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| **Building Mathematical Mindsets: Day 5 for Grade 5** |
| **Lesson Overview:** |
| **Standards:** SMP 3-I can tell others my ideas in math. I can listen to the ideas of others in math.SMP 7-I can notice patterns and structures in math.SMP 8-I can make statements describing patterns I see in math.**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:** * student copies 8 Squares recording
* 1 set of 8 squares already cut apart per group of 3-4
* color tiles
* graph paper
* math journals

**Video**:Boosting Messages video https://www.youcubed.org/resources/four-boosting-messages-jo-students/ (8:35) |
| **Before: 10 minutes** |
| 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 times 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)Ask students 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).Additional information: **First woman,** Maryam Mirzakhani **to win the Fields Medal stated: *“You have to spend some energy and effort to see the beauty of math*.”** *"It is fun — it's like solving a puzzle or connecting the dots in a detective case," Mirzakhani said*[*when she won the prestigious Fields Medal*](http://www.npr.org/sections/thetwo-way/2014/08/13/340086786/maths-highest-honor-is-given-to-woman-for-the-first-time)*in 2014. "I felt that this was something I could do, and I wanted to pursue this path."*More information can be found here: <https://www.bing.com/videos/search?q=maryam+mirzakhani+youtube&view=detail&mid=DE9136A15EB3877044FADE9136A15EB3877044FA&FORM=VIRE>Summarize: Top mathematicians think slowly and deeply. We should not race to finish first, but rather we should focus on finishing with a greater understanding.Tell students that today we are going to complete an activity called “8 squares.” Your table group will be given sets of shapes. Those shapes can be used to form 8 squares. Your first job is to work as a table group to make the 8 squares. After you have the 8 squares, your group will work together to decide the fractional size of each piece if 1 square is one whole. Who remembers how we decided that we could know if half of a square was covered earlier this week? And what about one fourth? You may find some halves and fourths in these pieces, but there are also some other fractions. Take the time to think deeply about the pieces with your group? What size is each piece? How do you know? Your group will record the squares and size of each piece on the recording sheet.  |
| **During: 30 minutes** |
| Students work in table groups to build the 8 squares and identify the fractional value of each piece.* What strategies did you use to build a square?
* How did you decide the fractional value of that piece?
* Can you use one piece to find the fractional value of another piece?
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| **After: 20 minutes** |
| Discuss strategies used to build squares and to identify the size of each piece. Highlight standards for mathematical practice used in class. Students may identify and make use of mathematical structures (MP7) and possibly making mathematical claims (MP8) by using understanding that any time a half is cut into 2 equal parts, you have a fourth. And anytime you cut a fourth into 2 equal parts you have an eighth. Students may also provide mathematical arguments and critique the reasoning of their peers (MP3). You might make note of students who were taking time to deeply think about the relationships between the sizes of different pieces. Say: Let’s make learning deeply our community class goal. Our goal is to listen and learn from peers. We have a lot 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.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 write what they hope their 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. <https://www.youcubed.org/> is a free site, but you will have to register to access some of the materials. Today’s 8 square activity was adapted from an idea in *Comprehending Math* (Chapter 3: Visualization) by Arthur Hyde

Key:

There is more than one way for squares to be formed, but here is one possible way:

D-H-H, D-J-J, J-K-G, R-N-M, S-A-S, S-B-C-S, E-P-P, F-Q-O-O

Sizes:

A = ¾, B= 3/8, C= 3/8, D=1/2, E=1/2, F=1/8, G=1/2, H=1/4, J=1/4, K=1/4, M=3/8, N=1/2, O=1/4, P=1/4, Q=3/8, R=1/8, S=1/8

**8 Squares** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Record how your group formed the 8 squares. Draw as close as possible, but you can use the letters of the shapes to label the pieces as well. Use a fraction to describe the size of each piece if one square is one whole.

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| --- | --- | --- | --- | --- | --- |
| A = | B =  | C =  | D =  | E = | F = |
| G = | H = | J = | K = | M = | N = |
| O = | P = | Q = | R = | S = |  |

How much of a whole is each piece?







