Grade 2 Sample - Roadmap to Implementing High Quality Mathematics Instruction

The Roadmap to Implementing High Quality Mathematics Instruction seeks to **ground instruction in the *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 *Kentucky Academic Standards (KAS) for Mathematics*, educators might begin by exploring the connection between these two resources:

- **Grade 2 Breaking Down a Standard sample for KY.2.NBT.5**:
  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 2 Assignment Review Protocol for Piled Up**
  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.2.NBT.5	Represent and solve problems involving addition and subtraction.	Savvas 3 Act Math: Piled Up

Identify the Target of the Standard:

☐ **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 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:

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

✓ MP.1. Make sense of problems and persevere in solving them.
- What information do you have?
- What do you need to find out?

✓ MP.2. Reason abstractly and quantitatively.
- Can you explain what you've done so far?

☐ MP.5. Use appropriate tools strategically.

☐ MP.6. Attend to precision.

- How can you represent the problem with symbols and numbers?

☐ MP.3. Construct viable arguments and critique the reasoning of others.

✓ MP.4. Model with mathematics.
- How useful was your model at predicting the answer?
- Would you change your model after watching the video?
- How would you change it?

☐ MP.7. Look for and make use of structure.

☐ 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.1 and MP.4 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.

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. Before showing the information for Act 2, ask what information do you need to answer the main question? How could you get that information? How would you use it?	✓ Persevering in exploring and reasoning through tasks. Students use the recording sheet to make reasonable predictions on how many tiles they think there are.
✓ Selecting tasks that provide multiple entry points using varied tools and representations. • Play the video of a girl emptying a container of two types of colored tiles. Take advantage of your students' initial reactions. Ask, what do	

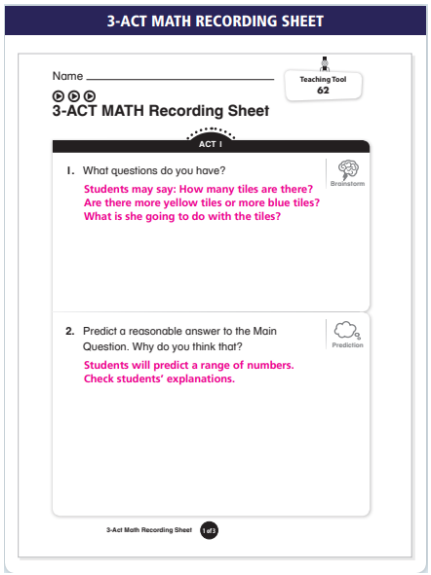
you notice? What do you wonder?

- Start a discussion with students to develop a main question. Students may need help developing mathematical questions that are applicable to the situation. Ask: What is interesting about what is happening in this video? What might you want to know about what is going to happen next? Help students determine the main question, **how many tiles are there?**
- Survey the class for a range of predictions. Ask, what number is too small to be the number of tiles? What number is too many?

☐ Posing tasks on a regular basis that require a high level of cognitive demand.

✓ Supporting students in exploring tasks without taking over student thinking.

- Reveal Act 2, have students discuss whether this information matches their expectations. Blue tiles: 4 columns of 10, 1 column of 9. Yellow tiles: 3 columns of 10, 1 column of 2.
- Students complete the work on chart paper. These will be displayed around the room so students can complete a gallery walk to use, discuss, and make connections among representations. Possible questions to ask students as they complete their gallery walk
  - How is this representation (strategy) different from your representation (strategy)?
  - How is this representation (strategy) the same as your representation (strategy)?
  - How could you use this representation (strategy) to solve a problem?
- The teacher can also use Corey's or Lydia's Work to analyze within a classroom discussion if needed.


3-ACT MATH RECORDING SHEET

Name _____ Teaching Tool 62

3-ACT MATH Recording Sheet

ACT 1

1. What questions do you have?

Students may say: How many tiles are there? Are there more yellow tiles or more blue tiles? What is she going to do with the tiles?

Brainstorm

2. Predict a reasonable answer to the Main Question. Why do you think that?

Students will predict a range of numbers. Check students' explanations.

Prediction

3-Act Math Recording Sheet 1 of 1

✓ Taking responsibility for making sense of tasks by drawing on and making connections with their prior understanding and ideas.

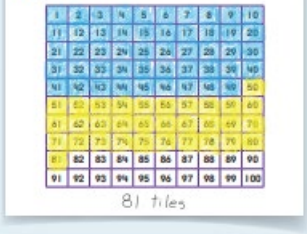
- Students will use a self-assessment tool to assess and monitor their progress to work towards meeting learning goals and to identify areas of growth in their own work.
- Students complete a gallery walk to respond to their peer's work. They will respond to questions posed (see Teacher Actions) and are encouraged to come up with their own questions about the work. They will then assess their classmate's work and will debrief with their partner to ask them questions (see possible questions in Teacher Actions), respond to their classmate, and give them suggestions based on their assessment of work.

☐ Using tools and representations as needed to support their thinking and 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.

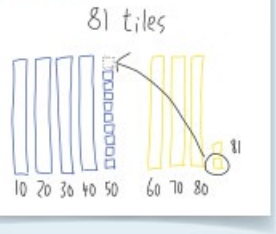
ANALYZE STUDENT WORK

Corey's Work



Corey says he filled in the hundreds chart one square at a time. Is there a faster, more efficient way he could have done this? [Yes, he could have counted by tens by coloring a whole row at once.]

Lydia's Work



Lydia says she can make 10 using the 9 left over blue tiles with 1 yellow tile. How does that help her? [She has to do less counting since she can count by 10s for all of the tiles but 1 instead of counting by 1s for the leftover tiles.]

- Following the completion of the task and the gallery walk, the teacher will allow students to use a self-assessment to reflect upon their work and to capture understandings and/or to address misconceptions. The teacher will then have students complete a reflection for another student's work. The teacher will make a conscious effort to pair students up for them to meet back up and discuss their assessments with their partner as well as making sure that students are paired up with a peer that solved the problem in a different way than them. Possible questions to ask students as they discuss; "What did you like about your partner's work?"/" What did they do well?"/" How can you help your partner make their work even better?"

☐ Encouraging students to use varied approaches and strategies to make sense of and solve tasks.

How did we get here: EMTP 2 feels like a natural fit since students are given a situation where there are multiple entry points where students reason mathematically. Problem based lessons and 3 Act Tasks provide students the opportunities to reason and take the first initial step to solve the problem in a real-world context.

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

Promote a growth mindset by presenting culturally relevant tasks. Bring in students' existing funds of knowledge (culture, contexts, language and experiences); students are more apt to engage with mathematics when they can make a connection to the world they live in. Consider ways to get to know students, such as asking them to list their favorite musicians, songs, sports, activities, games, food, etc., or by asking deeper questions about their culture, memories, and family. Using resources like 3 Act Tasks provides students the opportunities to reason and take the first initial step to solve the problem in a real-world context.

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

How can I encourage students to work through a problem and allow them to understand that they have to adapt while they are problem solving by choosing another strategy?

Allowing students to reference our problem strategy anchor chart as well as referencing and calling upon MP.1 (Make sense of problems and persevere in solving them) to encourage students to work through their and adapt accordingly.

How can I use the gallery walk intentionally to allow students to reflect upon their classmates' work and be able to be self-aware of their work as they make observations?

Pair students with varying ability levels as well as pair students together that approach problem solving differently. Create a classroom environment where students can look at their own work as well as their classmates work to allow them to improve their problem-solving skills as well as encouraging students to think of multiple ways to solve a problem and persevere in through them.

How can I create engaging discourse among students, so they are being helpful and positive about their classmates' work?

Use of math question stems encourages students to always give a positive first then an area of growth when speaking to their classmates. Create an environment that doesn't focus on what is wrong in a student's work, but looking at how well the student worked through the problem and find ways that classmates can encourage others to continue the problem-solving process.

How did we get here: Focusing on self-awareness is a natural fit to support EMTP 2, especially as students routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose by students using self-assessment and/or asking questions of their peers around the mathematics being learned.