Mathematics Standards

For more than a decade, research studies of mathematics education in high-performing countries have concluded that mathematics education in the United States must become substantially more focused and coherent in order to improve mathematics achievement in this country. To deliver on this promise, the mathematics standards are designed to address the problem of a curriculum that is “a mile wide and an inch deep.”

These new standards build on the best of high-quality math standards from states across the country. They also draw on the most important international models for mathematical practice, as well as research and input from numerous sources, including state departments of education, scholars, assessment developers, professional organizations, educators, parents and students, and members of the public.

The math standards provide clarity and specificity rather than broad general statements. They endeavor to follow the design envisioned by William Schmidt and Richard Houang (2002), by not only stressing conceptual understanding of key ideas, but also by continually returning to organizing principles such as place value and the laws of arithmetic to structure those ideas.

In addition, the “sequence of topics and performances” that is outlined in a body of math standards must respect what is already known about how students learn. As Confrey (2007) points out, developing “sequenced obstacles and challenges for students…absent the insights about meaning that derive from careful study of learning, would be unfortunate and unwise.” Therefore, the development of the standards began with research-based learning progressions detailing what is known today about how students’ mathematical knowledge, skill, and understanding develop over time. The knowledge and skills students need to be prepared for mathematics in college, career, and life are woven throughout the mathematics standards. They do not include separate Anchor Standards like those used in the ELA/literacy standards.

The Common Core concentrates on a clear set of math skills and concepts. Students will learn concepts in a more organized way both during the school year and across grades. The standards encourage students to solve real-world problems.

Understanding Mathematics

These standards define what students should understand and be able to do in their study of mathematics. But asking a student to understand something also means asking a teacher to assess whether the student has understood it. But what does mathematical understanding look like? One way for teachers to do that is to ask the student to justify, in a way that is appropriate to the student’s mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from. Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness.

**Grade 6 » Geometry**

**Solve real-world and mathematical problems involving area, surface area, and volume.**

[CCSS.Math.Content.6.G.A.1](http://www.corestandards.org/Math/Content/6/G/A/1/)
Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

[CCSS.Math.Content.6.G.A.2](http://www.corestandards.org/Math/Content/6/G/A/2/)
Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas *V = l w h* and *V = b h* to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

[CCSS.Math.Content.6.G.A.3](http://www.corestandards.org/Math/Content/6/G/A/3/)
Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

[CCSS.Math.Content.6.G.A.4](http://www.corestandards.org/Math/Content/6/G/A/4/)
Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

**Grade 7 » Geometry**

**Draw construct, and describe geometrical figures and describe the relationships between them.**

[CCSS.Math.Content.7.G.A.1](http://www.corestandards.org/Math/Content/7/G/A/1/)
Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

[CCSS.Math.Content.7.G.A.2](http://www.corestandards.org/Math/Content/7/G/A/2/)
Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

[CCSS.Math.Content.7.G.A.3](http://www.corestandards.org/Math/Content/7/G/A/3/)
Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

**Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.**

[CCSS.Math.Content.7.G.B.4](http://www.corestandards.org/Math/Content/7/G/B/4/)
Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

[CCSS.Math.Content.7.G.B.5](http://www.corestandards.org/Math/Content/7/G/B/5/)
Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

[CCSS.Math.Content.7.G.B.6](http://www.corestandards.org/Math/Content/7/G/B/6/)
Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**Grade 8 » Geometry**

**Understand congruence and similarity using physical models, transparencies, or geometry software.**

[CCSS.Math.Content.8.G.A.1](http://www.corestandards.org/Math/Content/8/G/A/1/)
Verify experimentally the properties of rotations, reflections, and translations:

[CCSS.Math.Content.8.G.A.1.a](http://www.corestandards.org/Math/Content/8/G/A/1/a/)
Lines are taken to lines, and line segments to line segments of the same length.

[CCSS.Math.Content.8.G.A.1.b](http://www.corestandards.org/Math/Content/8/G/A/1/b/)
Angles are taken to angles of the same measure.

[CCSS.Math.Content.8.G.A.1.c](http://www.corestandards.org/Math/Content/8/G/A/1/c/)
Parallel lines are taken to parallel lines.

[CCSS.Math.Content.8.G.A.2](http://www.corestandards.org/Math/Content/8/G/A/2/)
Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

[CCSS.Math.Content.8.G.A.3](http://www.corestandards.org/Math/Content/8/G/A/3/)
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

[CCSS.Math.Content.8.G.A.4](http://www.corestandards.org/Math/Content/8/G/A/4/)
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

[CCSS.Math.Content.8.G.A.5](http://www.corestandards.org/Math/Content/8/G/A/5/)
Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*.

**Understand and apply the Pythagorean Theorem.**

[CCSS.Math.Content.8.G.B.6](http://www.corestandards.org/Math/Content/8/G/B/6/)
Explain a proof of the Pythagorean Theorem and its converse.

[CCSS.Math.Content.8.G.B.7](http://www.corestandards.org/Math/Content/8/G/B/7/)
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

[CCSS.Math.Content.8.G.B.8](http://www.corestandards.org/Math/Content/8/G/B/8/)
Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

**Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.**

[CCSS.Math.Content.8.G.C.9](http://www.corestandards.org/Math/Content/8/G/C/9/)
Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.