

The Window Problem

Lesson Plan

Cube Fellow: Julie Miker

Teacher Mentor: Katrina Easterling

Goal: This lesson is designed to help students recognize patterns and then be able to find a general formula for the pattern.

Grade and Course: 7th grade, pre-algebra

KY Standards: MA 07-5.1.1, MA 07-5.1.2

Objectives:

1. Students will be able to extend and describe patterns.
2. Students will be able to give a mathematical rule for a pattern.
3. Students will be able to represent and analyze relationships using graphs and words.

Resources/materials needed: worksheet, crayons (3 colors for each student), square tile blocks also in 3 different colors, graph paper

Description of Plan: Start by having the students assign a color code for the three different types of window panes. Use this code to draw the first few windows, using one block of the graph paper to represent one pane of the window. Have the students color in these windows and then also work as groups to make the windows out of the tiles. After they understand what to do, have them complete the drawings all the way up to a 10 x 10 square. Then move to the worksheet to the worksheet and start to fill in the numbers for the total number of each kind of panes for each step. Here the students should start to see some patterns emerging. Then you should be able to come up with the general formulae for each type of pane. Finally, have the students graph the data from each column and then discuss which relationships are constant, linear, and nonlinear and why they are so.

Lesson Source: *Lessons for Algebraic Thinking, Grades 6-8*

Instructional Mode: Interactive lecture, group activity

Date Given: October 14, 2008

Estimated Time: Two 50 minute sessions

Date Submitted to Algebra3: February 25, 2009

The Window Problem

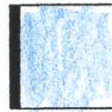
Peerless Window Company puts together square windows from three kinds of units:



Corner Pane



Center Pane



Edge Pane

The production manager at Peerless needs to decide how many of each type of unit to make so the company can avoid wasting units. Complete the labeled rows in the following table. You may complete extra rows if you wish. Look for patterns and find a rule for each kind of pane for any size square window.

Window Size	Number of Corner-Pane Units	Number of Center-Pane Units	Number of Edge-Pane Units	Total Number of Panes
2 × 2	4	0	0 = 4 · 0	4
3 × 3	4	1	4 = 4 · 1	9
4 × 4	4	4	8 = 4 · 2	16
5 × 5	4	9	12 = 4 · 3	25
6 × 6	4	16	16 = 4 · 4	36
7 × 7	4	25	20 = 4 · 5	49
8 × 8	4	36	24 = 4 · 6	64
9 × 9	4	49	28 = 4 · 7	81
10 × 10	4	64	32 = 4 · 8	100
$n \times n$	4	$(n-2) \cdot (n-2) = (n-2)^2$	$4 \cdot (n-2)$	n^2

2x2



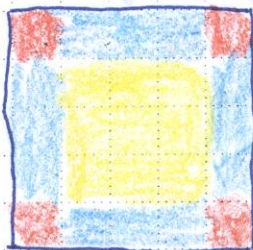
3x3



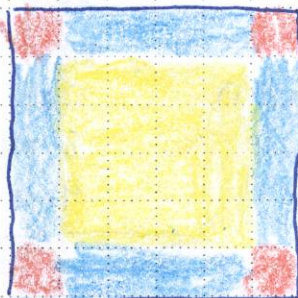
4x4



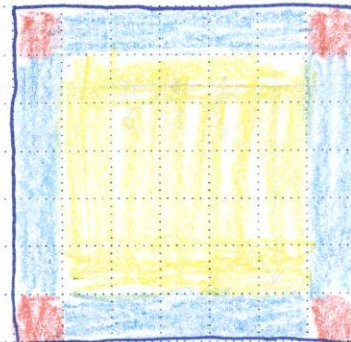
5x5



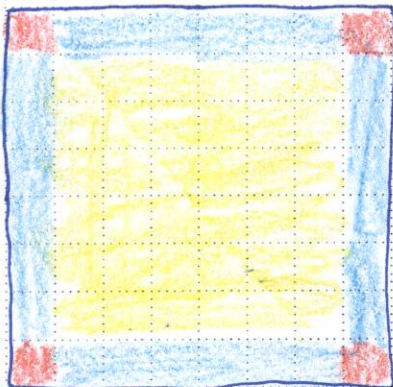
6x6



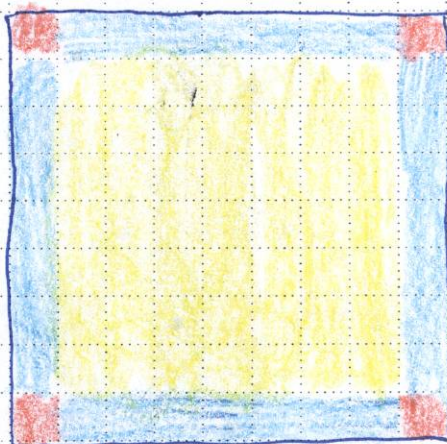
7x7



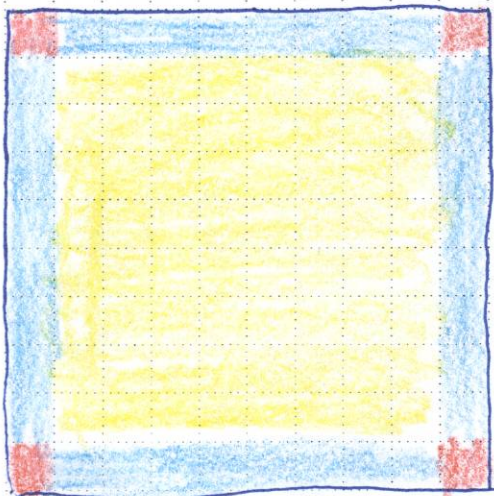
8x8



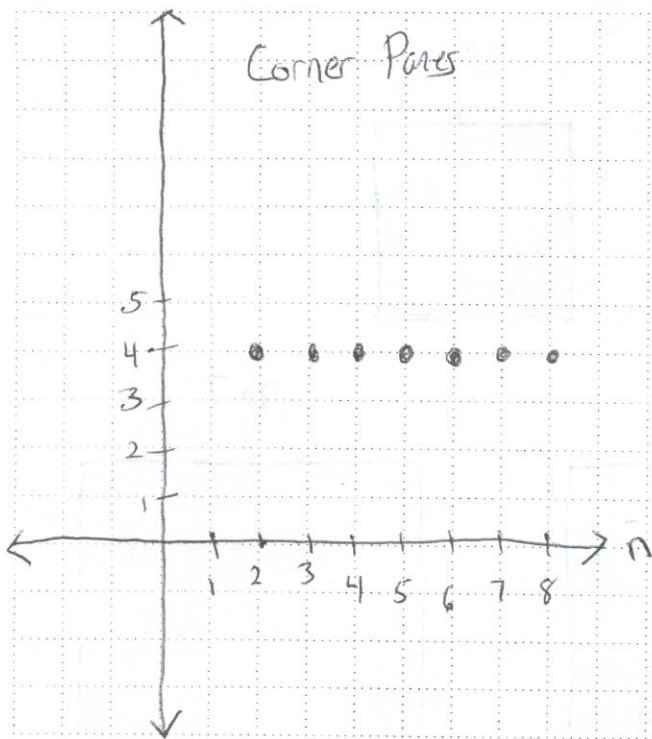
9x9



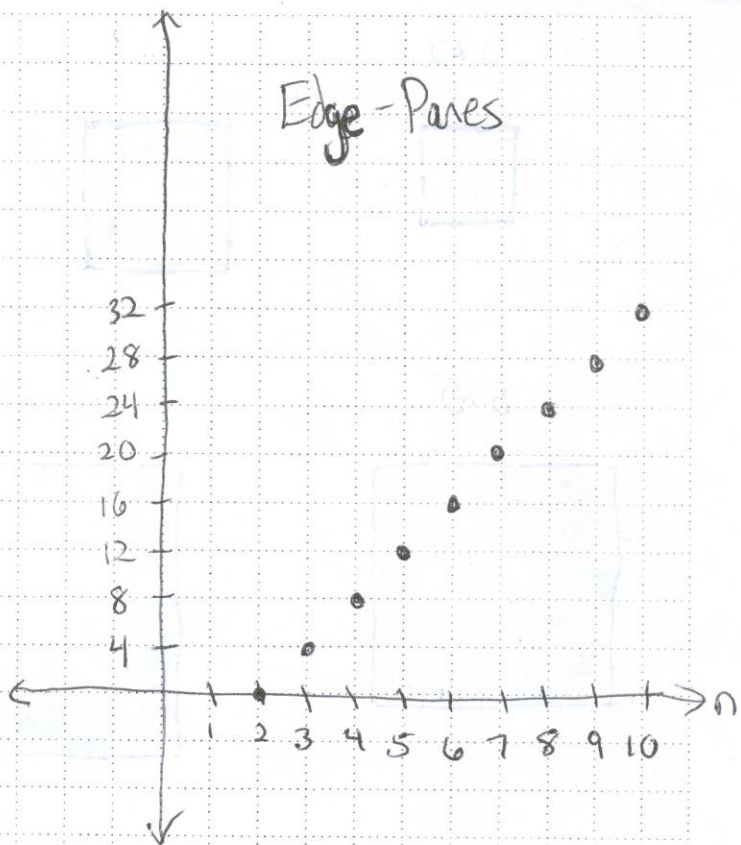
10x10



Corner Pans



Edge-Pans



Center Pane

