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 grade levels, the way these standards look as students engage with and master new and more advanced mathematical ideas does change. Table 6-2 presents examples of how the MP standards may be integrated into tasks appropriate for students in grade six. (Refer to the Overview of the Standards Chapters for a description of the MP standards.)

Table 6-2. Standards for Mathematical Practice—Explanation and Examples for Grade Six

Standards for Mathematical Practice	Explanation and Examples
MP.1 Make sense of problems and persevere in solving them.	In grade six, students solve real-world problems through the application of algebraic and geometric concepts. These problems involve ratio, rate, area, and statistics. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking 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?" Students can explain the relationships between equations, verbal descriptions, and tables and graphs. Mathematically proficient students check their answers to problems using a different method.
MP.2 Reason abstractly and quantitatively.	Students represent a wide variety of real-world contexts by using rational numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to operate with symbolic representations by applying properties of operations or other meaningful moves. To reinforce students' reasoning and understanding, teachers might ask, "How do you know?" or "What is the relationship of the quantities?"
MP.3 Construct viable arguments and critique the reasoning of others.	Students construct arguments with verbal or written explanations accompanied by expressions, equations, inequalities, models, graphs, tables, and other data displays (e.g., box plots, dot plots, histograms). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions such as these: "How did you get that?" "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.
MP.4 Model with mathematics	In grade six, students model problem situations symbolically, graphically, in tables, contextually, and with drawings of quantities as needed. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. They begin to explore covariance and represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (e.g., box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to make sense of and explain the connections between the different representations. They should be able to use any of these representations, as appropriate, and apply them to a problem context. Students should be encouraged to answer questions such as "What are some ways to represent the quantities?" or "What formula might apply in this situation?"

Table 6-2 *(continued)*

Standards for Mathematical Practice	Explanation and Examples
MP.5 Use appropriate tools strategically.	When solving a mathematical problem, students consider available tools (including estimation and technology) and decide when particular tools might be helpful. For instance, students in grade six may decide to represent figures on the coordinate plane to calculate area. Number lines are used to create dot plots, histograms, and box plots to visually compare the center and variability of the data. Visual fraction models can be used to represent situations involving division of fractions. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures. Students should be encouraged to answer questions such as "What approach did you try first?" or "Why was it helpful to use _____?"
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. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations, or inequalities. When using ratio reasoning in solving problems, students are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. Students also learn to express numerical answers with an appropriate degree of precision when working with rational numbers in a situational problem. Teachers might ask, "What mathematical language, definitions, or properties can you use to explain _____?"
MP.7 Look for and make use of structure.	Students routinely seek patterns or structures to model and solve problems. For instance, students notice patterns that exist in ratio tables, recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (e.g., $6+3x=3(2+x)$ by the distributive property) and solve equations (e.g., $2c+3=15$, $2c=12$ by the subtraction property of equality, $c=6$ by the division property of equality). Students compose and decompose two- and three-dimensional figures to solve real-world problems involving area and volume. Teachers might ask, "What do you notice when _____?" or "What parts of the problem might you eliminate, simplify, or _____?"
MP.8 Look for and express regularity in repeated reasoning.	In grade six, students use repeated reasoning to understand algorithms and make generalizations about patterns. During opportunities to solve and model problems designed to support generalizing, they notice that $\frac{a}{b} \div \frac{c}{d} = \frac{ad}{bc}$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations that show the relationships between quantities. Students should be encouraged to answer questions such as, "How would we prove that _____?" or "How is this situation like and different from other situations?"

Adapted from ADE 2010, North Carolina Department of Public Instruction (NCDPI) 2013b, and Georgia Department of Education (GaDOE) 2011.