

Standards for Mathematical Practice

Parents' Guide

In today's environment, there are "habits of mind" that students need to develop and use when they employ math strategies, talk about the math they are learning, and solve problems. These practices help them learn the content and describe how students should be able to use the mathematics they learn in the world. These skills are important to employers who want to hire people who can solve problems and make sense of things. These are the eight Standards for Mathematical Practice.

1. Make sense of problems and persevere in solving them.

There are several important behaviors to look for to meet this standard. Students should not give up if a problem is unfamiliar or hard! They search their memories for a similar problem or for what they already learned that might help. They explain the problem to themselves and try to visualize it. If one strategy does not work, they try another.

Questions parents can ask their child to help him or her develop this skill:

- What are you solving for in the problem?
- Can you think of a problem that you have solved before that is like this one?
- How will you go about solving the problem? What is your plan?
- Are you making progress toward solving the problem? Should you try a different plan?
- How can you check your answer? Can you check using a different method?

2. Reason abstractly and quantitatively.

When students "reason quantitatively" they use tools to help them make sense. They may create a model with objects or use a model to explain their thinking. They may make a chart or a table to figure out what is happening. Students must also be able to think logically about the numbers and symbols in the problem. To do this, they need to know what each symbol stands for and how they are all related. If students are working on a word problem, they should be able to represent it with an expression or an equation. If they are working on a numbers-only problem, students should be able to think of a situation the numbers could represent.

Questions parents can ask their child to help him or her develop this skill:

- Can you write or recall an expression or equation to match the problem situation?
- What do the numbers or variables in the equation refer to?
- What's the connection among the numbers and the variables in the equation?

3. Construct viable arguments and critique the reasoning of others.

Students are expected to be able to make and defend a mathematical point. Why would doing this help us get the answer? They justify their conclusions, are able to communicate to others what they think and why they think that. They also must be good listeners so they are able to follow other students' reasoning about solving a problem and be able to say whether that reasoning makes sense to

them or leaves questions. Mathematical argument is not like an everyday argument. It is based on mathematical points.

Questions parents can ask their child to help him or her develop this skill:

- Tell me what your answer means.
- How do you know that your answer is correct?
- If I told you I think the answer should be (offer a wrong answer), how would you explain to me why I'm wrong?

4. Model with mathematics.

Students are able to apply the mathematics they know to a real life situation. They might apply proportional reasoning to help plan a dinner or party or analyze a problem in the community. They know which are the important quantities in a situation and can set up a mathematical problem or equation to get an answer. They should then return to the question and explain what their answer means in the situation.

Questions parents can ask their child to help him or her develop this skill:

- Do you know a formula or relationship that fits this problem situation?
- What's the connection among the numbers in the problem?
- Is your answer reasonable? How do you know?
- What does the number(s) in your solution refer to?

5. Use appropriate tools strategically.

Students have a number of tools at their disposal to help with mathematics. They can use drawings, tables, charts, graphs, and/or words to help them find solutions. They should consider which tool might best show others what they want them to understand. While a table might be a good way for a chef to see the amounts of recipe ingredients needed for different size groups, a graph is a better representation for the public to see the rise or decline of crime or homelessness. Some tools can get you to a correct answer but are very tedious. Students should look for efficient tools.

Questions parents can ask their child to help him or her develop this skill:

- What tools could you use to solve this problem? How can each one help you?
- Which tool is more useful for this problem? Explain your choice.
- Why is this tool (the one selected) better to use than (another tool mentioned)?
- Before you solve the problem, can you estimate the answer?

6. Attend to precision.

Students should be precise (a) in their communication so others understand what they mean; (b) in their calculations; and (c) in their explanations of what the work or data they are presenting means. They should use the precise language of mathematics, use terms accurately, and label their work with care.

Questions parents can ask their child to help him or her develop this skill:

- What do the symbols that you used mean?
- What units of measure are you using? (for the measurement problems)
- Explain to me (a term from the lesson).

7. Look for and make use of structure.

Students should look closely at a problem to figure out if there is a pattern or structure that will help them. Mathematical structures include the number sequence, the place value system, properties of operations, and patterns that can be generalized, such as the formulas for finding area or the inverse relationships of addition and subtraction and of multiplication and division. They may ask themselves, “Would making parallel lines help with a geometry problem?”, “Are these all square numbers?”, “What do I know about equivalence that could help me with this fraction problem?”.

Questions parents can ask their child to help him or her develop this skill:

- What do you notice about the answers to the exercises you’ve just completed?
- What do different parts of the expression or equation you are using tell you about the possible correct answers?

8. Look for and express regularity in repeated reasoning.

This is closely related to the last practice. Students look for the results that happen over and over again and decide that there is a repeated decimal or figure out how to generalize a shortcut. They can recognize similarities and patterns that emerge in repeated trials.

Questions parents can ask their child to help him or her develop this skill:

- What shortcut can you think of that will always work for these kinds of problems?
- What pattern(s) do you see? Can you make a rule of generalization?

Websites

The following posters may be useful in visualizing the Standards for Mathematical Practice by grade band:

Grades K-1 <https://drive.google.com/file/d/0BxzGDzUc3cOnLTVxVWdyRkw5LWc/view?usp=sharing>

Grades 2-3 <http://www.debbiewaggoner.com/uploads/1/2/9/9/12998469/practices-2-3.pdf>

Grades 4-5 <http://www.debbiewaggoner.com/uploads/1/2/9/9/12998469/practices-4-5.pdf>

Grade 6 <http://opi.mt.gov/pdf/ccsso/grade-6-math-practices-posters.pdf>