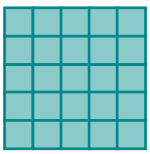
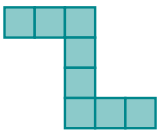
Video in the Middle Mathematical Tasks

Each VIM module is centered around either pattern-based tasks or similarity-based tasks. The tasks are designed to help students develop understanding of linearity or transformations-based similarity. All of the tasks are "low floor/high ceiling," meaning that they are accessible to a wide range of students. The "low floor" allows students with a broad range of mathematical backgrounds to get started and make progress on the task. The "high ceiling" means that students have an opportunity to push their thinking and to explore mathematical ideas deeply.

We created "Task Clusters" to group individual tasks that are related. The Task Clusters are represented below.

Pattern Task Clusters

Task Cluster	Cluster Icon	Individual Tasks
Growing Dots		• Growing Dots • Growing Dots—Working Backward • More Growing Dots
Cubes in a Line		• Cubes in a Line
Polygons		• Triangles • Exploring Polygons
Pool Border		• Pool Border
Logos		• Regina's Logo • Schemel's Logo

Pattern Task Descriptions

Growing Dots Cluster

This set of modules is based on three related tasks, *Growing Dots*, *Growing Dots—Working Backward*, and *More Growing Dots*. *Growing Dots* provides students an opportunity to identify how a linear pattern grows, recognizing recursive and explicit expressions for that growth. With *Growing Dots—Working Backward*, students explore the relationship between elapsed time and the number of dots, generate an equation to represent that relationship, and determine whether given numbers of dots are possible or not. *More Growing Dots* extends from the other "dots" problems to consider shifting the starting point and deepening students' understanding of slope and rate of change.

Growing Dots

- James & Danielle: Representing Recursive and Explicit Approaches
- Matt & James: Comparing Recursive and Explicit Approaches
- Revisiting James & Danielle: Assigning Mathematical Competence
- Matt's Metaphor: Including Others as Experts

Growing Dots—Working Backward

- Working Backward: Solving Linear Equations
- Casey & Irma: Examining Slope Across Representations

More Growing Dots

- Angel's Question: Examining Slope and *Y*-Intercept
- Revisiting Angel's Question: Making Sense of Problems and Persevering in Solving Them

Cubes in a Line

This set of modules is based on *Cubes in a Line*, a task in which students address the questions: "How many faces (face units) are there when two cubes are put together sharing a face? 10 cubes? 100 cubes? How many faces for any number of cubes?" Students address these questions through a variety of visual, numerical, and tabular methods, identifying how a linear pattern grows and how to describe that growth.

- Breanna & Cody: Representing Mathematical Thinking
- Chase's Question: Discussing Mathematical Thinking
- Meline & Hunter: Supporting Productive Struggle in Learning Mathematics
- Jasmine's Idea: Bridging Mathematical Patterns and Rules
- Discussing Two Cubes: Enabling Students to Communicate Mathematical Ideas
- More on Breanna & Cody: Understanding Students' Mathematical Thinking

Polygons Cluster

This set of modules is based on two related tasks, *Triangles* and *Exploring Polygons*. In *Triangles*, students create rules for determining the perimeter of any number of triangles in a row. *Exploring Polygons* builds on this by having students consider perimeter for squares, regular pentagons, and regular hexagons. As students explore these tasks, they identify how linear patterns grow and they look for similarities/differences across the types of polygons.

Triangles

- Lindsey's Question: Connecting Geometry to a Rule
- Amanda & Jackie: Connecting Different Representations
- Triangles Introduction: Launching a Mathematical Task
- Revisiting Lindsey's Question: Working With Unexpected Student Ideas

Exploring Polygons

- Polygons Introduction: Extending Students' Mathematical Thinking
- Stuart's Method: Using Structural Thinking
- Revisiting Stuart: Supporting Productive Struggle

Pool Border

This set of modules is based on *Pool Border*, a linear pattern task in which students are asked to write expressions to calculate the number of square tiles needed to surround a square swimming pool of unknown dimensions. Students are encouraged to write as many different expressions as possible. Discussion of the task focuses on connecting each algebraic expression to the geometric model of the pool as well as identifying connections among the algebraic expressions.

- Siri & Tiffany: Using and Connecting Mathematical Representations
- Pascal, Adam, & Tammy: Connecting Mathematical Structure Across Representations
- Lulu's Group: Translating Mathematical Strategies Into Symbols
- Discussing 5 by 5: Framing a Pattern Task
- Different Equations: Looking for Geometric Structure
- Debra's Question: Exploring Mathematical Equivalence
- Launching a Discussion: Affirming Learners' Identities
- Revisiting 5 by 5: Facilitating Meaningful Discourse

Logos Cluster

This set of modules is based on two related tasks, *Regina's Logo*, and *Schemel's Logo*. *Regina's Logo* is a linear pattern task that presents the first three steps of a growing "s pattern" of tiles and asks students to visualize how the pattern is growing, write an algebraic expression to show that growth, and use color to connect the elements of the algebraic expression to the geometric model. In *Schemel's Logo*, students engage in the same mathematical exploration, this time looking at figures that are growing in a quadratic pattern. In the case where both tasks are presented together, students compare the similarities and differences between linear and quadratic growth.

Regina's Logo

- Kiril & Reymond: Finding Linear Equations
- Reymond's Method: Connecting Algebra and Geometry
- Revisiting Kiril & Reymond: Discussing Mathematical Ideas
- More on Reymond's Method: Using Geometric Visualization

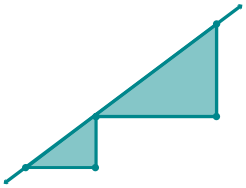
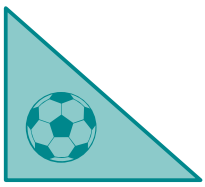
Schemel's Logo

- Amelia's Approach: Using Structural Thinking
- Understanding Amelia: Empowering Students Mathematically

Regina's Logo and Schemel's Logo

- Comparing Logos: Examining Linear vs. Quadratic Growth

Similarity Task Clusters

Task Cluster	Cluster Icon	Individual Tasks
Similar Triangles		• Similar Triangles on the Same Line
Ricardo's Flag		• Ricardo's Flag

Similarity Task Descriptions

Similar Triangles

This set of modules is based on *Similar Triangles on the Same Line*, a task in which students are shown three right triangles, each with its longest side on the same line. Students are asked to use visible thinking to prove that the three triangles are similar.

- Matilda, Milo, & Mati: Connecting Triangle Similarity, Transformations, and the Slope of a Line
- Slope Triangles: Introducing Slope
- Revisiting Matilda, Milo, & Mati: Implementing Tasks That Promote Reasoning and Problem Solving

Ricardo's Flag

This module is based on *Ricardo's Flag*, a two part task in which (1) students compare soccer flag enlargements of a cardboard flag to determine which of the enlargements are similar and (2) students determine the corresponding length of one side of a dilated flag.

- Discussing Ricardo's Flag: Positioning Multilingual Learners