Core Content State Standards

Math in Grades 1 - 5

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"I see trouble with algebra."
Presentation Roadmap

• CCSS shifts: focus, coherence, and rigor

• Math conceptual understandings

• Learning progressions (Gr 2) & (Gr 5)
  • Recommended SGO procedures
Shift #1 :: FOCUS

The PARCC assessments will focus strongly where the Standards focus

PARCC assessments will focus 70% or more on the major work in grades 3-8.

- Focus allows for a variety of problem types to get at concept in multiple ways.
- Students will have more time to master concepts at a deeper level.
Major, Supporting, and Additional Clusters

• To say that some things have greater emphasis is not to say that anything in the standards can be neglected in instruction.

• A color key identifies clusters per grade:
  
  Major Cluster; Supporting Cluster; Additional Cluster

Note: major clusters in grades 2 – 5 are listed in the appendix
Some Critical Areas ... Grade 1 CCSS excerpts

**Model** with discrete objects to explain add-to, take-from, put-together, take-apart, and compare situations.

Understand **connections** between “counting” and addition and subtraction (e.g., adding two is counting on “two”).

Create strategies (e.g., “making tens”) to solve addition and subtraction problems (within 20).

See **relationships between addition and subtraction**.

Interpret whole numbers in terms of **place value** (tens / ones).

Develop measurement understandings (units) and **compose and decompose** composite plane or solid figures.
Think across grades, and link to major topics within grades

Integrative tasks draw on multiple standards to ensure students are making important connections.

- The Standards are not treated as a checklist.
- Both in-grade and between-grade learning progressions are embedded in the standards.
Major Flows Leading to Algebra

Operations and Algebraic Thinking → Expressions and Equations → Algebra
Number and Operations—Base Ten → The Number System →
Number and Operations—Fractions

K 1 2 3 4 5 6 7 8 High School

Note: The above is not a complete map (e.g. proportional relationships).
CCSS Video Gallery

• [http://www.youtube.com/watch?v=83leur9qy5k&list=UUF0pa3nE3aZAfBMT8pqM5PA&index=17&feature=plcp](http://www.youtube.com/watch?v=83leur9qy5k&list=UUF0pa3nE3aZAfBMT8pqM5PA&index=17&feature=plcp)

• **Topics (5-minute videos):**
  
  – Paradigm shifts: Focus, Coherence, and Rigor
  – The Eight Mathematical Practices
  – Progression of Whole Numbers to Fractions
  – Pre-Algebra and HS Math Courses … Plus …
Fraction beginnings: Part vs. Whole

Grade 2: CCSS 2.G.3

Partition drawings into equal shares and describe shares using words *halves, thirds, half of, third of, etc.*, and describe a whole as two halves, three thirds, four fourths, etc.

Equal shares of identical wholes need not have the same shape. **Numerals for fractions** (1/2, 1/3, etc.) are **NOT used in grade 2**.

Fractions are compared only if they refer to the same whole.

Grade 3: CCSS 3.NF.3  • Which fraction is larger, 1/2 or 1/3?
BEWARE OF MISCONCEPTIONS

Does the above sketch represent $4/6 + 4/6 = 8/12$?

... what is wrong with this picture?
EXHIBIT A:
The first mention of multiplying or dividing fractions in **NJ CCCS** was “implied” in these standards (grade 5 and 6)

No lead up … no progression of skills … not very helpful …

Need unpacking?

**Grade 5  4.1.5 B**
Construct, use, and explain procedures for performing addition and subtraction with fractions and decimals with:

- Pencil-and-paper
- Mental math
- Calculator

**Grade 6  4.1.6 B**
Construct, use, and explain procedures for performing calculations with fractions and decimals with:

- Pencil-and-paper
- Mental math
- Calculator
Key standards (like 4.NF.4) demand that we slow down and devote more time to allow for reasoning / thinking / discussing as well as the necessary hard work and practice.

CCSS gives **three years** to the division of fractions:

**Grade 4**, we multiply a fraction by a whole number.

**Grade 5**, we multiply a fraction by a fraction

we divide a unit fraction by a whole number

and a whole number by a unit fraction.

**Grade 6**, we divide a fraction by a fraction.
(1) Build on prior work of multiplying whole numbers.

(2) Build fractions from unit fractions (i.e., *counting*):

\[
\frac{5}{4} \text{ means } 5 \times \frac{1}{4} \ldots \text{ also } \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}
\]

build from unit fractions using additive reasoning.
(see 4.NF.3)

(3) \(5 \times \frac{3}{4}\) is a more complex:

\[
5 \times \frac{3}{4} \ldots 5 \text{ times } 3 \text{ fourths} \text{ equals } 15 \text{ fourths}
\]

\[
\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{15}{4}
\]
A Fraction Progression

• Grade 3: fractions as numbers.

• Grade 4: fraction equivalence and ordering.
  unit fractions ... just like whole numbers.
  decimal notation for fractions

• Grade 5: add and subtract fractions (including mixed numbers w unlike denominators).
  multiply fractions and divide unit fractions.
Two Take-home Handouts ...

Handout #1:
Cogent math progressions from grade K through Grade 2: fluently adding and subtracting (within 20) re: 2.OA.2

Handout #2:
Grade 5: dividing a unit fraction by a whole number (& vice versa) re: 5.NF.7
Shift #3 :: RIGOR

In major topics, pursue *conceptual understanding, procedural skill and fluency,* and *application*

PARCC assessments try to reach rigor through innovations in technology and item design.
Readiness for Problem Solving

When are Students ready for problem solving?

**Answer:** When they have **both** of the following:

1. Conceptual Understanding;
2. Procedural fluency.

“These two issues need to be addressed, before asking students to do problem solving.”

*(recommendation of NCTM - Math Focal Points)*
Luis is making a game spinner. He wants the chance of landing on red (R) to be twice the chance of landing on blue (B). Show how he could label his spinner.

Number of blues ____
Number of reds  ____

Grade 4 NAEP 2007
59% incorrect
Conceptual Understanding

- **CONCRETE**: manipulation of sets of objects
- **REPRESENTATIONAL**: drawings and models
- **ABSTRACT**: Numerical meanings for symbols

- Students need to demonstrate mastery at each grade. Common Core is designed in stages.

- Math-talk is key to student achievement >>>
Math-Talk ... thinking about 3/4

a) \[ \text{Diagram of circle divided into 4 equal parts, 3 shaded} \]

b) \[ \text{Sequence of 3 red circles followed by an empty circle} \]

c) \[ \text{Sequence of 3 red circles followed by an empty circle} \]

d) How many 4’s are there in 3?

e) 18 crayons out of a box of 24

f) .75

g) I want to share 3 bottles of soda equally among 4 people. How much will each person get?

h) \[ \text{Number line from 0 to 3 with markings at 0, 1, 2, 3} \]

i) \[ \text{Rectangle divided into 4 equal parts, 3 shaded} \]

UM – DevTeam Draft Fraction Module

NJ DOE 2013
Sample Item: Unit Fractions

How can $\frac{2}{5} + \frac{1}{3}$ be represented as a length?

Draw a model of $\frac{2}{5}$ plus $\frac{1}{3}$ using the number line.

PARCC Item Development

Master Claim: On track for college and career

Sub-Claims:

A: Major content with connections to practices
B: Supporting and additional content with connections to practices
C: Mathematical reasoning and attention to precision with connections to content
D: Modeling/applications with connections to content
E: Fluency as called for in specific grades 3 – 6
Required Fluency in Grades 1-5

1   1.OA.6  Add/subtract within 10
2   2.OA.2  Add/subtract within 20
         2.NBT.5  Add/subtract within 100
3   3.OA.7  Multiply/divide within 100
         3.NBT.2  Add/subtract within 1000
4   4.NBT.4  Add/subtract within 1,000,000
5   5.NBT.5  Multi-digit multiplication
Student Growth
Objectives: Elementary ELA and Math
5 Steps of the SGO Process

Five Steps are suggested in regard to the SGO process.

Be mindful of the critical skills in grade-to-grade progressions.

• Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness.

• In choosing student outcome targets for an SGO, it is wise to seek advice-and-consent among peers and the principal.

• **THINK:** “What do I ask the students to KNOW and DO that would best prepare them for the next grade?”
Step 1: Choose or develop a quality assessment

1. Determine the appropriate standards, educational goals, and instructional period that will be captured by the assessment (and SGO).

2. Ensure the quality of the assessment by analyzing and modifying it as necessary.

3. Ensure rubrics and other scoring systems are well-designed.
## Step 2: Determine students’ starting point

<table>
<thead>
<tr>
<th>Source of Performance Data to Determine Students’ Starting Points</th>
<th>Examples and Notes</th>
</tr>
</thead>
</table>
| Results from beginning-of-course diagnostic tests or performance tasks | • Department-generated pre-assessment  
• NJASK scores |
| Results from prior-year tests that assess knowledge and skills that are pre-requisites for the current grade | • DRA for reading  
• End of course portfolio results  
• Prior grades in math course(s)  
• Readiness tests (as appropriate)  
• Teacher narratives |
| Results from tests in other subjects including both teacher- or school-generated tests and state tests (tests must have assessed pre-requisite knowledge and skills) | • Prior NJ ASK scores may be included in gathering baseline data but NJ ASK may not be an assessment for an SGO. |
Step 3: Set ambitious and achievable student growth objectives

<table>
<thead>
<tr>
<th>Typical Usage</th>
<th>SGOs must be</th>
<th>SGOs require a teacher to</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong> Specific</td>
<td>Specific</td>
<td>Describe how many students learn “what” or grow by “how much”</td>
</tr>
<tr>
<td><strong>M</strong> Measurable</td>
<td>Measurable</td>
<td>Use prior learning data and/or pre-assessments, and post-assessments</td>
</tr>
<tr>
<td><strong>A</strong> Achievable</td>
<td>Ambitious but Achievable</td>
<td>Determine growth/achievement using baseline data and teaching context</td>
</tr>
<tr>
<td><strong>R</strong> Relevant</td>
<td>Relevant</td>
<td>Align SGOs to content standards</td>
</tr>
<tr>
<td><strong>T</strong> Time-related</td>
<td>Time-related</td>
<td>Set an instructional period for the SGOs</td>
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<tr>
<td>Grade:</td>
<td>Subject</td>
<td>Number of Students</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------</td>
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</tr>
<tr>
<td>3</td>
<td>English Language Arts</td>
<td>20</td>
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</table>

**Name of Assessment**
Developmental Reading Assessment

**SGO Type**
General

**Rationale for Student Growth Objective**
(Please include content standards covered and explanation of assessment method.)

This SGO covers all of my students and the following 3rd grade ELA standards for reading literature and informational text:
- CCSS: RL.3.1, 3.2, 3.3, 3.4, 3.5, 3.7
- CCSS: RI.3.1, 3.2, 3.3, 3.4, 3.5, 3.7

**Pre-Assessment** - Second Grade Spring DRA scores

**Post-Assessment** - Third Grade Spring DRA

**Student Growth Objective**
At least 80% (16/20) will increase at least one level on the Spring DRA.

**Baseline Data**
(Please include what you know about your students’ performance/skills/achievement levels at the beginning of the year, as well as any additional student data or background information used in setting your objective.)

15 students are reading between levels 24-28, 5 are reading at level 30; comprehension scores (__/24) shows 15 students scored between 11-16, 5 students scored between 17-22.
<table>
<thead>
<tr>
<th>Grade:</th>
<th>Subject</th>
<th>Number of Students</th>
<th>Interval of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics</td>
<td>20</td>
<td>Full year</td>
</tr>
</tbody>
</table>

**Name of Assessment**
Mathematics Department-Developed Grade 1 Assessment

**SGO Type**
General

**Rationale for Student Growth Objective**
(Please include content standards covered and explanation of assessment method.)

SGO covers all of my students, for grade 1 math standards **1.OA.1-8, 1.NBT.1, and 1.NBT.4-6**.

**CCSSM**
Pre-Assessment - Grade K end-of-year teacher assessment of “CC” and “OA” standards (see Baseline Data)
Post-Assessment - Department-developed Grade 1 assessment (TBA)

**Student Growth Objective**
At least 70% (17/20) of my students will attain a score of 80% or above on the end-of-year test.

**Baseline Data**
(Please include what you know about your students’ performance/skills/achievement levels at the beginning of the year, as well as any additional student data or background information used in setting your objective.)

Grade K students relative to **K.CC.1, K.CC.2, K.CC.6, K.CC.7 and K.OA.5** (department-made assessment):
- 80% were proficient at counting to 100 by ones and 10s (**K.CC.1** and **K.CC.2**)
- 80% fluently added and subtracted (within 5) (**K.OA.5**)
- 60% successful with comparing numbers (within 10) presented as numerals (**K.CC.6** and **K.CC.7**)
<table>
<thead>
<tr>
<th>Grade:</th>
<th>Subject</th>
<th>Number of Students</th>
<th>Interval of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Mathematics</td>
<td>60</td>
<td>Full year</td>
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<td>Semester</td>
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<td>Other ________</td>
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<table>
<thead>
<tr>
<th>Name of Assessment</th>
<th>Mathematics Department-Developed Grade 5 Assessment</th>
<th>SGO Type</th>
<th>General</th>
<th>Specific</th>
</tr>
</thead>
</table>

**Rationale for Student Growth Objective**
(Please include content standards covered and explanation of assessment method.)

SGO covers all of my students, for the math standards that are part of the major content for grade 5.

CCSSM

Pre-Assessment - Grade 4 end-of-year teacher assessment of CCSS fraction standards (**4.NF.3** and **4.NF.4**)

Post-Assessment - Department-developed Grade 5 assessment (TBA)

**Student Growth Objective**

80% of the students will demonstrate mastery at 70% for the following CCSS math standards:

- Add and subtract fractions (including mixed numbers) ... CCSS **5.NF.1**; and
- Multiply and divide (unit) fractions ... CCSS **5.NF.4** and **5.NF.7**.

**Baseline Data**
(Please include what you know about your students' performance/skills/achievement levels at the beginning of the year, as well as any additional student data or background information used in setting your objective.)

Grade 4 students achievement relative to CCSS **4.NF.3** and **4.NF.4** (department-made assessment):

- 50% were proficient (at 65% mastery)
- 30% were developing (at 40% mastery)
- 20% were beginning at less than 40% mastery
Developing an SGO for an elementary classroom in ELA/Math

Activity

You will develop a student growth objective for English Language Arts or Mathematics.
Major, Supporting, Additional

• **Major CCSS Standards: Grade 2**
  
  – Represent and solve addition/subtraction problems
  
  – Add and subtract within 20
  
  – Understand place value
  
  – Use place value understanding and properties of operations to add and subtract
  
  – Measure and estimate lengths in standard units
  
  – Relate addition and subtraction to length
Major, Supporting, Additional

• **Major CCSS Standards: Grade 3**
  
  – Represent/solve multiplication/division problems
  – Understand mult/division & their relationship
  – Multiply/divide within 100
  – Solve (4 operations) & explain arithmetic patterns
  – Develop an understand of fractions as numbers
  – Solve measurement problems: time, volume, mass
  – Geometric measurement of area re: addn/mult
Major, Supporting, Additional

• **Major CCSS Standards: Grade 4**
  - Use 4 operations with wholes to solve problems
  - Generalize place value for multi-digit numbers
  - Use place value to perform multi-digit arithmetic
  - Extend fraction understandings (equiv/ordering)
  - Build fractions from unit fractions by extending previous understandings of whole numbers
  - Understand decimal notation for fractions and compare decimal fractions (to hundredths)
Major, Supporting, Additional

- **Major CCSS Standards: Grade 5**
  - Understand the place value system
  - Perform operations with multi-digit whole numbers and with decimals (to hundredths)
  - Use equivalent fraction strategies to add and subtract fractions (including mixed numbers)
  - Apply/extend previous understandings of mult/div to multiply and divide fractions
  - Geometric measurement: understand concepts of volume as related to multiplication and addition
References


References


McNamara, Julie & Shaughnessy, Meghan Beyond Pizzas & Pies Math Solutions, 2012, Macmillan Publishers


PARCC Model Content Frameworks Mathematics, Grades 3 - 11, PARCC c/o Achieve, www.parconline.org

