

NYS Next Generation Mathematics Learning Standards

NYSED AND S/CDN – MATHEMATICS TEAM
NOVEMBER 30, 2017

WELCOME and INTRODUCTIONS

NEW YORK STATE EDUCATION DEPARTMENT



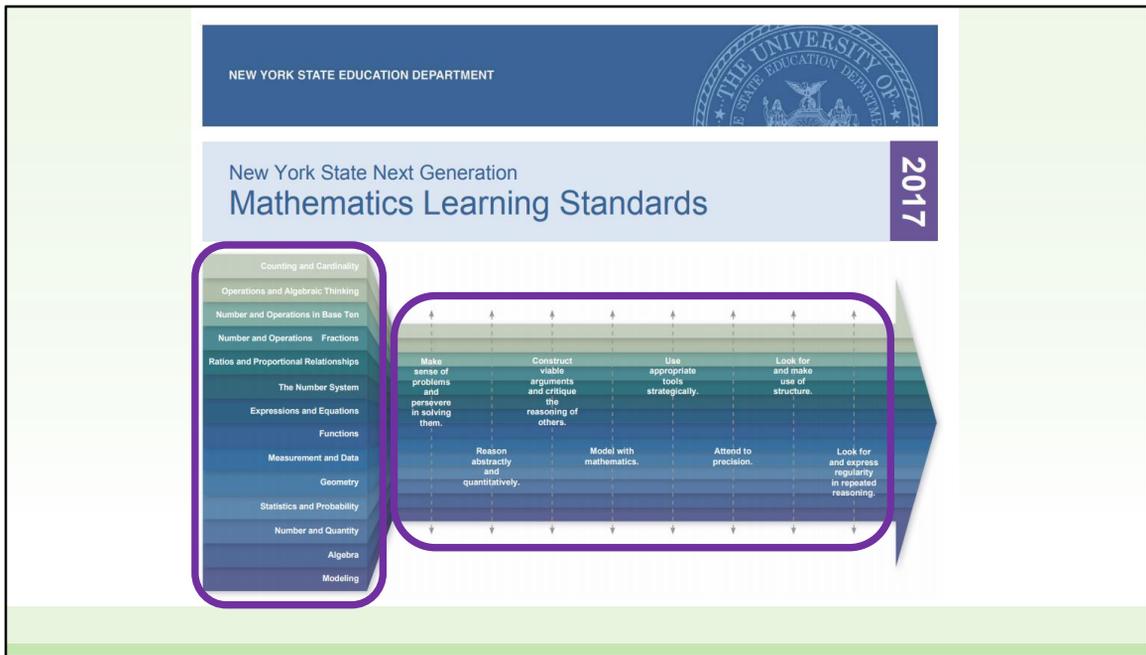
New York State Next Generation
Mathematics Learning Standards

2017

www.nysed.gov/next-generation-learning-standards

<https://www.engageny.org/next-generation-learning-standards>

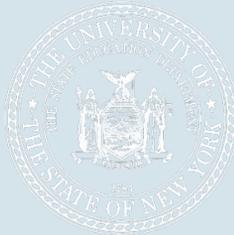
- Before we begin, we would like you to access your pre-downloaded or pre-printed copy of the New York State Next Generation Mathematics Learning Standards.
- If you have not yet downloaded or printed a copy, you can attempt to access it online, at either of these two web addresses, which are hyperlinked on this slide.
- There is limited Wi-Fi access.



- The graphic design on the cover of the New York State Next Generation Mathematics Learning Standards is a visual representation of the domains of the Content Standards, highlighted to the left (**pause and advance animation**), as well as the Standards for Mathematical Practice, we see infused throughout P-12 continuum (**pause and advance animation**).
- While the domains coherently build by grade level, we can see that students engage with each of the 8 Standards for Mathematical Practice throughout their mathematics learning experiences.

Table of Contents

The
Introduction:
Why Start
Here ?



★ Introduction	3
Standards for Mathematical Practice	7
Pre-Kindergarten	10
Kindergarten	17
Grade 1	25
Grade 2	35
Grade 3	45
Grade 4	55
Grade 5	67
Grade 6	77
Grade 7	89
Grade 8	97
High School — Introduction	105
Algebra I	108
Geometry	125
Algebra II	139
The Plus (+) Standards	157
Works Cited	169

As we take a look at the table of contents, we may be eager to get into the various grade-level standards, but we would like to first invite you to reflect on the introduction.

The introductory material is essential as it provides us with key understandings about the new standards as well as the context for the revision.

The introduction can be used as a tool to generate discussion for districts as they begin to implement the Next Generation Mathematics Learning Standards into their mathematics programs.

- Why is there a need for change?
- What is the relationship between standards, curriculum, instruction and assessment with regards to student learning?
- How do we make the standards accessible to our diverse learner populations?
- How do we connect content to practice?

We will be walking through these pieces together.

Introduction

The Opening Paragraph...

In 2015, New York State (NYS) began a process of review and revision of its current mathematics standards adopted in January of 2011. Through numerous phases of public comment, virtual and face-to-face meetings with committees consisting of NYS educators (Special Education, Bilingual Education and English as a New Language teachers), parents, curriculum specialists, school administrators, college professors, and experts in cognitive research, the New York State Next Generation Mathematics Learning Standards (2017) were developed.

These revised standards reflect the collaborative efforts and expertise of all constituents involved.

Let's first look at the opening paragraph of the Introduction.

Key understanding: this was a collaborative effort.

2015 Legislative Requirement: Standards re-evaluated with stakeholder input

NYSED conducted a survey (AIMHighNY) of **teachers, parents** and other **stakeholders** about the current standards. More than 10,500 people responded to the survey and provided over 750,000 pieces of **feedback**

Fall
2015

If we take a closer look at the revision timeline, we gain a better understanding of how the revised standards meet the 2015 legislation requiring that standards be reevaluated with stakeholder input.

(advance animation)

Beginning just over two years ago, in the Fall of 2015, NYSED began by conducting a survey of teachers, parents, and other stakeholders about the current standards. There were more than 10,500 respondents providing over 750,000 pieces of feedback.

2015 Legislative Requirement: Standards re-evaluated with stakeholder input

NYSED formed the Mathematics Learning Standards Review [committee](#) comprised of more than 68 educators and key stakeholders across the state that met for a week in Albany during July

Fall
2015

April
2016

The following spring, April of 2016, the New York State Education Department formed a committee which included more than 68 educators and key stakeholders. This committee came together to meet for a full week in July to begin the Mathematics Learning Standards Review process.

2015 Legislative Requirement: Standards re-evaluated with stakeholder input

NYSED released the new draft learning standards for public comment and received more than 4,100 comments

Fall
2015

April
2016

Sept.
2016

By September, the Education Department released a new draft of the mathematics learning standards, and once again sought public comment, resulting in an additional 4,100 comments.

2015 Legislative Requirement: Standards re-evaluated with stakeholder input

The Mathematics Content Advisory Panel and other committees reviewed every learning standard, making any necessary modifications based on professional expertise as well as input gathered from public comment and child development experts

Fall
2015

April
2016

Sept.
2016

Dec. 2016 –
April 2017

The Mathematics Content Advisory Panel and other committees reviewed each standard, and made additional necessary modifications based upon professional expertise as well as input generated from public comment and various child development experts.

*You will be able to hear more from the New York State Early Learning Task force if you choose to attend the afternoon breakout session (Early Learning and the Standards).

2015 Legislative Requirement: Standards re-evaluated with stakeholder input

Revised learning standards presented to the Board of Regents

Fall
2015

April
2016

Sept.
2016

Dec. 2016 –
April 2017

May
2017

In May of 2017, the revised learning standards were presented to the New York State Board of Regents.

**2015 Legislative Requirement:
Standards re-evaluated with stakeholder input**

Next Generation Mathematics Learning Standards approved by the Board of Regents

**Fall
2015**

**April
2016**

**Sept.
2016**

**Dec. 2016 –
April 2017**

**May
2017**

**Sept.
2017**

In September 2017, the Next Generation Mathematics Learning Standards were approved by the New York State Board of Regents.

Introduction

The New York State Next Generation Mathematics Learning Standards (2017) reflect revisions, additions, vertical movement, and clarifications to the current mathematics standards. The Standards are defined as the **knowledge, skills and understanding** that individuals can and do habitually demonstrate over time because of instruction and learning experiences.

Standards

In the second paragraph of the Introduction, we come across four terms: Standards, Curriculum, Instruction, and Assessment.

- How do they relate?
- How are they different?

Let's dive in.

- The NYS Next Generation Mathematics Learning Standards were built from the revisions, additions, vertical movement of, and clarification to the NYS P-12 CCLS for mathematics which will be in effect through the school year 2019-2020.
- We can agree that standards are the knowledge, skills, and understanding that we want our learners to be able to do so that they are successful in their post-secondary path of their choosing. **(advance animation)**

Introduction

These mathematics standards, collectively, are focused and cohesive—designed to support **student access to the knowledge and understanding of the mathematical concepts** that are necessary to function in a world very dependent upon the application of mathematics, while providing educators the opportunity to **devise innovative programs to support this endeavor.**

Instruction

Curriculum

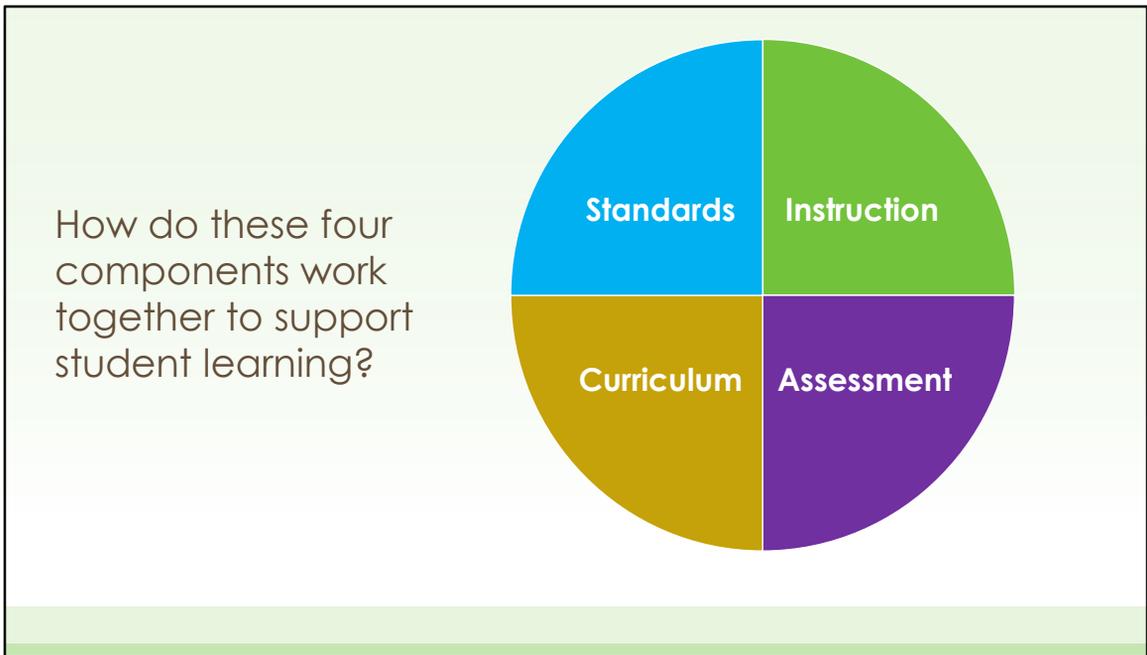
- These standards, which are both focused and cohesive, are intended to support student access to that knowledge and understanding, which we refer to as instruction (**advance animation**). The standards also inform educators as they devise innovative programs in the development of curriculum (**advance animation**).

Introduction

As with any set of standards, they need to be *rigorous*; they need to demand a balance of *conceptual understanding*, *procedural fluency* and *application* and represent a **significant level of achievement in mathematics that will enable students to successfully transition to post-secondary education and the workforce.**

Assessment

- We find that the standards are both rigorous and balanced in conceptual understanding, procedural fluency and application.
- They represent the level of achievement in mathematics that will allow students to successfully transition to either post-secondary education or workforce opportunities.
- We determine student's level of achievement through various assessments **(advance animation)**.



These four components: standards, curriculum, instruction, and assessment, cannot stand alone.

Collaboratively consider how these four components work together to support student learning.

Using one piece of blank paper provided at each table, develop a visual that represents the relationship between standards, curriculum, instruction, and assessment AND THE IMPACT ON STUDENT LEARNING.

[Set the timer for 10 minutes.]

[Facilitators circulate the room. With three minutes remaining, begin to identify 3-5 teams to share at the document camera – have teams who are presenting come to the front to share their visual.]

Introduction

Context for Revision of the *NYS Next Generation Mathematics Learning Standards (2017)*

Changing expectations for mathematics achievement

Increasingly Diverse Learner Populations

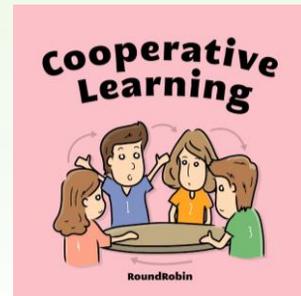
Students with Disabilities and the Standards

Understanding the *NYS Next Generation Mathematics Learning Standards (2017)*

- Let's go back to the introduction of the standards document, where we are provided with some insight into the context for the revision of the New York State Next Generation Mathematics Learning Standards.
- We are reminded of the ever changing expectations for mathematics achievement, the increasing diversity of learner populations in our classrooms, and the necessity of including our students with disabilities.
- **REVISIT THIS STATEMENT: *There is also additional information providing a deeper understanding of the NYS Next Generation Mathematics Learning Standards.***

Round Robin

- Each team of 4 will be provided a set of task cards to read
- While reading your assigned task card, answer the following:
 - What is the most important takeaway?
 - How do you relate your takeaway to standards, curriculum, instruction, and/or assessment?



- To deepen the understanding of the first 4 sections of the Introduction, we will engage in a round robin jigsaw task.
 - Teams of 4 will be provided a set of task cards.
- [2 sets of cards per table. If there are more than 8 at a table, they can share cards.]**
- As you read your task card, consider what the biggest take away is, and how you envision the main message will impact future planning of standards, curriculum, instruction, and assessment.

[Set the timer for 5 minutes]

[After timer]

- Share out within your team of 4.
- Each person gets 30 seconds for a total of 2 minutes.



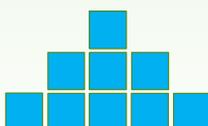
What types of learning experiences support these changing expectations?
To make the content standards more accessible to ALL STUDENTS, we can use tasks that have a low floor and a high ceiling (**advance animation**).

Today you will engage in a task that comes from Jo Boaler and YouCubed.org. (**advance animation**)

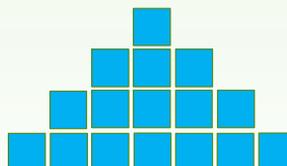
Describe how the shapes are growing.



Case 1



Case 2



Case 3

Ask the participants to look at the cases and think about how the shapes are growing. Each participant should be provided with a “squares upon squares” activity sheet. Each participant should write down the description of how they think the shapes are growing on their sheet (3-5 minutes).

Continuous Round Table

- Pass your paper clockwise
- Read your teammates description
- Write at least 1 comment reflecting on their description
- Repeat process until you receive your paper back



Format for Continuous Round Table

- 30 seconds per paper, for a total length of time, 2 minutes.
- Last 30 seconds will be used for each individual to read the groups' comments about their description.
- Each table will then have 2 minutes for a table talk to discuss how this continuous round table structure is a powerful tool that can be used in the classroom.

That's Me!

- Which method do you identify with?
- We'll share some common strategies. If you hear one of yours, stand up and say, "That's me!"

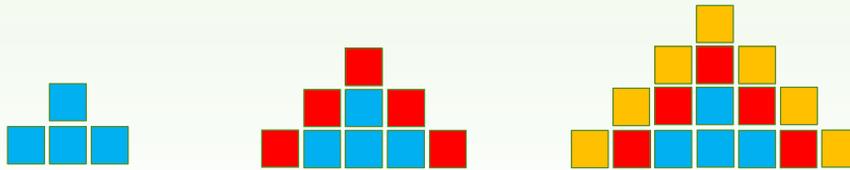


How did you engage in this task?

We will share with you some common ways students see this pattern grow.

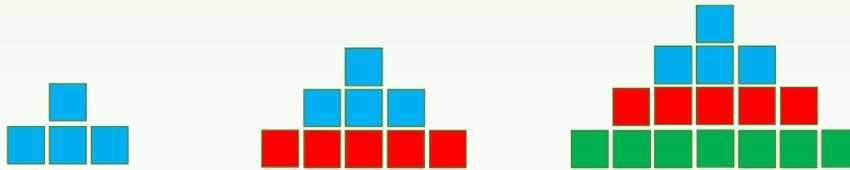
If you hear one that you used, stand up and say "that's me!"

Raindrop Method



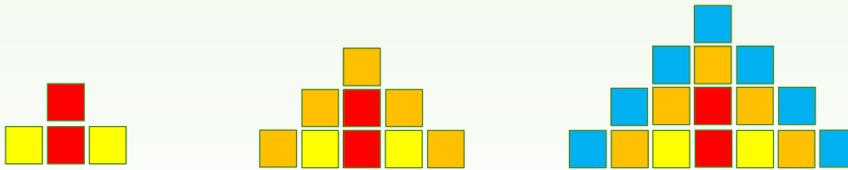
One common way to visualize this pattern is the raindrop method. The learner sees the square tiles falling down from above like raindrops. If you used the raindrop method, stand up and say, "That's me."

Bowling Alley Method



Another way to visualize this pattern growing is the bowling alley method. The learner sees the rows coming up from the bottom like bowling pins. If you used the bowling alley method, stand up and say, "That's me!"

Wayne's World

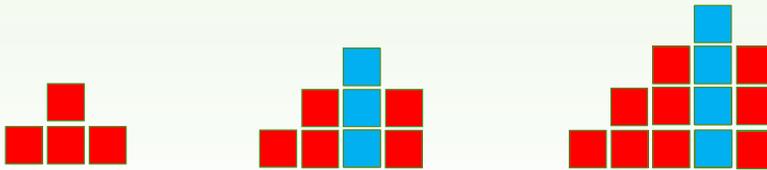


Here's a throwback to 1992.

In the Wayne's World method, the learner sees the squares going up like the stairway to heaven.....access denied.

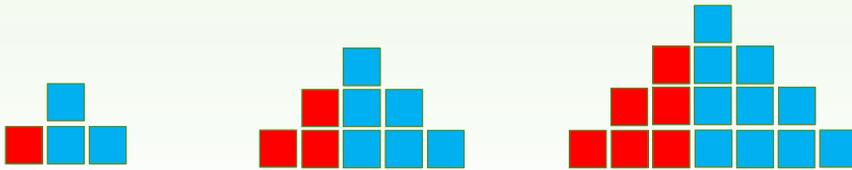
If you used the Wayne's World staircase method, stand up and say, "That's me."

Red Sea Method



Others might see the pattern grow like the parting of the Red Sea.
The shape splits itself and fills in the middle.
If you used the red sea method, stand up and say, "That's me!"

Square Method



Another way to see the pattern grow is the square method.
The learner moves the tiles to create a square.
If you used the square method, stand up and say, "That's me!"
(2 minutes total).

Team Collaboration

- What would the 6th case look like? How many **total** blocks would it have? How do you know?
- How many blocks would there be in the nth case? How do you know?

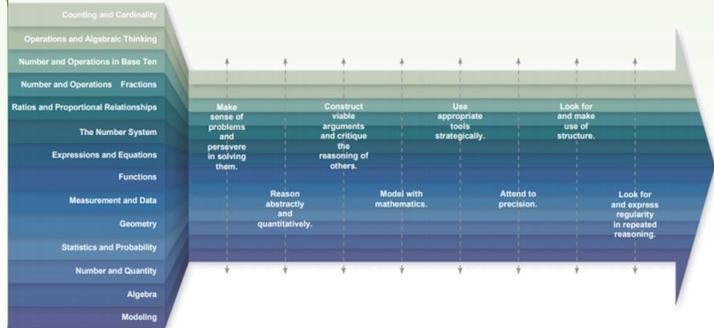
Allow 10 minutes for collaboration (may need more time) to close out task.
Have 1-2 teams share out their solutions.

How Do The NYS Next Generation Mathematics Learning Standards Support These Changing Expectations?

Connecting Content to Practice

Standards for Mathematical Content

NY-3.OA.9
NY-4.OA.5
NY-5.OA.3
NY-6.EE.1
NY-6.EE.2
NY-6.G.5
AI-F.BF.1a



After completion of this task, let's reflect again on the cover page and introduction which speaks to the content standards as they build procedural and conceptual understanding.

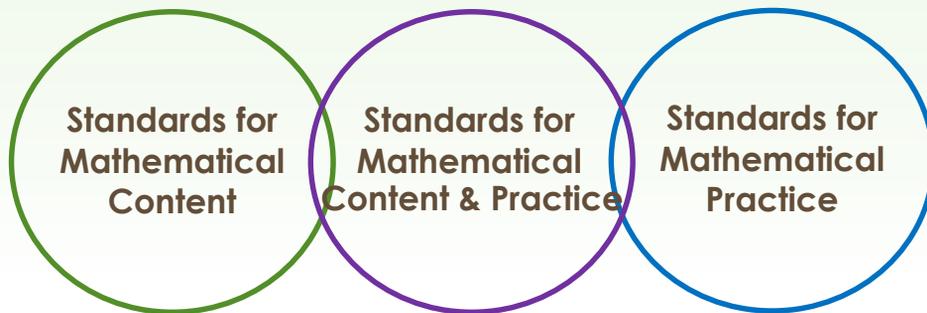
In the shapes task we engaged in:

Low Floor – High Ceiling tasks are intended to provide access to appropriate grade level tasks with entry points for students who are not on grade level. While the end goal of this task is an Algebra I standard, working with sequences, several other standards are embedded.

Time will be provided in one of the afternoon segments to dig into the grade-level content standards.

How Do The NYS Next Generation Mathematics Learning Standards Support These Changing Expectations?

Connecting Content to Practice



What are the Standards for Mathematical Practice?

True understanding of the content standards does not occur until there is a merging of the content standards and the Standards for Mathematical Practice.

Let's take some time to familiarize ourselves or review the Standards for Mathematical Practice.

Standards for Mathematical Practice

- 1. Make sense of problems and persevere in solving them**
- 2. Reason abstractly and quantitatively**
- 3. Construct viable arguments and critique the reasoning of others**
- 4. Model with mathematics**
- 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**

The Standards for Mathematical Practice were developed prior to the adoption of the Common Core Learning Standards.

They were based upon the NCTM math strands.

The Standards for Mathematical Practice can be thought of as “habits of mind”, or what we should see students doing as part of their natural routine in math classroom.

[Hand out Standard for Mathematical Practices sheet.]

The Standards for Mathematical Practice are outlined in more detail on pages 7 and 8 in the Next Generation Mathematics Learning Standards document.

Table Talk

- Each table has been assigned a number
- At your table fill in the following sentence frame:

SMP _____ Looked like _____ and
Sounded like _____ during this activity.

You've experienced an open-ended task and utilized the Standards for Mathematical Practice while engaging in the task.

Each table has been assigned a number that corresponds to one of the eight Standards for Mathematical Practice.

Using that number, at your table, fill in the following sentence frame:

Work as an impactful and motivated data scientist developing technical **solutions to complex problems**. **Analyze data to identify trends** and support the development of mission-related analyses, using techniques such as econometrics regression analysis, cluster analysis, Bayesian analysis, discriminant analysis, sentiment analysis, support vector machines, survival analysis, and other modes of machine learning. **Contribute to the development of new concepts** and experiments, translate these ideas into executable action plans, and **communicate** these plans to a diverse client base. **Create mathematical models** and programs used to test solutions to complex systems. Work within cross-functional teams to engage the client, comprehend the client's problems, develop strategic analytical products, support requirements analysis, including process and systems analyses, support the development of business and system architectures, and define actionable system requirements.



Source: <https://www.clearancejobs.com/jobs/2618108/data-scientist-junior-in-washington-dc-at-booz-allen-hamilton>

This is a job description. Notice what is highlighted, is there a common theme with what we have been able to discuss today?

Perspective employers want their employees to have the total package; not only content, but the ability to put that content into practice as well.

What do the Standards for Mathematical Practice Look and Sound Like in Kindergarten?



<https://www.teachingchannel.org/videos/pre-k-math-lesson>

NYSED Office of Curriculum and Instruction
518-474-5922

John Svendsen (NYSED Math Associate) John.Svendsen@nysed.gov

Sue Brockley (NYSED Math Associate) Susan.Brockley@nysed.gov

Boards of Cooperative Educational Services
(BOCES)

Staff and Curriculum Development Network
(S/CDN)

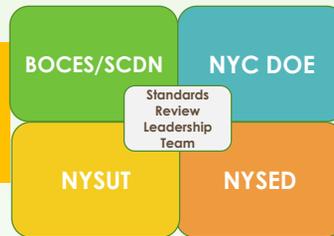
NYSCDN.COM

*Whose mission is to strengthen the capacity of school
districts to promote successful attainment of the New York
State Standards by all students.*

NYSED Contact Information

Standards Review Committee

The Math and ELA Leadership Teams plan the logistics for the standards review process including developing materials and providing guidance for the Standards Review Committees.



Both Math and ELA Committees are split into grade band subcommittees; and into course subcommittees for high school math.

Grade Band Committees	
Facilitator:	Content Advisory Member
Teachers:	P-12, ENL, Special Education
Administrators:	Building level, District level, Instructional Coaches
College Professors:	SUNY, CUNY, Community Colleges
Parents:	Urban, Suburban, rural, ENL, SWD

[Back](#)

35

For mathematics, the 68 member committee was broken up into seven subcommittee groups (Prekindergarten-Grade 2, Grades 3-5, Grades 6-8, Algebra I, Algebra II, Geometry and Plus Standards) that were comprised of NYS teachers, parents, curriculum specialists, school administrators and college professors.

At the elementary/middle level there were 2 grade level teachers for each grade level within the band, as well as a special education teacher, bilingual teacher, and 2 administrators. There was parent representation in each band as well. At the high school level, there were 3 or 4 classroom teachers in each band. A special education teacher was in the Algebra I group, and parent representation was in Algebra I, II and Geometry. We had an additional math coach, bilingual teacher, administrator, special education teacher and a higher education professor float amongst high school groups to aid accordingly.

For English Language Arts, the grade band committees were broken up into grades P-2, 3-5, 6-8, 9-12, and Literacy 6-12. P-12 classroom teachers, parents, curriculum specialists, school librarians, and college professors were all involved in the review and revisions. Each grade-band room was facilitated by a New York State educator, including a superintendent, two middle school teachers, and two high school

teachers.