Iguana Algebra

Summary

Students will identify patterns to solve equations.

Materials

- Pattern Blocks
  (enough for each group to have some).
  Chart paper
- *Patterning Practice*

Additional Resources
Books

- *Lesson for Algebraic Thinking*
  , by Maryann Wickett, Katharine Kharas, and Marilyn Burns; ISBN 0-941355-48-9

Background for Teachers

The focus of this lesson is patterns. Students should be familiar with input and output patterns to make the connections in this lesson easier to make. Students need to know that a variable is a quantity that varies, and that symbols such as x, t, and n are used to represent variables. It doesn't always have to equal only one number. Sometimes it could have multiple representations. Students need to see patterns to solve equations.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude toward mathematics.
2. Communicate mathematically.

Instructional Procedures

Invitation to Learn
Ask the students to close their eyes and think about any animal. Then have them think of the animal as a baby. What did it look like? What does it look like as it grows? What does your animal look like as an adult? Have students open their eyes and explain that today they are going to use patterns to explore how a certain animal changes.
Instructional Procedures
Session 1

Create an iguana using pattern blocks on the overhead projector (hexagon for the body, one square for the head, two triangles for the legs, and a parallelogram for the tail). Ask students to guess what animal this represents. Explain that if they use their imagination they can see the pattern is an iguana.
Label the pattern as stage one and ask students what they think the iguana will look like at stage two. Allow students to guess and try a few of them out. Then add one more block to the tail and label it as stage two.
Ask the students to identify what is the same about stage one and two. Guide students to see that the number of blocks in the body is the same. Then ask students to identify what is different. As students identify the block on the tail as being the only thing different, use the words varies and variable to explain how the tail changes at each stage.
Create stage three of the iguana by adding another block to the tail. Have students identify what stays the same. The Body. Have the students identify how many blocks are in the body. Then introduce the word constant to describe the body. Point out that the body always has four

blocks.

Draw the three stages on the board. Explain to the students that their group will be creating what they think stage four looks like. Take time to explain the rules of using the manipulatives and working together.

Answer students' questions and allow students to get to work. As they work circulate the room and encourage students to discuss what they are thinking and doing with each other. As groups show they can correctly make stage four, instruct them to make stages five and six as well.

Record the Information. Explain to students that every time they make a new stage they have to count up how many blocks are in each stage. Instead of counting the number of blocks each time, ask the students to look for a pattern in the number of blocks so they can predict how many blocks will be used in future stages.

Set up a three column recording sheet. Label the first column as Stage #, the second column as Body and Tail, and the third column as Total # of Blocks. Fill in the information in the correct column as students explain the numbers for each. Fill in the information for the first five stages.

Discuss with the students about the patterns. Guide students to identify that the body number stays the same; label it with the word constant. Pose the question of how many blocks it would take to build stage ten and how do students know. Have them talk with their group.

Assign groups to describe what the hundredth stage looks like and how many blocks it would take to build it. Have the group write their thoughts down and then share with the class.

Make sure students know how to generalize the problem. Continue to ask groups to describe and find the number of blocks for different stages.

Once students can generalize the patterns, introduce the variable. Explain to students that they don't need to count the blocks every time. The pattern can be written using a variable to describe what happens each time.

Write the equation $t = 4 + s$. Explain that s = the stage number and t = the total number of blocks (or you can use shapes--squares and triangles). Write the symbols that represent the variables above their corresponding columns. Explain to students that if they know the stage number they can find the total number of blocks. Relate the equation to the previous equations that were done.

Now ask the students how they could find the stage number if all they knew was the total number of blocks. Write the problem $t = 4 + s$ and $t = 50$. Give students time to work with their group to find what s equals (the stage number). Encourage students to write down what they figure out and how they do it.

Ask students to share with the class their answers and how they solved it. Listen to hear if students can identify the process of solving an equation. Give students a few more problems to practice and test. Give the students a caterpillar pattern using two triangles for ears, hexagon for the head, a square for the neck and add a hexagon to the tail for each stage (show them the first three stages and follow the same process as above). Then ask the students to draw what the next two stages would look like, the chart or equation the shows how many blocks are needed each time, and explain what the hundredth stage would look like and how many blocks are needed. Allow them to work in groups and be ready to present their findings to the class.

Ask questions and monitor to make sure students are using the patterns to solve the future stages.

Extensions

Curriculum Extensions/Adaptations/Integration

Show students how to plot the stage number and total number of blocks on a grid. They can use the line graph to look at patterns in a new way.

Have students create creature patterns with the blocks that tessellate a surface. They can color

the blocks in or cut them from colored paper.

Describe the animals in terms of fractions; the hexagon is the whole and the smaller pieces are fractions of it. The students can find the worth of their pattern.

Family Connections

Students can create their own patterns at home and share them with their family.

Have students complete the patterning practice sheet at home.

Assessment Plan

Allow students to create their own patterns and chart to correlate with them. You might want to put some parameters on the project: body needs a constant of four and the stage number and number of new blocks need to be the same.

Pose similar problems to have students solve using patterns.

Have students describe the pattern in their math journal and include the equation.

Journal Prompt

Describe what is an equation and how it is used in math

Journal Rubric	1	2	3	4
Use of Vocabulary	Student does not use math vocabulary.	Student uses some math vocabulary, not necessarily related to topic.	Students use most of the related math vocabulary.	Students use all math vocabulary that relates to the topic.
Logical Order	Student cannot express the math process.	Student can express some of the steps involved in the related process, it might not be in order.	Student can express most of the steps in the process and they are in a logical order.	Student can express all steps in a logical order.
Mathematical Ideas	Student does not know how to relate math and cannot express any of the math ideas.	Student knows some math ideas, but cannot relate them to other math ideas. Student cannot express these ideas very	Student has a good knowledge of math and how it relates to other ideas. They might not always be able to express it.	Student has a knowledge of math ideas, how they relate to each other, and how to express those relations.

		clearly.		

Bibliography

Weiss, D. F. (2005). Keeping it real: The rationale for using manipulatives in the middle grades. *Mathematics Teaching in the Middle Grades*, Volume 11 (Issue 5), Page 238-242.
Learning is social. Students need to be given the opportunity to talk about the processes they are learning. As they answer and ask questions, explain their thinking, and articulate their thought processes, students create a new understanding of how math works, and what is right and wrong. This communication can even positively shift their understanding.
Smith, B.L., & MacGregor, J.T. (1998). What is collaborative learning? In K.A. Feldman and M.B. Paulsen (eds.) *Teaching and Learning in the Classroom* (2nd. ed., pp.585-596). Boston, MA: Pearson Custom Publishing
As students work in small groups, the use of manipulatives will stimulate conversation. It allows students who cannot think abstractly yet to see what is happening. Manipulatives can be an effective tool for students to use in constructing ideas and communicating with each other.

Authors

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