Common Core Standards for Mathematical Practice

As you enter, please take a sticky dot and place on the Standards for Mathematical Practice continuum to express your comfort level.

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Wake County Public Schools
Code of Cooperation

• Participate in discussions and activities
• Listen to others
• Honor Time
• Be respectful to all  
  • Sidebar conversations  
  • Cell Phones
Session Outcomes

Today, participants will have:

⊙ an understanding of the Standards for Mathematical Practice

⊙ an opportunity to experience activities & videos that model the Standards for Mathematical Practice 1-4

⊙ an opportunity to explore how the Standards for Mathematical Practice 5-8 naturally emerge when using standards 1-4

⊙ an opportunity to reflect on your current implementation of the Standards for Mathematical Practice
Today’s Training

1. Overview: Practice vs. Content Standards

2. Understanding the Standards for Mathematical Practice 1-4
   • What does it look like in an elementary classroom?

3. Understanding the Standards for Mathematical Practice 5-8
   • How do Practice Standards 5-8 naturally emerge?

4. Putting it all together
Practice vs. Content Standards

Content Standards:
• **WHAT** the students are learning

Math isn’t just about the content!
Name that Standard....

As a Table Group:

- Located in the middle of your table POD, is a paper numbered it 1-8.
- Select a recorder.
- You will have 2 minutes to list the eight Standards for Mathematical Practice IN ORDER!
Standards for Mathematical Practice

1. Make sense of problems & persevere in solving them
2. Reason abstractly & quantitatively
3. Construct viable arguments & critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for & make use of structure
8. Look for & express regularity in repeated reasoning
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The Practice Standards in Action
<table>
<thead>
<tr>
<th>Standard for Mathematical Practice</th>
<th>What does this look like?</th>
<th>Examples from video or activity</th>
<th>How can I improve this in my classroom?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Make sense of problems and persevere in solving them.</td>
<td>Mathematically proficient students explain the meaning of a problem and look for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures and plan a solution path rather than simply jumping into a solution attempt. They try simpler forms of the problem in order to gain insight into its solution. They monitor progress and change course if necessary. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs. Students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers using a different method, and ask themselves, &quot;Does this make sense?&quot; They can understand the approaches of others and identify correspondences between different approaches.</td>
<td></td>
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</tbody>
</table>
1. Make sense of problems and persevere in solving them

- **Read**: Take 1 minute to read the standard.
- **Think**: Take 1 minute to write down what this standard looks like.
- **Share**: Take 3 minutes to share with a shoulder buddy.
1. Makes sense of problems and persevere in solving them

How does the activity promote this Practice Standard?

I will keep trying!
I will explore other ways to solve the problem.

1. Read the problem carefully.
2. Understand the question & predict a solution.
3. Choose a solution path.
4. Try my path & make changes if needed.
5. Check my answer and make sure my solution is reasonable.
Reflection:

• Do the activities and discussions in my classroom focus on students’ thinking, how and why a particular strategy was used instead of just getting the right answer?

• Do I use rich-tasks that allow multiple entry points and solutions or do I provide more simple and direct problems?

• Do I focus on 1-2 problems for students to solve and discuss thoroughly or provide a worksheet of problems to solve?

• Do I focus on tricks, such as key words, that focus on memorization and can often be unreliable or conceptual understanding?
2. Reason abstractly and quantitatively

- **Read**: Take 1 minute to read the standard.
- **Think**: Take 1 minute to write down what this standard looks like.
- **Share**: Take 2 minutes to share with a shoulder buddy.
2. Reason abstractly & quantitatively
2. Reason Abstractly and Quantitatively.

I will...

- use math to represent situations.
- think about the size of quantities and the meaning of units.
- decontextualize and contextualize.

### Decontextualize

take quantities out of context to work with them

![Tree and apples](image)

2 + 3 = 5

### Contextualize

put quantities into context to see if they make sense

![Number line and operations](image)

Sam had 4 bags of gum with 10 pieces in each. That’s 40 pieces!
Reflection:

- Do I offer opportunities for students to contextualize and decontextualize?
- Do I only provide abstract problems for students to solve (worksheet of equations)?
- Do I allow my students opportunities to work with others to write problems to match equations?
- Do I provide opportunities for students to connect their solutions and explain them in relation to the context of the problem?
- Do I provide experiences modeling and discussing flexible use of numbers?
3. Construct viable arguments and critique the reasoning of others

- **Read**
  - Take 1 minute to read the standard.

- **Think**
  - Take 1 minute to write down what this standard looks like.

- **Share**
  - Take 2 minutes to share with a shoulder buddy.
3. Construct viable arguments & critique the reasoning of others

How does the activity promote this Practice Standard?
3. Construct viable arguments & critique the reasoning of others
3. Construct Viable Arguments and Critique Reasoning of Others.

**I will** make and test conjectures.

**I will** explain and justify my thinking using words, objects, and drawings.

**I will** listen to other ideas and decide if they make sense.

**I will** ask useful questions.
Reflection:

• Do I encourage students to explain and prove their solutions/answers or accept memorized processes or formulas?

• Do I expect justifications (why or why not?) or simple yes/no answers?

• Do I model effective arguments and critiquing the reasoning of others?

• Do I provide activities for students to defend their arguments using concrete objects, diagrams, examples, definitions, and/or data?

• Do I provide students opportunities to share their solutions with the class?
4. Model with mathematics

Read
- Take 1 minute to read the standard.

Think
- Take 1 minute to write down what this standard looks like.

Share
- Take 2 minutes to share with a shoulder buddy.
4. Model with mathematics

I will...

- use math to represent problems in my world.
- explain math situations using objects, drawings, symbols, equations and words.
- make connections between representations.
- check my answer and improve the model as needed.
Reflection:

- Do I give my students ample opportunities to model their mathematical thinking?
- Do I discuss with my students how the models being used helped them find solutions?
- Do I encourage my students to use multiple models to represent the math?
- Do I help students identify more efficient models by discussing when a specific model might be more appropriate?
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Standards for Mathematical Practice 5-8

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.
5. Use Appropriate Tools Strategically.

I will...

- decide which tool will best help me solve the problem.
- estimate my answer before using a tool.
- compare my estimate to my answer and see if my tool was effective.

How does this Practice Standard naturally emerge when implementing Practice Standards 1-4?
Reflection:

- Do I model the use of appropriate tools when solving problems and discuss why a particular tool was selected with my students?
- Do I provide a variety of tools in which students can explore and practice using?
- Do I ask students which tools might be helpful to solve specific problems or tasks?
- Do I engage my class in discussions about advantages and limitations of specific tools?
- Do I ensure my students know how to use tools correctly?
6. Attend to Precision.
I must be precise.
I will...

- decide when to estimate or give an exact answer.
- use units to give meaning to numbers.
- use appropriate vocabulary.

A rectangle has two sets of parallel lines.
Reflection:

• Do I use appropriate grade-level math vocabulary during instruction?

• Can my student use precise language when communicating with others?

• How can I support my students in understanding math vocabulary?

• Do I provide students with opportunities to be precise?
7. Look for and Make Use of Structure.

I will...
- find structure and patterns in numbers.
- use patterns to make rules about math.
- use my rules to help solve problems.

How does this Practice Standard naturally emerge when implementing Practice Standards 1-4?
Reflection:

• Do I ask my students regularly “What do you notice?”

• Do I provide lessons in which patterns can emerge?

• Do I provide opportunities for my students to work together and share their thinking?
8. Look For and Express Regularity in Repeated Reasoning.

I will...
- look for patterns when working with numbers.
- observe when calculations are repeated.
- use my observations to take shortcuts.

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15 × 1 = 15
15 × 10 = 150
15 × 100 = 1500
15 × 1000 = ???
Reflection:

- Do I pose problems or tasks that draw attention to repetition?
- **Do I encourage discoveries?**
- Do I have students explain shortcuts when discovered in class?
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<table>
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<th>Standard 2</th>
<th>Standard 3</th>
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<th>Standard 5</th>
<th>Standard 6</th>
<th>Standard 7</th>
<th>Standard 8</th>
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<td>Reason abstractly and quantitatively</td>
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<tr>
<td><strong>Do students...</strong></td>
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<tr>
<td>Predict solutions through estimation?</td>
<td>Decontextualize a problem?</td>
<td>Analyze situations and use counter examples?</td>
<td>Explain math using objects, drawings, symbols, equations, and words?</td>
<td>Consider the available tools when solving mathematical problems?</td>
<td>Use mathematical vocabulary appropriately?</td>
<td>Use patterns to make rules about math?</td>
<td>Understand the basic computations performed in math?</td>
</tr>
<tr>
<td>Use multiple representations?</td>
<td>Contextualize a problem?</td>
<td>Use math to represent real world situations?</td>
<td>Justify their thinking using words, objects, and drawings?</td>
<td>Know the tools appropriate for their grade and make decisions about which ones will be helpful?</td>
<td>Use units to give meaning to numbers?</td>
<td>Have conceptual understanding of the procedures used in math?</td>
<td>Communicate with others to understand and develop generalizations about operations?</td>
</tr>
<tr>
<td>Explain their answers?</td>
<td>Use, share multiple representations?</td>
<td>Make sense of quantities and use number sense to solve problems?</td>
<td>Hear, or read arguments of others and decide if they make sense?</td>
<td>View the mathematical models of others to judge effectiveness?</td>
<td>Compare estimates to actual answers to see if the tool was effective?</td>
<td>Make decisions about when to estimate or give exact answers?</td>
<td>Continually evaluate whether their answers make sense?</td>
</tr>
<tr>
<td>Check their answers for reasonableness?</td>
<td>Make sense of problems and persevere in solving them?</td>
<td>Ask useful questions to clarify or improve their arguments?</td>
<td>Alter models as needed throughout the process?</td>
<td>Use technological tools to explore &amp; deepen their understanding?</td>
<td>Calculate accurately and efficiently?</td>
<td>Share ideas with others to develop general methods for problem solving?</td>
<td>Apply mental math strategies to practice patterns in the number system?</td>
</tr>
<tr>
<td>Collaborate to understand the approaches of others?</td>
<td>Apply the concepts they have learned?</td>
<td><strong>Checklist for Practice Standards</strong></td>
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</table>
Things to remember....

All Standards for Mathematical Practice will not be demonstrated with every math exercise given, but multiple standards should be evident in every mathematics lesson.
Final Reflection...

In what ways must classroom instruction change to support activities that demonstrate Standards for Mathematical Practice?
Resources

• Scholastic
  • http://www.scholastic.com/teachers/top-teaching/2013/03/guide-8-mathematical-practice-standards

• Inside Mathematics
  • http://www.insidemathematics.org/index.php/common-core-math-intro

• Illustrative Mathematics
  • http://www.illustrativemathematics.org/standards/practice

• Classroom Discussions: Using Math Talk to Help Students Learn by Anderson, Chapin, and O’Connor

• Classroom Discussions: Seeing Math Discourse in Action (Video Set) by Chapin, O’Connor, and Anderson
Resources Continued...

• *Putting the Practices into Action: Implementing the Common Core Standards for Mathematical Practice K-8* by Susan O’Connell and John SanGiovanni

• Math Solutions
  - Article: *How to Get Students Talking!*