

# Ms. Moran's Monitoring Chart

Solution Strategy	Assessing Questions	Advancing Questions	Who and What	Order
<b>Students Cannot Get Started</b>	<ul style="list-style-type: none"> <li>What have you noticed so far?</li> <li>How many tiles were needed for Stage 1? For Stage 2?</li> <li>What is the task asking you to figure out?</li> </ul>	<ul style="list-style-type: none"> <li>Can you try building the staircase for Stage 5? How would you get started?</li> <li>What do you notice about how the staircases grow at each stage?</li> </ul>		*Start here: back at recursive. Bring out growth 2D and not constant. (Araya group)
<b>Solution A. Identify the Recursive Pattern</b>  Student uses a table or visual inspection of staircases to determine that the number of squares in a stage is the number of squares in the previous stage plus the stage number.	<ul style="list-style-type: none"> <li>What have you noticed so far?</li> <li>How would you describe how the staircases grow?</li> <li>If you had Staircase 3, what would you do to find the number of squares in Staircase 4?</li> <li>How would you describe the number of squares at Stage 5? At Stage 10?</li> </ul>	<ul style="list-style-type: none"> <li>What if you did Stage 50? Or Stage 100? Would you want to use that pattern?</li> <li>Is there a way to use the tiles to help you visualize what's happening with the pattern?</li> </ul> <p><i>Goes up by extra number each stage: Araya, Kyle, Esme, Adreana (1st visit)</i></p> <p><i>2nd visit: Seeing "missing" part of square as previous stage</i></p>	Create table for Stages 1-9. Add stage number each time -Maya Taylor, Collin (1st visit) -Also Aiden, Micki, Emily, Erin (1st visit)	
<b>Solution B. Double the Staircase to Create a Rectangle</b>  Student creates the $n \times (n+1)$ rectangle by putting two copies of the same staircase together.  Student finds the area of the original staircase by taking $\frac{1}{2}$ of the area of the resulting rectangle.  Area of staircase in Stage $n = \frac{n(n+1)}{2}$	<ul style="list-style-type: none"> <li>What have you noticed so far?</li> <li>What shape are you creating? Why?</li> <li>Can you describe how this works for Stage 3? For Stage 4?</li> </ul>	<ul style="list-style-type: none"> <li>How can you relate the stage number to the shape you've created?</li> <li>(If equation) How does this equation relate to the staircase?</li> <li>(If no equation) Using what you noticed, what would the equation be for the <math>n</math>th stage?</li> </ul>	Araya, Kyle, Esme, Adreana (2nd visit)  Start: make square out of current and previous stage Then make rectangle with two copies of current stage 3rd visit: $y = \frac{x^2}{2} + \frac{1}{2}x?$ (not connected to rectangle model)	

Solution Strategy	Assessing Questions	Advancing Questions	Who and What Order
<b>Solution C. Divide the Staircase Into Triangles</b> Student draws a diagonal through the staircase to create one large triangle and several smaller triangles. Student uses $A = \frac{1}{2}(b \cdot h)$ to determine the area of a large triangle. Since base and height are the same as the stage number, $A = \frac{1}{2}n^2$ . Student determines that the area of each small triangle is $\frac{1}{2}$ and that the number of small triangles is the same as the stage number. This means that the combined area of the small triangles is $\frac{1}{2}n$ . Total area = $\frac{1}{2}n^2 + \frac{1}{2}n$	<ul style="list-style-type: none"> <li>What have you noticed so far?</li> <li>What shape are you creating? Why?</li> <li>How did you figure out the number of squares in the large triangle? In the smaller triangles?</li> <li>How does this work for Stage 3? For Stage 4?</li> </ul>	<ul style="list-style-type: none"> <li>How can you relate the stage number to the different triangles? How is the size of the large triangle related to the stage number? How are the small triangles related to the stage number?</li> <li>(If equation) How does this equation relate to the staircase?</li> <li>(If no equation) Using what you noticed, what would the equation be for the <math>n</math>th stage?</li> </ul>	<i>Aidan, Micki, Emily, Erin (1st visit): draw diagonal; triangles above and below</i> <i>Focus on geometric solution, then explore variables with whole class</i> <i>-count "whole" ones; then <math>\frac{1}{2}\Delta S</math> above diagonal and below</i> $y = \frac{1 \cdot n}{2} + \frac{1}{2}x$ <i>(3 variables, 1 w x)</i> <i>*2nd presentation (Aidan et al.)</i> <i>3rd: Mae and Isabel method</i> <i>Look across equations</i> <i>****Also show graph with Desmos</i>
<b>Solution D. Rearrange the Staircase Into a Rectangle</b> Student rearranges the squares in a staircase to create a rectangle. Student determines the area of the original staircase by calculating the area of the resulting rectangle. Student uses a slightly different approach for even-number stages and for odd-number stages. $\text{Area} = \frac{1}{2}n(n+1)$	<ul style="list-style-type: none"> <li>What have you noticed so far?</li> <li>What shape are you creating? Why?</li> <li>How does this shape relate to the stage number of the staircase?</li> <li>Can you do the same process with another stage?</li> </ul>	<ul style="list-style-type: none"> <li>Would your process work better for Stage 3 or Stage 4? Why?</li> <li>(If equation) How does this equation relate to the staircase?</li> <li>(If no equation) Using what you noticed, what would the equation be for the <math>n</math>th stage?</li> </ul>	<i>Mae &amp; Isabel: table/square tiles, Stage 10 is 5 x 11, explain in words</i> $\frac{1}{2}n \times (n+1)$ , no equation. <i>2nd visit:</i> $(n+2)(n+1) = y$

Solution Strategy	Assessing Questions	Advancing Questions	Who and What	Order
<b>Solution E. Suggest Growth Is Exponential</b> Student recognizes that the difference in the number of squares in each stage is not constant and that the growth is not linear. Because the amount each staircase grows keeps getting bigger, the student decides that the growth must be exponential.	<ul style="list-style-type: none"> <li>Why do you think the pattern is exponential?</li> <li>How would you describe the growth in the staircases?</li> <li>What does it mean for a function to be exponential?</li> </ul>	<ul style="list-style-type: none"> <li><math>y = 3^x</math> is an exponential function. How does the growth in <math>y = 3^x</math> relate to the growth you identified in the staircase pattern?</li> </ul>		
<b>Other</b> <i>Looking at equations with <math>x^2</math> Graphing!</i>	<i>Guess/check <math>x^2 + 1, x^2 + 2 \dots</math> Maya, Taylor, Collin) 2nd visit: height <math>\times</math> base Mae and Isabel: graph with Desmos <math>(n+2)(n+1) = y</math></i>	<i>Maya group: <math>x^2 - x + 1</math> works for stages 1, 2 not 3) Maya group: sketch graph from table</i>	<i>Elijah group (2nd visit): length/width growing <math>x^2 \leftarrow</math> subtract something</i>	