

Adapted from: Smith, Margaret Schwan, Victoria Bill, and Elizabeth K. Hughes. "Thinking Through a Lesson Protocol: Successfully Implementing High-Level Tasks." *Mathematics Teaching in the Middle School 14* (October 2008): 132-138.

PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK	
What are your mathematical goals for the lesson? (i.e., what do you want students to know and understand about mathematics as a result of this lesson?)	Students understand that by composing and decomposing the area of rectangles they may also find the area of triangles, special quadrilaterals, and polygons.
<ul style="list-style-type: none"> • What are your expectations for students as they work on and complete this task? • What resources or tools will students have to use in their work that will give them entry into, and help them reason through, the task? • How will the students work— independently, in small groups, or in pairs—to explore this task? • How will students record and report their work? 	<p>Graph paper of different sizes, scissors, colored pencils, pattern blocks, seed packets, rulers, counters, calculators</p> <p>Work in pairs or small groups</p> <p>Work in personal math journals then transfer to chart paper for presentation</p>
How will you introduce students to the activity so as to provide access to <i>all</i> students while maintaining the cognitive demands of the task?	<p>Task #1 Create a rectangular garden showing the areas needed for each type of vegetable planted. Write the areas as units².</p> <p>Bring a variety of seed packets and allow students to explore the information found on the seed packet. Students may choose the vegetables they want to plant in their garden.</p> <p>Explain the task of planting a garden and deciding how much area is needed for each type of vegetable planted. Clarify as needed.</p>

PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK

As students work independently or in small groups, what questions will you ask to—

- help a group get started or make progress on the task?
- focus students' thinking on the key mathematical ideas in the task?
- assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations?
- advance students' understanding of the mathematical ideas?

What materials will help you get started?
What size of garden are you going to make?
Can you illustrate your garden showing where you plant each seed type?

Does each vegetable need the same amount of area?
How are you going to arrange your garden?

How will you ensure that students remain engaged in the task?

- What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance in solving the task?
- What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?

Have you tried graph paper?
Pattern blocks might help.
What do you know?
What are you trying to figure out?
Can you draw a picture of this?
Can you prove your answer?

What would your garden look like if you added one more vegetable? Two more? Three more?
Can you create a formula that will allow you to figure the area for any size garden?

PART 3: SHARING AND DISCUSSING THE TASK

How will you orchestrate the class discussion so that you accomplish your mathematical goals?

- Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why?
- What specific questions will you ask so that students will—
 1. make sense of the mathematical ideas that you want them to learn?
 2. expand on, debate, and question the solutions being shared?
 3. make connections among the different strategies that are presented?
 4. look for patterns?
 5. begin to form generalizations?

What will you see or hear that lets you know that *all* students in the class understand the mathematical ideas that you intended for them to learn?

- Representation using manipulatives
- Representation using a drawing
- Representation using graph paper
- Representation using an equation
- Representation using a formula

Can you explain _____'s strategy?

Did anyone solve it the same way?

Which way is more efficient?

Task #2

Create a triangular section within your garden showing the areas needed for each type of vegetable planted. Write the areas as units².

Task #3

Create a section of your garden that uses a special quadrilateral shape again showing the areas needed for each type of vegetable planted. Write the areas as units².

Task #1

Create a rectangular garden showing the areas needed for each type of vegetable planted. Write the areas as units².

Task #2

Create a triangular section within your garden showing the areas needed for each type of vegetable planted. Write the areas as units².

Task #3

Create a section of your garden that uses a special quadrilateral shape again showing the areas needed for each type of vegetable planted. Write the areas as units².