

## **MP2 Reason abstractly and quantitatively.**

Mathematically proficient students at the elementary grades make sense of quantities and their relationships in problem situations. They can contextualize quantities and operations by using images or stories. They interpret symbols as having meaning, not just as directions to carry out a procedure. Even as they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects.

(Illustrative Mathematics, *Standards for Mathematical Practice: Commentary and Elaborations for K–5*)

In this unit, students work with situations that involve multiplicative relationships. They reason about these relationships using the contexts of cube buildings and pattern blocks and also reason about the number patterns they see when they record the accumulation of equal groups. For example, in Session 2.2, they use tables to represent buildings that have 3 rooms on each floor. Once a table is filled out, however, students sometimes see the number pattern (e.g., counting by 3s) but lose their sense of how those numbers tell a story about how the building is changing as more floors are added.

Number of Floors	Number of Rooms
1	3
2	6
3	9
4	12
5	15
6	18

**Teacher:** What is happening in this column? [The teacher points to the first column, the number of floors.]

**Jeffrey:** It's going by one. The number, it goes by 1s.

**Teacher:** How about the column for the total number of rooms?

**Jacy:** It's going by 3s.

**Nate:** You're counting by 3s, because if you count 3 plus 3 is 6, and you do the same thing for the 6 and it goes to 9, and the same thing to the 9 and it goes to 12.

The students are describing the pattern they see in the table as they look at the numbers, but it is not clear whether they are connecting these numbers to what they represent in the cube buildings. The teacher next focuses students' attention on one row of the table to help them think through that connection. She points to the second row of the table.

**Teacher:** So, what does this mean going across? What does the two mean and what does the six mean?

**Rochelle:** I think there will be two floors and six rooms.

**Teacher:** What does that mean, two floors and six rooms? What does she mean by that?

**Simon:** It means if you put three on top, you have six.


**Teacher:** Three on top of what? Who can show me with the cubes what this second row means?



A key feature of multiplicative relationships is that they involve two different units, the number of groups and the number of items in a group, and it is often challenging for second graders to keep track of and coordinate those units. In the context of buildings that students build with connecting cubes (and later in the context of pattern blocks), students can point to the rooms, the floors, and the building as a whole to keep clear about what the units are and what patterns in the table mean.

By helping students keep abstractions connected to contexts, the teacher supports students as they develop meaning for the symbols and gain experience with multiplicative structures. It is through maintaining images of groups that students develop problem-solving strategies that lay the foundation for their future work in multiplication.

The following chart shows where Mathematical Practice Notes specifically address MP2 and when that mathematical practice is assessed.

 <b>MP2 Reason abstractly and quantitatively.</b>		
<b>SESSION</b>	<b>MPN</b>	<b>ASSESSMENT CHECKLIST</b>
1.1	•	
1.2	•	
2.1	•	
2.2	•	
2.3	•	
2.4		•
2.5	•	•
2.6	•	•