

COMMON CORE STATE STANDARDS FOR MATHEMATICS

Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.

Mathematically proficient students:

- explain to themselves the meaning of a problem and looking for entry points to its solution.
- analyze givens, constraints, relationships, and goals.
- make conjectures about the form and meaning of the solution attempt.
- consider analogous problems, and try special cases and simpler forms of the original problem.
- monitor and evaluate their progress and change course if necessary.
- transform algebraic expressions or change the viewing window on their graphing calculator to get information.
- explain correspondences between equations, verbal descriptions, tables, and graphs.
- draw diagrams of important features and relationships, graph data, and search for regularity or trends.
- use concrete objects or pictures to help conceptualize and solve a problem.
- check their answers to problems using a different method.
- ask themselves, “Does this make sense?”
- understand the approaches of others to solving complex problems.

2. Reason abstractly and quantitatively.

Mathematically proficient students:

- make sense of quantities and their relationships in problem situations.
 - ✓ *decontextualize* (abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents and
 - ✓ *contextualize* (pause as needed during the manipulation process in order to probe into the referents for the symbols involved).
- use quantitative reasoning that entails creating a coherent representation of quantities, not just how to compute them
- know and flexibly use different properties of operations and objects.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students:

- understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- make conjectures and build a logical progression of statements to explore the truth of their conjectures.
- analyze situations by breaking them into cases
- recognize and use counterexamples.
- justify their conclusions, communicate them to others, and respond to the arguments of others.
- reason inductively about data, making plausible arguments that take into account the context
- compare the effectiveness of plausible arguments
- distinguish correct logic or reasoning from that which is flawed
 - ✓ elementary students construct arguments using objects, drawings, diagrams, and actions..
 - ✓ later students learn to determine domains to which an argument applies.
- listen or read the arguments of others, decide whether they make sense, and ask useful questions

4 Model with mathematics.

Mathematically proficient students:

- apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
 - ✓ In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community.
 - ✓ By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
- simplify a complicated situation, realizing that these may need revision later.
- identify important quantities in a practical situation
- map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- analyze those relationships mathematically to draw conclusions.
- interpret their mathematical results in the context of the situation.
- reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students

- consider available tools when solving a mathematical problem.
- are familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools
- detect possible errors by using estimations and other mathematical knowledge.
- know that technology can enable them to visualize the results of varying assumptions, and explore consequences.
- identify relevant mathematical resources and use them to pose or solve problems.

- use technological tools to explore and deepen their understanding of concepts.
- 6 Attend to precision.**
Mathematically proficient students:
- try to communicate precisely to others.
 - use clear definitions in discussion with others and in their own reasoning.
 - state the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
 - specify units of measure and label axes to clarify the correspondence with quantities in a problem.
 - calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the context.
 - ✓ In the elementary grades, students give carefully formulated explanations to each other.
 - ✓ In high school, students have learned to examine claims and make explicit use of definitions.
- 7 Look for and make use of structure.**
Mathematically proficient students:
- look closely to discern a pattern or structure.
 - ✓ Young students might notice that three and seven more is the same amount as seven and three more.
 - ✓ Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for the distributive property.
 - ✓ In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$.
 - step back for an overview and can shift perspective.
 - see complicated things, such as some algebraic expressions, as single objects or composed of several objects.
- 8 Look for and express regularity in repeated reasoning.**
Mathematically proficient students:
- notice if calculations are repeated
 - look both for general methods and for shortcuts.
 - maintain oversight of the process, while attending to the details.
 - continually evaluate the reasonableness of intermediate results.

STANDARDS FOR MATHEMATICAL CONTENT

6th grade content standards:

- Understand ratio concepts and use ratio reasoning to solve problems

7th grade content standards:

- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Draw, construct and describe geometrical figures and describe the relationships between them.

8th grade geometry content standards:

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

1. Verify experimentally the properties of rotations, reflections, and translations.
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.
3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
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.