Math Practices in a Nutshell

CCSS – Mathematics Standards for Mathematical Practice

Intro – This document provides a very brief summary of each of the mathematical practices from the CCSS- Math. These summaries are based on extensive experience and conversations around each of the practices but should not be considered the ultimate authoritative work. These are intended to expand upon and clarify some of the ideas in the standards by interpreting the descriptions and synthesizing the conversations. Please understand that these are simplified (perhaps oversimplified) for the purpose of beginning the process of understanding the Mathematical Practices. The people involved in these conversations include teachers, administrators, curriculum authors, researchers, CCSS writers, mathematicians and even a few folks from literacy education. Please also remember that these Standards for Mathematical Practice are how we expect students to think about and engage in math. (Many of these are important skills in other aspects of life, but that's a whole other topic) These are not isolated standards. They must be used and developed in conjunction with each other as well as within the CCSS-M Content Standards (or some set of content standards) to be truly effective.

Enjoy…

Practice Number and Title	Synopsis
1 – Make sense of problems and persevere in solving them	This practice overarches ALL problem solving. Students must be able to **interpret for themselves what the question is asking** and discern **what information is relevant** and what is superfluous. They must also develop the desire and technique **to start ANY problem** and the stamina to adjust course and keep going when they encounter obstacles.
2 – Reason abstractly and quantitatively	The title of this practice might lead to the idea of variables. This is not the focus of this practice. While variables are involved, this practice **asks students to think about all of the symbols they use** (numerals are symbols, too, that we have attached a meaning to). This practice is much more about decontextualizing and (re) contextualizing information from/to a problem. Students **need to be able to pull the symbols (numbers or variables or expressions) out of the problem's context; manipulate, calculate, combine, etc. these symbols; then interpret the result and take it back into the context of the problem.** For example… Mary has 7 apples, Johnny has 5. How many do they have together? 5+7=12. 12 what??? It's not until the student labels the result as 12 apples does s/he (re)contextualize the information.
3 – Construct a viable argument and critique the reasoning of others	This one is quite self-explanatory. This is one that **will serve students in many realms outside of math** – scientists do this on a regular basis; lawyers, too; persuasive writers; policy makers; children convincing parents that they need a cell phone…
4 – Model with Mathematics	Focus should be on the middle word on this practice. This practice is about using math to represent a situation and being able to explain how the parameters of that situation are reflected in the model. This practice is about establishing a line of best fit in the midst of a scatterplot; creating a quadratic equation that represents the path of a projectile through the air; developing a system of equations or inequalities that allows for comparison of two proposals; writing a number sentence that represents a story. This is **<u>NOT</u> about using manipulatives** to demonstrate or develop the meaning of an operation; **<u>nor</u> is it about writing a paragraph to describe the steps taken in solving a problem**.
5 – Using appropriate tools strategically	Pretty self-explanatory title with a **VERY broad definition of tools**. This definition includes everything from brain power (mental math) to pencil and paper, to physical tools (rulers, protractors, compasses) to calculators and other "technology" (recognizing that pencils and paper were once very advanced technology**)**. Tools could also be graphic organizers, charts, tables, graphs, manipulatives, etc.

6 – Attending to precision	This practice is much more about **precision in language and communication** than it is about accurate calculations. It is about **sharing ideas using the most (developmentally appropriate) <u>concise</u> language and descriptions available.**
7 – Look for and make use of structure	Be careful to not interpret the word "structure" to mean a physical entity. **Structure in this case means how the number or expression or equation is built or composed.** Any time we look at place value parts or factors of a number, we are looking at its structure. Whenever we decompose a number to make calculations easier or more sensical, we are using its structure. Any time we identify a component of an equation as the vertex of the graph or the slope of the line, we are making use of the equation's structure. Any time we recognize one portion of an expression as the square or derivative of another, we are looking at (for the purpose of using) its structure.
8 – Look for and express regularity in repeated reasoning	This one might become your students' favorite. **This practice allows students to guess and check - AS LONG AS they follow it up by EXPRESSING the regularity**. Guessing and checking with numerical values (if used within this practice) can lead to the development of an equation that can lead to the solution of a problem. This practice is also useful in making sense of the formulas we use by **finding a pattern or relationship in numbers generated during an exploration of the topic**. We can explore the area of a triangle by building rectangles, drawing the diagonal and realizing that the area of a triangle is half of the area of a rectangle, therefore the formula is… OR by repeatedly testing sets of points for collinearity by using the slope formula, then by switching to the general (x,y) as one of the points we test, an equation for the line can be easily developed.