Grade 4 Sample - Roadmap to Implementing High Quality Mathematics Instruction

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 4 Breaking Down a Standard sample for KY.4.NF.1:
  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 4 Assignment Review Protocol for Fractions and Rectangles:
  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.4.NF.1	Extend understanding of fraction equivalence and ordering.	Illustrative Mathematics: Fractions and Rectangles

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 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.
- ☐ MP.5. Use appropriate tools strategically.
- ✓ MP.6. Attend to precision.

  Students attend to precision in the way they partition and see that 3/12 is equivalent to ¼.

✓ MP.3. Construct viable arguments and critique the reasoning of others. Students critique the reasoning of Laura in part B and justify why she is correct.	☐ MP.7. Look for and make use of structure.
☐ MP.4. Model with mathematics.	☐ 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.3 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.

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.

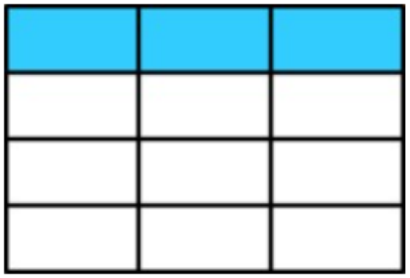
Teacher Actions:	**Student Actions:**
✓ Engaging students in purposeful sharing of mathematical ideas, reasoning, and approaches, using varied representations. Students don't necessarily generate representations like the one shown in the task stem where the pieces are "scattered around," so it is good for them to see and think about such representations. Asking students: • Can you explain what you did to solve the problem? • Compare your answer to ___'s answer. • How do you know your answer is accurate?	✓ Presenting and explaining ideas, reasoning, and representations to one another in pairs, small-group, and whole-class discourse. Providing students the opportunity to work in pairs or even in a small group by showing their reasoning on chart paper to part a and b. ✓ Listening carefully to and critiquing the reasoning of peers, using examples to support or counterexamples to refute arguments. Students can then move around the room using the gallery walk structure providing feedback by asking questions on whether they agree or disagree with the group's thinking. Providing sentence stem structures to ensure that MP.3 is being elevated.

This task helps set students on the path to understanding that if you divide the numerator and denominator by the same whole number, you get an equivalent fraction. It is as if we are "putting smaller pieces together to form bigger pieces," as opposed to subdividing the pieces.

☐ Selecting and sequencing student approaches and solution strategies for whole-class analysis and discussion.

✓ Facilitating discourse among students by positioning them as authors of ideas, who explain and defend their approaches.

Students should see that Laura is correct. We can see this by simply re-arranging the shaded parts of the rectangle to form a single row (See picture below.)



✓ Ensuring progress toward mathematical goals by making explicit connections among student approaches and reasoning.

The primary goal of this task is for students to use pictures to explain the equivalence between 3/12 and 1/4. This is a step toward students understanding the general idea that:
$\frac{a}{b}$ is equivalent to a fraction $\frac{(n\ x\ a)}{(n\ x\ b)}$

- How do you know?
- Can you explain that?
- Do you agree?
- How is your answer different than ___'s?

☐ Seeking to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others.

☐ Identifying how different approaches to solving a task are the same and how they are different.

How did we get here: This task provides students and teachers the opportunity to dive into MP.3 and by focusing on facilitating meaningful mathematical discourse by providing questions to ask other students in order for them to reason and explain their thinking build a classroom with a sense of belonging and a culture that values one another's perspectives.

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 sense of belonging. Build a safe community where mathematical discourse supports active listening, promotes diverse perspectives and insights, and allows students to consider others' reasoning to advance their own mathematical understanding. Creating a learning community is essential for mathematical practices that are interpersonal by nature, such as MP.3. Co-create shared agreements or ground rules about how all members of the learning community will interact with empathy and the desire to understand other perspectives.

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

How do I determine when whole-class discussion might need to happen?

Some students might only see 3/12 and other students might only see ¼ therefore bringing both of those students thinking for a whole class discussion and elevate the students thinking by facilitating discourse will help make the connection that the two fractions are equivalent.

How might I elevate the importance of exploring math concepts as opposed to seeking the "right" answer?

Focusing on facilitating mathematical discourse and building a classroom culture where students can question, and critique others is a safe classroom environment where students are able to be vulnerable and make mistakes.

How did we get here:

By building a safe classroom environment, elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions as seen in this fraction task above. Providing opportunities for students to justify their conclusions, communicate them to others and respond to the arguments of others will continue to build the learning community for MP.3.