Growing Patterns

Summary

Students will graph growing patterns using ordered pairs on a coordinate grid.

Main Core Tie

Mathematics Grade 6

Strand: RATIOS AND PROPORTIONAL RELATIONSHIPS (6.RP) Standard 6.RP.3

Materials

- Square color tiles
- Centimeter graph paper
- Overhead pattern blocks--squares and triangles
- Pattern block triangles
- Square color tiles
- Math journal

Additional Resources

Books

- *The Fly on the Ceiling, A Math Myth*
  , by Dr. Julie Glass; ISBN 0-679-88607-9
- *Navigating Through Algebra in Grades 6-8*
  , by Susan Friel, Sid Rachlin, and Dot Doyle; ISBN 0-87353-501-4

Background for Teachers

Growing patterns can show increasing or decreasing sequences and can help students analyze mathematical change. In this activity, students graph growing patterns using ordered pairs on a coordinate grid. A *coordinate grid* is a two-dimensional system in which a location is described by its distances from two intersecting, perpendicular lines, called axes. *Coordinates* are ordered pairs of numbers that give the location of a point on a coordinate grid. Finally, an *ordered pair* is a pair of numbers that gives the coordinates of a point on a grid, the first number of the pair is the horizontal (x) coordinate, the second number is the vertical (y) coordinate.

Intended Learning Outcomes

2. Become mathematical problem solvers.
3. Reason mathematically.
4. Communicate mathematically.

Instructional Procedures

Invitation to Learn

On the overhead projector, show students the diagram of the first four houses.
How many pieces are needed to make each house? How many squares and triangles are needed for a given house?
Create a table (using x and y) in their math journals to show the information.
Ask students to use their squares and triangles to make house 5, record the information for house 5, and see if they notice a pattern.
Have students predict the total number of pieces they would need to build house 12, and explain their reasoning.

Write a rule (formula) that gives the total number of pieces needed to build any house in the sequence.

Instructional Procedures

Students create a growing pattern using the initials in their name with square color tiles and centimeter graph paper.
On the overhead, give an example to the class using your own initial.
Students create their initial using as few squares as possible.
Copy that image down on the graph paper.
Students "grow" their initial to size 4, and copy the images down on the graph paper. Explain that they need to use more squares for each growth of their initial, but that it should still look like their original initial.
Create a table (using x and y) with the number of squares used for each size.
Look for a pattern.
Predict what the 10th size would look like. How many squares would be needed to build it?
Write the prediction and reasoning in math journals.
Students create a formula for the nth size.
Have several students share their growth patterns with the class and discuss how they came up with their formulas.
Create a graph on a coordinate grid using the ordered pairs from the table.

Extensions

Leonardo Fibonacci, an Italian mathematician, who lived from about 1180 to about 1250, found this pattern.
0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610 . . . .
Each number in the series is the sum of the two numbers before it. Mathematicians are still finding things in nature that can be described with this sequence of numbers. Have students research Leonardo Fibonacci and Italy during the time he lived.
Read *The Fly on the Ceiling, A Math Myth* and learn about Rene' Descartes, the founder of the coordinate grid.
Add the words *ordered pair, coordinates*, and *coordinate grid* to your spelling and vocabulary units.

Family Connections

Students play Battleship with a family member. This gives them practice using ordered pairs and a coordinate grid.
Students ask a family member to grow their initial to the sixth size on graph paper. Have the student find the pattern of growth and create a formula to find the *n*th size.

Assessment Plan

Observation and class discussion of the students growing their patterns.
Students' ability to predict what the growth pattern would look like and explain their reasoning.

Bibliography

Research Basis

Bryant, V.A. (1992) Improving Mathematics Achievement of At-Risk and Targeted Students in Grades 4-6 through the Use of Manipulatives. http://eric.ed.gov ERIC # ED355107
This document presents a practicum designed to improve mathematics achievement through the use of manipulatives. Results indicated an increase in test scores and letter grades.
Hinzman, K.P. (1997) Use of Manipulatives in Mathematics at the Middle School Level and Their

Effects on Students' Grades and Attitudes. http://eric.ed.gov ERIC # ED411150
This paper reports on a study that examines mathematics when manipulatives are used in the classroom. Results indicate that student performance is enhanced by the use of manipulatives and students' attitudes toward mathematics was more positive than students who did not use manipulatives in the classroom.

Authors

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