

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	
<p>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?)</p>	<p>The student will be able to organize and plot a multitude of rational numbers on a number line.</p>
<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? 	<ul style="list-style-type: none"> • Pencils, papers, whiteboards, rulers, base ten blocks, measuring tapes, • Working in pairs • Record student work and solutions in individual math journals or binders
<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>	<p>Give each student a zipper bag of M&Ms and have them line up in order of least to greatest number of M&Ms.</p> <p>Ask questions such as: who has the greatest number of M&Ms, who has the least, etc.</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 do you know?
- Explain what you are supposed to do.
- Tell me what you're thinking.
- Can you show me another way?
- What's the important information you need to solve this problem?
- How can you prove that?
- Why did you decide to do it that way?

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?

- Could you draw a picture?
- What do you think the answer should look like?
- What is the problem asking you?

Extensions:

- How much more would each student need to make a full bag of M&Ms?

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?

1. Pictures
2. Change all information to decimals
3. Change all information to fractions
4. The use of a number line to plot points

Questions:

- How do these strategies compare?
- Is one method of solving the problem easier to understand? Why?
- Is this how you solved the problem? How was it similar or different?
- Do you see a pattern?
- Could you use this to solve other problems? What problems might they be?