Grade 6 Sample - Roadmap to Implementing High Quality Mathematics Instruction (Version 1)

The Roadmap to Implementing High-Quality Mathematics resource, as well as the Roadmap Overview, are available on www.kystandards.org.

The Roadmap to Implementing High Quality Mathematics Instruction seeks to **ground instruction in the** *Kentucky Academic Standards (KAS) for Mathematics,* **thus reaffirming a commitment to equitable learning opportunities for all Kentucky students.**

How did we get here: As much of the information in this first section of the Roadmap relates to clarity around the standard and ensuring the learning experience is aligned to grade-level *KAS for Mathematics*, educators might begin by exploring the connection between these two resources:

- Grade 6 Breaking Down a Standard sample for KY.6.G.2:
  Designed to mirror the architecture of the *KAS for Mathematics*, the Breaking Down a Mathematics Standard resource supports clarity by guiding educators to look deeply at the components of the architecture of the standards, contributing to a holistic understanding of the *KAS for Mathematics*, and the instructional implications resulting from that exploration, including the impact on student learning.
- Grade 6 Assignment Review Protocol for Girl Scout Cookies 3-Act Task
  A protocol intended to help answer the question, "Does this task give students the opportunity to meaningfully engage in worthwhile grade-appropriate content?"

KAS for Mathematics	Cluster:	Learning Experience:
KY.6.G.2	Solve real-world and mathematical problems involving area, surface area and volume.	Girl Scout Cookies Three Act Task

Identify the Target of the Standard(s):

☐ **Conceptual Understanding** refers to understanding mathematical concepts, operations and relations. Conceptual understanding is more than knowing isolated facts and methods; students should be able to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful. Conceptual understanding allows students to connect prior knowledge to new ideas and concepts.

☐ **Procedural Skill/Fluency** is the ability to apply procedures accurately, efficiently, flexibly and appropriately. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills. Students' ability to solve more complex application and modeling tasks is dependent on procedural skill and fluency

✓ **Application** provides a valuable context for learning and the opportunity to solve problems in a relevant and a meaningful way. It is through real-world application that students learn to select an efficient method to find a solution, determine whether the solution(s) makes sense by reasoning and develop critical thinking skills.

Identify the Practice Standard(s):

May reference *Engaging the SMPs: Look fors & Question stems*

☐ MP.1. Make sense of problems and persevere in solving them.

✓ MP.2. Reason abstractly and quantitatively.
- How might you explain what you've done so far?
- Have you thought of all the possibilities?

☐ MP.5. Use appropriate tools strategically.

✓ MP.6. Attend to precision.
- Compare your answer to ___'s answer.
- Can you explain what you did to solve the problem?

☐ MP.3. Construct viable arguments and critique the reasoning of others.	☐ MP.7. Look for and make use of structure.
✓ MP.4. Model with mathematics. • Why do the results make sense? • Would it help to create a diagram? Draw a picture? Make a table?	☐ MP.8. Look for and express regularity in repeated reasoning.

How did we get here: As educators begin considering what this learning experience might look like and feel like with students, the *Engaging the SMPs: Look fors and Question Stems* can be a really great place to start. For this learning experience, questions from MP.2, MP.4 and MP.6 felt like a natural fit to keep in mind when considering how to move student thinking forward while not taking away the thinking away from the student.

Note: To demonstrate the idea that educators can take different routes and still arrive at the same destination, there are two samples available related to this same Grade 6 learning experience. As this first section focuses more on grounding in the standards and ensuring the task engages students in grade-level content, you will see less variation in this section of the sample Roadmaps than in the other two that follow.

The Roadmap to Implementing High Quality Mathematics Instruction seeks to **support intentional integration of evidence-based instructional practices.**

Identify Evidence-based Instructional Practice(s) May reference *Effective Mathematics Teaching Practices (NCTM)*	
☐ EMTP 1: Establish mathematics goals to focus learning.	☐ EMTP 5: Pose purposeful questions.
✓ EMTP 2: Implement tasks that promote reasoning and problem solving.	☐ EMTP 6: Build procedural fluency from conceptual understanding.
☐ EMTP 3: Use and connect mathematical representations.	☐ EMTP 7: Support productive struggle in learning mathematics.
☐ EMTP 4: Facilitate meaningful mathematical discourse.	☐ EMTP 8: Elicit and use evidence of student thinking.

Teacher Actions:	**Student Actions:**
✓ Motivating students' learning of mathematics through opportunities for exploring and solving problems that build on and extend their current mathematical understanding. Build in time for discussion about Act 3, as the mathematical answer students arrive at may not match the real-world answer unveiled in the video. This task offers "sequel" questions that are not just repetitions of the questions in the task. These questions offer an opportunity to extend understanding by asking students to actively examine task constraints that may limit possible solutions and strategies.	✓ Persevering in exploring and reasoning through tasks. The task also requires them to relate the volume of two objects to one another, so students will have to persevere to find the relationship between the two volumes (MP.1). Students will have to determine if their answers are reasonable for the situation (MP.1). This task requires students to understand volume, attending to precision (MP.6) in their calculations and communicating their conclusions. ☐ Taking responsibility for making sense of tasks by drawing on and making connections with their prior understanding and ideas. ☐ Using tools and representations as needed to support their thinking and

☐ Selecting tasks that provide multiple entry points through the use of varied tools and representations. ☐ Posing tasks on a regular basis that require a high level of cognitive demand. ✓ Supporting students in exploring tasks without taking over student thinking. Before the students begin the task, prepare questions to ask students when they are struggling and when they get stuck. Questions might include: • What do you know about the cookie box? What do you wish you knew? How might you figure that out? • What do you know about the cargo space? What do you wish you knew? How might you figure that out? • How does the volume you calculated for the cookie box compare to the value provided for the cargo space? • Is your answer reasonable? The questions listed above with the SMPs would also support students. ☐ Encouraging students to use varied approaches and strategies to make sense of and solve tasks.	problem solving. ☐ Accepting and expecting that their classmates will use a variety of solution approaches and that they will discuss and justify their strategies to one another.

How did we get here: EMTP 2 feels like a natural fit since the 3 Act Task is a common framework for "implementing tasks that promote reasoning and problem solving". A 3-Act Task is especially motivating for students as bits of information clarifying the context are revealed along the way. Tasks like these often require many different skills, including sifting through information and deciding what is relevant, interpreting graphs, locating information needed to solve a problem, and making simplifying assumptions. Questioning related to why the mathematical calculation may/may not match what is revealed in Act 3 can support students in exploring and reasoning through tasks moving forward.

The Roadmap to Implementing High Quality Mathematics Instruction seeks to **expand educator familiarity with strategies to interweave the development of social emotional competencies with development of mathematics content.**

Identify the Competency Intended to Support the Evidence-Based Instructional Practice: May reference *Integrating SEAD within the KAS for Mathematics* resource library				
☐ SELF-AWARENESS	✓ SELF-MANAGEMENT	☐ SOCIAL AWARENESS	☐ RELATIONSHIP SKILLS	☐ RESPONSIBLE DECISION-MAKING

Specific Design Considerations from *Integrating SEAD within the KAS for Mathematics* Grade Level Resource
Provide opportunities for students to think metacognitively and organize their own thoughts with given information. A 3-Act task does not tell students how to solve the problem or provide them with a direction on how to solve the problem. Students must think about

how to take what they have been given, consider what new information they might need to find out and apply what they know to solve the problem.

Routinely ask questions that encourage students to reflect on barriers they may encounter and help them think about ways they can overcome challenges.

As information continues to be provided across the 3-Act Task, students will have to be engaged in a productive struggle. The task never says, "What is the volume of the cookie box?" Students have to make that connection themselves. Preparing questions before the students even begin the task will allow me to anticipate barriers students might encounter and consider how I can move thinking forward without taking over student thinking.

Teacher Reflection Questions from *Integrating SEAD within the KAS for Mathematics* Grade Level Resource

What do I look for to see what my students understand and where my students need guidance?

While students are working, I listen to the small group conversations to hear what they are discussing. Based on the conversations I hear, I can determine what (if anything) might need to be addressed with the entire class and what (if anything) might be best addressed in small groups.

What opportunities for student reflection are embedded within my plan for instruction?

One of the main questions that I want students to ask themselves during this lesson is, "Is your answer reasonable?". I want students to reflect on what they know and how their mathematical thinking compares to what they might have experienced in real life. I hope this prompts students to re-evaluate their assumptions, how that influenced their work and see if they can come up with another answer. At the end of the task, I want students to reflect on the question, "How did your answer compare to the actual number of cookie boxes in the cargo space from Act 3? Why do you think they were similar/different? What do you want to be sure to remember about this task when you are problem solving in the future?"

How did we get here: Focusing on self-management is a natural fit to support EMTP 2, especially as student action, "Persevering in exploring and reasoning through tasks" was selected as being elevated in this particular Roadmap. Another way to support student self-management might be to provide sentence stems for students to choose from when formulating questions, such as:

- Analysis: "How would you explain…? What is the importance of …?"
- Clarification: "Explain how … What is meant by …?"
- Cause and Effect: "What connection is there between …?"
- Comparison: "What is the difference between …? How are they alike?"

Encouraging students to use the question stems when they are stuck will offer students options for what to say other than "I don't know what to do", equipping them to ask questions to help move their own thinking forward. Supporting student self-management was critical to engaging students fully in the mathematics of this learning experience.