Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student Exploration: Pattern Finder**

**Vocabulary:** experiment, hypothesis, observe, prediction, theory

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. What is the order of the seasons? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. A traffic light is green. What color will it be next? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. If today is Wednesday, what day will it be 9 days from now? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What do seasons, traffic lights, and days of the week all have in common? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Gizmo Warm-up**

The *Pattern Finder* Gizmo lets you find and test patterns by observing frogs hop around a set of lily pads.

1. Grab the blue frog and drop it on any lily pad you want. **Observe** the frog. Describe a pattern you find.

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1. Click **Catch all**. Grab the blue frog and put it on a few different pads. Does it follow the same pattern? \_\_\_\_\_\_\_\_\_
2. Predict what color lily pad it will go to if placed on the pad in the top-left corner. \_\_\_\_\_\_\_\_\_
3. Put the blue frog on the pad in the top-left corner. What color does it jump to? \_\_\_\_\_\_\_\_\_
4. You just ran an **experiment** to test a pattern. Was your **prediction** correct? \_\_\_\_\_\_\_\_\_

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| **Activity A:**  **Observing patterns** | Get the Gizmo ready:   * Click **Catch all**. | 663SE2 |

**Question: How do we find patterns?**

1. Collect data:Place the brown frog on any blue lily pad. Record the colors of the lily pads it visits in order. Write **R** for red, **B** for blue, and **G** for green. Record the first 15 hops.

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1. Analyze: Put the brown frog on other pads and watch. What pattern does it seem to follow?

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1. Observe: Click **Catch all** and repeat the above steps with the pink frog.
   * 1. What pattern does the pink frog follow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     2. Does its pattern depend on where it starts? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Find the pattern: What pattern does the yellow frog follow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Extend: Describe the red frog’s pattern. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Challenge: Compare the purple and red frogs. (Hint: Pay attention to more than just color.)
   * 1. How are their patterns similar? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + 1. How are they different? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity B:**  **Testing patterns** | Get the Gizmo ready:   * Select **Advanced**. * Click **Catch all**. | 663SE3 |

**Question: How can we gain confidence in the patterns we see?**

* 1. Form hypothesis: Put the yellow frog on any pad. Observe it carefully. Try it on other pads. When you think you understand the frog’s behavior, write your belief, or **hypothesis**, below.

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* 1. Predict: The true test of a hypothesis is if it predicts the results of experiments you have not yet tried. You should not trust a pattern until it correctly predicts the results of a test.

Use your hypothesis to fill in the two sentences below.

* + 1. *From the blue pad at lower left, the yellow frog will next jump to a \_\_\_\_\_\_\_\_\_\_ pad.*
    2. *From the red pad at lower right, the yellow frog will next jump to a \_\_\_\_\_\_\_\_\_\_ pad.*
  1. Test: Run experiments to test your predictions. Were you correct both times? \_\_\_\_\_\_\_\_\_\_\_\_
* If one of your predictions was wrong, your hypothesis has been disproven.
* If your predictions were correct, your tests support your hypothesis.
* If enough experiments support a hypothesis, it can become a **theory**.

* 1. Form hypothesis: Now observe the pink frog carefully. What pattern does it repeat?

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* 1. Predict: What are the next 10 colors the pink frog will visit if you start it at the bottom left?

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* 1. Test: Test your hypothesis. What happened? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Challenge: Can you ever absolutely prove that a hypothesis is correct? Explain. \_\_\_\_\_\_\_\_\_

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| **Activity C:**  **Using patterns** | Get the Gizmo ready:   * Select **Advanced**. * Click **Catch all**. | 663SE4 |

**Question: How can we use patterns to answer questions?**

1. Find a pattern: Place the blue frog on any pad and observe it. What pattern does it follow?

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1. Analyze: No matter where it starts, what color will it visit *least* in its first 20 jumps? Why?

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1. Observe: Click **Catch all**.Observe the red frog. What rules does it appear to follow?

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1. Analyze: Think about what will happen if you drop the red frog on a green pad.
   1. What color will it never hit? \_\_\_\_\_\_\_\_\_\_\_ Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* 1. Starting on green, what color will the red frog spend most of its time on? \_\_\_\_\_\_\_\_\_
  2. Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Observe: Click **Catch all**. Observe the purple frog. What rules does it appear to follow?

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1. Challenge: Suppose you drop the purple frog on a green lily pad. Will it be easier to predict the color it will be on after 1 jump or after 4 jumps? Explain.

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