

Smarter Balanced Assessment System: Connecting the Mathematics Claims to Classroom Instruction Grades K-5



Participant Guide
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CONNECTICUT STATE DEPARTMENT OF EDUCATION



Common Core State Standards Shifts in Mathematics

1. **Focus** strongly where the Standards focus

Focus: The Standards call for a greater focus in mathematics. Rather than racing to cover topics in a mile-wide, inch-deep curriculum, the Standards require us to significantly narrow and deepen the way time and energy is spent in the math classroom. We focus deeply on the major work* of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the math classroom.

2. **Coherence:** **think** across grades, and **link** to major topics within grades

Thinking across grades: The Standards are designed around coherent progressions from grade to grade. Learning is carefully connected across grades so that students can build new understanding onto foundations built in previous years. Each standard is not a new event, but an extension of previous learning.

Linking to major topics: Instead of allowing additional or supporting topics to detract from the focus of the grade, these concepts serve the grade level focus. For example, instead of data displays as an end in themselves, they are an opportunity to do grade-level word problems.

3. **Rigor:** in major topics* pursue:
- **conceptual understanding**,
 - procedural skill and **fluency**, and
 - **application** with equal intensity.

Conceptual understanding: The Standards call for conceptual understanding of key concepts, such as place value and ratios. Students must be able to access concepts from a number of perspectives so that they are able to see math as more than a set of mnemonics or discrete procedures.

Procedural skill and fluency: The Standards call for speed and accuracy in calculation. Students are given opportunities to practice core functions such as single-digit multiplication so that they have access to more complex concepts and procedures.

Application: The Standards call for students to use math flexibly for applications in problem-solving contexts. In content areas outside of math, particularly science, students are given the opportunity to use math to make meaning of and access content.

High-level Summary of Major Work in Grades K–8

- K–2 Addition and subtraction—concepts, skills, and problem solving; place value
- 3–5 Multiplication and division of whole numbers and fractions—concepts, skills, and problem solving
- 6 Ratios and proportional relationships; early expressions and equations
- 7 Ratios and proportional relationships; arithmetic of rational numbers
- 8 Linear algebra and linear functions

*For a list of major, additional and supporting clusters by grade, please refer to 'Focus in Math' at achievethecore.org/focus pp. 4–12

Handout #2
COMMON CORE STATE STANDARDS FOR MATHEMATICS
Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately) and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

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.



"Going Deeper" with the Standards of Mathematical Practice

Standard of Practice	Letter	How  demonstrates the Standard!
1. Make sense of problems and persevere in solving them.		
2. Reason abstractly and quantitatively.		
3. Construct viable arguments and critique the reasoning of others.		
4. Model with mathematics.		
5. Use appropriate tools strategically.		
6. Attend to precision.		
7. Look for and make use of structure.		
8. Look for and express regularity in repeated reasoning.		

From <http://www.debbiewaggoner.com/math-practice-standards.html> . "Going Deeper" with Big Bang Theory. You must have Drop Box open to view the videos.

Activity 1-Handout #3

Decide if the equations below are true or false. Explain your answer.

Equation	True	False	Because
$4 \times 5 = 20$			
$34 = 7 \times 5$			
$3 \times 6 = 9 \times 2$			
$5 \times 8 = 10 \times 4$			
$6 \times 9 = 5 \times 10$			
$2 \times (3 \times 4) = 8 \times 3$			
$8 \times 6 = 7 \times 6 + 6$			
$4 \times (10 + 2) = 40 + 2$			

HANDOUT #4

Smarter Balanced Assessment System: Connecting the Mathematics Claims to Classroom Instruction

Bringing It Back to the Standards and the Teaching Practices

Standards for Mathematical Content Domain Cluster Heading Standard(s)	Standards for Mathematical Practice	Mathematics Teaching Practices	
		Teacher Actions	Student Actions

Activity 3

Lamar wants to make the number 261. He has plenty of hundreds blocks and ones blocks to work with, but only 4 tens blocks.

His friend Jose said,

You can still make 261 with the blocks you have.

Show or Explain how Lamar can make 261.

Activity Four Handout # 7

- A. Helen raised \$12 for the food bank last year and she raised 6 times as much money this year. How much money did she raise this year?
- B. Sandra raised \$15 for the PTA and Nita raised \$45. How many times as much money did Nita raise as compared to Sandra?
- C. Luis raised \$45 for the animal shelter, which was 3 times as much money as Anthony raised. How much money did Anthony raise?
- D. Marcia raised \$60 for a charity, which was 3 times as much money as Brian raised. How much money did they raise together?" (or "How much more did Marcia raise than Brian?