

Learning the mathematical practices!

MATHEMATICAL PRACTICE #1

MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM

8 MATHEMATICAL PRACTICES

- 1 **Make Sense of Problems and Persevere in Solving Them**
- 2 Reason Abstractly and Quantitatively
- 3 Construct Viable Arguments and Critique the Reasoning of Others
- 4 Model with Mathematics
- 5 Use Appropriate Tools Strategically
- 6 Attend to Precision
- 7 Look For and Make Use of Structure
- 8 Look For and Express Regularity in Repeated Reasoning



Your minivan has a flat, rectangular space in the back that measures 5ft. by 3 ft. When you fold down the rear seats of your van and move them forward, the rectangular space in the van is increased by 2 ft. By how many square feet does the area of the rectangular space increase when the rear seats are folded down and moved forward?

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for ways that will lead to a solution. They plan out a solution pathway rather than simply jumping into a solution attempt. They monitor and evaluate their progress and change course.

Younger students might rely on using concrete objects or pictures to help solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?"

Older students might, depending on the context of the problem, transform algebraic expressions or make adjustments to their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends.

-Reference taken from the Common Core State Standards

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.

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mathematics

...invites you into the practices;

<http://www.insidemathematics.org/common-core-resources/mathematical-practice-standards/standard-1-make-sense-of-problems-persevere-in-solving-them>

WHAT DO PROFICIENT STUDENTS DO?

- Explain their thought processes in solving a problem one way. (Pair – Share)
- Explain their thoughts and shows the solution in several ways. (Wait Time)
- Discuss, explain, demonstrate solving a problem with multiple representations and in multiple ways. (Grouping/Engaging)

Make sense of problems and persevere in solving them



When presented with a problem, I can make a plan, carry out my plan, and evaluate its success.

BEFORE...

EXPLAIN the problem to myself.

- Have I solved a problem like this before?

ORGANIZE information...

- What is the question I need to answer?
- What is given?
- What is not given?
- What are the relationships between known and unknown quantities?
- What tools will I use?
- What prior knowledge do I have to help me?

DURING...

PERSEVERE

MONITOR my work

CHANGE my plan if it isn't working out

ASK myself: "Does this make sense?"

AFTER...

CHECK

- Is my answer correct?
- How do my representations connect to my algorithms?

EVALUATE

- What worked?
- What didn't work?
- What other strategies were used?
- How was my solution similar to or different from my classmates'?

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Jordan School District 2011, Grade 6



Investigations
in Number, Data, and Space®

Math Practice 1: Make sense of problems and persevere in solving them.

This Practice talks about the importance of "explaining...the meaning of a problem and looking for entry points;" planning a way to solve a problem; monitoring the solution process; and double checking the solution to ensure that it makes sense. It describes how "younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem" and explains that students should understand and compare different approaches to the same problem.

[Read the full text of MP1.](#)



Watch this video to see it in action!

https://investigations.terc.edu/curriculum_clrm/mathpracticestandards.cfm

WHAT IS THE TEACHER DOING?

WHAT ARE STUDENTS DOING?

Students

- Explain the meaning of the problem.
- Discuss the meaning of the problem with one another.
- Make conjectures (inferences) and plan a solution path.
- Monitor and evaluate their progress "Does this make sense?"
- Use a variety of strategies to solve problems.
- Are flexible in choosing appropriate strategies for solving and computing a problem.

Teachers

- Providing time to think about and analyze the problem.
- Facilitating discussion between students about the meaning of the problem.
- Modeling problem solving process and appropriate strategies to solve problems.
- Monitoring and evaluating student progress.
- Providing descriptive feedback.
- Helping students shift toward a more efficient strategy when solving and computing problems.

-Tompkins Seneca Tioga BOCES (2012)

THESE PRACTICES REST ON IMPORTANT "PROCESSES AND PROFICIENCIES" WITH LONGSTANDING IMPORTANCE IN MATHEMATICS EDUCATION.

—COMMON CORE STATE STANDARDS

"It isn't that they cannot see the solution. It is that they cannot see the problem."

-GK Chesterton

WHAT DOES IT LOOK LIKE AT EACH LEVEL?

Elementary: Students work in pairs to evaluate their approach to a problem, telling a partner to describe their process, saying "what [they] did, and what [they] might do next time."

Middle: Different approaches to a solution are posted, asking students to identify "what this mathematician was thinking or trying out" and evaluating the success of the strategy.

High: Frame the task as a real-world design conundrum, inviting students to engage in a 'tinkering' process of working toward mathematical proof, changing course as necessary as they develop their thinking.

-Inside Mathematics (2013)

Questions to ask yourself :

- Do you give your child enough time to ask themselves the meaning of the problem?
- Is your child aware that there may be more than one entry point to a solution?

Standard for Mathematical Practice #1

Make sense of problems and persevere in solving them.



QUESTIONS TO ASK STUDENTS

-GO Math! Houghton Mifflin Harcourt (2012)

- What is the problem asking?
- How will you use that information?
- Why did you choose that operation?
- What other information do you need?
- What is another way to solve that problem?
- How do you know your answer makes sense?
- What did you do first? Why?
- What can you do if you don't know how to solve a problem?
- Have you solved a problem similar to this one?
- When did you realize your first method would not work?

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