

Connecting Mathematical Practices and Content

The Standards for Mathematical Practice (MP) are developed throughout each grade and, together with the content standards, prescribe that students experience mathematics as a rigorous, coherent, useful, and logical subject. The MP standards represent a picture of what it looks like for students to understand and do mathematics in the classroom and should be integrated into every mathematics lesson for all students.

Although the description of the MP standards remains the same at all grades, the way these standards look as students engage with and master new and more advanced mathematical ideas does change. Table 5-2 presents examples of how the MP standards may be integrated into tasks appropriate for students in grade five. (Refer to the Overview of the Standards Chapters for a description of the MP standards.)

Table 5-2. Standards for Mathematical Practice—Explanation and Examples for Grade Five

Standards for Mathematical Practice	Explanation and Examples
<p>MP.1</p> <p>Make sense of problems and persevere in solving them.</p>	<p>In grade five, students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions that include mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. For example, “Sonia had $2\frac{1}{3}$ sticks of gum. She promised her brother that she would give him $\frac{1}{2}$ of a stick of gum. How much will she have left after she gives her brother the amount she promised?” Teachers can encourage students to check their thinking by having students ask themselves questions such as these: “What is the most efficient way to solve the problem?” “Does this make sense?” “Can I solve the problem in a different way?”</p>
<p>MP.2</p> <p>Reason abstractly and quantitatively.</p>	<p>Students recognize that a number represents a specific quantity. They connect quantities to written symbols and create logical representations of problems, considering appropriate units and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Teachers can support student reasoning by asking questions such as these: “What do the numbers in the problem represent?” “What is the relationship of the quantities?” Students write simple expressions that record calculations with numbers and represent or round numbers using place-value concepts. For example, students use abstract and quantitative thinking to recognize, without calculating the quotient, that $0.5 \times (300 \div 15)$ is $\frac{1}{2}$ of $(300 \div 15)$.</p>
<p>MP.3</p> <p>Construct viable arguments and critique the reasoning of others.</p>	<p>In grade five, students may construct arguments by using visual models such as objects and drawings. They explain calculations based upon models, properties of operations, and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions such as “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to others’ thinking.</p> <p>Students use various strategies to solve problems, and they defend and justify their work to others. For example: “Two after-school clubs are having pizza parties. The teacher will order 3 pizzas for every 5 students in the math club and 5 equally sized pizzas for every 8 students on the student council. How much pizza will each student get at the respective parties? If a student wants to attend the party where she will get the most pizza (assuming the pizza is divided equally among the students at the parties), which party should she attend?”</p>

Table 5-2 (continued)

Standards for Mathematical Practice	Explanation and Examples
MP.4 Model with mathematics.	Fifth-grade students experiment with representing problem situations in multiple ways—for example, by using numbers, mathematical language, drawings, pictures, objects, charts, lists, graphs, and equations. Teachers might ask, “How would it help to create a diagram, chart, or table?” or “What are some ways to represent the quantities?” Students need opportunities to represent problems in various ways and explain the connections. Students in grade five evaluate their results in the context of the situation and explain whether answers to problems make sense. They evaluate the utility of models they see and draw and can determine which models are the most useful and efficient for solving particular problems.
MP.5 Use appropriate tools strategically.	Students consider available tools, including estimation, and decide which tools might help them solve mathematical problems. For instance, students may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions to find a pattern for volume using the lengths of the sides. They use graph paper to accurately create graphs, solve problems, or make predictions from real-world data.
MP.6 Attend to precision.	Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Teachers might ask, “How do you know your solution is reasonable?” Students use appropriate terminology when they refer to expressions, fractions, geometric figures, and coordinate grids. Teachers might ask, “What symbols or mathematical notations are important in this problem?” Students are careful to specify units of measure and state the meaning of the symbols they choose. For instance, to determine the volume of a rectangular prism, students record their answers in cubic units.
MP.7 Look for and make use of structure.	Students look closely to discover a pattern or structure. For instance, they use properties of operations as strategies to add, subtract, multiply, and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation. Teachers might ask, “How do you know if something is a pattern?” or “What do you notice when _____?”
MP.8 Look for and express regularity in repeated reasoning.	Grade-five students use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand and use algorithms to extend multi-digit division from one-digit to two-digit divisors and to fluently multiply multi-digit whole numbers. They use various strategies to perform all operations with decimals to hundredths, and they explore operations with fractions with visual models and begin to formulate generalizations. Teachers might ask, “Can you explain how this strategy works in other situations?” or “Is this always true, sometimes true, or never true?”

Adapted from Arizona Department of Education (ADE) 2010 and North Carolina Department of Public Instruction 2013b.

Standards-Based Learning at Grade Five

The following narrative is organized by the domains in the Standards for Mathematical Content and highlights some necessary foundational skills from previous grade levels. It also provides exemplars to explain the content standards, highlight connections to Standards for Mathematical Practice (MP), and demonstrate the importance of developing conceptual understanding, procedural skill and fluency, and application. A triangle symbol (▲) indicates standards in the major clusters (see table 5-1).