

7th Grade Standards For Mathematical Practice

11/8/11

Our session will start momentarily. While you are waiting, please do the following:

Enter/edit your profile information by going to:

- Tools - Preferences - My Profile...
- Fill out the info on the "identity" tab and click "OK"
- To view the profile of another use, hover your mouse over his or her name in the participants window

Configure your microphone and speakers by going to:

- Tools – audio – audio setup wizard

Confirm your connection speed by going to:

- Tools – preferences – connection speed



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Clearing up confusion:

- This webinar is not about CCGPS content, it is about using the CCGPS Mathematical Practices this year with GPS content.
- For information about how and why CCSS were developed and adopted, watch: [common core- teaching channel](#) and this: [common core- math- teaching channel](#)
- GPS is taught and tested 2011-12. CCGPS is taught and tested 2012-13.
- I will provide a list of resources at the end of this webinar.



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Take-away

- Something that you can use tomorrow
- Something to ponder
- Resources



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What is learning?

What defines an effective classroom?

How do students become proficient in
mathematics?



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Dr. Lewin video can be found at:

<http://www.youtube.com/watch?v=7Zc9Nuoe2Ow>



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Is this learning?
Is this an effective classroom?
Are Dr. Lewin's students becoming
proficient in mathematics?



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- Attendance in Professor Lewin's classes fell by 40% by the end of the term.
- 10% of Professor Lewin's students failed his Mechanics class.
- 14% of Professor Lewin's students failed his Electricity & Magnetism class.



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Where do we begin in creating a classroom environment which encourages students to take responsibility for their learning and allows them to become proficient in mathematics?



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CCGPS Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them 6. Attend to precision	2. Reason abstractly and quantitatively	Reasoning and explaining
	3. Construct viable arguments and critique the reasoning of others	
	4. Model with mathematics	Modeling and using tools
	5. Use appropriate tools strategically	
	7. Look for and make use of structure.	Seeing structure and generalizing
	8. Look for and express regularity in repeated reasoning.	



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- "The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important 'processes and proficiencies' with longstanding importance in mathematics education."
(CCSS, 2010)
- The mathematical practices require a "re-negotiation" of the classroom contract.
- 3 Major Shifts:
 - Teachers cannot create learning-only learners can do that.
 - Increased student responsibility- from receptive to active learner
 - Teacher/student relationship shift- from adversarial to collaborative
 Black and Wiliam, 2006



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What Not to Do

- Problem solving Friday
- Enrichment for the few
- Just give the answer
- Isolate content from process



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Who Wants to be a Millionaire video can be found at:

<http://www.youtube.com/watch?v=BbX44YSsQ2I>



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CCGPS Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them 6. Attend to precision	2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others	Reasoning and explaining
	4. Model with mathematics 5. Use appropriate tools strategically	Modeling and using tools
	7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Seeing structure and generalizing



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

- Mathematically proficient students:
 - start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
 - can explain correspondences between representations, such as describing, tabling, and graphing or drawing diagrams of a situation, in order to help solve a problem, and search for regularity or trends.
 - check their answers, including reworking a problem, and they continually ask themselves, "Does this make sense?"

6. Attend to precision.

- Mathematically proficient students:
 - try to communicate precisely.
 - state the meaning of symbols they choose, including using the equal sign consistently and appropriately.
 - are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem.
 - calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context.



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

- Mathematically proficient students:
 - start by explaining to themselves the meaning of a problem and looking for entry points to its solution.
 - 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.
 - check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?"

6. Attend to precision.

- Mathematically proficient students:
 - try to communicate precisely to others.
 - state the meaning of symbols they choose, including using the equal sign consistently and appropriately.
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1. Make sense of problems and persevere in solving them.

- Teachers who are developing students' capacity to "make sense of problems and persevere in solving them" develop ways of framing mathematical challenges that are clear and explicit, and then check in repeatedly with students to help them clarify their thinking and their process. A teacher of adolescents and young adults might 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)

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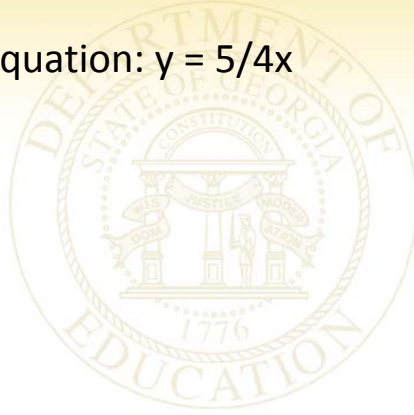
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Problem #1

Graph the equation: $y = 5/4x$



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Problem #1

Graph the equation: $y = 5/4x$

The fastest-moving tectonic plates on Earth move apart at a rate of 5 centimeters for every 4 months. Let y be defined as the amount of movement in centimeters and x as the amount of time. Give the equation described by the statement and then graph on a coordinate plane.



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Reasoning and explaining

2. Reason abstractly and quantitatively.

- Mathematically proficient students:
 - make sense of the quantities and their relationships in problem situations.
 - have the ability to decontextualize - to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents.
 - have the ability to contextualize - to pause as needed during the manipulation process in order to probe into the referents for the symbols involved.

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

- Mathematically proficient students:
 - understand and use stated assumptions, definitions, and previously established results in constructing arguments.
 - make conjectures and build a logical progression of statements to explore the truth of their conjectures.
 - are able to analyze situations by breaking them into cases and can recognize and use counterexamples.
 - justify their conclusions, communicate them to others, and respond to the argument of others.
 - reason inductively about data, making plausible arguments that take into account the context from which the data arose.



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Reasoning and explaining

2. Reason abstractly and quantitatively.

- Teachers who are developing students' capacity to "reason abstractly and quantitatively" help their learners understand the relationships between problem scenarios and mathematical representation, as well as how the symbols represent strategies for solution.

(Inside Mathematics)

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



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(Inside Mathematics)

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

- Teachers who are developing students' capacity to "construct viable arguments and critique the reasoning of others" require their students to engage in active mathematical discourse. This might involve having students explain and discuss their thinking processes aloud, or signaling agreement/disagreement with a hand signal. A teacher of adolescents and young adults might actively engage her students in extended conjecture about conditions for proof in the construction of quadrilaterals, testing their assumptions and questioning their approaches.

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Problem #2

You have been hired by the National Election Commission to examine how the American people feel about the fairness of the voting procedures in the U.S. You interview voters exiting the polling place, is this biased?



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You have been hired by the National Election Commission to examine how the American people feel about the fairness of the voting procedures in the U.S. Who will you ask? How and why?



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Modeling and using tools

4. Model with mathematics.

- Mathematically proficient students
 - can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
 - can apply what they know about modeling to simplify a complicated situation, and realize that the model is not perfect.
 - are able to identify important relationships in a situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas.
 - can analyze those relationships to make relevant and logical conclusions.
 - routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly revising the model if it has not served its purpose.

5. Use appropriate tools strategically.

- Mathematically proficient students:
 - consider the available tools when solving a mathematical problem.
 - are sufficiently familiar with tools appropriate to their grade or course to make sound decisions about when each of those tools might be helpful, recognizing both the insight to be gained and their limitations.
 - are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems.
 - are able to use technological tools to explore and deepen their understandings of concepts.



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- Mathematically proficient students:
 - can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
 - can apply what they know, are comfortable making assumptions to simplify a complicated situation, and realize that these may need revision later.
 - are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas.
 - can analyze those relationships mathematically to draw conclusions.
 - routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

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Modeling and using tools

4. Model with mathematics.

- Teachers who are developing students' capacity to "model with mathematics" move explicitly between real-world scenarios and mathematical representations of those scenarios. A teacher of adolescents and young adults might pose a "kite factory" scenario, in which advanced students are asked to determine the conditions for always creating a particular shape of kite given the dimensions of the diagonals and the angle of intersection.

(Inside Mathematics)

5. Use appropriate tools strategically.



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(Inside Mathematics)

5. Use appropriate tools strategically.

- Teachers who are developing students' capacity to "use appropriate tools strategically" make clear to students why the use of manipulatives, rulers, compasses, protractors, and other tools will aid their problem solving processes. A teacher of adolescents and young adults might have established norms for accessing tools during the students' group "tinkering processes," allowing students to use paper strips, brass fasteners, and protractors to create and test quadrilateral "kite" models.

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Problem #3

A box has a volume of 60 in^3 , what are its possible dimensions?



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Problem #3

A box has a volume of 60 in^3 , what are its possible dimensions?

What are the dimensions of a box with a volume of 60 in^3 that uses the least amount of material? Show how you know.



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Seeing structure and generalizing

7. Look for and make sense of structure.

- Mathematically proficient students:
 - look closely to discern a pattern or structure.
 - can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects.
 - recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems.
 - can step back for an overview and shift perspective.

8. Look for and express regularity in repeated reasoning.

- Mathematically proficient students:
 - notice if calculations are repeated and look for general methods and for shortcuts.
 - maintain oversight of the process as they work to solve a problem, while attending to the details.
 - continually evaluate the reasonableness of their immediate results.



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Seeing structure and generalizing

7. Look for and make sense of structure.

- Teachers who are developing students' capacity to "look for and make use of structure" help learners identify and evaluate efficient strategies for solution. A teacher of adolescents and young adults might focus on exploring geometric processes through patterns and proof.

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(Inside Mathematics)

8. Look for and express regularity in repeated reasoning.

- Engaging in repeated reasoning may emerge over many weeks so that students learning to divide fractions may gradually attain insight into the underlying concepts over many days or weeks. In the end, students arrive at the algorithm or formula through discovery, but in a longitudinal discovery process, and so sharing the "eureka" moment from a single lesson will not reveal the process that led to the insight.

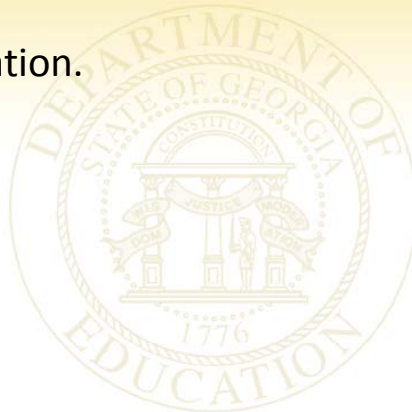
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Problem #4

Define equation.



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Problem #4

Define equation.

What are the differences between equations, inequalities, and expressions? Write as much as you can to explain what you know about how they are different.



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Where can we start?

- GaDOE Teaching Guides
- http://public.doe.k12.ga.us/ci_services.aspx?PageReq=CIServMath
- Learning Village
- <https://portal.doe.k12.ga.us/LearningVillageLogin.aspx>
- List Serve
- join-mathematics-k-5@list.doe.k12.ga.us
- join-mathematics-6-8@list.doe.k12.ga.us
- join-mathematics-9-12@list.doe.k12.ga.us
- join-mathematics-districtsupport@list.doe.k12.ga.us
- join-mathematics-administrators@list.doe.k12.ga.us
- join-mathematics-resa@list.doe.k12.ga.us
- Inside Mathematics
- <http://www.insidemathematics.org/>
- Teaching Channel
- http://www.teachingchannel.org/videos?categories=topics_common-core
- Arizona
- <http://www.ade.az.gov/standards/math/2010MathStandards/>
- New York City
- <http://schools.nyc.gov/Academics/CommonCoreLibrary/SeeStudentWork/default.htm>
- North Carolina
- <http://www.ncpublicschools.org/acre/standards/extended/>
- Ohio
- <http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEPrimary.aspx?page=2&TopicRelationID=1704>



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Dancing Guy video can be found at:

<http://www.youtube.com/watch?v=fW8amMCVAJQ>



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Contact

Brooke Kline	James Pratt
Program Specialist (6-12)	Program Specialist (6-12)
bkline@doe.k12.ga.us	jpratt@doe.k12.ga.us

<http://prezi.com/l1hbmc8dfq9c/ms-ccgps-standards-for-mathematical-practice/>



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