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. . . . Arguments may also rely on definitions, previously established results, properties, or structures. . . . Students might also use counterexamples to argue that a conjecture is not true. . . .
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> 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.
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> (Illustrative Mathematics, *Standards for Mathematical Practice: Commentary and Elaborations for K–5*)

In Investigation 3, which focuses on classifying 2-D shapes, students refer to definitions in order to determine which shapes belong in which categories. In Session 3.5, the class is discussing how a rhombus is related to other shapes by referring to the characteristics of square, rectangle, rhombus, and quadrilateral on their chart.

Teacher: So what matters in order for this shape [holds up the blue pattern block] to be a rhombus?

Edwin: The sides just have to be even.

Oscar: And it has to be four sides.

Teacher: It has to have four sides—a quadrilateral—and the sides have to be equal. [puts out all six pattern block pieces] So which of these are rhombuses, and which are not, and how do you know?

Elena: The green one isn't because it's a triangle

Keith: And the yellow one has 6 sides, not 4.

Pilar: The red one has four, but they're not equal, so it's not.

Adam: And the orange one is a square, so it's . . . wait . . .

Teacher: Hmmm. What are you all thinking about this one?

Gil: It's a square, so it can't be a rhombus. [mutterings of assent and some disagreement]

Jane: Wait, it *does* have 4 sides, and they *are* equal.

Gil: But in a rhombus the angles are slanty. A square has right angles.

Arthur: We don't have anything about slanty on our chart.

Denzel: I think a rhombus shouldn't have right angles.

Teacher: So, actually, having right angles isn't part of how mathematicians define a rhombus. As long as it has four straight sides that are equal, it's a rhombus.

Gil: But if the orange square is square, it can't be a rhombus. Like it can't be a triangle *and* a square.

Pilar: Why not? We already said that a square is a special rectangle, so it could be a special rhombus, too. Plus it's a quadrilateral.

Benjamin: Is a square just everything?

Bridget: Not a triangle.

In this discussion, students are working together to clarify what a rhombus is, what shapes are rhombuses, and how a rhombus is related to the other shapes they have been discussing. Students are learning to base their arguments about how to classify a particular shape on *properties* of the shapes rather than on an overall impression of what a shape looks like. Sometimes students listen to and build on each others' arguments; at other times, they offer a counter argument. For example, when Gil states that a shape can't be both a square and a rhombus, Pilar offers an example of how a particular shape can fit into more than one category.

Throughout the discussion, the teacher asks questions to move the discussion forward or provides critical information. For example, when Denzel suggests that maybe a rhombus can't have right angles, the teacher clarifies what the properties of a rhombus are—since these are a matter of definition. While students can argue from an established mathematical definition, they cannot change that definition.

In both of the examples above, MP6 and MP3 are closely related. In the episode under MP6, students are attending to precision as they discuss measuring the area of an irregular shape, but they are also engaged in making arguments about why it is important to count the part of the area that is outside of Kathryn's rectangles. They clarify the concept of area as they critique her stance that area is always determined by multiplying. Other students make arguments about how one might take into account partial square units. In the example under MP3, students are attending to the precision of their language as they describe and classify shapes. By constructing arguments about how a shape does or does not fit into a particular category, they deepen their understanding of mathematical vocabulary.

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

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SESSION	MPN	ASSESSMENT CHECKLIST
2.2	●	
2.3	●	
2.5	●	●
2.6	●	
2.7		●
3.2	●	
3.3	●	