

Handout #1

A Guide to 8 Mathematical Practice Standards

1. Make sense of problems and persevere in solving them

KNOW IT: Understand the problem, find a way to attack it, and work until it is done. This standard will be present in every math problem. As a teacher, one of the hardest tasks will be pushing students to solve tough problems by applying what they already know, and to monitor their thinking when problem-solving.

SHOW IT: Give students challenging tasks and let them work through them. Allow wait time for your students. Work for progress and “aha” moments. Students will begin to see that math is about the process and not just about one right answer. Ask higher order thinking questions and prompt them to use their strategies and tools to solve.



Adapted from:

http://www.specialconnections.ku.edu/?q=assessment/curriculum_based_assessment_measurement/teacher_to_ols/using_curriculum_based_measurement

2. Reason abstractly and quantitatively

KNOW IT: Students should be able to break a number problem apart and show it symbolically, with pictures, or in any way other than the standard algorithm. Additionally, if students are solving a word problem, they should be able to apply the “math work” in order to solve.

SHOW IT: Have students draw representations of problems. Encourage use of manipulatives. Allow students to try different strategies to determine which works best for them. Ask questions that lead students to understanding. Have students draw pictures to show their thinking, with and without traditional number sentences.



The campers left the campgrounds at 1:00 pm to go hiking. They stopped for 1 hour to eat lunch and reached the top of the mountain at 6:34 pm. How long did they hike?



1:00 → 2:00 → 3:00 → 4:00 → 5:00 → 6:00 → 6:34 = 5 hrs., 34 min –
1 hr. = 4 hrs., 34 min.

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3. Construct viable arguments and critique the reasoning of others

KNOW IT: Be able to talk about math, using mathematical language, to support or disagree with the work of others.

SHOW IT: Post mathematical vocabulary with visuals and make students use it when solving and explaining their reasoning (verbally and in writing). Use math "talk moves" to encourage discourse. Ensure that your classroom environment is a safe place for students to discuss ideas and take intellectual risks.



4. Model with mathematics

KNOW IT: Students should be able to use math to solve real-world problems, organize data, and understand the world around them.

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SHOW IT: Have students use math in and across subjects both in and outside of school. Use real graphics, articles, and data from the newspaper or other sources to make math relevant and real. Have students create real-world problems using their mathematical knowledge and real-life situations.

SOUTHBOUND TO MIAMI AIRPORT - WEEKEND/HOLIDAYS AM/PM															
Train No.	AM SOUTHBOUND							PM SOUTHBOUND							
	P661	P663	P665	P667	P669	P671	P673	P675	P677	P679	P681	P683	P685	P687	P689
Mangonia Park	5:50	6:50	7:50	8:50	9:50	10:50	11:50	12:50	1:50	2:50	3:50	4:50	5:50	6:50	9:00
West Palm Beach ✕	5:58	6:58	7:58	8:58	9:58	10:58	11:58	12:58	1:58	2:58	3:58	4:58	5:58	6:58	9:08
Lake Worth	6:08	7:08	8:08	9:08	10:08	11:08	12:08	1:08	2:08	3:08	4:08	5:08	6:08	7:08	9:18
Boynton Beach	6:14	7:14	8:14	9:14	10:14	11:14	12:14	1:14	2:14	3:14	4:14	5:14	6:14	7:14	9:24
Delray Beach	6:23	7:23	8:23	9:23	10:23	11:23	12:23	1:23	2:23	3:23	4:23	5:23	6:23	7:23	9:33
Boca Raton	6:29	7:29	8:29	9:29	10:29	11:29	12:29	1:29	2:29	3:29	4:29	5:29	6:29	7:29	9:39
Deerfield Beach	6:36	7:36	8:36	9:36	10:36	11:36	12:36	1:36	2:36	3:36	4:36	5:36	6:36	7:36	9:46
Pompano Beach	6:41	7:41	8:41	9:41	10:41	11:41	12:41	1:41	2:41	3:41	4:41	5:41	6:41	7:41	9:51
Cypress Creek	6:48	7:48	8:48	9:48	10:48	11:48	12:48	1:48	2:48	3:48	4:48	5:48	6:48	7:48	9:58
Fort Lauderdale	6:56	7:56	8:56	9:56	10:56	11:56	12:56	1:56	2:56	3:56	4:56	5:56	6:56	7:56	10:06
Fort Lauderdale Airport ✕	7:03	8:03	9:03	10:03	11:03	12:03	1:03	2:03	3:03	4:03	5:03	6:03	7:03	8:03	10:13
Sheridan Street	7:07	8:07	9:07	10:07	11:07	12:07	1:07	2:07	3:07	4:07	5:07	6:07	7:07	8:07	10:17
Hollywood	7:11	8:11	9:11	10:11	11:11	12:11	1:11	2:11	3:11	4:11	5:11	6:11	7:11	8:11	10:21
Golden Glades	7:20	8:20	9:20	10:20	11:20	12:20	1:20	2:20	3:20	4:20	5:20	6:20	7:20	8:20	10:30
Opa-locka	7:25	8:25	9:25	10:25	11:25	12:25	1:25	2:25	3:25	4:25	5:25	6:25	7:25	8:25	10:35
Metroraill Transfer	7:32	8:32	9:32	10:32	11:32	12:32	1:32	2:32	3:32	4:32	5:32	6:32	7:32	8:32	10:42
Hialeah Market/ Miami Airport ✕	7:50	8:50	9:50	10:50	11:50	12:50	1:50	2:50	3:50	4:50	5:50	6:50	7:50	8:50	11:00

The plane to Miami leaves Cypress Creek at 6:44 pm; it arrives in Miami in 1 hour and 32 minutes...

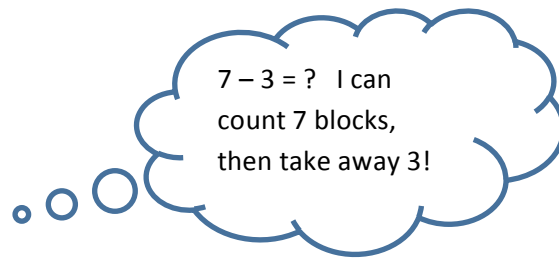
5. Use appropriate tools strategically

KNOW IT: Students should be able to select the appropriate math tool to use and use it correctly to solve problems. As students get older and become more independent they will have to know which tool(s) to select and why.

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SHOW IT: Don't always tell students which tool to use. As students become more independent with math concepts and skills, provide them with 2 or 3 tools to choose from. Allow them to choose and then discuss what worked best and why. Leave math tools accessible and resist the urge to tell students what must be used for the task. Let them decide!



6. Attend to precision

KNOW IT: Students discuss and solve mathematics while being exact and specific.

SHOW IT: Prompt students to use precise and exact language in math.

Measurements should be exact, numbers should be precise, and

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explanations should be detailed. Give students feedback on their math language and encourage metacognitive skills (planning, checking their work, etc.) to improve precision.

"I know that
100 pennies
equal \$1.00."



7. Look for and make use of structure

KNOW IT: Find patterns and repeated reasoning that can help solve more complex problems. For young students this might be recognizing fact families, inverses, or the distributive property. As students get older, they can break apart problems and numbers into familiar relationships.

SHOW IT: Help students identify multiple strategies and then select the best one. Repeatedly break apart numbers and problems into different

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parts. Encourage students to use what they know to solve a new problem and prove solutions without relying on an algorithm.



"I notice that $4 \times 2 = 8$ and $8 \div 4 = 2$."

8. Look for and express regularity in repeated reasoning

KNOW IT: Students should be able to understand the big idea while working out the details of a specific problem. Students should be able to solve the given problem and generalize their thinking to new problems and situations.

SHOW IT: Show students how the problem works. Once they understand the problem and make sense of its structure, make them generalize to a variety of problems. Instead of repeatedly solving the

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same type of problem, allow them to use their mathematical reasoning and apply it to other situations.



“Oh! So that also means that if $6 \times 2 = 12$ then $12 \div 6 = 2$ and $12 \div 2 = 6$.”

Useful Resources

<ul style="list-style-type: none"> • Georgia Department of Education • NYC Department of Education • Inside Mathematics • Illustrative Mathematics (video resources). • The Mathematics Assessment Project • DynaMath • Teaching Channel 	<ul style="list-style-type: none"> • Mathalicious.com • NCTM’s “Never Say Anything a Kid Can Say” • All Things Common Core • Learner Express (Video Resources) • Mathlanding (Video Resources) • National Library of Virtual Manipulatives • The Hunt Institute
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