

## 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 8-2 presents examples of how the MP standards may be integrated into tasks appropriate for students in grade eight. (Refer to the Overview of the Standards Chapters for a description of the MP standards.)

**Table 8-2. Standards for Mathematical Practice—Explanation and Examples for Grade Eight**

Standards for Mathematical Practice	Explanation and Examples
<p><b>MP.1</b> Make sense of problems and persevere in solving them.</p>	<p>In grade eight, students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking 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><b>MP.2</b> Reason abstractly and quantitatively.</p>	<p>Students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students <i>contextualize</i> to understand the meaning of the number(s) or variable(s) related to the problem and <i>decontextualize</i> to manipulate symbolic representations by applying properties of operations.</p>
<p><b>MP.3</b> Construct viable arguments and critique the reasoning of others.</p>	<p>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.</p>
<p><b>MP.4</b> Model with mathematics.</p>	<p>Students in grade eight model real-world problem situations symbolically, graphically, in tables, and contextually. Working with the new concept of a <i>function</i>, students learn that relationships between variable quantities in the real world often satisfy a dependent relationship, in that one quantity determines the value of another. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students use scatter plots to represent data and describe associations between variables. They should be able to use any of these representations as appropriate to a particular problem context. Students should be encouraged to answer questions such as “What are some ways to represent the quantities?” or “How might it help to create a table, chart, graph, or _____?”</p>

**Table 8-2 (continued)**

Standards for Mathematical Practice	Explanation and Examples
<p><b>MP.5</b> Use appropriate tools strategically.</p>	<p>Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when particular tools might be helpful. For instance, students in grade eight may translate a set of data given in tabular form into a graphical representation to compare it with another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal that intersects parallel lines. Teachers might ask, “What approach are you considering?” or “Why was it helpful to use _____?”</p>
<p><b>MP.6</b> Attend to precision.</p>	<p>In grade eight, 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 the number system, functions, geometric figures, and data displays. Teachers might ask, “What mathematical language, definitions, or properties can you use to explain _____?”</p>
<p><b>MP.7</b> Look for and make use of structure.</p>	<p>Students routinely seek patterns or structures to model and solve problems. In grade eight, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.</p>
<p><b>MP.8</b> Look for and express regularity in repeated reasoning.</p>	<p>In grade eight, students use repeated reasoning to understand the slope formula and to make sense of rational and irrational numbers. Through multiple opportunities to model linear relationships, they notice that the slope of the graph of the linear relationship and the rate of change of the associated function are the same. For example, as students repeatedly check whether points are on the line with a slope of 3 that goes through the point (1, 2), they might abstract the equation of the line in the form <math>\frac{y-2}{x-1} = 3</math>. Students divide to find decimal equivalents of rational numbers (e.g., <math>\frac{2}{3} = 0.\bar{6}</math>) and generalize their observations. They use iterative processes to determine more precise rational approximations for irrational numbers. 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 using these operations?”</p>

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

## Standards-Based Learning at Grade Eight

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 8-1).