

Standards of Student Practice in Mathematics Proficiency Matrix

Practice	Students:	Initial (IN)	Intermediate (I)	Advanced (A)
1	Make sense of problems	Explain their thought processes in solving a problem one way.	Explain their thought processes in solving a problem and representing it in several ways.	Discuss, explain, and demonstrate solving a problem with multiple representations and in multiple ways.
	Persevere in solving them	Stay with a challenging problem for more than one attempt.	Try several approaches in finding a solution, and only seek hints if stuck.	Struggle with various attempts over time, and learn from previous solution attempts
2	Reason abstractly & quantitatively	Reason with models or pictorial representations to solve problems.	Are able to translate situations into symbols for solving problems.	Convert situations into symbols to appropriately solve problems as well as convert symbols into meaningful situations.
3	Construct viable arguments	Explain their thinking for the solution they found.	Explain their own thinking and thinking of others with accurate vocabulary.	Justify and explain, with accurate language and vocabulary, why their solution is correct.
	Critique the reasoning of others.	Understand and discuss other ideas and approaches.	Explain other students' solutions and identify strengths and weaknesses of the solution.	Compare and contrast various solution strategies and explain the reasoning of others.
4	Model with Mathematics	Use models to represent and solve a problem, and translate the solution to mathematical symbols.	Use models and symbols to represent and solve a problem, and accurately explain the solution representation.	Use a variety of models, symbolic representations, and technology tools to demonstrate a solution to a problem.
5	Use appropriate tools strategically	Use the appropriate tool to find a solution.	Select from a variety of tools the ones that can be used to solve a problem, and explain their reasoning for the selection.	Combine various tools, including technology, explore and solve a problem as well as justify their tool selection and problem solution.
6	Attend to precision	Communicate their reasoning and solution to others.	Incorporate appropriate vocabulary and symbols in others.	Use appropriate symbols, vocabulary, and labeling to effectively communicate and exchange ideas.
7	Look for & make use of structure	Look for structure within mathematics to help them solve problems efficiently (such as $2 \times 7 \times 5$ has the same value as $2 \times 5 \times 7$, so instead of multiplying 14×5 , which is $(2 \times 7) \times 5$, the student can mentally calculate 10×7 ; seeing $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y).	Compose and decompose number situations and relationships through observed patterns in order to simplify solutions.	See complex and complicated mathematical expressions as component parts.
8	Look for & express regularity in repeated reasoning	Look for obvious patterns, and use if/ then reasoning strategies for obvious patterns.	Find and explain subtle patterns.	Discover deep, underlying relationships, i.e. uncover a model or equation that unifies the various aspects of a problem such as a discovery of an underlying function.

Note: Absent (AB)

From Hull, T., Harbin Miles, R. and Balka, D. (2012). *The common core mathematics standards: Transforming practice through team leadership*. Corwin and the National Council of Teachers of Mathematics. Thousand Oaks: CA.