TI-nspire™

Grade level: 8-10
Subject: Algebra I-Geometry
Time required: 45 to 90 minutes

Patterns & Predictions

by – Johanna Bowman

Activity overview

Students are given multiple representations of basic counting patterns. Interactive graphs and geometric patterns allow students to compare the visual and mathematical patterns. Students can scroll back and forth through the document to compare the representations for a written summary.

Concepts

- *Basic Counting Principle*
- *Linear Patterns & Equations*
- *Parabolic Patterns & Equations*
- *Combinations: Geometric & Algebraic*
- *Visual Analysis of Patterns & Predictions*

Teacher preparation

Pre-load activity in TI-Nspire calculators.
Prepare to discuss expectations and assessment rubrics for written worksheets and digital documents.

Classroom management tips

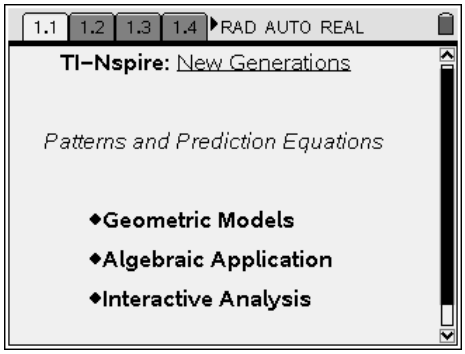
Have materials and calculators available for easy access. Pair students to enable peer assistance. Use multi-media projector or viewscreen to display calculator activity. Ask for volunteers to operate the projector.

Step-by-step directions

Open New Generation activity. Discuss the title and how patterns of numbers and geometric figures can be "generated" using new technology.

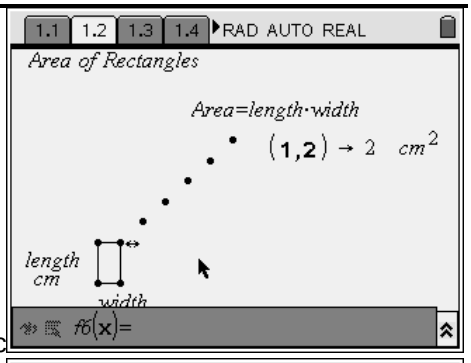
Discuss how patterns lead to possible predictions of future terms or objects in a pattern.

Ask students to explain the three bulleted terms in their own words. Students should take written notes for each screen.



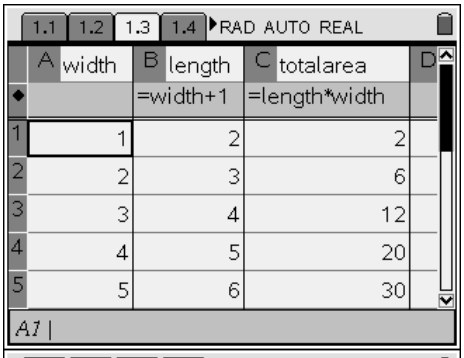
Encourage students to drag the indicated corner of the rectangle and observe the changes in the coordinates and in the calculated area.

Discuss the units of measurement and how the coordinates are related to the formula.



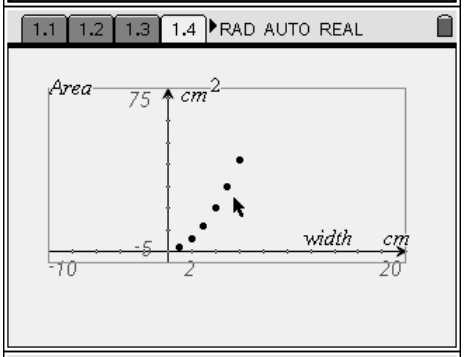
Have students scroll back to the previous screen to compare the table to the changing values related to the area of the rectangle.

Students should recognize that values in the first two columns correlate to the coordinates for width and length of the rectangle. The third column lists the calculated area as it increases.



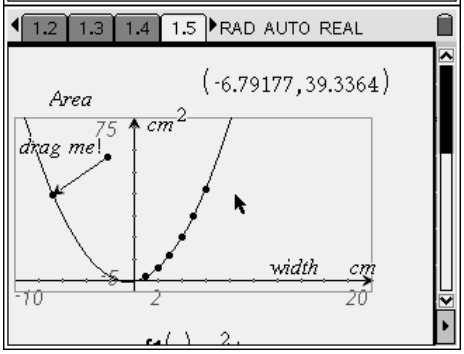
Students should use the Trace function to observe the coordinates of the points on the graph. Students should scroll back to the previous screens to compare the values. Discuss the changing representation of the original formula for area.

The coordinates now compare the width to the related area and, in turn, produce the parabolic graph of a quadratic function.



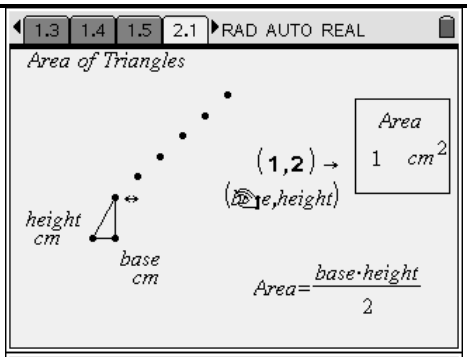
As students toggle back to the previous screen, they should discuss the continuity of the line through the discrete points that are indicated on the parabola.

Depending on the ability of the class, the regression equation can be produced or discussed. This screen is a split screen and the spreadsheet can be expanded by dragging the right border of the screen.



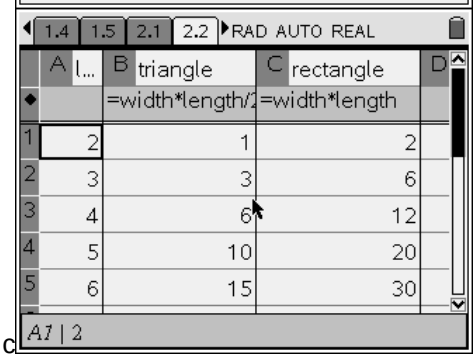
Students should again observe the basic relationship of the coordinates of the vertex of the triangle as they drag the point to increase the calculated area.

Notation should be made of the units of measurement and the relationship of the coordinates to the given formula.



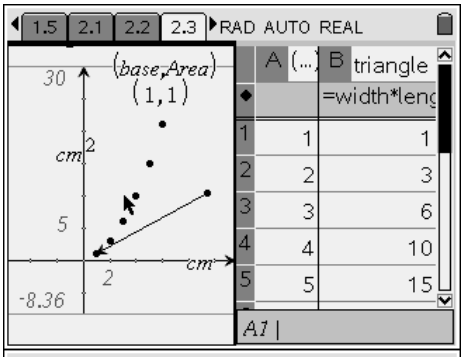
Students are encouraged to scroll back to the previous screen to compare the tabular representation of the area of the triangle.

Students should discuss the three columns and the relationship between the areas of the triangle and rectangle.



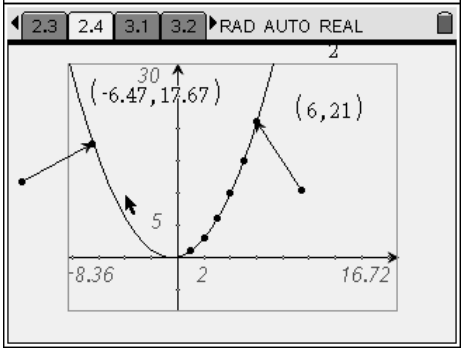
This screen again compares the width of the triangle to its area to produce the path of a curve instead of a linear pattern.

Encourage them to scroll back to the similar graph for the area of the rectangle and again discuss the quadratic nature of the pattern.



Students should begin to see the resemblance of this problem to the area of the rectangle. Discuss the given points which represent whole number values from the geometric figure, and how the given triangle or rectangle could have fractional dimensions.

It is important to discuss the realistic domain and range for a geometric figure, and when it might be possible to have negative values for this quadratic relationship.



Students should count the total number of segments that can be drawn between the given points. The values should be listed on the table.

At this point the students may not be able to see a relationship between the previous problems and this pattern.

Have students scroll back to previous screen to observe the numerical patterns.

Again, students should count the number of angles formed from the given number of rays.

The Hide/Show function can be used to hide the inner rays for students who have trouble seeing overlapping angles. For the 3 rays, hide the middle ray to see the large angle.

Complete the numerical pattern on the table and compare it to the previous table.

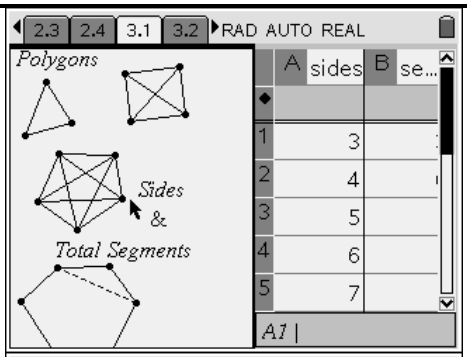
Students should begin to see the similarity in the pattern of numbers for the area of the triangle, the segments in each polygon, and the number of angles formed by given rays.

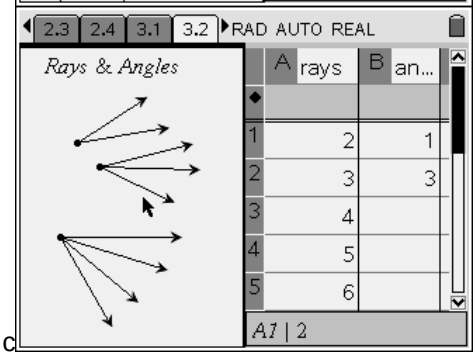
For this screen, the students should recognize that familiar triangular number sequence, but may need review of combinations and the calculator format. It is easy to grab the previous term to copy it to the entry line, and then increase the value in the formula.

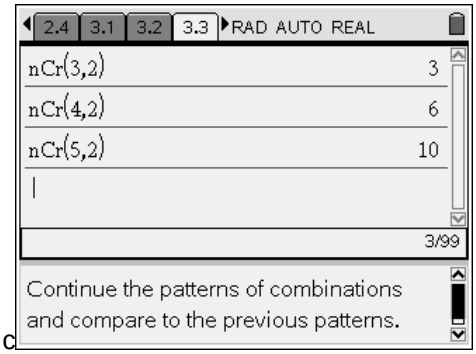
After students have written the summary of the lesson, and completed the worksheet, this puzzle can be given as an extension.

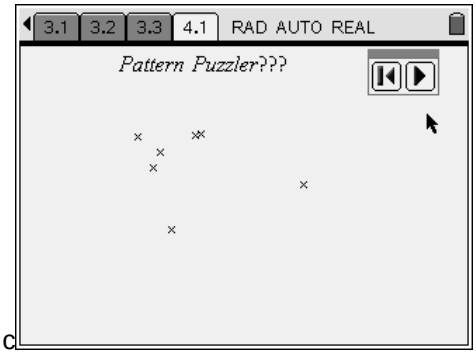
The answer can be seen by using Hide/Show to show that the background is a polygon, and the Xs are moving along the diagonals of the polygon.

A hint for the students would be to watch just one X as it moves across the screen.









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Assessment and evaluation

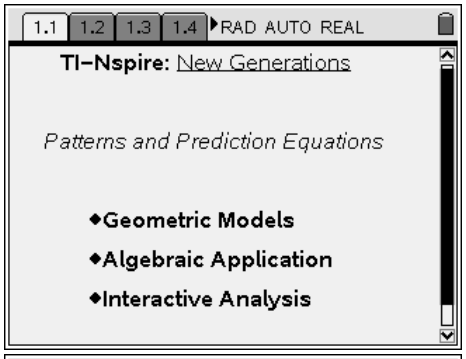
- *A rubric should be used to assess student participation, discussion, and written work. A follow-up quiz on concepts could be designed. Students should be able to recognize and extend both algebraic and geometric patterns.*
- *Students can easily scroll back through the activity and work with another student to review the patterns.*

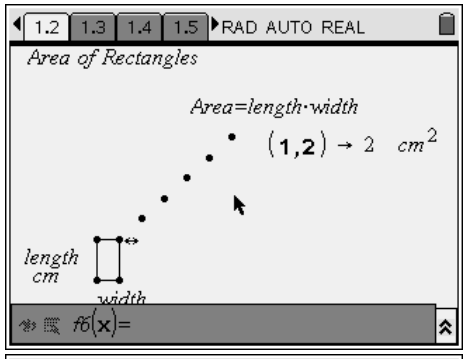
Activity extensions

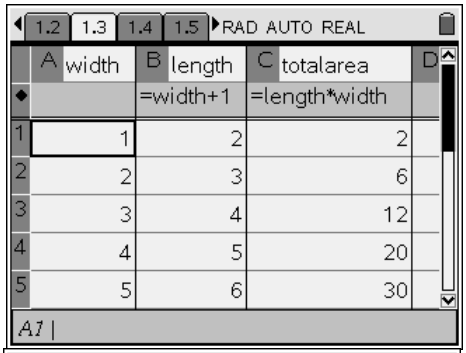
- *Students can invent their own puzzles to share with the class or to swap and solve.*
- *Make a folder to collect other algebraic and geometric patterns in tns files.*
- *Keep an in-class folder for students to collect hard copies of algebraic and geometric patterns.*
- *Observe patterns in nature and in construction. Use digital cameras to collect information for an ongoing study of real applications.*

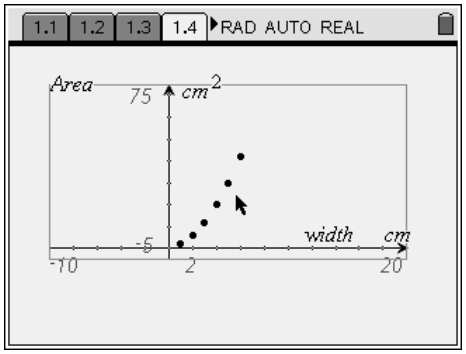
Student TI-Nspire Document

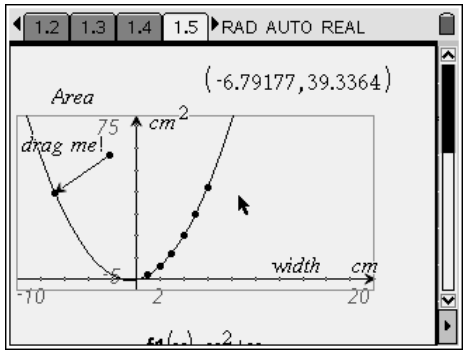
New Generations

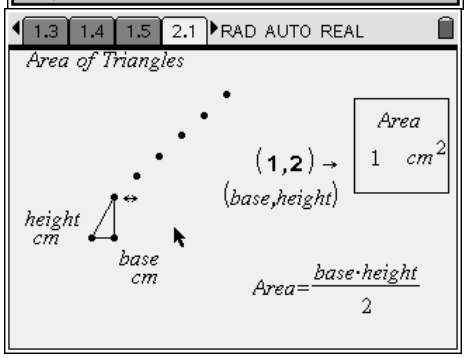












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