Problem Solving Process and Math Practice Standards

ST Math
Created by MIND Research Institute

Action	Math Practices (habits of mind)	Puzzle Talks & Extensions	Facilitation Questions
Notice & Wonder	**SMP 1**: start by explaining to themselves the meaning of the problem & looking for entry points to its solution **SMP 1**: make conjectures about the form & meaning of the solution & plan a solution pathway rather than simply jumping into a solution attempt	**Focus** thinking on what is important, make connections to prior knowledge. Pause & take notice of the information given, make sense of the problem, identify the question, & connect to previous knowledge.	• What do you notice? • What do you wonder? • What question is the problem asking?
Predict & Justify	**SMP 1**: analyze givens, constraints, relationships, & goals **SMP 3**: make conjectures & build a logical progression of statements to explore the truth of their conjectures	**Uncover** students' thinking around how they plan to address the problem; where they will enter the problem; name the strategy; what they think will happen and why; and what a reasonable solution should look like.	• What is your strategy? • What do you think will happen when you try it?
Test & Observe	**SMP 1**: monitor & evaluate progress & change course if necessary **SMP 4**: apply what they know are comfortable making assumptions & approximations to simplify a complicated situation, realizing that these may need revision later	**Engage** in thinking & processing the results of employing the strategy to gain understanding before analyzing.	• Try your strategy. • Describe what happened.
Analyze & Learn	**SMP 1**: check their answers to problems using a different method, & they continually ask themselves, "Does this make sense?" **SMP 3**: listen or read the arguments of others, decide whether they make sense, & ask useful questions to clarify or improve the arguments **SMP 4**: routinely interpret their mathematical results in the context of the situation & reflect on whether the results make sense, possibly improving the model if it has not served its purpose	**Facilitate** thinking around evaluating strategy, analyzing feedback/results & revising understanding. Examine thinking, reinforce strategies, or examine errors & learning from mistakes.	• What did you learn? • How will you use what you learned?
Extend & Connect	**SMP 1**: understand the approaches of others to solving complex problems & identify correspondences between different approaches **SMP 3**: justify their conclusions, communicate them to others, & respond to the arguments of others	**Stretch** thinking & make connections with what was learned to existing schemas. Deepen understanding of the concept & apply learning to novel situations	• How does what you learned support/challenge your understanding of (the concept)? • What would happen if...? • How would you apply this concept to (this) situation?

*All the standards are inherent in this process depending on the problem that you are solving. The standards listed here are provided as an example. *Standards for Mathematical Practice*. N.p.: Common Core State Standards Initiative. https://learning.ccsso.org/common-core-state-standards-initiative.