

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.
 - Find meaning in problems
 - Look for entry points
 - Analyze, conjecture and plan solution pathways
 - Monitor and adjust
 - Verify answers
 - Ask themselves the question: “Does this make sense?”
- 2 Reason abstractly and quantitatively.
 - Make sense of quantities and their relationships in problems
 - Learn to contextualize and decontextualize
 - Create coherent representations of problems
- 3 Construct viable arguments and critique the reasoning of others.
 - Understand and use information to construct arguments
 - Make and explore the truth of conjectures
 - Recognize and use counterexamples
 - Justify conclusions and respond to arguments of others
- 4 Model with Mathematics.
 - Apply mathematics to problems in everyday life
 - Make assumptions and approximations
 - Identify quantities in a practical situation
 - Interpret results in the context of the situation and reflect on whether the results make sense
- 5 Use appropriate tools strategically.
 - Consider the available tools when solving problems
 - Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools)
 - Make sound decisions of which of these tools might be helpful
- 6 Attend to precision.
 - Communicate precisely to others
 - Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes
 - Calculate accurately and efficiently
- 7 Look for and make use of structure.
 - Discern patterns and structures
 - Can step back for an overview and shift perspective
 - See complicated things as single objects or as being composed of several objects
- 8 Look for and express regularity in repeated reasoning.
 - Notice if calculations are repeated and look both for general methods and shortcuts
 - In solving problems, maintain oversight of the process while attending to detail
 - Evaluate the reasonableness of their immediate results