

## Rich Mathematical Task – Grade 2 – *Bracelet Task*

<b>Task Overview/Description/Purpose:</b>	
Students investigate a range of numbers to determine which ones can be divided equally into two groups without any leftovers. The purpose of this task is to deepen understanding of the properties of numbers by exploring odd and even. In this task, students apply prior knowledge of even and odd numbers and extend learning to a larger range of numbers.	
<b>Standards Alignment: Strand -<i>Number and Number Sense</i></b>	
<b>Primary SOL:</b> 2.2. The student will c) use objects to determine whether a number is even or odd.	
<b>Related SOL (within or across grade levels/courses):</b> 2.2.a, 2.6.b, 2.6.c, 5.3.b	
<b>Learning Intentions:</b>	
<ul style="list-style-type: none"> <li>• <b>Content</b> - I am learning to identify the characteristics of numbers.</li> <li>• <b>Language</b> - I am learning to describe the characteristics of numbers using mathematical language.</li> <li>• <b>Social</b> - I am learning to understand my peers' reasoning by listening, looking, and connecting their ideas to mine.</li> </ul>	
<b>Success Criteria (Evidence of Student Learning):</b>	
<ul style="list-style-type: none"> <li>• I can tell if a number is odd or even by making two equal groups or by pairing objects.</li> <li>• I can describe the difference between odd and even numbers.</li> </ul>	
<b>Mathematics Process Goals:</b>	
Problem Solving	<ul style="list-style-type: none"> <li>• Students will investigate a range of numbers to determine which ones can be divided into two equal groups with no leftovers. This may include further exploration of other numbers that can and cannot be divided evenly.</li> </ul>
Communication and Reasoning	<ul style="list-style-type: none"> <li>• Students will use the vocabulary odd and even to describe the properties of numbers. They will reason whether a number is odd or even using evidence from their work and communicate their thinking during whole class discussion and in writing.</li> </ul>
Connections and Representations	<ul style="list-style-type: none"> <li>• Students will use pictures, words and symbols to represent their solutions to the problem. They will make connections among their representations and to the meaning of the words odd and even. Students will test conjectures about which numbers can and cannot be divided evenly into two groups.</li> </ul>
<b>Task Pre-Planning</b>	
<b>Approximate Length/Time Frame:</b> 60 minutes	
<b>Grouping of Students:</b> Students begin the task independently. As the task progresses, students share ideas with a partner. Students will communicate findings by sharing models and representations during a whole group reflection.	
<b>Materials and Technology:</b>	<b>Vocabulary:</b>
<ul style="list-style-type: none"> <li>• copy of task recording sheet (one per student)</li> <li>• manipulatives (e.g., blue/green blocks, tiles, cubes)</li> <li>• colored pencils or crayons</li> </ul>	<ul style="list-style-type: none"> <li>• odd, even</li> <li>• pair</li> <li>• equal</li> </ul>

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### Task Pre-Planning

**Anticipate Responses:** See Planning for Mathematical Discourse Chart (Columns 1-3).

### Task Implementation (Before)

#### Task Launch:

- In a whole group setting, invite students to connect with the context of the problem by asking, “Have any of you ever seen or made a bead bracelet before?” Include a photograph of a bead bracelet and asking students, “What do you notice? What do you wonder?” to activate prior knowledge.
- Introduce the task by reading the problem aloud to students. Ask a few students to restate the task in their own words to promote understanding and clarify questions.
- Pass out the task to each student to solve independently. Have manipulatives and drawing tools available.
- As students finish working independently, pair them up with a partner to share their solutions and practice explaining their reasoning.

### Task Implementation (During)

#### Directions for Supporting Implementation of the Task

- Monitor – Teacher will listen and observe students as they work on task and ask assessing or advancing questions (see chart on page 4).
- Select – Teacher will decide which strategies or thinking will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning.
- Sequence – Teacher will decide the order in which student ideas will be highlighted (after student task implementation).
- Connect – Teacher will consider ways to facilitate connections between different student responses.

#### Suggestions For Additional Student Support

May include, among others:

- Consider activating students’ prior knowledge by facilitating a number sense routine that draws upon skills needed to successfully complete the task. For example, count around the room by twos forward to 30 and backward from 30. Or, students may benefit from playing “Guess My Number” in which they are invited to think about a number greater than 10 but less than 20 to help them connect to the parameters of the task.
- Provide students with a variety of manipulatives and writing utensils to support their representations. The use of blue and green manipulatives will support student visualization of the problem. Reference the image of the beaded bracelet.
- Sentence frames can be used to support student discourse:
  - Lucy can make the bracelet with \_\_ beads because \_\_\_\_\_.
  - My strategy is the same/different because \_\_\_\_\_.
- After students have shared solutions, create an anchor chart including the vocabulary words **odd** and **even** along with picture representations to summarize student findings. It is important not to lower the cognitive demand of the task by introducing these vocabulary words before students have an opportunity to explore the mathematics.
- Some students may find it easier to access numbers in a lower range so it may be helpful to differentiate the task by changing the total number of beads to between 10 and 20. Another option may be to remove this parameter altogether and ask for any totals that would support an even number of blue and green beads.

Students ready for an extension can be encouraged to work with an extended range of numbers. Would the patterns they notice between 20 and 30 be the same for larger numbers? Will this generalization always work?

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### Task Implementation (After)

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

- Reflect on student solution strategies during a whole group discussion. Use this time to connect different students' responses and connect the responses to the key mathematical ideas of odd and even.
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during the task discussion.
- Questions to promote student engagement and discourse:
  - How many beads could Lucy use to make the bracelet?
  - How do you know your number will work?
  - Who can add on to that?
  - Do you agree or disagree? Why?
  - How is this strategy the same or different from another strategy?
  - Did anyone think about that in a different way?
- Help students test their generalizations about the properties of odd and even numbers by inviting them to make a list of the numbers that would/would not work for Lucy's bracelet. At this point, it will be helpful to model student solutions so students can reflect on how the even numbers allow for the same number of each color of beads and the odd numbers always have an extra bead of one color. Guiding questions may include:
  - What do these sets of numbers have in common? (use models to support student explanations)
  - What word do we use to describe numbers that can be evenly split into two groups or put into pairs with no leftovers? (even)
  - What word do we use for numbers that don't split evenly or have leftovers? (odd)
- Close the lesson by creating an anchor chart summarizing students' descriptions of odd and even numbers from the discussion above.

#### 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?
  - For students who are unable to accurately count objects -- consider working on rote counting sequences by ones or in multiples. More time may also be needed counting objects with one-to-one correspondence or in groups.
  - For students who used memorized even/odd 'rules' -- press for conceptual understanding and encourage students to use models to represent the meaning of odd and even numbers.
  - Students who split the objects into two equal groups or into pairs-- Consider pairing students who have representations of each of these strategies. Do they see how they are the same/different? Will both strategies work? Student thinking may be extended by encouraging them to write equations to match their representations and to test generalizations about other numbers.

**Rich Mathematical Task – Grade 2 – Bracelet Task**  
**Planning for Mathematical Discourse**

Mathematical Task: Bracelet Task

Content Standard(s): 2.2c

Teacher Completes Prior to Task Implementation			Teacher Completes During Task Implementation	
<b>Anticipated Student Response/Strategy</b> <i>Provide examples of possible correct student responses along with examples of student errors/misconceptions</i>	<b>Assessing Questions – Teacher Stays to Hear Response</b> <i>Teacher questioning that allows student to explain and clarify thinking</i>	<b>Advancing Questions – Teacher Poses Question and Walks Away</b> <i>Teacher questioning that moves thinking forward</i>	<b>List of Students Providing Response</b> <i>Who? Which students used this strategy?</i>	<b>Discussion Order - sequencing student responses</b> <ul style="list-style-type: none"> <li>Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion</li> <li>Connect different students' responses and connect the responses to the key mathematical ideas</li> <li>Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion</li> </ul>
<b>Anticipated Student Response:</b> Student is not sure how to get started.	<ul style="list-style-type: none"> <li>What's happening in the problem?</li> <li>How many beads can Lucy use on her bracelet?</li> <li>Do you have more than 20 and less than 30 beads?</li> <li>Do you have the same number of blue as green beads?</li> </ul>	<ul style="list-style-type: none"> <li>How could you use the manipulatives to show what's going on in this story?</li> <li>What might it look like to have the same number of blue and green beads?</li> </ul>		
<b>Anticipated Student Response:</b> Student creates a group of one color of beads and matches it with an equal group of beads of the other color. The student uses trial and error to test numbers that will add together to equal a total between 20 and 30.	<ul style="list-style-type: none"> <li>How many beads do you have so far?</li> <li>Do you have the same number of blue as green beads?</li> <li>Do you have more than a total of 20 beads and less than 30?</li> </ul>	<ul style="list-style-type: none"> <li>How will you know when you have a number of beads that will work?</li> </ul>	Student F	

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<b>Anticipated Student Response/Strategy</b> <i>Provide examples of possible correct student responses along with examples of student errors/misconceptions</i>	<b>Assessing Questions – Teacher Stays to Hear Response</b> <i>Teacher questioning that allows student to explain and clarify thinking</i>	<b>Advancing Questions – Teacher Poses Question and Walks Away</b> <i>Teacher questioning that moves thinking forward</i>	<b>List of Students Providing Response</b> <i>Who? Which students used this strategy?</i>	<b>Discussion Order - sequencing student responses</b> <ul style="list-style-type: none"> <li>• <i>Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion</i></li> <li>• <i>Connect different students' responses and connect the responses to the key mathematical ideas</i></li> <li>• <i>Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion</i></li> </ul>
<b>Anticipated Student Response:</b> Student represents a number of green beads between 20 and 30 and matches it with the same number of blue beads (misunderstanding that the <i>total</i> is supposed to be between 20 and 30, not 20-30 of each color).	<ul style="list-style-type: none"> <li>• How many beads do you have so far?</li> <li>• Do you have the same number of blue as green beads?</li> <li>• Do you have more than a total of 20 beads and less than 30?</li> </ul>	<ul style="list-style-type: none"> <li>• How might you keep track of the beads you have counted so far?</li> <li>• How will you know when you have a number of beads that will work?</li> </ul>		
<b>Anticipated Student Response:</b> Student pairs a blue and green together and continues to count by ones (or two's) until there are an equal number of blue and green beads with a total between 20 and 30 (22, 24, 26, 28).	<ul style="list-style-type: none"> <li>• How did pairing one blue and one green at a time help you ensure there were the same number of both colors?</li> <li>• How did you count the beads?</li> <li>• How did you know when to stop counting?</li> </ul>	<ul style="list-style-type: none"> <li>• Is there a faster way to count the beads? (to promote skip counting)</li> <li>• Are there other numbers between 20 and 30 that could work? How do you know?</li> <li>• What numbers won't work? Why?</li> </ul>	Student A Student E	

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<b>Anticipated Student Response/Strategy</b> <i>Provide examples of possible correct student responses along with examples of student errors/misconceptions</i>	<b>Assessing Questions – Teacher Stays to Hear Response</b> <i>Teacher questioning that allows student to explain and clarify thinking</i>	<b>Advancing Questions – Teacher Poses Question and Walks Away</b> <i>Teacher questioning that moves thinking forward</i>	<b>List of Students Providing Response</b> <i>Who? Which students used this strategy?</i>	<b>Discussion Order - sequencing student responses</b> <ul style="list-style-type: none"> <li><i>Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion</i></li> <li><i>Connect different students' responses and connect the responses to the key mathematical ideas</i></li> <li><i>Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion</i></li> </ul>
<b>Anticipated Student Response:</b> Student makes list of doubles facts. For example, $11+11=22$ , $12+12=24$ , etc.	<ul style="list-style-type: none"> <li>How did you know what two numbers to add together? (doubled the number, may state they used the same number twice)</li> <li>Which number represents the blue beads? The green?</li> <li>How did using doubles help you find your answer?</li> </ul>	<ul style="list-style-type: none"> <li>Will using doubles facts always result in an even number (or one that can be split evenly?)</li> <li>Are there other numbers between 20 and 30 that could work? How do you know?</li> <li>What numbers won't work? Why?</li> </ul>	Student C	
<b>Anticipated Student Response:</b> Student records 24 as the answer and states, "I know it will work because 4 is an even number and 24 has a 4 at the end of it."	<ul style="list-style-type: none"> <li>How do you know 4 is an even number?</li> <li>How does that help you with the number 24?</li> </ul>	<ul style="list-style-type: none"> <li>Will your strategy always work?</li> <li>Are there other numbers between 20 and 30 that could work? How do you know?</li> <li>What numbers won't work? Why?</li> </ul>	Student B	

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Name \_\_\_\_\_

Date \_\_\_\_\_

### Bracelet Task

Lucy wants to make a bracelet for her sister. Her sister's favorite colors are blue and green. She wants to choose a design in which she can use the same number of blue beads as green beads.

If Lucy uses more than a total of 20 beads, but less than 30, how many beads could she use to make the bracelet with the same number of blue and green beads?

Explain your thinking using pictures, words and/or numbers.

**Rich Mathematical Task – Grade 2 – *Bracelet Task***  
**Rich Mathematical Task Rubric**

	<b>Advanced</b>	<b>Proficient</b>	<b>Developing</b>	<b>Emerging</b>
<b>Mathematical Understanding</b>	Proficient Plus: <ul style="list-style-type: none"> <li>• Uses relationships among mathematical concepts</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates an understanding of concepts and skills associated with task</li> <li>• Applies mathematical concepts and skills which lead to a valid and correct solution</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates a partial understanding of concepts and skills associated with task</li> <li>• Applies mathematical concepts and skills which lead to an incomplete or incorrect solution</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates little or no understanding of concepts and skills associated with task</li> <li>• Applies limited mathematical concepts and skills in an attempt to find a solution or provides no solution</li> </ul>
<b>Problem Solving</b>	Proficient Plus: <ul style="list-style-type: none"> <li>• Problem solving strategy is efficient</li> </ul>	<ul style="list-style-type: none"> <li>• Problem solving strategy displays an understanding of the underlying mathematical concept</li> <li>• Produces a solution relevant to the problem and confirms the reasonableness of the solution</li> </ul>	<ul style="list-style-type: none"> <li>• Chooses a problem solving strategy that does not display an understanding of the underlying mathematical concept</li> <li>• Produces a solution relevant to the problem but does not confirm the reasonableness of the solution</li> </ul>	<ul style="list-style-type: none"> <li>• A problem solving strategy is not evident or is not complete</li> <li>• Does not produce a solution that is relevant to the problem</li> </ul>
<b>Communication and Reasoning</b>	Proficient Plus: <ul style="list-style-type: none"> <li>• Reasoning is organized and coherent</li> <li>• Consistent use of precise mathematical language and accurate use of symbolic notation</li> </ul>	<ul style="list-style-type: none"> <li>• Communicates thinking process</li> <li>• Demonstrates reasoning and/or justifies solution steps</li> <li>• Supports arguments and claims with evidence</li> <li>• Uses mathematical language to express ideas with precision</li> </ul>	<ul style="list-style-type: none"> <li>• Reasoning or justification of solution steps is limited or contains misconceptions</li> <li>• Provides limited or inconsistent evidence to support arguments and claims</li> <li>• Uses limited mathematical language to partially communicate thinking with some imprecision</li> </ul>	<ul style="list-style-type: none"> <li>• Provides little to no correct reasoning or justification</li> <li>• Does not provide evidence to support arguments and claims</li> <li>• Uses little or no mathematical language to communicate thinking</li> </ul>
<b>Representations and Connections</b>	Proficient Plus: <ul style="list-style-type: none"> <li>• Uses representations to analyze relationships and extend thinking</li> <li>• Uses mathematical connections to extend the solution to other mathematics or to deepen understanding</li> </ul>	<ul style="list-style-type: none"> <li>• Uses a representation or multiple representations, with accurate labels, to explore and model the problem</li> <li>• Makes a mathematical connection that is relevant to the context of the problem</li> </ul>	<ul style="list-style-type: none"> <li>• Uses an incomplete or limited representation to model the problem</li> <li>• Makes a partial mathematical connection or the connection is not relevant to the context of the problem</li> </ul>	<ul style="list-style-type: none"> <li>• Uses no representation or uses a representation that does not model the problem</li> <li>• Makes no mathematical connections</li> </ul>



## Rich Mathematical Task – Grade 2 – *Bracelet Task*

### Task Supporting Documents

Suggested photo for task launch.



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