

A Guide to the 8 Mathematical Practice Standards

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The updated Massachusetts standards including the Standards of Mathematical Practice involve students developing a mathematical mindset and seeing math in the world around them. We are making problem-solvers. The eight mathematical practice standards are a guide to good math instruction. Here is a brief explanation of the eight standards.

#1 Make sense of problems and persevere in solving them

What it means: Understand the problem, find a way to attack it, and work until it is done. Basically, you will find practice standard #1 in every math problem, every day. The hardest part is pushing students to solve tough problems by applying what they already know and to monitor themselves when problem-solving.

Own it: Give students tough tasks and let them work through them. Allow wait time for yourself and your students. Work for progress and “aha” moments. The math becomes about the process and not about the one right answer. Lead with questions, but don’t pick up a pencil. Have students make headway in the task themselves.

#2 Reason abstractly and quantitatively

What it means: Get ready for the words *contextualize* and *decontextualize*. If students have a problem, they should be able to break it apart and show it symbolically, with pictures, or in any way other than the standard algorithm. Conversely, if students are working a problem, they should be able to apply the “math work” to the situation.

Own It: Have students draw representations of problems. Break out the manipulatives. Let students figure out what to do with data themselves instead of boxing them into one type of organization. Ask questions that lead students to understanding. Have students draw their thinking, with and without traditional number sentences.

#3 Construct viable arguments and critique the reasoning of others

What it means: Be able to talk about math, using mathematical language, to support or oppose the work of others.

Own it: Post mathematical vocabulary and make your students use it — not just in math class, either! Use “talk moves” to encourage discourse. Work on your classroom environment from day one so that it is a safe place to discuss ideas.

#4 Model with mathematics

What it means: Use math to solve real-world problems, organize data, and understand the world around you.

Own it: Math limited to math class is worthless. Have students use math in science, art, music, and even reading. Use real graphics, articles, and data from the newspaper or other sources to make math relevant and real. Have students create real-world problems using their mathematical knowledge.

#5 Use appropriate tools strategically

What it means: Students can select the appropriate math tool to use and use it correctly to solve problems. In the real world, no one tells you that it is time to use the meter stick instead of the protractor.

Own it: Don't tell students what tool to use. Try to leave the decision open ended and then discuss what worked best and why. For example, I wanted my students to find their height. They had measuring tapes, rulers, and meter sticks among their math tools. Once everyone found their height, we discussed which tools worked best and why. Leave math tools accessible and resist the urge to tell students what must be used for the task. Let them decide; they might surprise you!

#6 Attend to precision

What it means: Students speak and solve mathematics with exactness and meticulousness.

Own it: Push students to use precise and exact language in math. Measurements should be exact, numbers should be precise, and explanations must be detailed. One change I've made is not allowing the phrase, "I don't get it." Students have to explain exactly what they do and do not understand and where their understanding falls apart.

#7 Look for and make use of structure

What it means: Find patterns and repeated reasoning that can help solve more complex problems. For young students this might be recognizing fact families, inverses, or the distributive property. As students get older, they can break apart problems and numbers into familiar relationships.

Own It: Help students identify multiple strategies and then select the best one. Repeatedly break apart numbers and problems into different parts. Use what you know is true to solve a new problem. Prove solutions without relying on the algorithm. For example, my students are changing mixed numbers into improper fractions. They have to prove to me that they have the right answer without using the "steps."

#8 Look for and express regularity in repeated reasoning

What it means: Keep an eye on the big picture while working out the details of the problem. You don't want kids that can solve the one problem you've given them; you want students who can generalize their thinking.

Own it: I heard Greg Tang speak a couple of years ago and he gave some advice I think fits this standard perfectly. He said to show students how the problem works. As soon as they "get it," start making them generalize to a variety of problems. Don't work fifty of the same problem; take your mathematical reasoning and apply it to other situations.