Patterns: They're Grrrrrowing!

Exploring and Analyzing Patterns

1.1

LEARNING GOALS

In this lesson, you will:

- Identify multiple patterns within a sequence.
- Use patterns to solve problems.

You can find patterns everywhere! Sometimes you can describe them in terms of color, shape, size or texture. Other times, a pattern's beauty isn't evident until you describe it using mathematics.

Let's consider a pattern found in nature—the family tree of a male drone bee. Female bees have two parents, a male and a female whereas male bees have just one parent, a female. In this family tree the parents appear below the original male drone bee.

(Male =   : Female =   )

Generation		Number of Bees
1		1
2		1
3		2
4		3
5		5
6		8
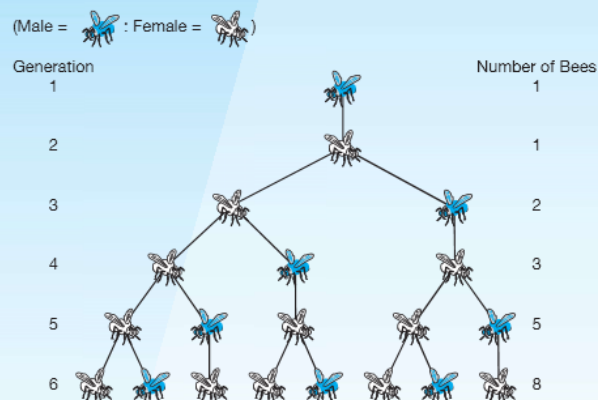
The total number of bees in each generation follows the pattern:

$$1, 1, 2, 3, 5, 8, \ldots$$

What makes this particular pattern fascinating is that it seems to appear everywhere! This pattern is called the Fibonacci Sequence and you can find it in flowers, seashells, pineapples, art, architecture, and even in your DNA!
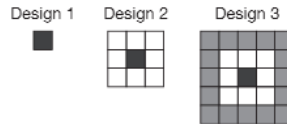
Do you see the pattern? If so, name the next three terms.

3

1

**PROBLEM 1** **There's More Than One Way to Tile a Floor**

Terrance owns a flooring company. His latest job involves tiling a square room. Terrance's customer, Mr. Rivera, requests a tile pattern of alternating black, white, and gray tiles as shown. Each tile is one square foot.

Design 1   Design 2   Design 3

1. Analyze Terrance's design of a tile pattern for a square floor. Describe as many patterns as you can.

2. Sketch the design for a square floor that is 9 feet by 9 feet.
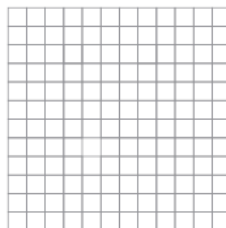
Remember, each tile is one square foot.

2

3. Describe the key features of Design 8 of a square floor. Write as many key features as you can.

> A table might help you organize the various patterns you noticed in Question 1.

1

Design	1	2	3	4	5	6	7	8
Square Dimensions								
Edge Color								
Number of Black Tiles								
Number of White Tiles								
Number of Gray Tiles								
Total Tiles								

3

1

4. A hotel manager wants Terrance to tile their lobby using the same design he created for Mr. Rivera. The lobby measures 45 feet by 45 feet. He wants the outer edge to be the same color as the center tile. Will this occur? Justify your answer.

> Think about how you can work backwards to get to this answer efficiently.

5. Very picky Paula Perkins requests a tile floor from Terrance. She also wants the alternating black, white, and gray tile pattern; however, she wants the outer edge of the tile to match her wall color. The room is 101 feet by 101 feet and the wall color is white. What color must the center tile be to ensure the outer edge is white? Show or explain your work.

> How can you predict what will happen without doing all of the calculations?

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PROBLEM **2**   **Can You Keep a Secret?**   **1**

The class president, vice president, and treasurer of a high school count the ballots for the homecoming king election. The election result is generally kept a secret until the pep rally, when the winner is announced in front of the entire senior class. Unfortunately, this year's ballot counters are not very good at keeping a secret. The very next day, each ballot counter tells two of their friends in the senior class the election result, but makes each friend vow not to spread the result. However, each of the ballot counter's friends cannot keep a secret either. The following day each friend of each ballot counter shares the election result with two of their friends in the senior class. This pattern continues for the entire week leading up to the pep rally.

Let's assume that no student is told the result of the election twice.

1. Create a visual model to represent this problem situation. Describe the patterns you observe.

2. How many new seniors will know the winner of the homecoming king election on the fourth day? Explain your reasoning.

3. The total number of students in the senior class is 250. If the ballot counters knew the election result on Monday, will every senior already know the winner of the election when the result is announced at the pep rally 6 days later? Explain your reasoning.

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1   **PROBLEM 3**   **How Large Is Your Yard?**

Maureen and Matthew are designing their backyard patio. There will be an entrance and exit off the front and back of the patio. The sequence shown represents different designs depending on the size of the patio.

Design 1   Design 2   Design 3

Entrance

Patio →

Exit
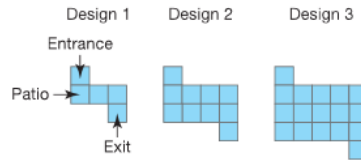
1. Analyze each design in the sequence. Describe as many patterns as you can.

2. Sketch Design 6 of the sequence.
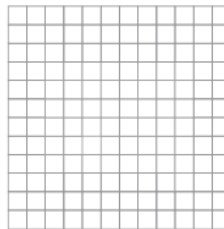
3. Matthew has 180 tiles he can use for this project. Identify the largest patio design that he can make. Show or explain your reasoning.

Be prepared to share your solutions and methods.

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