



North Carolina Department of Public Instruction
Mathematics

K-8 Mathematics Standards Review & Revision

May 31, 2017

NC State Board of Education

Dr. Tiffany Perkins

Director, K-12 Standards, Curriculum & Instruction

Dr. Jennifer Curtis

Section Chief, K-12 Mathematics

Standards

A **distinction** should be made between “standards” and “curriculum”

Standards are what we want students to know and be able to do – it’s the end result



Defining a Content Standard

State	Definition
North Carolina	A big, powerful idea that provides students with knowledge and skills that are valuable beyond a single test, are of value in multiple disciplines and provides students with the ability to move to the next level of learning
Ohio	The knowledge and skills that students should attain, often called the “what” of “what students should know and be able to do;” the important and enduring ideas, concepts, issues, dilemmas and knowledge essential to the discipline
Iowa	Broad statements that identify the knowledge and skills that students should acquire
California	The knowledge, concepts and skills that students should acquire at each grade level

Curriculum

Ainsworth (2010) defines **curriculum** as “the high **delivery system** for ensuring that all students achieve the desired end – attainment of their designated grade- or course-specific standards” (p. 4).

In North Carolina, this is determined by the Local Education Agency.



K-8 Mathematics Revised Standards Final Draft Presentation



May Meeting Overview

- **The Policy & Process**
- **Stakeholder Input**
- **Data Review Team & Writing Teams**
- **Draft 1**
- **LEA Feedback**
- **Draft 2**
- **Public Comment**
- **Draft 3**
- **Implementation Plans & SBE Feedback**



Policy & Process

GCS-F-012 Policy delineating the Standard Course of Study Curriculum Development Process

1. Review data and research, surveys and other feedback
2. Establish writing teams and develop drafts of proposed changes
3. Submit draft for public review and input
4. Revise draft as necessary
5. Submit to State Board of Education for discussion and approval
6. Conduct professional development for teachers and administrators
7. ** Added Step – State External Reviews



EXTERNAL REVIEW RESULTS

Participating States:

Kentucky, Ohio, Oklahoma, Minnesota, and Utah

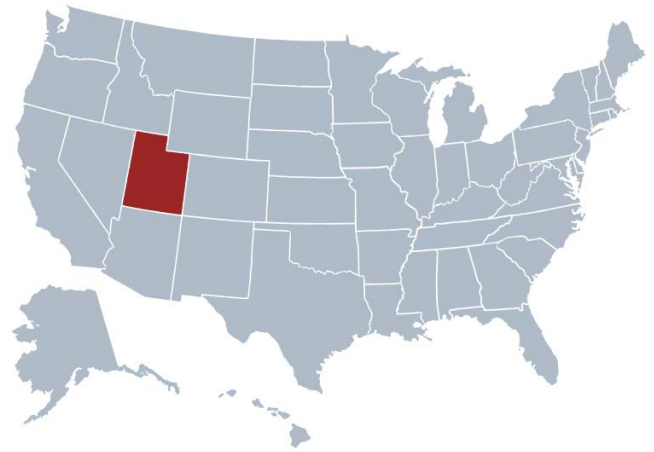
External Review

State Departments of Education were contacted to provide an external review of North Carolina's math draft standards.

These states were asked to consider the standards based on clarity, conciseness, and appropriate end-of-year expectations.

Responses received from:

- Kentucky
- Minnesota
- Ohio
- Oklahoma
- Utah



External Review - General Comments

- Strongly agree that the standards in K-8 are clear, concise, and contain appropriate end-of-year expectations.
- Language is more direct and clear with the removal of parentheticals and for examples (e.g. and such as). These removals will need to be addressed in support documents.
- The removal of the outline structure (a. b. c.) and using bullets allows the teachers to see the standard holistically.
- It is clear that great attention has been given to making clear the purpose of each standard.

External Review – Impact of Comments on Revisions

Most of the revisions added more clarity to the standards

Draft 3 Standard

NC.7.RP.3

Use proportional relationships to solve ratio and percent problems.

Sample Comment from a state

Use proportional relationships to solve ratio and percent problems.

Directly referring to scaling up, scale factor, & unit rate feels essential

to ensure rote procedures, especially "cross multiply & divide" are not relied upon too heavily too soon.

(applies to 7.RP.2-3)

Final Draft Standard

NC.7.RP.3

Use **scale factors and unit rates in** proportional relationships to solve ratio and percent problems.

External Review – Impact of Comments on Revisions

Some of the revisions to the Standards pointed out ways to make a stronger connection to previous learning

Draft 3 Standard

NC.5.MD.1

Given a conversion chart, solve one-step conversion problems within a given measurement system.

Comment from State

5.MD.1 - Do you want the language of this standard to be more closely related to 4.MD.2 related to multiplication and division?

Final Draft Standard

NC.5.MD.1

Given a conversion chart, **use multiplicative reasoning** to solve one-step conversion problems within a given measurement system.



External Review – Impact of Comments on Revisions

One revision concerned moving part of a standard for better alignment

Draft 3 Standard

NC.6.NC.7

Understand ordering and absolute value of rational numbers.

- a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
- b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- c. Understand the absolute value of a rational number as its distance from 0 on the number line to:
 - Interpret absolute value as magnitude for a positive or negative quantity in a real-world context.
 - Distinguish comparisons of absolute value from statements about order.

Comment from State

NC.6.NS.7

Understand ordering and absolute value of rational numbers.

- a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
- b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- c. Understand the absolute value of a rational number as its distance from 0 on the number line to:

→ move to 6.NS.5

Final Draft Standard

NC.6.NS.5

Understand and use rational numbers to:

- Describe quantities having opposite directions or values.
- Represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- Understand the absolute value of a rational number as its distance from 0 on the number line to:
 - Interpret absolute value as magnitude for a positive or negative quantity in a real-world context.
 - Distinguish comparisons of absolute value from statements about order.

External Review Comments

- Confirmed discussions and decisions made by the data review team, writing teams, and North Carolina teachers and professionals
- Used to inform the instructional support documents and professional development during implementation

Examples of Comments

K-8 Standards Review Comments from the External Review

Participating States: Kentucky, Minnesota, Ohio, Oklahoma, and Utah

Love usage of "subitizing" - very appropriate

The bullets in 1.OA.1 really help clarify the problem types/situations expected in the standard. It is appropriate to move comparison problems to 2nd grade. There are so many problem types introduced in 1st grade. It's appropriate to move some to 2nd grade, especially the comparison problems which are more advanced.

Unitizing very appropriate word to be used.

3.OA.7 - This clarification is huge! Changing from "Fluently multiply and divide within 100" to "Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10" adds so much clarity!

I have a vertical alignment and grade level appropriateness concern with NC.3.G.1. In the standard NC.3.G.1, students are asked to describe the attributes of rhombuses, rectangles, squares, parallelograms, and trapezoids based on their side lengths, number of parallel sides, and the presence or absence of right angles. My vertical alignment concern comes in at standard NC.4.G.1. In NC.4.G.1 students are asked to draw and identify points, lines, line segments, rays, angles, and perpendicular and parallel lines. The skills students learn as a part of these standards in grade 3 and 4 are in reverse of where they fit in the Van Hiele Model. According to Van Hiele, students in Level 0 develop recognition and visualization skills. At this stage they are learning geometric vocabulary. In your standard NC.4.G.1, students are at Level 0 because they are learning geometric vocabulary and recognizing parallel lines. The standard does not require the parallel lines to be in a 2-dimensional figure. In Level 1 of the Van Hiele, students begin to draw and analyze shapes by thinking about their properties. At this level, students recognize properties but do not see their connection(s) to others. An example of a property students may recognize at Level 1 is that opposite side in some quadrilaterals are parallel. Identifying the number of parallel lines in a quadrilateral like students do in NC.3.G.1 is Level 1. Consider removing parallel lines from grade 3 because it is not grade level appropriate based on the progression of the geometry standards

K-8 Standards Review Comments from the External Review



Worth noting Langral (2000) suggest four types of ratios are important in proportional problems: part-part-whole, associated sets, well-known measures, and growth (stretching and shrinking)

Initially equations in the form $ax+by=K$ are conceptually easier to understand rather than generalizing the linear relationship with $y=mx+b$.

Much stronger verb language: report to describe (implies details using understanding of basic stats), relate to justify provides an understanding of expectations. Analyze center and variability allows students to explore the data.

It is clear that great attention has been given to making clear the purpose of each standard. In comparison to the original standards, the delineation of each standard, while often primarily a formatting issue, helps draw attention to the components of that standard that matter.

Agree that the standards are clear and concise and that the standards provide appropriate end of year expectations.

Language for the most part is more clear and concise. Language from related standards were combined to strengthen connections.

Limitations with number will assist students with demonstrating proficiency and create an interest to know additional numbers.

New language for the clusters provides greater clarity. In some cases clusters were broken apart. This is appropriate.

Specificity of standards for instruction is excellent.



K-8 Final Draft Standards

7th Grade

Standards for Mathematical Practice

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

Ratio and Proportional Relationships

Current Standard Abbreviation	Current Standard	Proposed Standard Abbreviation	Final Draft Proposed Standard
Analyze proportional relationships and use them to solve real-world and mathematical problems.		Analyze proportional relationships and use them to solve real-world and mathematical problems.	
7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $(\frac{1}{2})/(\frac{1}{4})$ miles per hour, equivalently 2 miles per hour.</i>	NC.7.RP.1	Compute unit rates associated with ratios of fractions to solve real-world and mathematical problems.
7.RP.2	Recognize and represent proportional relationships between quantities. - Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. - Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. - Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.</i>	NC.7.RP.2	Recognize and represent proportional relationships between quantities. - Understand that a proportion is a relationship of equality between ratios. - Represent proportional relationships using tables and graphs. - Recognize whether ratios are in a proportional relationship using tables and graphs. - Compare two different proportional relationships using tables, graphs, equations, and verbal descriptions. - Identify the unit rate (constant of proportionality) within two quantities in a proportional relationship using tables, graphs, equations, and verbal descriptions.

K- 8 Educator Participation in the Review & Revision Process

Short Video



Data Review and Writing Team Members

Teachers and School-Level Coaches		District-Level Coaches and Specialist		Higher Education
Heather Landreth	Ron Hundley	Crystal Cabral	Adjoa Notwe-Rankin	Carol Midgett
Meg McKee	Krista Hannah	Ana Floyd	Lynn Marcin	Jeane Joyner
Marta Garcia	Ivey Powell	Dawne Coker	Krista Boyd	Drew Polly
Courtney Eller	Shelly Eudy	Kelly DeLong	Jennifer Arberg	Kay Pitchford
Natasha Rubin	Teresa Morton	Leanne Daughtry	Kim McCuiston	Katie Schwartz
Kim Bell	Stacy Wozny	Wendy Rich	Jenny Ainslie	Temple Walkowiak
Tami Harsh	Tymesia Butcher	Michael Elder	Karen Boone	Dawn McNair
Ron Hundley	Vanessa Lynch	Crystal Williams	LuAnn Malik	Katie Mawhinney
Jimmel Williams	Demetra Lassiter	Christina Zukowski	Beth Pike	Hollylynne Lee
Tisa Futch	Brenda Siniard	Alycen Wilson		Paloa Sztajn
Morgan Overby	Michelle (Sheely) Alford			Lisa Williamson
Alison Royster	Rachel Eure			Tracie Salinas
Leigha Jordan	Leigha Jordan			
Lynne Allen	Tisa Futch			



Next Steps



Sharing and Learning

Information Sessions

- Webinars for principals, teachers, district leaders late summer/early fall 2017
- Will be recorded for those who cannot attend
- Topics: Standards as revised, Implementation plan, Resource Development & Timeline of Releases

Professional Development

Sessions will be held across the state similar to the rollout for high school

4 Regional Sessions in Winter/Early Spring 2018

4 Regional Summer sessions 2018

4 Regional Follow-up Winter 2019

**** Due to the ending of MSP grant, there is no funding to do an K-5 or K-8 Math Summit, but it is very much needed. HS this year, MS last year, will depend upon state budget since Federal support is no longer available for K-12 mathematics**



Resource Development

DPI Math Section	MSP Projects
<i>Collaborative Pacing Guides</i> – by grade level – we facilitate, LEAs create and we share statewide	<i>K- 5 Project</i> – led by Richmond County, UNC Pembroke and many teachers across the state – tasks, lessons, resources
<i>Instructional Guidance Documents</i> that includes links to formative assessment ideas, tasks, etc.	<i>K-8 Project - expanding</i> Mt. Airy – Wake Forest School of Medicine – case study / problem based learning – teachers from across the region
<i>Progressions</i>– outlining the learning across grade levels – understandings and how they develop over time	<i>6-8 Project (2)</i> Charlotte-Mecklenburg partnering with Johnson C. Smith University expanding to include grade 8; Avery County partnering with Appalachian State grades 6-8



2017-2019 NC MATH K-8 IMPLEMENTATION PLAN

INPUTS

NCDPI mathematics team working with multiple internal and external stakeholders (UNC-Greensboro, District Math Leaders, Teacher Leaders and other NCDPI divisions) to create an implementation plan

A Leadership Institute for district leaders to regularly discuss implementation

MSP grant recipients are co-developing curriculum supports and resources to be shared statewide

An Implementation Pacing Framework will help guide the timing during this process

Districts have options:
1) to develop own pacing guide;
2) to use NCDPI's guide; or
3) to use another district's shared guide

PROCESSES



Summer and Fall 2017 Information Sessions



In-Person Regional Math Professional Development in the 2017-18 school year for teachers



NCDPI Mathematics Section, MSP Projects and NC²ML in collaboration with districts will facilitate the creation of instructional support tools for teachers



Curriculum Leader Collaborative (CLC) Implementation Support

OUTCOMES

- Provide a foundation for implementation that districts and schools can build upon locally and supplement if needed
- Provide a path of continuous learning and direct support for classroom teachers that is non-evaluative
- Increase the capacity of districts and teachers to identify quality classroom resources
- Support the understanding of mathematical coherence and the progression of learning across K-8
- Collaboratively develop a platform for sharing all resources with LEAs and Charters across North Carolina

PARTNERSHIP:



PUBLIC SCHOOLS OF NORTH CAROLINA
State Board of Education | Department of Public Instruction



Recommendations

- Adopt revised K-8 Math Standards as posted
- Deliver professional development and support resource alignment in the 2017-18 school year
- Implement new K-8 Math Standards in the 2018-19 school year

Questions?



DPI Mathematics Section

Dr. Jennifer Curtis

K – 12 Mathematics Section Chief
919-807-3838

jennifer.curtis@dpi.nc.gov

Nina Barrett

Mathematics Program Assistant
919-807-3846

nina.barrett@dpi.nc.gov

Lisa Ashe

Secondary Mathematics Consultant
919-807-3909

lisa.ashe@dpi.nc.gov

Joseph Reaper

Secondary Mathematics Consultant
919-807-3691

joseph.reaper@dpi.nc.gov

Kitty Rutherford

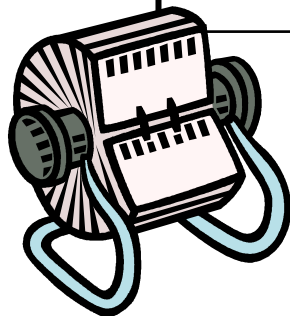
Elementary Mathematics Consultant
919-807-3841

kitty.rutherford@dpi.nc.gov

Denise Schulz

Elementary Mathematics Consultant
919-807-3842

denise.schulz@dpi.nc.gov





K-8 Mathematics Standards Review & Revision

Jennifer Curtis, Ed.D.

Section Chief, K-12 Mathematics

Overview

- **The policy & process**
- **Stakeholder input**
- **Data Review Team & Writing Teams**
- **Draft 1**
- **LEA Feedback**
- **Draft 2**
- **Public Comment**
- **Draft 3**



Policy & Process

GCS-F-012 Policy delineating the Standard Course of Study Curriculum Development Process

Completed Steps vs. **Coming soon**

1. Review data and research, surveys and other feedback
2. Establish writing teams and develop drafts of proposed changes
3. Submit draft for public review and input
4. Revise draft as necessary
5. **Submit to State Board of Education for discussion and approval**
6. **Conduct professional development for teachers and administrators**



November
2016

- Data Review Committee Meeting

December
2016

- Writing Team Meeting

January
2017

- Draft 1

January
2017

- LEA Review & Feedback

March
2017

- Writing Team Revisions

March
2017

- Draft 2

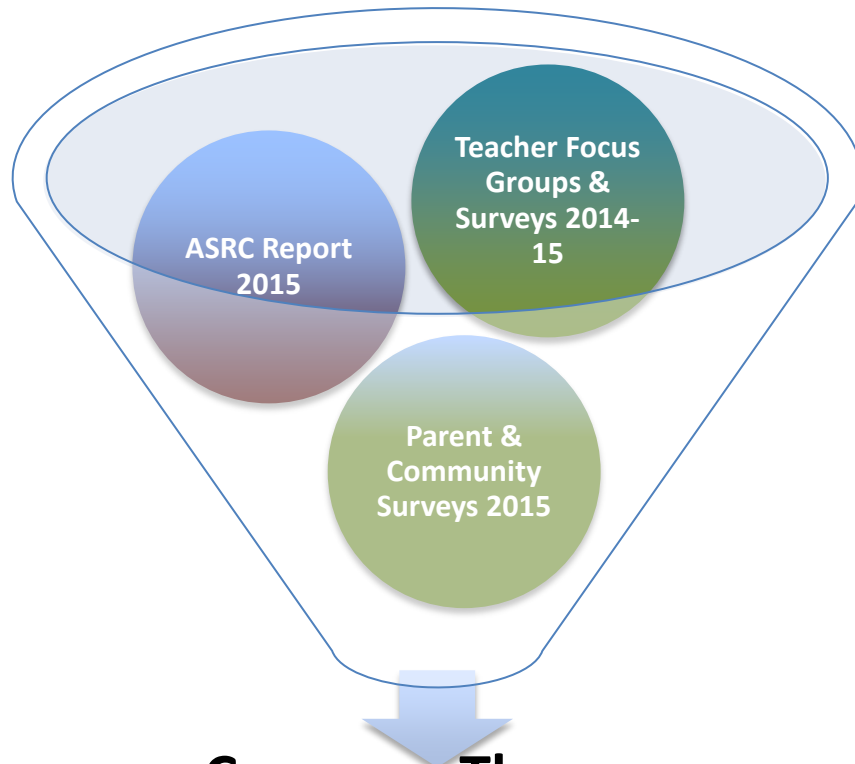
April
2017

- Public Comment Survey

April
2017

- Draft 3

1. Review data and research, surveys and other feedback.



Common Themes

Developed by Data Review Group

November 2016

The Data Review Group consisted of:

- Teachers from Western, Central, and Eastern NC
- Teachers from large, medium and small districts
- District math specialists and coaches
- Math Education and Mathematics Professors from NC Universities

Review and Writing Team Members

Teachers and School Level Coaches		District Level Coaches and Specialist		High Education
Heather Landreth	Ron Hundley	Crystal Cabral	Adjoa Notwe-Rankin	Carol Midgett
Meg McKee	Krista Hannah	Ana Floyd	Lynn Marcin	Jeane Joyner
Marta Garcia	Ivey Powell	Dawne Coker	Krista Boyd	Drew Polly
Courtney Eller	Shelly Eudy	Kelly DeLong	Jennifer Arberg	Kay Pitchford
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Ron Hundley	Vanessa Lynch	Crystal Williams	LuAnn Malik	Katie Mawhinney
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Tisa Futch	Brenda Siniard	Alycen Wilson		Paloa Sztajn
Morgan Overby	Michelle (Sheely) Alford			Lisa Williamson
Alison Royster	Rachel Eure			Tracie Salinas
Leigha Jordan	Leigha Jordan			
Lynne Allen	Tisa Futch			



2. Establish writing teams and develop drafts of proposed changes.

The 1st & 2nd Drafts' Writing Teams consisted of members of the Data Review Group.

Writing Teams created:

1. Grades K - 2
2. Grades 3 - 5
3. Grades 6 – 8

Staff applied public comment data to create Draft 3



K-8 Math Standards Revision

LEA Feedback Statistics

K – 2	Rigor The K-2 revised standards cover conceptual understanding, procedural fluency, and mathematical reasoning.		Coherence The K-2 revised standards convey a unified vision of mathematics, establish connections among the major areas of study, and show a meaningful progression of content across the grades.		Clarity The K-2 revised standards are clear and concise.		Measurability The K-2 revised standards are measurable, observable, or verifiable in some way.	
	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs
Strongly Agree	34	34.34%	34	34.34%	33	33.33%	29	29.29%
Agree	64	64.65%	62	62.63%	56	56.57%	69	69.70%
Disagree	1	1.01%	3	3.03%	10	10.10%	1	1.01%
Strongly Disagree	0	0.00%	0	0.00%	0	0.00%	0	0.00%
total	99	100.00%	99	100.00%	99	100.00%	99	100.00%
Strongly Agree + Agree		98.99%		96.97%		89.9%		98.99%

K-8 Math Standards Revision

LEA Feedback Statistics

3 – 5	Rigor The K-2 revised standards cover conceptual understanding, procedural fluency, and mathematical reasoning.		Coherence The K-2 revised standards convey a unified vision of mathematics, establish connections among the major areas of study, and show a meaningful progression of content across the grades.		Clarity The K-2 revised standards are clear and concise.		Measurability The K-2 revised standards are measurable, observable, or verifiable in some way.	
	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs
Strongly Agree	31	31.63%	28	28.57%	31	31.63%	33	33.67%
Agree	62	63.27%	62	63.27%	54	55.10%	61	62.24%
Disagree	4	4.08%	7	7.14%	13	13.27%	4	4.08%
Strongly Disagree	1	1.02%	1	1.02%	0	0.00%	0	0.00%
total	98	100.00%	98	100.00%	98	100.00%	98	100.00%
Strongly Agree + Agree		94.9%		91.84%		86.73%		95.91%

K-8 Math Standards Revision

LEA Feedback Statistics

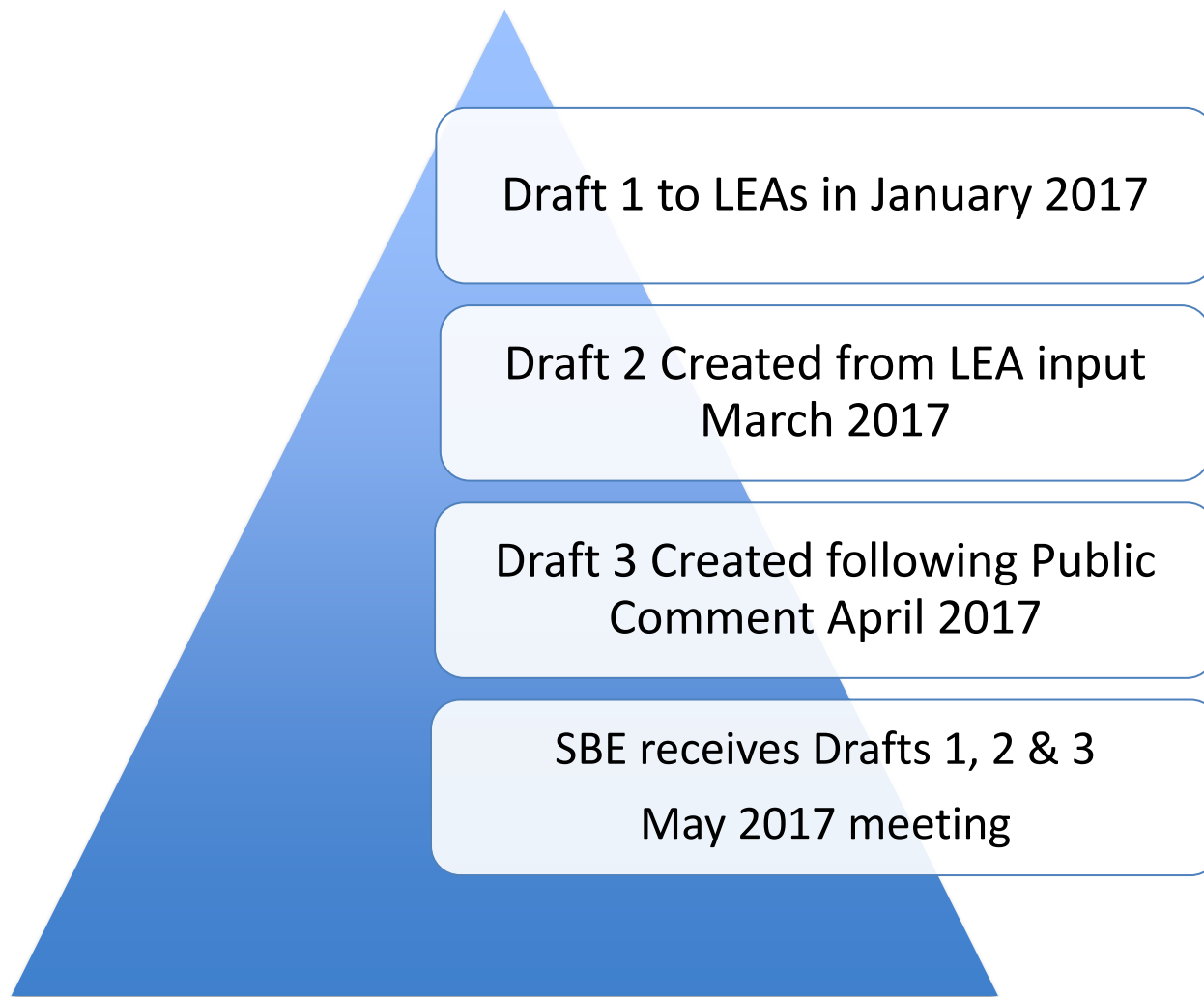
6 – 8	Rigor The K-2 revised standards cover conceptual understanding, procedural fluency, and mathematical reasoning.		Coherence The K-2 revised standards convey a unified vision of mathematics, establish connections among the major areas of study, and show a meaningful progression of content across the grades.		Clarity The K-2 revised standards are clear and concise.		Measurability The K-2 revised standards are measurable, observable, or verifiable in some way.	
	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs	Number of LEAs	Percent of LEAs
Strongly Agree	23	24.47%	22	23.40%	15	15.96%	20	21.28%
Agree	65	69.15%	62	65.96%	69	73.40%	69	73.40%
Disagree	6	6.38%	10	10.64%	10	10.64%	5	5.32%
Strongly Disagree	0	0.00%	0	0.00%	0	0.00%	0	0.00%
total	94	100.00%	94	100.00%	94	100.00%	94	100.00%
Strongly Agree + Agree		93.62%		89.36%		89.36%		94.68%

K-8 Math Standards Revision

LEA Feedback Statistics

6 – 8	Integers			Rigor	
	Number of LEAs	Percent of LEAs		Number of LEAs	Percent of LEAs
Meets the needs of students	77	76.24%	The standards are balanced between concepts and procedures.	81	86.17%
Comes close to meeting the needs of students	19	18.81%	The standards place too much focus on conceptual understanding.	11	11.70%
Does not meet the needs of students	5	4.95%	The standards place too much focus on procedural fluency.	2	2.13%
	101	100.00%		94	100.00%

3. Submit draft for public review and input



K-8 Math Standards Revision

Public Feedback Statistics

Kindergarten

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	131	23.7%
Agree	381	68.9%
Disagree	34	6.2%
Strongly Disagree	7	1.3%
<i>total</i>	553	100.1%
Summary: Strongly Agree + Agree		92.6%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	131	23.7%
Agree	352	63.8%
Disagree	56	10.1%
Strongly Disagree	13	2.4%
<i>total</i>	552	100%
Summary: Strongly Agree + Agree		87.5%

K-8 Math Standards Revision

Public Feedback Statistics

1st Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	121	23.5%
Agree	359	69.7%
Disagree	28	5.4%
Strongly Disagree	7	1.4%
<i>total</i>	515	100%
Summary: Strongly Agree + Agree		93.2%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	113	22%
Agree	325	63.2%
Disagree	61	11.9%
Strongly Disagree	15	2.9%
<i>total</i>	514	100%
Summary: Strongly Agree + Agree		85.5%

K-8 Math Standards Revision

Public Feedback Statistics

2nd Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	118	23.7%
Agree	348	70%
Disagree	23	4.6%
Strongly Disagree	8	1.6%
<i>total</i>	497	99.9%
Summary: Strongly Agree + Agree		93.7%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	116	23.3%
Agree	328	66%
Disagree	39	7.9%
Strongly Disagree	14	2.8%
<i>total</i>	467	100%
Summary: Strongly Agree + Agree		89.3%

K-8 Math Standards Revision

Public Feedback Statistics

3rd Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	105	19.2%
Agree	396	72.5%
Disagree	33	6%
Strongly Disagree	12	2.2%
<i>total</i>	546	99.9%
Summary: Strongly Agree + Agree		91.7%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	100	18.3%
Agree	360	65.9%
Disagree	71	13%
Strongly Disagree	15	2.8%
<i>total</i>	546	100%
Summary: Strongly Agree + Agree		84.2%

K-8 Math Standards Revision

Public Feedback Statistics

4th Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	103	21.3%
Agree	339	70%
Disagree	35	7.2%
Strongly Disagree	7	1.5%
<i>total</i>	484	100%
Summary: Strongly Agree + Agree		91.3%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	92	19.2%
Agree	315	65.8%
Disagree	62	12.9%
Strongly Disagree	10	2.1%
<i>total</i>	446	100%
Summary: Strongly Agree + Agree		85%

K-8 Math Standards Revision

Public Feedback Statistics

5th Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	100	20.5%
Agree	347	71.1%
Disagree	30	6.2%
Strongly Disagree	11	2.3%
<i>total</i>	488	100.1%
Summary: Strongly Agree + Agree		91.6%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	84	17.3%
Agree	330	67.9%
Disagree	54	11.1%
Strongly Disagree	18	3.7%
<i>total</i>	457	100%
Summary: Strongly Agree + Agree		85.4%

K-8 Math Standards Revision

Public Feedback Statistics

6th Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	57	17.5%
Agree	245	75.2%
Disagree	15	4.6%
Strongly Disagree	9	2.8%
<i>total</i>	326	100.1%
Summary: Strongly Agree + Agree		92.7%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	59	18.2%
Agree	217	66.8%
Disagree	38	11.7%
Strongly Disagree	11	3.4%
<i>total</i>	325	100.1%
Summary: Strongly Agree + Agree		85%

K-8 Math Standards Revision

Public Feedback Statistics

7th Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	49	16.4%
Agree	227	75.9%
Disagree	13	4.4%
Strongly Disagree	10	3.3%
<i>total</i>	299	100.1%
Summary: Strongly Agree + Agree		92.3%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	52	17.5%
Agree	216	72.5%
Disagree	21	7.1%
Strongly Disagree	9	3%
<i>total</i>	298	100.1%
Summary: Strongly Agree + Agree		90%

K-8 Math Standards Revision

Public Feedback Statistics

8th Grade

Standards are clear and concise.

Agreement	Number	Percent
Strong Agree	62	20.3%
Agree	217	71.2%
Disagree	16	5.3%
Strongly Disagree	10	3.3%
<i>total</i>	305	100.1%
Summary: Strongly Agree + Agree		91.5%

Standards provide appropriate end of year expectations.

Agreement	Number	Percent
Strong Agree	63	20.6%
Agree	202	66.2%
Disagree	29	9.5%
Strongly Disagree	11	3.6%
<i>total</i>	288	99.9%
Summary: Strongly Agree + Agree		86.8%

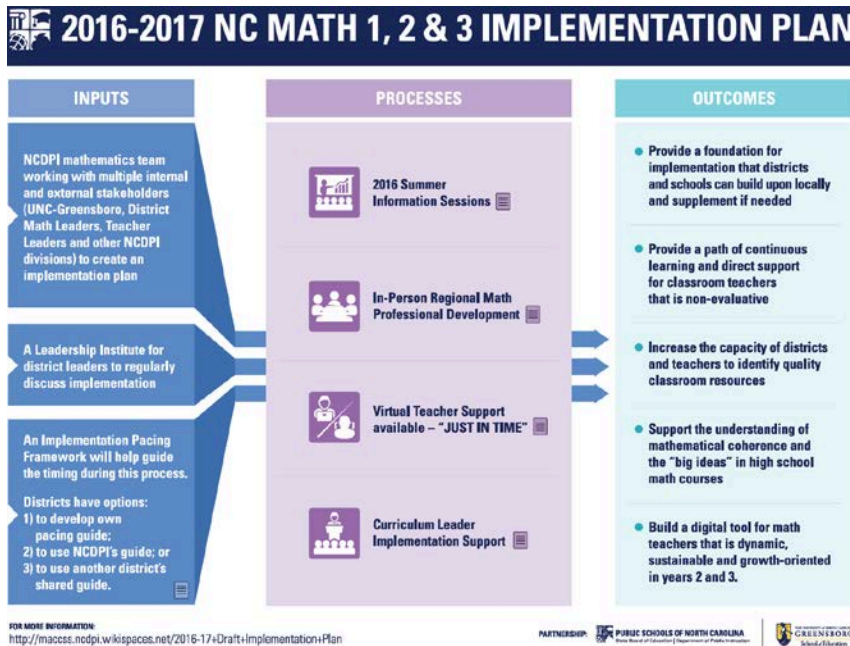
5. Submit to SBE for discussion and approval



Implementation Plans:
Recommendation is
for 2018-19 school
year.

This allows for the
following to take
place...

6. Professional development for educators



- Recall the HS Implementation Plan
- Will create similar graphic after input from SBE on the plans
- Many resources to be developed – teams are planning at this point pending SBE feedback and approval

Resources under Discussion for Development

DPI Math Section	MSP Projects
<i>Collaborative Pacing Guides</i> – by grade level – we facilitate, LEAs create and we share statewide	<i>K- 5 Project</i> – led by Richmond County, UNC Pembroke and many teachers across the state – tasks, lessons, ...
<i>Instructional Guidance Document</i> that includes links to formative assessment ideas, tasks, etc.	<i>6-8 Project - expanding</i> Mt. Airy – Wake Forest school of medicine – case study / problem based learning – teachers from across the region
<i>Progressions</i>– outlining the learning across grade levels – understandings and how they develop over time	<i>6-8 Project (2)</i> Charlotte-Mecklenburg partnering with Johnson C. Smith University expanding to include grade 8 and Avery County partnering with Appalachian State grades 6-8

Planning for the Work

- Wrote RFP for the Math Science Partnership Grant to include building resources in support of standards
- Awarded funds after SBE approval
- Initial planning meeting Greensboro early April
- Summer Math Convening with MSP projects and NC Math Collaborative UNCG – June 2017
- MSP projects coordinate and stay in touch with DPI and UNCG partners as resources developed

Sharing and Learning

Information Sessions

- Webinars for principals, teachers, district leaders late summer/early fall 2017
- Will be recorded for those who cannot attend
- Topics: Standards as revised, Implementation plan, Resource Development & Timeline of Releases

Professional Development

Sessions will be held across the state similar to the rollout for high school

4 Regional Sessions in Winter/Early Spring 2018

4 Regional Summer sessions 2018

4 Regional Follow-up Winter 2019

**** Due to the ending of MSP grant, there is no funding to do an K-5 or K-8 Math Summit, but it is very much needed. HS this year, MS last year, will depend upon state budget since Federal support is no longer available for K-12 mathematics**



The Standards

Current Standard

4.NF.4

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent $5/4$ as the product $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$.*

b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a)/b$.)*

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat $3/8$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

1st draft – based on Data Review Recommendations

NC.4.NF.4

Use unit fractions to understand operations of fractions.

Multiply fractions and whole numbers by:

- Modeling and explaining how a fraction can be represented by multiplying a whole number by a unit fraction.
- Modeling and explaining how a multiplication problem between a whole number and a fraction is equal to a problem involving a whole number and a unit fraction with the same denominator.
- Solving word problems involving multiplication of a fraction by a whole number by writing equations from a visual representation of the problem.

1st Round Writing Team

- Rewrite the standard using bullets
- Remove examples, to be included in instructional support documents
- Change wording for clarity
- Highlight the progression from using models to developing equations



The Standards

Current Standard

1st draft – based on Data Review Recommendations

NC.4.NF.4

Use unit fractions to understand operations of fractions.

Multiply fractions and whole numbers by:

- Modeling and explaining how a fraction can be represented by multiplying a whole number by a unit fraction.
- Modeling and explaining how a multiplication problem between a whole number and a fraction is equal to a problem involving a whole number and a unit fraction with the same denominator.
- Solving word problems involving multiplication of a fraction by a whole number by writing equations from a visual representation of the problem.

2nd draft – based on LEA Feedback

Use unit fractions to understand operations of fractions.
Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction.
- Solve word problems involving multiplication of a fraction by a whole number.

2nd Round Writing Team

- Changed the stem to link to previous learning
- The 1st and 2nd bullets were combined
- The methods mentioned in the third bullet were moved to the instructional support document



The Standards

Current Standard

1st draft – based on Data Review Recommendations

NC.4.NF.4

2nd draft – based on LEA Feedback

Use unit fractions to understand operations of fractions.
Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction.
- Solve word problems involving multiplication of a fraction by a whole number.

3rd draft – based on Public Feedback

Use unit fractions to understand operations of fractions.
Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction **less than one**.
- Solve word problems involving multiplication of a fraction by a whole number.

3rd Draft

-Limitation need to be added to first bullet, to avoid mixed numbers and improper fractions.



Overview of Changes: K-2 Operations and Algebraic Thinking

Grades K – 2: Operations and Algebraic Thinking

Students develop meanings for addition and subtraction as they encounter problem situations in Kindergarten, and they extend these meanings as they encounter increasingly difficult problem situations in Grade 1. Problems are represented in increasingly sophisticated ways. Students learn and use increasingly sophisticated computation methods to find answers. In each grade, the situations, representations, and methods are calibrated to be coherent and to foster growth from one grade to the next.

Throughout this domain, many of the standards with multiple parts were rewritten using bullets to make the expectations clear and concise. All examples were removed from the standards. The removed examples will be placed in the instructional support documents. The footnotes were removed and are placed in the standards or support documents.

General Information

Remember when reviewing this section:

- 1) Expectations expressed in a grade level are not repeated in higher grade levels.
- 2) Further explanation of standards will be found in the instructional support documents.

Kindergarten	1 st Grade	2 nd Grade
Most revisions in Kindergarten are the result of clarifying the intention of the standards. <u>No</u> concepts were added in the Operations and Algebraic Thinking Standards for Kindergarten, but conceptual subitizing is made more explicit in NC.K.OA.6. <u>No</u> concepts were removed from the Operations and Algebraic Thinking Standards for Kindergarten.	Most revisions in 1st grade <u>are</u> the result of clarifying the intention of the standards. <u>No</u> concepts were added in the Operations and Algebraic Thinking Standards for 1st grade. <u>1</u> concept was removed from the Operations and Algebraic Thinking Standards for 1st grade. Two problem types (compare-bigger unknown and compare-smaller unknown) were moved to from 1.OA. 1 to NC.2.OA.1.	Most revisions in 2nd grade <u>are</u> the result of clarifying the intention of the standards. <u>1</u> concept was added to the Operations and Algebraic Thinking Standards for 2nd grade. Two problem types (compare-bigger unknown and compare-smaller unknown) were moved to from 1.OA.1 to NC.2.OA.1. <u>No</u> concepts were removed from the Operations and Algebraic Thinking Standards for 2nd grade.

See Changes through the Grade Band



Overview of Changes: 3-5 Operations and Algebraic Thinking

Grades 3 – 5: Operations and Algebraic Thinking

Students focus on understanding the meaning and properties of multiplication and division, and they extend these meanings as they encounter increasingly difficult problem situations. These skills and understandings are foundational for expression and equation work in middle grades.

References to “rounding” were changed to “estimation strategies” to shift the focus from the memorization of rounding rules to understanding reasonableness of answers.

Throughout this domain, many of the standards with multiple parts were rewritten using bullets to make the expectations clear and concise. All examples were removed from the standards. The removed examples will be placed in the instructional support documents. The footnotes were removed and are placed in the standards or support documents.

Remember when reviewing this section:

- 1) Expectations expressed in a grade level are not repeated in higher grade levels.
- 2) Further explanation of standards will be found in the instructional support documents.

3 rd Grade	4 th Grade	5 th Grade
Most revisions in 3 rd grade <u>are</u> the result of clarifying the intention of the standards.	Most revisions in 4 th grade <u>are</u> the result of clarifying the intention of the standards.	Most revisions in 5 th grade <u>are</u> the result of clarifying the intention of the standards.
<u>No</u> concepts were added in the Operations and Algebraic Thinking Standards for 3 rd grade.	<u>No</u> concepts were added in the Operations and Algebraic Thinking Standards for 4 th grade.	<u>No</u> concepts were added in the Operations and Algebraic Thinking Standards for 5 th grade.
<u>No</u> concepts were removed from the Operations and Algebraic Thinking Standards for 3 rd grade.	<u>No</u> concepts were removed from the Operations and Algebraic Thinking Standards for 4 th grade.	<u>No</u> concepts were removed from the Operations and Algebraic Thinking Standards for 5 th grade.
<u>New Limitation:</u> • In NC.3.OA.8, two-step word problems are now limited to the operations of addition, subtraction, and multiplication.	<u>New Limitation:</u> • In NC.4.OA.4, finding factors of a number is now limited to 50 instead of 100.	<u>New Limitation:</u> • In NC.5.OA.2, the use of brackets and braces to evaluate numerical expressions was removed.

A concept remained and limitations were modified or added.

Overview of Changes: 6-8 Expressions and Equations

Grades 6 – 8: Expressions and Equations

The Expressions and Equations domain naturally builds from the elementary domain Operations & Algebraic Thinking.

Throughout the Expressions and Equations domain, many of the standards with multiple parts were rewritten using bullets to make the expectation clear and concise. All examples were removed from the standards. The removed examples will be placed in the instructional support documents.

Remember when reviewing this section:

- 1) Expectations expressed in a grade level are not repeated in other grade levels. For example: Order of operations (except for exponents) are part of the elementary standards. This means that even though these skills are necessary for rewriting expressions in middle school, these skills will not be mentioned in the middle school standards.
- 2) Further explanation of standards, such as "What does it mean to view a part of an expression as a single entity?" will be found in the instructional support documents.

6th Grade
Most revisions in 6th grade are the result of clarifying the intention of the standards.

No concepts were added in the Expressions and Equations Standards for 6th grade.

No concepts were removed from the Expressions and Equations Standards for 6th grade.

Additional Information:

- The cluster heading was changed for **NC.6.EE.8** to clarify that students are not expected to solve inequalities.
- While the **NC.6.EE.9** was heavily revised for clarity, the focus on the vocabulary of dependent and independent variables has been removed.

7th Grade
Most revisions in 7th grade are the result of clarifying the intention of the standards.

No concepts were added in the Expressions and Equations Standards for 7th grade.

No concepts were removed from the Expressions and Equations Standards for 7th grade.

8th Grade
Most revisions in 8th grade are the result of clarifying the intention of the standards.

- Linear equations in **NC.8.EE.8** for a system are to be in slope-intercept form.

1 concept was added in the Expressions and Equations for 8th grade.

- Solving multi-step linear inequalities, with variables on both sides is now expected.

3 concepts were removed from the Expressions and Equations Standards for 8th grade.

- **NC.8.EE.4**, adding and subtracting numbers in scientific notation has been removed. Multiplying and dividing remains.
- **NC.8.EE.5**, comparing different proportional relationships, was moved to 7th grade, **NC.7.RP.2a**. Interpreting the unit rate as slope remains in **NC.8.F.4**.
- **NC.8.EE.8**, solving a system of equations using substitution was removed, since it is in NC Math 1. Solving a system by

A concept remained and important information is identified.

Some Highlights of Revisions

- Rounding and Estimation
- Identifying Gaps
- Clarity
- Specificity
- Grade Appropriate Expectations



Change from “rounding” to “estimation strategies”

- Rounding is one of several estimation strategies.
- This change of wording was done to shift the focus from the memorization of rounding rules to understanding reasonableness of answers.
- The unpacking will include examples to promote rounding with place value understanding instead of memorization of rounding rules.
- Context of the situation should determine the estimation strategy used.
- Unpacking document will also include other estimation strategies and real world applications of when rounding is appropriate.



Identifying Gaps in Content Progression

	Sixth Grade	Seventh Grade	Eighth Grade	Math I
Inequalities	Write inequalities to represent a real-world or mathematical problem.	Write and solve multi-step inequalities with the variable on one side of the equation.		Write and solve inequalities with the variable on both sides of the equation.
Equations	Write and solve simple one-step equations.	Write and solve multi-step equations with the variable on one side of the equation.	Write and solve equations with the variable on both sides of the equation.	

Expanding a Standard to Allow more time for understanding

	Sixth Grade	Seventh Grade
Operations with Negative Numbers	with a focus on modeling	Add and subtract integers Add and subtract negative rational numbers Multiply and divide negative rational numbers

	Sixth Grade	Seventh Grade
Summarizing Data	Summarize numerical data sets by: -Calculating measures of center (Mean and Median) -Calculating measures of variability (Mean Absolute Deviation and Interquartile Range) -Describe variability	

Clarity

- Used ***less technical mathematical language*** to make explicit the expectations of the standard.
- Clearly defined the expectations of the standards using concise ***bulleted points*** that were previously lost in paragraphs or multi-part standards.
- ***Removed examples*** that were imbedded in the standards that often were interpreted as limits to the standard.
- Clearly defined ***specific mathematical expectations*** of the grade within the standard, where appropriate.



Clarity – Technical Language, Bullets

3.NF.1

Develop understanding of fractions as numbers.

Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

NC.3.NF.1

Understand fractions as numbers.

Interpret unit fractions with denominators of 2, 3, 4, 6, and 8 as quantities formed when a whole is partitioned into equal parts;

- Explain that a unit fraction is one of those parts.
- Represent and identify unit fractions using area and length models.

Clarity – Removed Examples

7.EE.2

Use properties of operations to generate equivalent expressions.

Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”*

NC.7.EE.2

Use properties of operations to generate equivalent expressions.

Understand that equivalent expressions can reveal real-world and mathematical relationships. Interpret the meaning of the parts of each expression in context.

Clarity – Specificity

8.G.3

Understand congruence and similarity using physical models, transparencies, or geometry software.

Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

NC.8.G.3

Understand congruence and similarity using physical models, transparencies, or geometry software.

Describe the effect of dilations about the origin, translations, rotations about the origin in 90 degree increments, and reflections across the x-axis and y-axis on two-dimensional figures using coordinates.



Response to Specific Feedback

- Specificity, where appropriate, to grade level expectations
- Content related feedback between drafts from LEAs and public comment



Specific Feedback – Grade appropriate expectations

Original Standard

6.SP.5

Summarize and describe distributions.

Summarize numerical data sets in relation to their context, such as by:

- c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Draft 3

Summarize and describe distributions.

Summarize numerical data sets in relation to their context.

- b. Analyze center and variability by:
 - Giving quantitative measures of center, describing variability, and any overall pattern, and noting any striking deviations.
 - Justifying the appropriate choice of measures of center using the shape of the data distribution.

Specific Feedback – Grade appropriate expectations

Draft 1

NC.7.SP.3b

Make informal ~~and formal~~ inferences to compare two populations.

Informally assess the meaningfulness of the difference between two data sets by:

- Visually examining the overlap and separation between the graphical representations of two data sets.
- Expressing the difference between the measures of center as a multiple of the larger measure of variability.

Draft 2

NC.7.SP.3b

Make informal inferences to compare two populations.

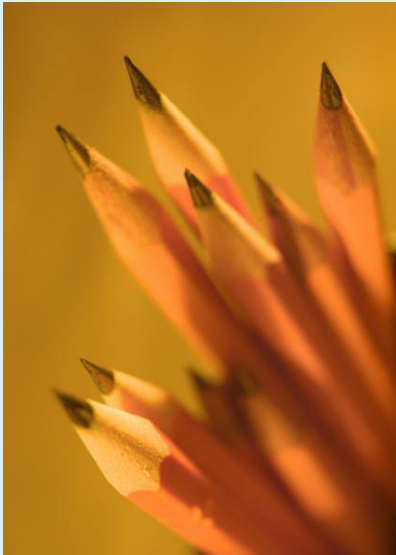
Recognize the role of variability when comparing two populations.

- b. Informally assess the difference between two data sets by examining the overlap and separation between the graphical representations of two data sets.

Assessment & Accountability

If Implementation is 2018-19...

- Current EOG tests 3 – 8 administered 2017-18



- Grades 3 – 8 Test development of items and field test 2017 – 18 School Year
- New tests 2018-19 School Year

Questions?



DPI Mathematics Section

Dr. Jennifer Curtis

K – 12 Mathematics Section Chief
919-807-3838

jennifer.curtis@dpi.nc.gov

Nina Barrett

Mathematics Program Assistant
919-807-3846

nina.barrett@dpi.nc.gov

Lisa Ashe

Secondary Mathematics Consultant
919-807-3909

lisa.ashe@dpi.nc.gov

Joseph Reaper

Secondary Mathematics Consultant
919-807-3691

joseph.reaper@dpi.nc.gov

Kitty Rutherford

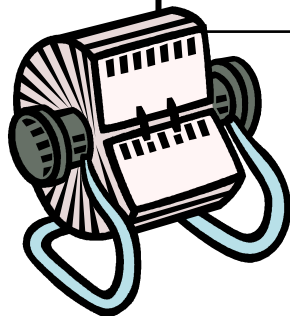
Elementary Mathematics Consultant
919-807-3841

kitty.rutherford@dpi.nc.gov

Denise Schulz

Elementary Mathematics Consultant
919-807-3842

denise.schulz@dpi.nc.gov





2017-2019 NC MATH K-8 IMPLEMENTATION PLAN

INPUTS

NCDPI mathematics team working with multiple internal and external stakeholders (UNC-Greensboro, District Math Leaders, Teacher Leaders and other NCDPI divisions) to create an implementation plan

A Leadership Institute for district leaders to regularly discuss implementation

MSP grant recipients are co-developing curriculum supports and resources to be shared statewide

An Implementation Pacing Framework will help guide the timing during this process

Districts have options:
1) to develop own pacing guide;
2) to use NCDPI's guide; or
3) to use another district's shared guide

PROCESSES



Summer and Fall 2017 Information Sessions



In-Person Regional Math Professional Development in the 2017-18 school year for teachers



NCDPI Mathematics Section, MSP Projects and NC²ML in collaboration with districts will facilitate the creation of instructional support tools for teachers



Curriculum Leader Collaborative (CLC) Implementation Support

OUTCOMES

- Provide a foundation for implementation that districts and schools can build upon locally and supplement if needed
- Provide a path of continuous learning and direct support for classroom teachers that is non-evaluative
- Increase the capacity of districts and teachers to identify quality classroom resources
- Support the understanding of mathematical coherence and the progression of learning across K-8
- Collaboratively develop a platform for sharing all resources with LEA's and Charters across North Carolina

PARTNERSHIP:



PUBLIC SCHOOLS OF NORTH CAROLINA
State Board of Education | Department of Public Instruction



THE UNIVERSITY OF NORTH CAROLINA
GREENSBORO
School of Education

