# Growing Sumandas

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| In this lesson, students will explore a growing pattern and then graph the pattern on a coordinate plane. |

Common Core Standard:

**Graph points on the coordinate plane to solve real-world and mathematical problems.**

**NC.5.G.1** Graph points in the first quadrant of a coordinate plane, and identify and interpret the x and y coordinates to solve problems.

Standards for Mathematical Practice:

2. Reason abstractly and quantitatively

1. Model with mathematics
2. Use appropriate tools strategically

7. Look for and make use of structure

Student Outcomes:

* I can model and extend a pattern
* I can represent a pattern using models, drawings, words, tables, and graphs
* I can make connections between a pattern and a graph

Materials:

* Pattern blocks (at least 15 squares and 5 triangles per student or pair of students)
* Growing Sumandas sheet (1 for each student)

Advance Preparation:

* Gather pattern blocks
* Copy the Growing Sumandas sheet
* Consider whether students will work in pairs or as a class for this task
* If students are working in pairs, they should have some experience with patterns, including working with tables
* If students are working pairs they should have experience using a table to plot points on a coordinate grid.

Directions:

1. Distribute pattern blocks.
2. Present the following scenario to the students:

*During your scientific exploration to a newly discovered rainforest you encounter a new creature called a sumanda.*

1. Invite students to build the sumanda with their blocks. Tell them that this is the sumanda at 1 year old.
2. Tell students that they will observe the sumanda’s growth. Demonstrate and have students build years 2, 3, and 4 beneath year one:

* 1. years old
	2. years old
	3. years old
1. Use the Growing Sumandas sheet to guide your instruction. Ask students to complete one section at a time, then elicit student answers and model the component. *However:* If students have experience with this process, have them work in pairs with much less teacher guidance.
2. To close, extend student thinking by asking the questions below.

Questions to Pose:

As students work in pairs:

* How did you decide to draw your table? How does your table relate to the blocks?
* What surprised you about the graph? Why was it surprising?
* What challenges are you running into? What are you doing to help you face them?

After:

* What do you notice about the shape of the graph? Why does this shape make sense?
* How does the graph help you describe the sumanda’s growth?
* How can the graph help you predict the sumanda’s future growth?
* What does this point on the graph tell you about the sumanda?

Possible Misconceptions/Suggestions:

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| **Possible Misconceptions** | **Suggestions** |
| Students have difficulty placing the attribute on the axis (number of years on the x-axis and number of blocks on the y-axis). | Have the students examine a collection of simple line graphs. Ask them to draw conclusions about the type of data listed on each axis. Note that the x-axis shows the data you are changing. The y- axis should show the data being *measured.* |

**Special Notes:**

A follow up task should follow this process with 2 patterns. The patterns should be graphed on the same coordinate grid and analyzed (5.OA.3).

Solutions:

Extend the Pattern:

* 1. years old
	2. years old

Words: Student words will vary. One example is - Each year, the sumanda grows one square on each side.

Table: Function tables may be set up horizontally or vertically. One example is –

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| Years old (n) | 1 | 2 | 3 | 4 | 5 | 6 |
| Number of blocks | 4 | 6 | 8 | 10 | 12 | 14 |

Number of blocks at the 10th stage: 22

Pattern Rule: Student answers may vary. Some examples are –

* + There are twice as many squares as the age of the sumanda. There are always 2 triangles.
	+ Add 2 blocks to the previous year
	+ Multiply the age by 2 then add 2 more
	+ Number of blocks = 2 n + 2
	+ Number of blocks = (2 x n) + 2

Coordinate points: (1,4) (2,6) (3,8) (4,10) (5,12) (6,14)

*Adapted from Partners for Mathematics Learning, 2008*

**Growing Sumandas, side 1**

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| Based on this pattern, draw and extend the sumanda for 2 more years: 5 years old6 years old |
| Use words to describe the pattern | Create a table to describe the pattern |
| Draw and describe the 10th stage of the pattern | Write a rule for this pattern |

Adapted from Partners for Mathematics Learning, 2008

## Growing Sumandas, side 2

###### Use the table to write the coordinate points for this pattern:

Plot the coordinate points on the graph below. Should these points be connected to form a line graph? How do you know?

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Adapted from Partners for Mathematics Learning, 2008