MATHEMATICAL PRACTICES IN THIS UNIT

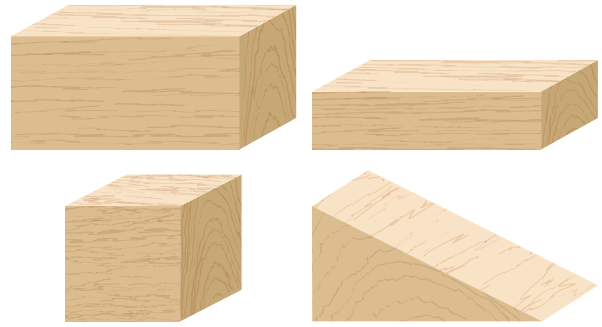
The eight Mathematical Practices are a critical part of students' mathematics learning. Mathematical Practice Notes are included throughout the unit to indicate opportunities for engaging students in these practices. Each unit focuses specifically on two Mathematical Practices.

In this unit, the highlighted practices are MP3, Construct viable arguments and critique the reasoning of others, and MP7, Look for and make use of structure. This essay describes each of these practices and provides examples from the unit of how to engage Grade 2 students in them.

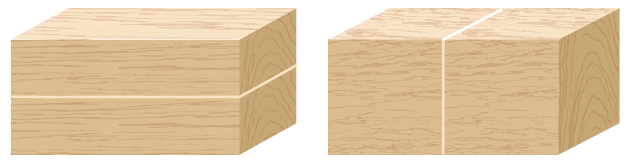
MP3 Construct viable arguments and critique the reasoning of others.

> Mathematically proficient students at the elementary grades construct mathematical arguments—that is, explain the reasoning underlying a strategy, solution, or conjecture—using concrete referents such as objects, drawings, diagrams, and actions. . . . Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). In the elementary grades, arguments are often a combination of all three. Some of their arguments apply to individual problems, but others are about conjectures based on regularities they have noticed across multiple problems (see MP8, Look for and express regularity in repeated reasoning). . . . Mathematically proficient students can listen to or read the arguments of others, decide whether they make sense, ask useful questions to clarify or improve the arguments, and build on those arguments. They can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.
>
> (Illustrative Mathematics, *Standards for Mathematical Practice: Commentary and Elaborations for K–5*)

To engage students in constructing viable arguments and critiquing the reasoning of others involves establishing a classroom culture in which students voice their ideas and allow their classmates to challenge them. That is, students listen to each other respectfully and think hard about the ideas presented. They compare their ideas to those a classmate has offered and consider whether their thinking is the same, whether the classmate's thought has triggered a new idea, or whether they disagree. In the following scenario, students are proving which Geoblocks are halves of other blocks. Anita, Marisa, and Leo have found three blocks that are half of rectangular prism K: rectangular prism J, cube D, and triangular prism N.

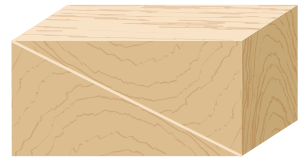


Anita: See, if you put two of these blocks together, they make the big block.



Leo: At first we didn't believe the triangle was half, but Marisa showed us.

Leo picks up two triangular prisms N to show how they fit together to make a shape congruent to rectangular prism K.



All three students agree on what it means to prove one block is half of another: If two identical blocks can be placed together to form a shape congruent to a third block, then the smaller blocks are each half of the larger block. In their demonstration to the teacher, Leo credits Marisa with having proved to Anita and him that triangular prism N is half of rectangular prism K.

The teacher now poses another challenge to the group: To determine whether the three blocks, each of which is half of block K, contain the same amount of wood or if one is larger than another. Anita, Leo, and Marisa begin to explore this question, and when the teacher returns, they are not in agreement.

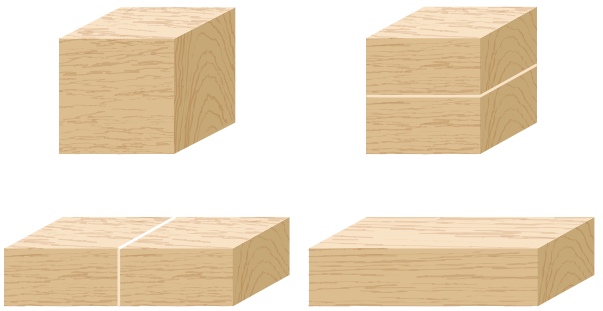
Leo: Look at how it sticks up. The triangle has to be bigger. [Leo is referring to triangular prism N.]

Marisa: But it doesn't stick up more than the cube.

Leo: But it sticks out this way.

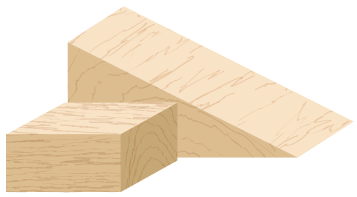
Teacher: I see you have different ideas about the triangular prism. What did you find out about the cube and the rectangular prism?

Anita: We can show they're the same. [Anita stacks two copies of rectangular prism H.] See, this is like the cube. [She slides the top block off, sets it alongside the other, and sets the two alongside block J.] Now it's like this one.



Leo: Both are two of those blocks. So they're the same.

Marisa pushes one copy of block H against the triangular prism.



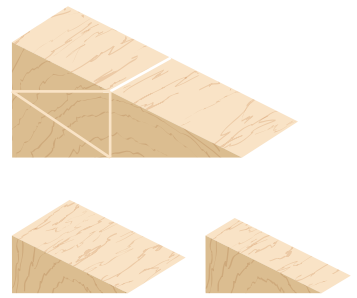
Marisa: This is also two of those, but it's hard to show.

The group has determined a way to prove that two different blocks contain the same amount of wood (that is, they represent the same quantity). If each block can be built up by the same smaller blocks, then they are the same. By rearranging two copies of block H, they demonstrate that blocks J, the rectangular prism, and D, the cube, are equivalent.

Because block N, the triangular prism, cannot be built from two copies of block H, they cannot prove in the same way that N is also equivalent to J and D. In fact, just looking at its shape, Leo believes that N must be larger. Marisa seems to be comparing the shapes in a different way and disagrees with Leo. The teacher recognizes that the students don't yet have the tools to resolve this issue.

Teacher: It's time to clean up now, but I want you to keep thinking about this question. Leo believes that the triangular prism is larger, and Marisa believes that both blocks are the same size. You might look at different ways to build up block N. Next time, work with block H together with these two smaller triangular prisms (Geoblocks Q and V) and see what you get.

At the end of the lesson, the question remains open for the students to continue to explore. The teacher guides students to specific Geoblocks (Q and V) because those blocks can be used to compose Geoblocks J, D, and N. As they continue to work, Marisa and Leo might discover that all of the Geoblocks J, D, and N can be built from four copies of Geoblock Q or eight copies of Geoblock V.



The following chart shows where Mathematical Practice Notes specifically address MP3 and when that mathematical practice is assessed.

MP3 Construct viable arguments and critique the reasoning of others.

SESSION	MPN	ASSESSMENT CHECKLIST
1.1	●	
1.2	●	
1.3	●	
2.2	●	
3.1		●
3.2	●	●
3.3	●	●
3.4	●	●
3.5	●	