

Standards for Mathematical Practice Look Fors

Student Behaviors

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

Students are:

- Working and reading rich problems carefully (TKES 3)
- Drawing pictures, diagrams, tables, or using objects to make sense of the problem (TKES 3)
- Discussing the meaning of the problem with classmates (TKES 4)
- Making choices about which solution path to take (TKES 5)
- Trying out potential solution paths and making changes as needed (TKES 8)
- Checking answers and making sure solutions are reasonable and make sense (TKES 6)
- Exploring other ways to solve the problem (TKES 8)
- Persisting in efforts to solve challenging problems, even after reaching a point of frustration. (TKES 8)

2. Reason abstractly and quantitatively.

Students are:

- Using mathematical symbols to represent situations (TKES 3)
- Taking quantities out of context to work with them (decontextualizing) (TKES 3)
- Putting quantities back in context to see if they make sense (contextualizing) (TKES 3)
- Considering units when determining if the answer makes sense in terms of the situation (TKES 3)

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

Students are:

- Making and testing conjectures (TKES 8)
- Explaining and justifying their thinking using words, objects, and drawings (TKES 6)
- Listening to the ideas of others and deciding if they make sense (TKES 4)
- Asking useful questions (TKES 3)
- Identifying flaws in logic when responding to the arguments of others (TKES 4)
- Elaborating with a second sentence (spontaneously or prompted by the teacher or another student) to explain their thinking and connect it to their first sentence. (TKES 8)
- Talking about and asking questions about each other's thinking, in order to clarify or improve their own mathematical understanding. (TKES 4)
- Revising their work based upon the justification and explanations of others. (TKES 8)

4. Model with mathematics.

Students are:

- Using mathematical models (i.e. formulas, equations, symbols) to solve problems in the world (TKES 3)
- Using appropriate tools such as objects, drawings, and tables to create mathematical models (TKES 3)
- Making connections between different mathematical representations (concrete, verbal, algebraic, numerical, graphical, pictorial, etc.) (TKES 8)
- Checking to see if an answer makes sense within the context of a situation and changing the model as needed (TKES 8)

5. Use appropriate tools strategically.

Students are:

- Using technological tools to explore and deepen understanding of concepts (TKES 3)
- Deciding which tool will best help solve the problem. Examples may include: (TKES 3)
 - Calculator
 - Concrete models
 - Digital Technology
 - Pencil/paper
 - Ruler, compass, protractor
- Estimating solutions before using a tool (TKES 3)
- Comparing estimates to solutions to see if the tool was effective (TKES 3)

6. Attend to precision.

Students are:

- Communicating precisely using clear language and accurate mathematics vocabulary (TKES 1)
- Deciding when to estimate or give an exact answer (TKES 1)
- Calculating accurately and efficiently, expressing answers with an appropriate degree of precision (TKES 1)
- Using appropriate units; appropriately labeling diagrams and graphs (TKES 1)

7. Look for and make use of structure.

Students are:

- Finding structure and patterns in numbers (TKES 1)
- Finding structure and patterns in diagrams and graphs (TKES 1)
- Using patterns to make rules about math (TKES 1)
- Using these math rules to help them solve problems (TKES 1)

8. Look for and express regularity in repeated reasoning.

Students are:

- Looking for patterns when working with numbers, diagrams, tables, and graphs (TKES 1)
- Observing when calculations are repeated (TKES 8)
- Using observations from repeated calculations to take shortcuts (TKES 8)

*Please note that most of the teacher and student behaviors listed can be paired with more than one TKES indicator.

Standards for Mathematical Practice Teacher Behaviors

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

Teachers are:

- Providing rich problems aligned to the standards (TKES 1)
- Providing appropriate time for students to engage in the productive struggle of problem solving (TKES 8)

Teachers ask:

- What information do you have? What do you need to find out? What do you think the answer might be?
- Can you draw a picture? How could you make this problem easier to solve?
- How is ___'s way of solving the problem like/different from yours? Does your plan make sense? Why or why not?
- What tools/manipulatives might help you? What are you having trouble with? How can you check this?

2. Reason abstractly and quantitatively.

Teachers are:

- Providing a variety of problems in different contexts that allow students to arrive at a solution in different ways (TKES 4)
- Using think aloud strategies as they model problem solving (TKES 3)
- Attentively listening for strategies students are using to solve problems (TKES 5)

Teachers ask:

- What does the number ___ represent in the problem? How can you represent the problem with symbols and numbers?
- Can you make a chart, table or graph?

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

Teachers are:

- Posing tasks that require students to explain, argue, or critique (TKES 8)
- Providing many opportunities for student discourse in pairs, groups, and during whole group instruction (TKES 4)

Teachers ask:

- Why or why not? How do you know? Can you explain that? Do you agree?
- How is your answer different than ___'s? What math language will help you prove your answer?
- What examples could prove or disprove your argument? What questions do you have for ___?

4. Model with mathematics.

Teachers are:

- Providing opportunities for students to solve problems in real life contexts (TKES 3)
- Identifying problem solving contexts connected to student interests (TKES 4)

Teachers ask:

- Can you write a number sentence to describe this situation? What do you already know about solving this problem?
- What connections do you see? Why do the results make sense? Is this working or do you need to change your model?

5. Use appropriate tools strategically.

Teachers are:

- Making a variety of tools readily accessible to students and allowing them to select appropriate tools for themselves (TKES 3)
- Helping students understand the benefits and limitations of a variety of math tools (TKES 8)

Teachers ask:

- How could you use manipulatives or a drawing to show your thinking?
- Which tool/manipulative would be best for this problem? What other resources could help you solve this problem?

6. Attend to precision.

Teachers are:

- Explicitly teaching mathematics vocabulary (TKES 1)
- Insisting on accurate use of academic language from students (TKES 8)
- Modeling precise communication (TKES 10)
- Requiring students to answer problems with complete sentences, including units (TKES 10)
- Providing opportunities for students to check the accuracy of their work (TKES 5)

Teachers ask:

- What does the word ___ mean? Explain what you did to solve the problem.
- Compare your answer to ___'s answer. What labels could you use?
- How do you know your answer is accurate? Did you use the most efficient way to solve the problem?

7. Look for and make use of structure.

Teachers are:

- Providing sense making experiences for all students (TKES 2)
- Allowing students to do the work of using structure to find the patterns for themselves rather than doing this work for students (TKES 8)

Teachers ask:

- Why does this happen? How is ___ related to ___? Why is this important to the problem?
- What do you know about ___ that you can apply to this situation? How can you use what you know to explain why this works?
- What patterns do you see?

8. Look for and express regularity in repeated reasoning.

Teachers are:

- Providing sense making experiences for all students (TKES 2)
- Allowing students to do the work of finding and using their own shortcuts rather than doing this work for students (TKES 8)

Teachers ask:

- What generalizations can you make? Can you find a shortcut to solve the problem?
- How would your shortcut make the problem easier? How could this problem help you solve another problem?