Rich Mathematical Task – Grade *3* – *Special Delivery*

Task Overview/Description/Purpose:

- In this task, students will compare and order fractions and mixed numbers to determine a route for delivering birthday invitations.
- The purpose of this task is for students to compare fractions to friendly benchmarks (e.g. 0, $\frac{1}{2}$, 1), and use measurement models to order fractions and mixed numbers, creating a valid route using pictures, numbers, and words.

Standards Alignment: Strand – *Number and Number Sense*

Primary SOL: 4.2 The student will

a) compare and order fractions and mixed numbers, with and without models*
b) represent equivalent fractions*

Related SOLs: 3.2c, 4.1b, 4.3c, 5.2d*

*On the state assessment, items measuring this objective are assessed without the use of a calculator.

Learning Intention(s):

- **Content** - I am learning to apply strategies for comparing and ordering fractions and mixed numbers.
- **Language** - I am learning how to use the language of fractions to explain the order from least to greatest and/or greatest to least.
- **Social** - I am learning to provide to my peers and to receive feedback about my own thinking.

Success Criteria (Evidence of Student Learning):

- I can compare and order fractions with like and unlike denominators using a model.
- I can represent equivalent fractions using a model.
- I can defend my mathematical reasoning using fraction language, notation, and representations.
- I can give specific feedback and use suggestions to clarify thinking.

Mathematics Process Goals

Problem Solving	• Students will apply their understanding of comparing fractions to choose an appropriate strategy or strategies for determining the order of Jahiem's route. • Students will accurately apply their strategy to produce a valid route.
Communication and Reasoning	• Students will communicate their thinking process for determining a route by comparing and ordering fractions to their learning community. • Students will use reasoning to compare and order fractions and justify solution steps in an organized and coherent matter. • Students will use appropriate mathematical language, including greater than, less than, equivalent, numerator and common denominator, to express ideas with accuracy and precision.
Connections and Representations	• Students will create and label a representation to explore the problem and model their solution steps. • Students will describe connections between strategies for comparing and ordering fractions having unlike denominators.

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Task Pre-Planning

Approximate Length/Time Frame: 60 minutes

Grouping of Students: Groups can consist of 2 to 4 students. The teacher should look for opportunities for students to be math leaders and choose student groups that encourage collaboration.

Materials and Technology:

- fraction strips, rods
- Cuisenaire rods
- beaded number line
- copy of task
- copy of open number line
- pencil

Vocabulary:

- fraction
- mixed number
- greater than, less than
- equivalent fraction
- numerator, denominator
- common, uncommon denominator

Anticipate Responses: See the Planning for Mathematical Discourse Chart (columns 1-3).

Task Implementation (Before)

Task Launch:

- The teacher will ask students what they know about houses in a neighborhood by displaying a photo of multiple houses in a row. This will activate students' prior knowledge related to the context of the problem.

- Next, students will engage in a Notice/Wonder group discussion while the teacher facilitates and records on a t-chart. The teacher should be mindful and acknowledge that students' homes may look different from the photo.
- Some important ideas to listen for to support context of problem are:
  - Noticing the houses are next to each other
  - Noticing the houses are all on the same linear street
  - Wondering about comparing distances from one house to the next
  - Wondering about order of houses
- The teacher will read the task aloud to students alongside the "I Can" statements. Following independent think time, students will be able to share their mathematical thinking with a partner.
- The teacher will ask questions to make sure the task is understood: "What are we trying to figure out?" "What do you already know that can help you get started?" Allow students to turn and talk.

Task Implementation (During)

Directions for Supporting Implementation of the Task

- Monitor – The teacher will observe students as they work independently on the task. The teacher will engage with students by asking assessing or advancing questions as necessary (see attached *Question Matrix).*
- Select – Teacher will decide which strategies or thinking will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning.

Task Implementation (During)

- Sequence – The teacher will select 2-3 student strategies to share with the whole group. One suggestion is to look for one common misconception and two correct responses using different strategies to share.
- Connect – The teacher will consider ways to facilitate connections between different student representations.
    - As teacher is monitoring, teacher will look for partnerships that make sense depending on what students are doing independently.
    - Partnerships could be planned to counter misconceptions, move someone along in the sophistication of ideas, or to explore different ways to solve the same problem.

Suggestions for Additional Student Support

- Sentence frames for supporting student-to-student discourse:
    - The first/second/third/last stop on the route is _____'s house because _____.
    - First I _____, then I _____.
    - I know that _____ is less/more than the benchmark _____, so it will be the first/last stop.
- Open number lines for organizing route
- Wide variety of manipulatives available for students to choose to use:
    - Fraction strips/bars (labeled and unlabeled)
    - Cuisenaire rods
    - Beaded number line

Task Implementation (After) *20 minutes*

Connecting Student Responses (From Anticipating Student Response Chart) and Closure of the Task:

- Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion. Some possible big mathematical ideas to highlight could include:
    - a common misconception;
    - trajectory of sophistication in student ideas (i.e. concrete to abstract)
    - different solutions with reasoning (ordering fractions greatest to least and least to greatest)
    - different representation of same solution
- Connect student responses and connect the responses to the key mathematical ideas to bring closure to the task. Possible questions to connect student strategies:
    - How are these strategies alike? How are they different?
    - How do these connect to our Learning Intentions?
    - Why is this important?
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion, such as a gallery walk to allow feedback on all strategies.
- Close the lesson by revisiting the success criteria. Have students reflect on their progress towards the criteria.

Teacher Reflection About Student Learning:

- Teacher will use the Planning for Mathematical Discourse Chart (anticipated student solutions) to monitor which students are using specific strategies. This will include: possible misconceptions, learning trajectories and sophistication of student ideas, and multiple solution pathways. Next steps based on this information could include:
    - Informing sequence of tasks. What will come next in instruction to further student thinking in comparing and ordering fractions?
    - Informing small groups based on misconceptions that are not addressed in sharing.

Task Implementation (During)
• After task implementation, the teacher will use the Rich Mathematical Task Rubric criteria to assess where students are in their mathematical understanding and use of the process goals. This could be a focus on one category. Next steps based on this information could include: ○ Informing small groups based on where students are in engagement in the process goal(s).

Planning for Mathematical Discourse

Mathematical Task: Special Delivery Content Standard(s): SOL 4.2

Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions** *Teacher questioning that moves thinking forward*	**List of Students Providing Response** *Who? Which students used this strategy?*	**Discussion Order - sequencing student responses** ○ *Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion* ○ *Connect different students' responses and connect the responses to the key mathematical ideas* ○ *Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion*
Anticipated Student Response: **Common misconception* Student may confuse $\frac{4}{5}$ and $\frac{5}{4}$ as equivalent.	• Tell me about your thinking. • What do you notice about the denominators? • Can you create a model of $\frac{4}{5}$? $\frac{5}{4}$?	• How can you use this model to help you plan your route?		
Anticipated Student Response: **Misconception* Student believes $1\frac{2}{8}$ is greater than $\frac{5}{4}$ and does not recognize equivalent relationship.	• Tell me about your thinking. • Can you create a model of both fractions? What do you notice?	• How can you show these fractions on your route?		
Anticipated Student Response: Students are able to solve using a representation but unable to explain their thinking.	• Tell me about your representation. • How did you decide where to begin and end your route?	• Can you record what you explained to me on your paper? "I chose to start my route ……. because…"		
Anticipated Student Response: Student is able to solve using fraction rods but unable to create route.	• Tell me about your representation. • Here is a sticky note. Can you show me where the first stop would be? 2nd stop?	• Let's put your paper under this representation. Can you trace your work and label each stop on your paper?		

NAME _____ DATE _____

Special Delivery

The table below shows the distance in miles from Jaheim's house to his friends' houses.

Friend	Distance in miles from Jahiem's House
Tara	4/5
Kaden	1 2/8
Sierra	1/10
Carlos	5/4

Jahiem is delivering birthday invitations to his friends who all live on his street. Jahiem's house is the first house on the street. Create a representation of the route he should follow. Use pictures, numbers, and words to represent:

- The location of each house including Jahiem's house
- The order for each stop (be sure to label each stop)
- Your reasoning for the order

Rich Mathematical Task Rubric

	Advanced	Proficient	Developing	Emerging
Mathematical Understanding	Proficient Plus: • Uses relationships among mathematical concepts or makes mathematical generalizations	• Demonstrates an understanding of concepts and skills associated with task • Applies mathematical concepts and skills which lead to a valid and correct solution	• Demonstrates a partial understanding of concepts and skills associated with task • Applies mathematical concepts and skills which lead to an incomplete or incorrect solution	• Demonstrates no understanding of concepts and skills associated with task • Applies limited mathematical concepts and skills in an attempt to find a solution or provides no solution
Problem Solving	Proficient Plus: • Problem solving strategy is well developed or efficient	• Problem solving strategy displays an understanding of the underlying mathematical concept • Produces a solution relevant to the problem and confirms the reasonableness of the solution	• Problem solving strategy displays a limited understanding of the underlying mathematical concept • Produces a solution relevant to the problem but does not confirm the reasonableness of the solution	• A problem solving strategy is not evident • Does not produce a solution that is relevant to the problem
Communication and Reasoning	Proficient Plus: • Reasoning or justification is comprehensive • Consistently uses precise mathematical language to communicate thinking	• Demonstrates reasoning and/or justifies solution steps • Supports arguments and claims with evidence • Uses mathematical language to communicate thinking	• Reasoning or justification of solution steps is limited or contains misconceptions • Provides limited or inconsistent evidence to support arguments and claims • Uses limited mathematical language to partially communicate thinking	• Provides no correct reasoning or justification • Does not provide evidence to support arguments and claims • Uses no mathematical language to communicate thinking
Representations and Connections	Proficient Plus: • Uses representations to analyze relationships and extend thinking • Uses mathematical connections to extend the solution to other mathematics or to deepen understanding	• Uses a representation or multiple representations, with accurate labels, to explore and model the problem • Makes a mathematical connection that is relevant to the context of the problem	• Uses an incomplete or limited representation to model the problem • Makes a partial mathematical connection or the connection is not relevant to the context of the problem	• Uses no representation or uses a representation that does not model the problem • Makes no mathematical connections

Open Number Lines