Rich Mathematical Task – Grade 2 - *Number of Students*

Task Overview/Description/Purpose:

- The purpose of this task is for students to demonstrate an understanding of equality using the context of the number of boys and girls in two classrooms.
- In this task, students will use a variety of strategies to create and justify equivalent relationships.

Standards Alignment: Strand –*Computation and Estimation*

Primary SOL: 2.17 The student will demonstrate an understanding of equality through the use of the equal symbol and the use of the not equal symbol.

Related SOL (within or across grade levels/courses): 1.15, 3.17

Learning Intention(s):

- **Content** - I am learning to represent and create equivalent relationships.
- **Language** - I am learning to use the language of mathematics to describe my understanding of the equal sign and equality.
- **Social** - I am learning to compare my strategy and solution to a classmate's thinking. I am learning to analyze multiple solutions to an open-ended situation.

Success Criteria (Evidence of Student Learning):

- I can use models, pictures, and number sentences to show that relationships are equal or not equal.
- I can explain why two number sentences are equal or not equal.
- I can compare my strategy and solution to my classmate's. I can explain how and why multiple solutions can be correct for the same open-ended problem.

Mathematics Process Goals

Problem Solving	• Students will apply the mathematical concept of equality and addition to create models and number sentences that are equivalent based on a set of open-ended criteria.
Communication and Reasoning	• Students will describe equality as a relationship that is the "same as" or a relationship that is balanced. Students can use a variety of reasoning strategies, aside from solving both sides of the equation. Students can recognize and apply the equal sign.
Connections and Representations	• Students will create equivalent relationships and accurately represent these relationships using the equal sign.

Task Pre-Planning

Approximate Length/Time Frame: 60 minutes

Grouping of Students: Students will begin the task independently. As the task progresses, students will share ideas with a partner. Students will communicate findings by sharing strategies during a whole group reflection.

Materials and Technology:

- Virtual Implementation Google Slides
- task for each student
- counters, unfix cubes, open number lines, concrete balance scales
- drawing tools, crayons, pencils, etc.

Vocabulary:

- addend
- equal and not equal
- equal symbol, equal sign
- balanced
- same as

Rich Mathematical Task – Grade 2 - *Number of Students*

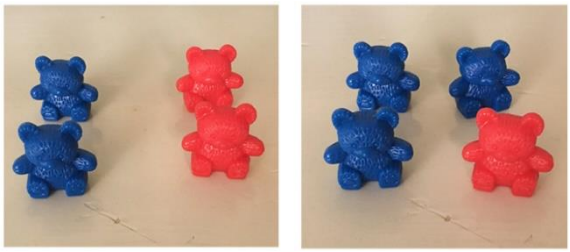
Task Pre-Planning

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

Task Implementation (Before) 15 minutes

Task Launch:

Consider starting this Same but Different number sense routine. The routine came from this website.



- Ask students: "How are these pictures the same? How are they different?" Students might discuss how both pictures have the same amount or an equal number of bears. Picture A has the same number of red bears and blue bears, and Picture B has more blue bears. This is a good opportunity to introduce vocabulary such as same, balanced, equal, and not equal.
- Read the task to students. Consider revealing the task slowly over time. As students learn more information, invite them to pause. Ask: "What do you know so far? What do you wonder?" When the question is revealed consider asking "What is the question asking you to find?" Slowly revealing the problem will support students in processing and making sense of the task.
- Pass out the task to each student to solve. Make manipulatives and drawing tools available, as needed.

Task Implementation (During) 20 minutes

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** – The teacher will decide which strategies or thinking will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning.
- **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 to share.
- **Connect** – The teacher will consider ways to facilitate connections between different student representations.

Suggestions For Additional Student Support

- Sentences frames to facilitate communication:
  - ____is the same as ___.
  - I know they are equal because…
- Vocabulary development:
  - Use Frayer models to deepen understanding of vocabulary terms.
  - Students who have difficulties with decoding/reading math text may benefit from pairing vocabulary with visuals. For example, have a balance scale with objects to model the meaning of "same as"
  - Keep vocabulary on an anchor chart or word wall and reference the visual as needed to reinforce verbal, written, and graphic representations of new vocabulary words.
- Organization:
  - Have materials available for students. Consider providing 2 colors of each material.
  - Prepare student workspace with materials required for task.

Task Implementation (During) 20 minutes

- Consider graphic organizers with 2 spaces to represent each class.

- Extension Questions:
  - How do you know you can reverse the order of the equation to find your solution?
  - Can you find more solutions that will work?
  - How many possibilities do you think there might be?
  - How could you continue adjusting your equation to find more solutions?

Task Implementation (After) 15 minutes

Connecting Student Responses and Closure of the Task:

- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion (opportunity for gallery walk or think/pair/share with a partner or small group).
- Based on the actual student responses, select and sequence specific students to present their mathematical work during class discussion. Consider sharing one strategy that shows a common misconception, and two other accurate strategies that can connect to each other. Facilitate a discussion about similarities and differences between the strategies.
- Connect different students' responses and connect the responses to the key mathematical ideas (equality, the relationship between addition and subtraction, and decomposing/composing numbers)
- Possible facilitator questions:
  - How is __'s strategy similar or different to __'s strategy?
  - Why can you change the order of the equation to find a solution that works?
  - Do you notice any patterns within these different solutions?
  - How do you know these number sentences are equal? Why is that important?
  - How do these connect to our learning intentions?
- Provide an opportunity for students to ask clarifying questions.
- Close the lesson by returning to the success criteria. Have students reflect on their progress toward the criteria.

Teacher Reflection About Student Learning:

- Use the rich mathematical task rubric to evaluate students' progress toward the goals.
- Look at the students' work. Who employed what strategies?
  - Who used a concrete tool? Who needed to model or represent each student? Who used a number sentence? Who used mathematical patterns and relationships?
  - Who was unable to complete the task even with support?
  - Who used the commutative property? Did they justify why or how the commutative property works? (Note: they don't need to name it. The purpose is to discuss how the idea can be used to understand mathematics)
  - Who used the first equation to support them in writing more equivalent relationships?
  - Who found a pattern that helped them to find multiple solutions?

Rich Mathematical Task – Grade 2 - *Number of Students*

Planning for Mathematical Discourse

Mathematical Task: Number of Students Content Standard(s): SOL 2.17

Teacher Completes Prior to Task Implementation		Teacher Completes During Task Implementation		
Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions – Teacher Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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: Student is not sure how to start.	• Reread the task. What is the problem asking? • What do you know about Nina's class? What do you know about Jocelyn's class? • What do you know about the words ***more and less***? • How might the routine we just did support you in thinking about this task?	• Imagine a classroom of boys and girls, or a line of boys and girls. What does it look like? How could visualizing the problem help you? • How could you represent this story using a picture or tool?		
Anticipated Student Response: Student does not create an equation or model that shows the same number of students in each class.	• What is the story telling you about Jocelyn's class? Nina's class? • Tell me about your work. Are these pictures or number sentences equal? How do you know?	• Take a moment to think about your picture/model and the problem. Did you represent each part of the problem? How do you know?		

Rich Mathematical Task – Grade 2 - *Number of Students*

Teacher Completes Prior to Task Implementation		Teacher Completes During Task Implementation		
Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions – Teacher Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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*
	• Are there the same number of students in each class? How do you know?	• What is the same about Nina and Jocelyn's class? What is different?		
Anticipated Student Response: Students write the exact same number sentence for both classes. For example: 7+9=7+9	• Tell me about your picture/model. Where are the boys and girls in Nina's class? Where are the boys and girls in Jocelyn's class? • What would it sound like to read your number sentence/equation out loud? • What does your number sentence say about the boys and the girls in each class? Does this number sentence represent the problem?	• Take a moment to represent your equation using a picture or tools. How does your representation match the story?		
Anticipated Student Response: Student correctly represents the story with a picture or model to find a solution.	• Tell me about your picture/model. What did you do? • What helped you know how to represent the problem?	• What would it look like to show your picture/model using number sentences? • I see you've used __ tools to represent this story. What		

Rich Mathematical Task – Grade 2 - *Number of Students*

Teacher Completes Prior to Task Implementation		Teacher Completes During Task Implementation		
Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions – Teacher Stays to Hear Response** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions – Teacher Poses Question and Walks Away** *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*
		would it look like to use numbers?		
Anticipated Student Response: Student records a number sentence to correctly represent the story. Students finds one solution.	• Tell me about your work. • How do you know your equation is balanced? • What strategy did you use to ensure both sides of the equation have the same number of students?	• How could you use this solution to help you find others? • How might you adjust your equation to find more possibilities? • As you're finding more possibilities, do you see any patterns?		
Anticipated Student Response: Student uses the commutative property and number relationships to correctly model the problem and create at least one solution.	• Tell me about your work. • Why did you reverse the order of the numbers? How did you know that would work? • What if you didn't change the order, would it still work? Why or why not? • How do you know the equation you created works for this story?	• How could you use this idea to find more solutions? • Do you see any patterns in your work?		

NAME _____ DATE _____

Number of Students

Nina is in 2nd grade. Her sister, Jocelyn, is in 4th grade.

- Nina's class and Jocelyn's class have the same number of students.
- Nina's class has more boys than girls.
- Jocelyn's class has more girls than boys.

How many boys and girls could be in Nina's class? How many boys and girls could be in Jocelyn's class?

Represent your thinking using models and number sentences. Explain how you know.

Possible sentence frames for supporting learners:

Nina's class could have __ boys and __ girls.

Jocelyn's class could have ___ boys and __ girls.

____+____=____+_____

Nina's class Jocelyn's class

I know my solution makes sense because….

Rich Mathematical Task – Grade 2 - *Number of Students*

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