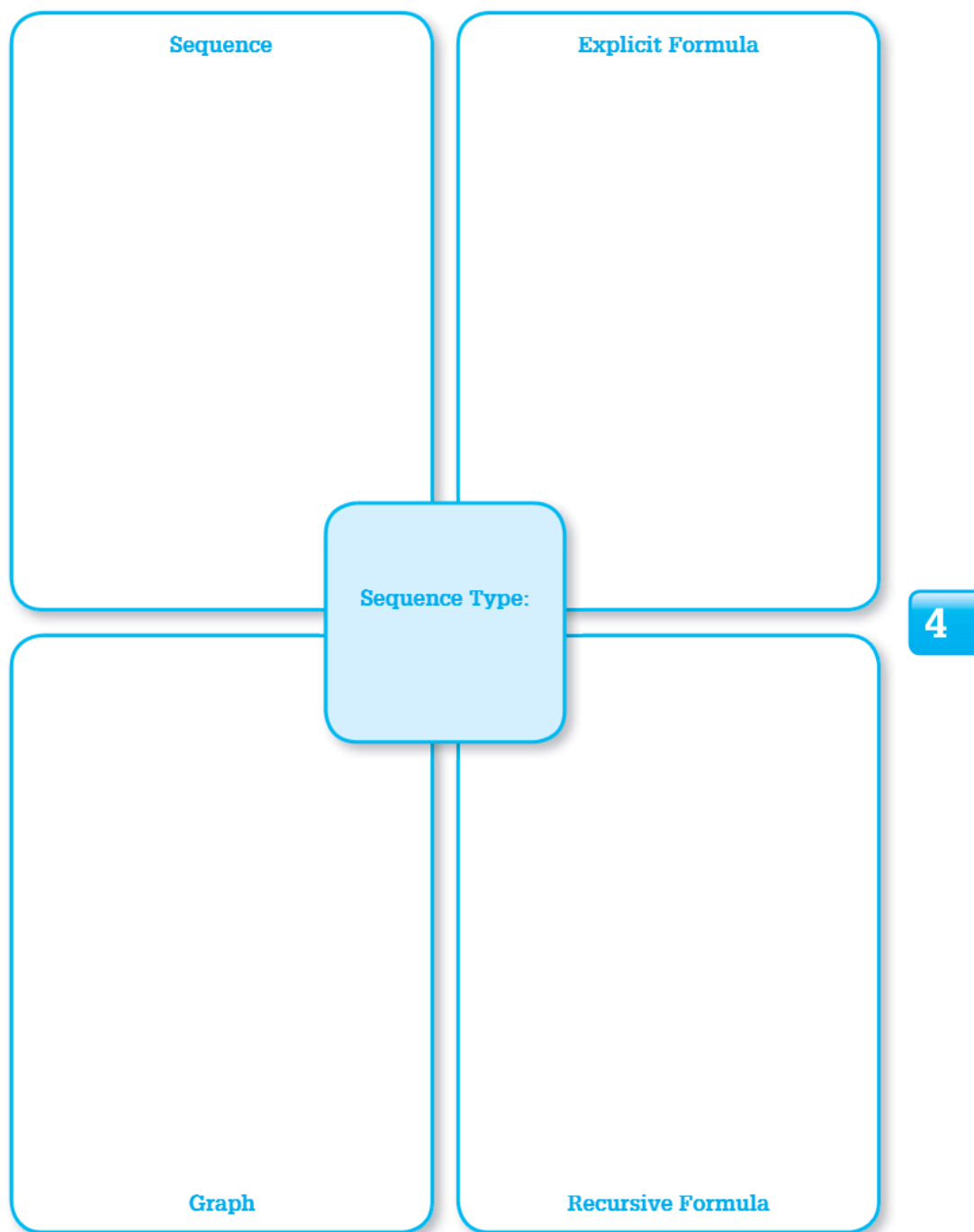
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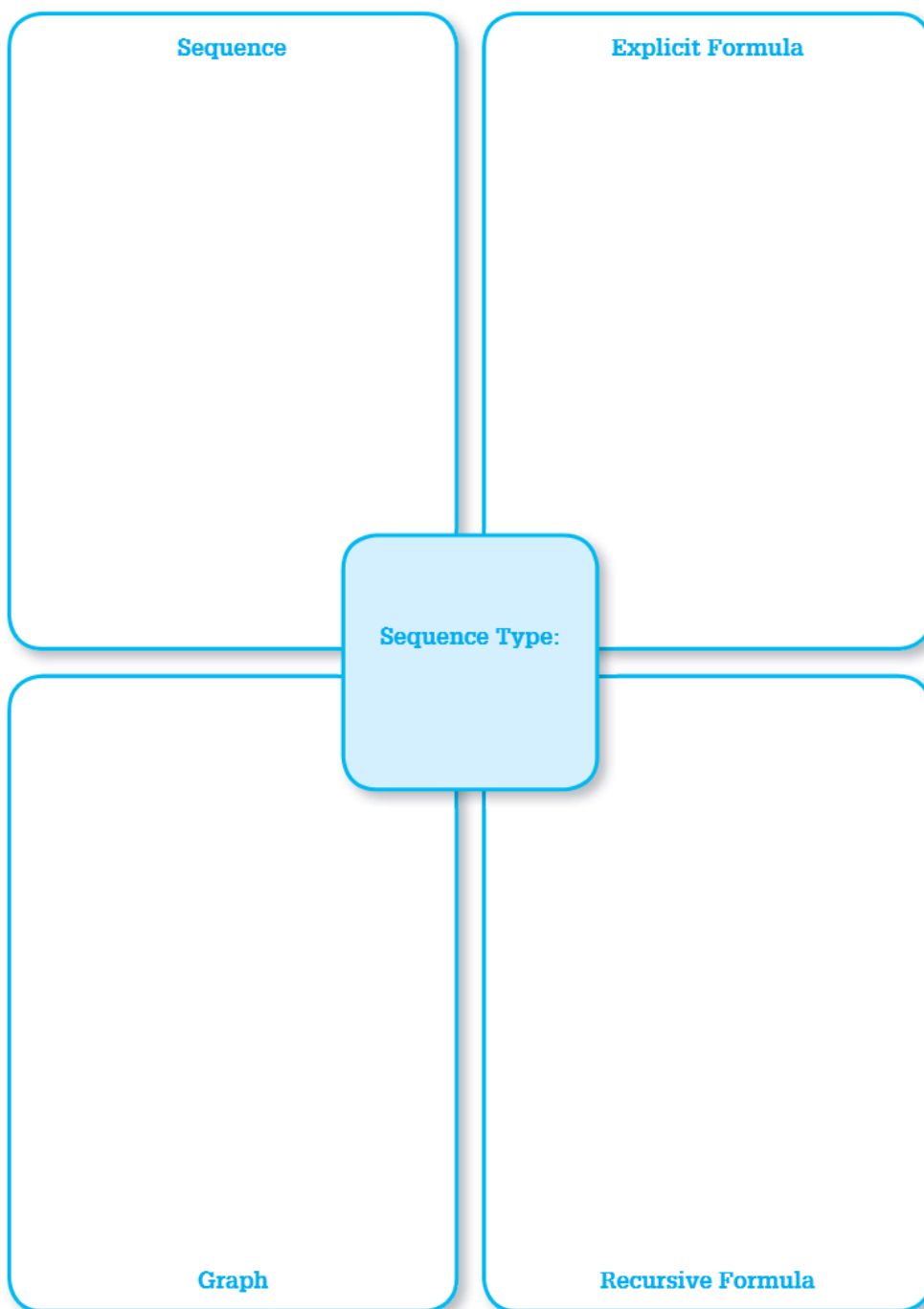
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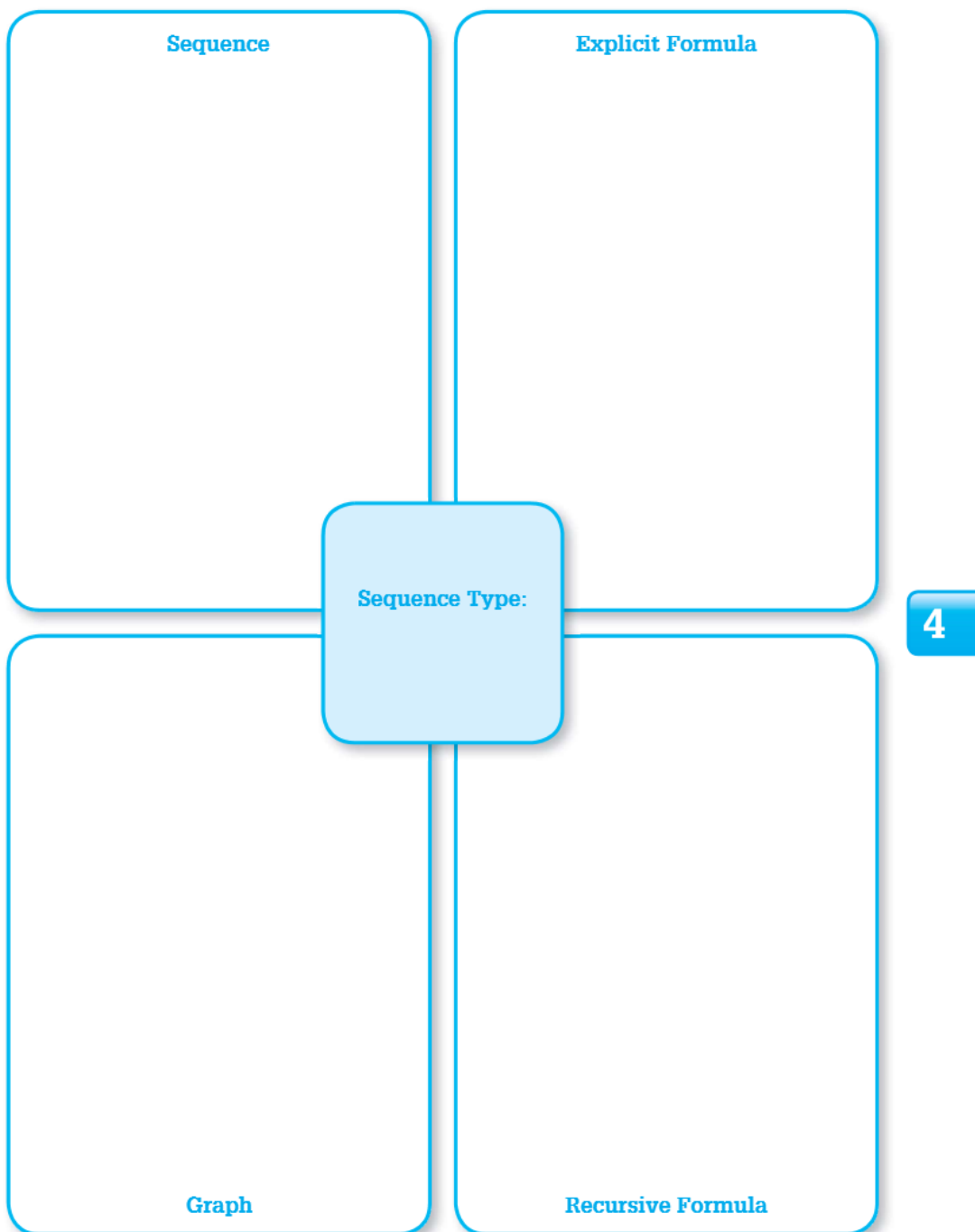
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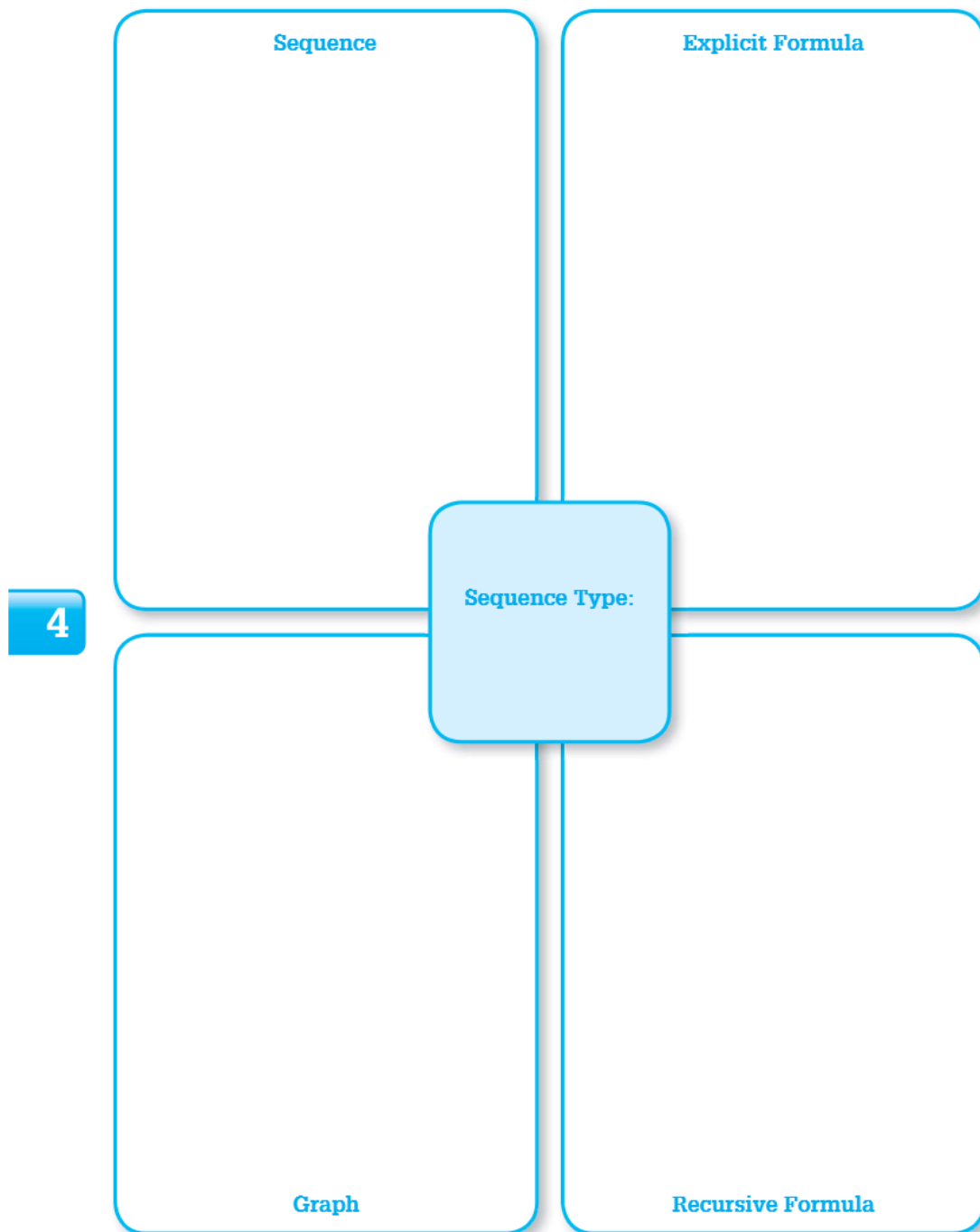


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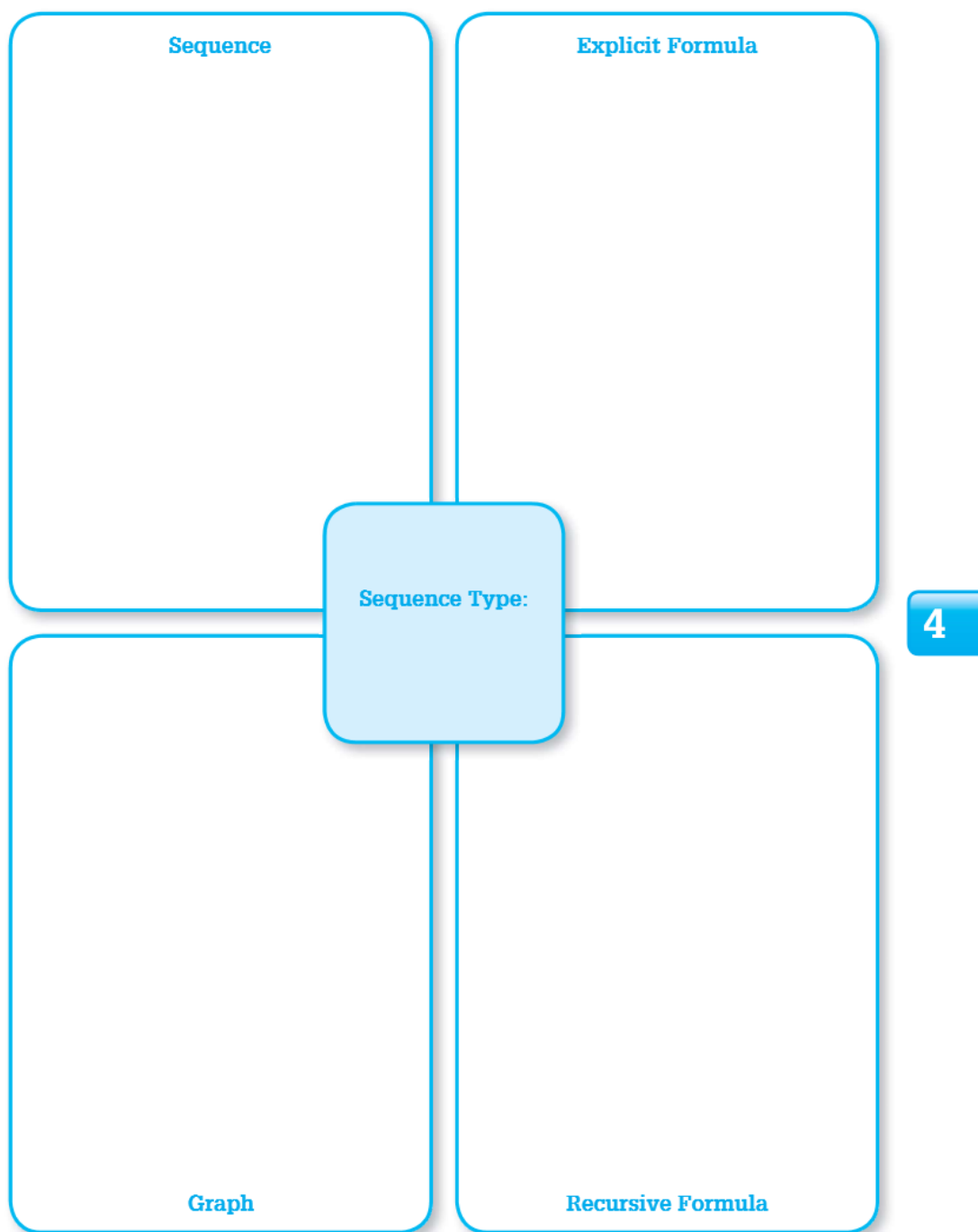


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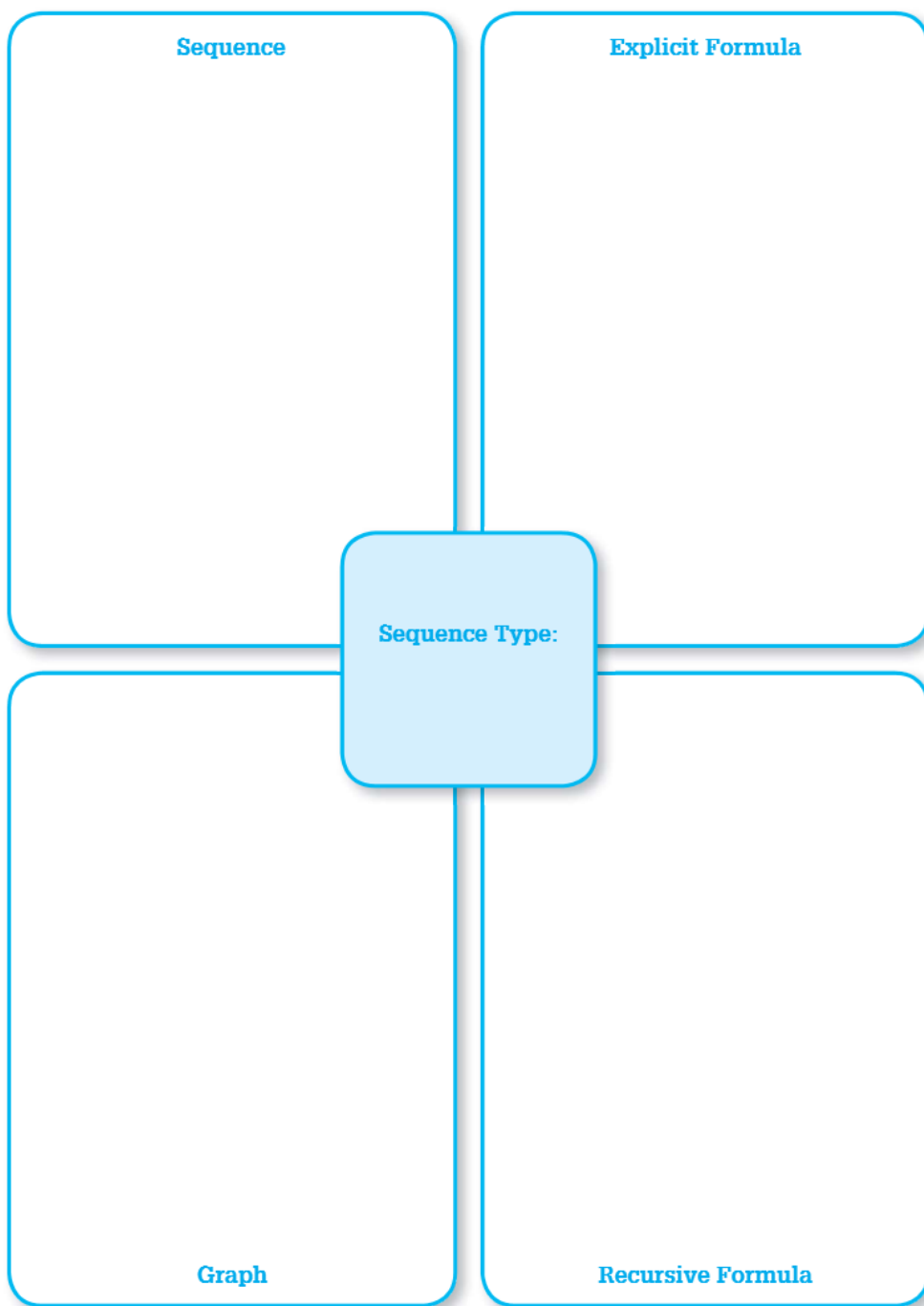


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