

5E Lesson Plan Hop To It!

teachHOUSTON Student Name(s):

Mentor Teacher Name:

Grade Level: 4th

Lesson Teaching Date and Time:

Concept(s): A sequence is an ordered set of numbers, shapes, or other mathematical objects, arranged according to a pattern or rule. Exploring sequences helps students develop problem solving skills that are applicable in many areas of mathematics. Investigating patterns and making predictions about them also helps students develop the algebraic thinking skills necessary to succeed in Algebra 1.

TEKS: (4.7) Patterns, Relationships, and Algebraic Thinking.

The student uses organizational structures to analyze and describe patterns and relationships.

Objectives	Evaluation Question for each Objective
1. Describe patterns and relationships of a given number sequence.	
2. Identify the next item for a given pattern.	
3. Determine the rule for the nth term of a given number sequence.	

Materials List

For the teacher:

- Hop To It! Skit
- Hop To It! Problem
- Hop To It! Rules
- Overhead Frogs and Lily Pads
- Overhead Shapes for engagement activity
- Overhead Hop To It! Chart

For each group:

- Hop to It! Chart
- Hot To It! Rules
- Frogs of two different colors and lily pads

Advanced Preparations:

- Group the required materials for the exploration (frogs, lily pads, chart, and rules) so they can be easily and quickly distributed to each group during the lesson

ENGAGEMENT		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
The teacher will demonstrate a physical pattern with clapping, snapping, stomping, etc. Repeat several times with different patterns.	What action comes next? How do you know?	Students will observe the pattern of actions performed by teacher and determine what comes next. Individual students volunteer to create a clapping, snapping, etc. pattern. The rest of the class will describe and continue the pattern.
The teacher will display some number & picture patterns on the board or overhead.	What is the next number/shape in line? <i>Answers will vary</i>	As a class, students will determine the next picture or number in a pattern.

<p>Possible examples:</p> <p>1, 2, 3... 1, 1, 2, 2, 3...</p> <p>2, 4, 6... 1, 3, 5...</p> <p>□ △ ○.... △▽▽△▽ ...</p> <p>△ ◇ ☆....</p>	<p>How do you know? <i>Answers will vary</i></p> <p>What do all patterns have in common? <i>-They are predictable in some way</i> <i>-They repeat</i> <i>-The pictures or numbers change</i></p> <p>How are patterns different? <i>-Some are based on adding; others are based on multiplication</i> <i>-Some patterns have numbers; some have pictures</i></p>	<p>Students will describe the relationships they see in the patterns.</p>
	<p>What comes next in the pattern? <i>Answers will vary based on the patterns students create</i></p> <p>How do you know? <i>Answers will vary</i></p>	<p>Students will create their own patterns.</p> <p>Student volunteers will go to the overhead and share their patterns with the whole class.</p> <p>The rest of the class will attempt to continue the pattern and/or describe it.</p>
		<p>Two student volunteers will take on the roles of the Princess and the frog for the skit (see attached).</p>

TRANSITION

In the previous activity we explored many different kinds of patterns and you even created your own patterns. In the next activity we will see if we can solve the Princess' problems using patterns. Do you think the frog will ever be a Prince again?

EXPLORATION

What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>The teacher will facilitate students forming groups of 2-4.</p> <p>The teacher will provide each group of students with Hop To It! Rules (see attached), Hop To It! Chart (see attached), frogs and lily pads.</p>		<p>Students will form groups to work on the Hop To It! Activity.</p>
<p>The teacher will describe the Hop To It! problem very clearly for students using manipulatives to model the situation until all students understand the problem.</p> <p>The teacher will display the Hop To It! rules on the overhead and make sure all students understand the rules.</p> <p>The teacher will ask students for suggestions for solving the Hop To It! problem.</p> <p>“We will use many of the strategies you have suggested. First, I’d like us to try solving a simpler problem. Let’s try it with one pair of frogs first.”</p>	<p>How can we figure out this problem? <i>-Use the plastic frogs and lily pad cards to act it out</i> <i>-Look for a pattern</i> <i>-Try it with a smaller number of frogs first</i></p> <p>Is there more than one strategy that could help us solve this problem? <i>Yes; acting it out, making a table, solving a simpler problem, finding a pattern</i></p>	<p>Students will ask clarifying questions until they understand the problem situation and the rules.</p> <p>Students will brainstorm possible problem solving strategies. (i.e., act it out, make a table, solve a simpler problem, find a pattern, etc.).</p>

<p>Using the over head frogs and lily pads, the teacher will model the problem with the students using one pair of frogs. The teacher will record the appropriate information in the Hop To It! chart.</p>	<p>What should we do first? <i>Move the green frog</i> <i>Move the yellow frog</i></p> <p>Which color should we move first? <i>It doesn't matter</i></p> <p>Can we move both frogs at the same time? <i>No</i></p> <p>How many slides? How many hops? How many pairs of frogs? How many Lily Pads? How many total moves? <i>2 slides, 1 hop</i> <i>1 pair of frogs, 3 lily pads</i> <i>3 total moves</i></p>	<p>Students will use their manipulatives to model the problem along with the teacher and record their answers on their own Hop To It! chart.</p>
<p>List student predictions on the board.</p>	<p>What do you predict is the total number of moves for two pairs of frogs? <i>-4 moves</i> <i>-6 moves</i> <i>-Additional answers welcome</i></p> <p>How did you get your prediction? <i>-Since 1 pair of frogs takes 3 moves, it is possible 2 pairs of frogs takes 4 moves – every time you add 2</i> <i>-Since 1 pair of frogs takes 3 moves, maybe 2 pairs of frogs will take 6 moves since it is double</i> <i>-Additional answers welcome</i></p>	<p>Students will predict the number of moves needed for two pairs of frogs.</p>

<p>Repeat the modeling process with two pairs of frogs.</p>		<p>A student volunteer will model the process with two frogs on the overhead, while students use their manipulatives at their desks to do the same. Everyone will fill out their Hop To It! charts.</p>
<p>The teacher will walk around while students work on the activity. The teacher will listen to students' conversations in their groups and will ask questions while observing student work.</p>	<p>What kinds of patterns have you noticed? <i>-The number of slides increases by 2</i></p>	<p>Students will continue to work on the problem in their groups until they can answer the original question: How many moves does it take to move 6 pairs of frogs?</p>

<p>TRANSITION</p>
<p>You have been working hard trying to solve the princess' problem. Now let's share some of our strategies with each other.</p>

<p>EXPLANATION</p>		
<p>What the Teacher Will Do</p>	<p>Eliciting Questions/ Student Responses</p>	<p>What the Students Will Do</p>
<p>As students present, he teacher will continue to record the numbers on the over head Hop To It chart.</p>	<p>Tell us about what you did.</p> <p>What strategies did you use?</p> <p>Did anyone else use the same strategy? Did anyone else do something</p>	<p>Groups of students will present their findings.</p> <p>The entire class will participate in a class discussion surrounding the results of the exploration.</p>

	different? Do you agree with this group's conclusion? Why or why not?	
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TRANSITION
You have noticed many patterns in our problem so far. You have found the number of moves required for 6 pairs of frogs. But what if we wanted to know the number of moves for 10 frogs or 100 frogs?! In this next activity, we will use the patterns we have found to make predictions about large numbers of frogs.

ELABORATION		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
The teacher will monitor groups' progress and ask leading questions as necessary to make sure all groups are on the right track.	<p>How could you figure out the number of moves without using your frogs and lily pads? <i>Continue the pattern in our chart</i></p> <p>How do the patterns in your chart help you? <i>If we continue the pattern, we can eventually find the number of moves for any number of frogs.</i></p> <p>Make a prediction about the number of moves needed to move 10 pairs of frogs. How could you check your prediction using your chart? <i>We could put our prediction in the chart and see if it fits in with the pattern we</i></p>	<p>Students work in their groups to find a rule to determine the number of moves for any number of frogs.</p> <p>Students may write their rule verbally or symbolically.</p>



Hop To It! Rules

1. A frog may **hop** over a frog next to it, only if there is an empty lily pad on the other side.
2. A frog may **slide** to an empty lily pad next to it.
3. A frog may not **hop** over two frogs.

4. No frog can move backwards.

5. No frog can jump into the water. These frogs have not been trained to swim.

1 pair of frogs



2 pairs of frogs





Hop To It! Skit

Frog:

Hi Princess

Princess:

Oh, no. Here we go again. Another prince with morphing issues. There is no way I'm kissing those slimy lips.

Frog:

C'mon Princess. Give me a break.

Princess:

I don't have time for this. I'm trying to run a kingdom here and we've got problems.

Frog:

If you help me, I can help you.

Princess:

How can **YOU** help? You're an ugly frog.

Frog:

I'm really good at solving problems.

Princess:

Alright, I'll make you a deal. If you can solve one of my problems, I'll solve yours.

Frog:

Yeah, that's fair. So what is the problem?

Princess:

There are 6 frogs lined up on 6 lily pads to the left. There are 6 frogs lined up on 6 lily pads to the right. There is one empty lily pad between the two groups. The two groups need to swap places, but they are only allowed to move in two ways. A frog may jump over a frog next to it only if there is an empty lily pad on the other side. Or a frog may move onto an empty lily pad next to it. I need to figure out how many moves it will take to get all 12 frogs in the right place.