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| **Building Mathematical Mindsets: Day 3 for Grade 4** |
| **Lesson Overview:** |
| **Standards for Mathematical Practice:** 1. Make sense of problems and persevere in solving them.3. Construct viable arguments and critique the reasoning of others.5. Use appropriate tools strategically.6. Attend to precision.**Mathematical Mindset Goal:*** Mathematicians ask questions about their own work and the work of others to make sense of math.
* Mistakes are valuable. Our brains are growing when we make mistakes.

**Materials:** * anchor chart paper for norms developed in class (Titles: “Things we will do when we work together:” and “Things we won’t do when we work together:”)
* Brain Teaser Puzzles handout (1 per student)
* Manipulatives for Brain Teaser Puzzles (tangrams, toothpicks, counters, etc.)
* Printable Tangrams: <https://www.education.com/slideshow/tangrams/>
* math journals

**Video**:* Mistakes are Powerful: https://www.youcubed.org/resources/mistakes-powerful-video/ (2:44)
* You Can Learn Anything: <https://www.youtube.com/watch?v=JC82Il2cjqA> (1:30)
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| **Before: 15 minutes** |
| **1. Review****Say:** We are using our first week of school to begin building a mathematical mindset that will help us to grow as mathematicians all year long. Ask: What are some of the things that we have talked about over the past two days that we can remember throughout the year? Give students an opportunity to share a few of the ideas from the past few days. **2. Introduction****Say:** Today, we are going to talk about two other important habits of mathematicians. Mathematicians ask many questions. Questions are really important. When we ask questions about what we are seeing or ideas that our classmates are sharing, we are trying to make sense of the mathematics we are exploring. Mathematicians ask many questions. Sometimes they ask questions of their own work and other times they ask questions about the thinking of other mathematicians. We have already seen that our classmates sometimes see things in a different way. We can learn more about a math idea by trying to think deeply about how the different representations we see are connected.Mathematicians ask questions like…* Does that make sense?
* Why does that work?
* How is that strategy connected to the one I used? What is different? What is the same?
* Does that work all of the time or is this a special case?
* What do these numbers represent?
* Is my answer reasonable?

Researchers have found that students who ask these kinds of question have higher achievement in math. Of course! If you ask questions to understand and learn from thoughts and ideas that develop because of the questions, then your brain is growing. **3. Video****Say:** Today, we are also going to talk about something that may surprise you: Mistakes are valuable. Scientists studying how we learn have discovered that our brains are growing when we make mistakes (mistakes are a good thing). That means that it is through mistakes that we grow and learn. So, easy work is a waste of time. Our brain is not growing and learning when we only do things that are easy for us. Show this short video clip from YouCubed: Mistakes are Powerful: https://www.youcubed.org/resources/mistakes-powerful-video/ (2:44)**Say:** We can appreciate mistakes, because it means we are growing and learning. When a mistake is shared in class, this helps us all to understand what we are learning about a little bit better. So, we should all thank someone who makes a mistake because they are helping us all to grow and learn! |
| **During: 25 minutes** |
| **4. Math Activity****Say:** Today, we are going to work with partners to solve several puzzles. As you work with your partner, ask questions and make sense of each puzzle. Listen to your own questions and to your partner’s questions. Jot down some questions you ask. Take notes about what you notice as you try to answer your question. Consider which tools might help you to think about the problem. How can you use the tools to show your thinking? Tell students that they may make mistakes today as they are trying to solve the puzzles, but they can know that their braining is growing and that they just have to keep working to figure it out. Give students time to work with partners to solve the puzzles (see handout). As students are working, move around the room visiting as many pairs as possible. Acknowledge how students are working with their partners, sharing ideas, listening to their partner’s ideas, and responding when they make a mistake.  |
| **After: 20 minutes** |
| **5. Establishing Norms****Say:** During math class this year, we will have lots of opportunities to share ideas (MP3). Before we have our discussion today, let’s think about some norms for our classroom discussions. When a group or family works together to make norms, they think about some things they like and don’t like when they work with others. Since we will be working with partners, in groups, and as a whole class at different times throughout the year, let’s set up some norms that will help us work together. Talk in your table group about some things that you like or appreciate when you are working with others. Give students about 5 minutes to discuss ideas.  Make a class norms anchor chart with two sections: “Things we will do when we work together:” and “Things that we won’t do when we work together:”. After students have had some time to think, have several students share ideas. Ask if someone else agrees with that norm. If so, ask someone to explain why. Provide the prompt….”I agree because…” **Say:** Sometimes we disagree with our classmates. Does it mean that we don’t like them or that we think they are not smart if we disagree? Of course, not…it just means we are thinking in a different way. Ask if any one disagrees with the norm and why. Provide the prompt, “I disagree because…” Through the discussion, come to a consensus on what the norm should be (it may be an adapted version of the original). Collect about three norms for what we like. Then repeat with ideas that we don’t like.Keep in mind that you will need to continue to work with students on listening to other’s ideas. You may talk about behaviors that show that we are listening and interested in ideas that others are sharing. Some behaviors that are important for listening:* Look at the person who is speaking.
* Listen to hear, but most importantly, listen to understand. Your brain should be thinking: Does this make sense? How does this connect with what I was already thinking or what I’ve already done? Do I agree or disagree?
* Lean in a little to show interest.
* You can ask questions to help you understand, but be careful not to interrupt mid-sentence. Let the speaker finish their thought.

**Say:** Let’s practice using our new norms today with a discussion about strategies used to complete some of the puzzles today. Have students share what strategies they used and what questions they asked as they were working. Encourage students to clarify when they make general statements like “It had to add to nine every time.” Ask, what is “it”? Or if a student says, “I did it differently.” Ask, what is it? How was it different?” Keep examples like this in mind. (MP 6)Discuss what happened when ideas didn’t work today. Remind students that we all make mistakes as we learn. It’s how our brain grows. None of us were born knowing math, so we are all learning and moving forward and that is what is important. Tell students that today we worked as mathematicians persevering when a task was hard (SMP1). We also practiced working with our classmates (SMP3) This video is a reminder about how important mistakes are in our learning. Be ready to reflect in your math journal about what you have learned today when the video finishes. You Can Learning Anything: <https://www.youtube.com/watch?v=JC82Il2cjqA>Give students an opportunity to reflect on something interesting they learned from math class today in their math journals.  |

\*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. Puzzle ideas were taken from *Creative Problem Solving in School Mathematics* by George Lenchner.