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| **Building Mathematical Mindsets: Day 4 for Grade 4** |
| **Lesson Overview:** |
| **Standards for Mathematical Practice:**  3. Construct viable arguments and critique the reasoning of others.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning.  **Mathematical Mindset Goal:**   * Math class is about learning, not performing. * Depth is more important than speed. * We need to think deeply, connect methods, reason, and justify our thinking.   **Materials:**   * Framing Rectangles handout (1 per student) * square tiles * graph paper * chart paper and markers * poster paper/construction paper * coloring materials such as crayons, markers, or colored pencils * math journals   **Video**:   * Boosting Messages: https://www.youcubed.org/resources/four-boosting-messages-jo-students/ (8:35) |
| **Before: 10 minutes** |
| **1. Introduction**  **Say:** We have learned quite a bit this week about what it means to think mathematically. One more important idea to remember throughout math class this year is that math class is about learning, not performing. Our class will be focused on learning and growing as mathematicians. Math is not about answering a bunch of questions and getting them right. Our goal is to think deeply, connect representations, reason, and justify our thinking. Thinking deeply about math ideas is much more important than speed.  Laurent Schwartz won the Fields Medal in mathematics and was considered one of the greatest mathematicians of his time. He wrote a book about his life and said that when he was in school he felt stupid because his school valued fast thinking, but he thought slowly and deeply. He said, “*I was always deeply uncertain about my own intellectual capacity; I thought I was unintelligent. And it is true that I was, and still am, rather slow. I need time to seize things because I always need to understand them fully. Towards the end of the eleventh grade, I secretly thought of myself as stupid. I worried about this for a long time. I’m still just as slow…At the end of the eleventh grade, I took the measure of the situation, and came to the conclusion that rapidity doesn’t have a precise relationship to intelligence. What is important is to deeply understand things and their relationship to each other. This is where intelligence lies. The fact of being quick or slow isn’t really relevant*.” (Jo Boaler, Mathematical Mindsets, page 30)  Askstudents what Laurent Schwartz meant by this statement: “…*rapidity doesn’t have a precise relationship to intelligence.”* (You might also emphasize again that he was an award winner and considered one of the greatest mathematicians of his time). Summarize by saying: Top mathematicians think slowly and deeply. We should not race to finish first, but rather we should focus on finishing with a greater understanding. |
| **During: 30 minutes** |
| **2. Math Activity**  Tell students that today we are going to complete an activity called “Framing Rectangles.” Tell students that they will be thinking about area and perimeter of rectangles. Ask students what they remember about area and perimeter. Be sure to focus on the idea that **area is the number of squares it takes to cover a rectangle**, and **perimeter is the length around the edge of the rectangle**.  Provide students with the Framing Rectangles handout. Make sure students are aware of the location of tools such as square tiles and graph paper. Students use tools such as square tiles and graph paper with partners to complete the Framing Rectangles handout. As students are working, ask questions such as:   * How do you know that you have all of the rectangles for this number? * What patterns or structures did you use? (i.e. students may have ‘tested’ each number by going in order to be sure) * How might you group these numbers based on the information you are finding? |
| **After: 20 minutes** |
| **3. Discussion**  Discuss the rectangles that can be made from each number 1 to 30. Record with dimensions on the board or on several sheets of chart paper or construction paper. Then ask students what they noticed about the number of rectangles for each number. Students may notice that some numbers only have one rectangle and other numbers have many rectangles.  ***(During Cluster 2, students will complete a similar activity in the lesson Making Rectangles - NC.4.OA.4. They will make rectangles and explore the mathematics at a deeper level connecting to factors, multiples, and prime and composite numbers.*  *Mastery of this vocabulary is not expected at this time. This lesson simply stands as an exploration and will be connected to the mathematics content at a later time.)***  Discuss questions 3 or 4 and ask students how they know their rectangles meet the criteria of the challenge. Tell students that they can continue to think about those questions because that’s what mathematicians do. They don’t need to hurry to finish, but they keep thinking about math ideas over time to understand them better.  **Say:** Let’s make learning deeply our community class goal. Our goal is to listen and learn from peers. We have lots to learn, and we will learn it best when we see ourselves as a team with a goal of learning and learning deeply. Let’s watch this video that summarizes many of the ideas that we have talked about this week. Think about what is most important for you to remember as you learn math this school year. After this video, you will have an opportunity to write about it in your journals and find a way to represent what you want our math classroom to be like this year.  Boosting Messages: https://www.youcubed.org/resources/four-boosting-messages-jo-students/  Give students an opportunity to reflect in their math journals and create a small poster titled: Our Math Classroom is a Place Where…” Then students should represent with words, lists, illustrations, or graffiti writing what they hope our classroom will be like over the entire school year. Tell students that we will continue to use these posters to remind us of what we want our math class to be like this year. |

\*Ideas, tasks, and some videos for this series of lessons were developed from the following the Week of Inspiration and Tasks tabs at <https://www.youcubed.org/> and Jo Boaler’s book Mathematical Mindsets: Unleashing Students’ Potential Through Creative Math, Inspiring Messages, and Innovative Teaching. However, these lessons and videos are in a different order, contain additional detail, have an explicit connection to Standards for Mathematical Practice, and contain a few outside sources. YouCubed (<https://www.youcubed.org/>) is a free site, but you will have to register to access some of the materials. Additional information regarding today’s activity can be found here: <https://bhi61nm2cr3mkdgk1dtaov18-wpengine.netdna-ssl.com/wp-content/uploads/2017/07/3-5-WiM-3-Framing-Rectangles-revised.pdf>.

**Framing Rectangles** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Challenge Questions:**

1. How many rectangles can be made for each number from 1 to 30? Use square tiles or graph paper to explore the number of rectangles that can be made for each number. Record the rectangles you find for each number.

2. How might you group the numbers 1 to 30 based on the number of rectangles you made?

3. Create a rectangle with a border (perimeter) that takes the same number of square tiles to cover (area). Find as many rectangles as you can.

4. Create a rectangle with a border (perimeter) that takes double the number of square tiles to cover (area). Find as many rectangles as you can.