**Math Practices: What They Mean, Owning Them, Useful Resources**

**#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.

**Useful resources:** The Georgia Department of Education has created critical-thinking [math tasks](https://www.georgiastandards.org/Common-Core/Pages/Math-K-5.aspx) for every standard. The New York City Department of Education has a set of aligned [tasks](http://schools.nyc.gov/Academics/CommonCoreLibrary/TasksUnitsStudentWork/default.htm) as well.

**#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.

**Useful Resources:** [Inside Mathematics](http://www.insidemathematics.org/index.php/standard-2) breaks down each practice standard with video segments, as does [Illustrative Mathematics](http://www.illustrativemathematics.org/standards/practice). The Mathematics Assessment Project provides [sample tasks](http://map.mathshell.org/materials/stds.php) for each standard.

**#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.

**Resources:** Talk moves are a prerequisite to being able to achieve the practice standards. [Download](http://www.scholastic.com/teachers/sites/default/files/posts/u135/files/mathtalk.pdf) some of the talk moves my co-workers and I use to print and hang, read [“How to Get Students Talking!”](http://www.mathsolutions.com/index.cfm?page=nl_wp2b&crid=376&contentid=1086) from Math Solutions to understand the importance of talk moves, and check out chapter 2 of [*Classroom Discussions: Using Math Talk to Help Students Learn*](http://store.mathsolutions.com/product-info.php?Classroom-Discussions-Using-Math-Talk-pid188.html) for great examples.

**#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.

**Resources:** [*DynaMath*](http://shop.scholastic.com/webapp/wcs/stores/servlet/ProductDisplayView?productId=98190&langId=-1&storeId=10751&catalogId=10004)makes real-world connections fun and engaging for students. Mathalicious.com is a paid service, but just [browse](http://www.mathalicious.com/) the free sample lessons and you’ll see the creativity. [*Teaching Children Mathematics*](http://www.nctm.org/publications/toc.aspx?jrnl=tcm) features articles, lessons, and ideas every month that model mathematics across curriculums.

**#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!

**Resources:** Set your [manipulative ground rules](http://www.scholastic.com/teachers/top-teaching/2012/08/math-manipulatives-learning-control-chaos) early to ensure classroom management. The [National Library of Virtual Manipulatives](http://nlvm.usu.edu/en/nav/vlibrary.html) gives you every tool you could ever want. A host of videos on the [Teaching Channel](https://www.teachingchannel.org/videos?page=1&categories=subjects_math,topics_common-core&load=1) show great math lessons with valuable incorporation of tools.

**#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.

**Resources:** NCTM’s [“Never Say Anything a Kid Can Say”](https://www.georgiastandards.org/resources/Online%20High%20School%20Math%20Training%20Materials/Math-I-Session-5-Never-Say-Anything-a-Kid-Can-Say-Article.pdf) offers some tough advice for getting students to be precise while working through tasks. [All Things Common Core](http://allthingscommoncore.com/content/classroom-sneak-peek-mathematical-practice-6) details what precision looks like in a classroom.

**#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.”

**Resources:** [Greg Tang’s strategy](http://www.readingrockets.org/books/interviews/tang/) of breaking numbers into the appropriate pieces to make math easy is really what repeated reasoning is all about. [Mathlanding](http://www.mathlanding.org/collections/pd_collection/ccss-practice-standard-7) uses videos and examples that show that even the youngest mathematicians make use of structure.

**#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.

**Resources:** [Learner Express](http://www.learner.org/series/modules/express/videos/video_clips.html?type=1&subject=math&practice=repeated_reasoning) has video lessons showing repeated reasoning. [Greg Tang](http://www.gregtangmath.com/About) offers several resources for finding regularity through math “games.” [NCTM offers tasks](http://www.nctm.org/rsmtasks/) aligned to each of the practice standards.