

Standards for Mathematical Practice - Second Grade Specific

Mathematical Practices are listed with each grade's mathematical content standards to reflect the need to connect the mathematical practices to mathematical content in instruction.

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).

Students are expected to:

1. Make sense of problems and persevere in solving them.

In second grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, “Does this make sense?” They make conjectures about the solution and plan out a problem-solving approach.

2. Reason abstractly and quantitatively.

Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. Second graders begin to know and use different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Second graders may construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They practice their mathematical communication skills as they participate in mathematical discussions involving questions like “How did you get that?”, “Explain your thinking,” and “Why is that true?” They not only explain their own thinking, but listen to others’ explanations. They decide if the explanations make sense and ask appropriate questions.

4. Model with mathematics.

In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.

5. Use appropriate tools strategically.

In second grade, students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be better suited. For instance, second graders may decide to solve a problem by drawing a picture rather than writing an equation.

6. Attend to precision.

As young children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning.

7. Look for and make use of structure.

Second graders look for patterns. For instance, they adopt mental math strategies based on patterns (making ten, fact families, doubles).

8. Look for and express regularity in repeated reasoning.

In the early grades, students notice repetitive actions in counting and computation, etc. When children have multiple opportunities to add and subtract “ten” and multiples of “ten” they notice the pattern and gain a better understanding of place value. Students continually check their work by asking themselves, “Does this make sense?”

Georgia Department of Education

Second Grade Team Homework:

- **Watch this video** with your grade level teammates- Watch #19, *Pattern Blocks*.
http://www.learner.org/resources/series32.html#program_descriptions (yes, it is old, yet provides a good look at a problem-based setting)
Once the video has begun, you can hover the cursor over the screen and right click- you now have a zoom option for full screen so it is easier to view as a group.
- **Answer the questions** at the end of the video with your colleagues.
- The students began working in pairs. What routines and rituals had to be understood, modeled, and practiced prior to attempting this type of task? Can you find similar routines and rituals described in the GPS frameworks? How is this classroom organized so that students can explore in this way?
- There are many mathematical opportunities beyond geometry in this task. How could you build on what students learned in this session? What should come before this task? What could come next?
- The teacher calls the rhombus a diamond. Which term do you think should be used?
- How can you use what you noticed in this video to help students become proficient at the mathematical practice standards?
- **Try the task** used by this teacher with your students. This could be done as a small group activity with a parapro, coteacher, or parent guiding one group while the teacher guides the other. If you don't have slates for student recording, you can use plastic plates and expo markers. These make easy portable whiteboards.

Here's a quick overview: Remember, the teacher used questions and observations to guide the process, and did not do the work for the students. They decided how they would begin within their teams, and they decided how to work within the parameters given by the teacher. They had to figure out ways to meet the teacher's challenge and record their discoveries. She also challenges them to organize their thinking. This situation requires students to engage in the mathematical practices.

Start with exploration. Allow students to make sense of what you are asking them to do, and to explain their understanding to each other.

If you do not have pattern blocks in your classroom, visit a kindergarten teacher! They are great at sharing.

Compare notes with your colleagues. How did it go? What did you notice about your students? Were students able to record and explain their work? How could this lesson be extended? How can you create productively problematic situations for your students?