Course Follow-up Activities

Patterns to Symbols: Algebra
(Grades 3-6)

Activity 1

Choose a current-next rule from the following list or create one of your own.

i. + 6 each time
ii. x 3 each time
iii. x 2 + 3 each time

Then give the students in your class each a different starting number and have them create a list using the rule.

Before your students compare their lists, ask whether they think anyone will have the same list. Then call on two students who have some of the same numbers in their lists to share the lists. Point out that the beginning of one list may be different, but as the lists continue, they are the same.

For example for the rule x 2 + 3 two lists might be: 1, 5, 13, 29, 61,… and 5, 13, 29, 61, 125, …

The discussion should continue with students identifying which lists are "the same" only differing in the starting number(s). Students can then be asked to determine how many different lists there are and why there are that many.

An additional challenge would be to ask students to find a rule that had a given different number of lists.

Activity 1 Reflection Questions

Were students able to see that lists that began differently were really the "same list?" What teaching strategies did you use to help students see this concept?

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How did students go about proving that there were only a certain number of lists? What counts as a proof in this sense? How can you push students to give more than just examples?

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Were students able to use both addition and multiplication to develop rules to create a certain number of lists? How does this reinforce the connection between multiplication and addition?

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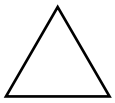
Activity 2

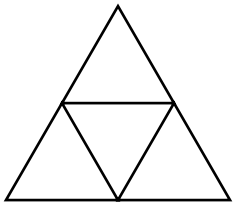
This activity presents students with numeric patterns that arise from a geometric setting. It is helpful to provide small sticks, such as tooth picks, for students to model the triangles.

Share the following with students to set up the problem:

> Graham is having fun playing with small sticks and making triangles with them.
> First he makes a single triangle using 3 sticks.



> Next he makes a two-level triangle. He notices that now there are 2 sticks along the bottom, 6 sticks in the bottom row, and 9 sticks total.



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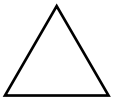
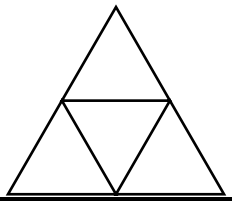
Graham begins the following table:

	Number of sticks on bottom	Number of sticks in bottom layer	Total number of sticks
	**1**	**3**	**3**
	**2**	**6**	**9**
	3	**9**	
	4		

Have students complete, and possibly extend the table and then begin looking for patterns.
Possible questions include:
Is it possible to have 52 sticks in the bottom layer?
Is it possible to use exactly 66 sticks total?

The discussion should focus on what patterns students see and how those patterns relate to the triangles, or why they make sense.

Activity 2 Reflection Questions

Were the students able to identify a variety of patterns in the table? Did the patterns move both horizontally and vertically? What about diagonally? How did you help students see the patterns?

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Were students able to extend the patterns to answer questions about what was and wasn't possible? What questions did you use to help students begin to see the generalization?

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Was the class able to come to consensus about why each of the patterns they found made sense? How did you help the students verbalize their understanding?

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Activity 3

This activity focuses specifically at looking at the differences between one element in a sequence and the next.

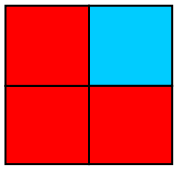
It may be helpful to provide small squares of two colors for students to model the problem.

Share the following with students to set up the problem:

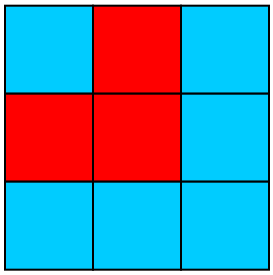
Brian and Thérèse are playing a game using small squares.

Brian goes first and puts down one blue square.

Then Thérèse puts down red squares so that the whole is a new square.



Now it is Brian's turn…



Both Brian and Thérèse are interested in how many squares the each adds. So they begin a table about the squares.

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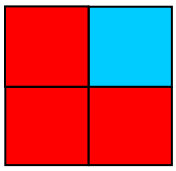
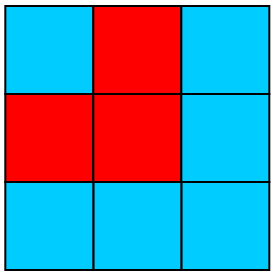
	Length of side	Number of squares	Number of squares added
	1	1	1
	2	3	3
	3		
	4		

Have students complete, and possibly extend the table and then begin looking for patterns.

Possible questions include:
If one person had 16 squares would he/she ever be able to use them all in one turn?
Is it possible for one player to use exactly 30 squares in a series of turns?

The discussion should focus on what patterns students see, particularly the differences, and why these make sense.

Activity 3 Reflection Questions

Were the students able to identify a variety of patterns in the table? Were they able to explain the pattern of differences? How did different students relate to the pattern visually and numerically?

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Were students able to extend the patterns to answer questions about what was and wasn't possible? What questions did you pose to help develop this understanding?

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How can focusing on differences help students understand non-linear patterns?

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