Waterbury Public Schools Roll Out Presentation of The Common Core State Standards for Mathematics

Developed by William A. Rice
Supervisor of Math
Waterbury Public Schools

Criteria Used to Develop the CCSS

- Research and evidence based
- Aligned with college and work expectations
- Rigorous
- Internationally benchmarked.

Lessons Learned from the Past

- TIMSS (Trends in International Math & Science Study): math performance is being compromised by a lack of focus and coherence in the "**mile wide. Inch deep" curriculum.**
- Hong Kong students outscore US students in the grade 4 TIMSS, even though Hong Kong only teaches about **half the tested topics. US covers over 80% of the tested topics.**
- High-performing countries spend more time on **mathematically central concepts: greater depth and coherence. Singapore: "Teach less, learn more."**

Paradigm Shifts for Mathematics

- Bid Adieu to CMT Strand Land
- Bid Guten Tag to standards-based focused, coherent instruction
- Put the practice standards into practice
- CCSSM is built on Mastery. Content will end and will not be taught explicitly again.
  (Ex. Counting & Cardinality only in K)
- It is no longer acceptable for students to only be able to solve a problem in only one way.

The Mathematics Standards

Description of the Common Core State Standards for Mathematics (CCSSM)

Page Layout & Formatting

Acronyms and Abbreviations and Domain Coding

- **CCSSM** – Common Core State Standards for Mathematics.
- **SBAC** – Smarter Balanced Assessment Consortium (Group who will be writing the tests for 2014-15)

K-5 Domains

- CC = Counting and Cardinality
- OA = Operations and Algebraic Thinking
- NBT = Number Operations in Base Ten
- NF = Number and Operations – Fractions
- MD = Measurement and Data
- G = Geometry

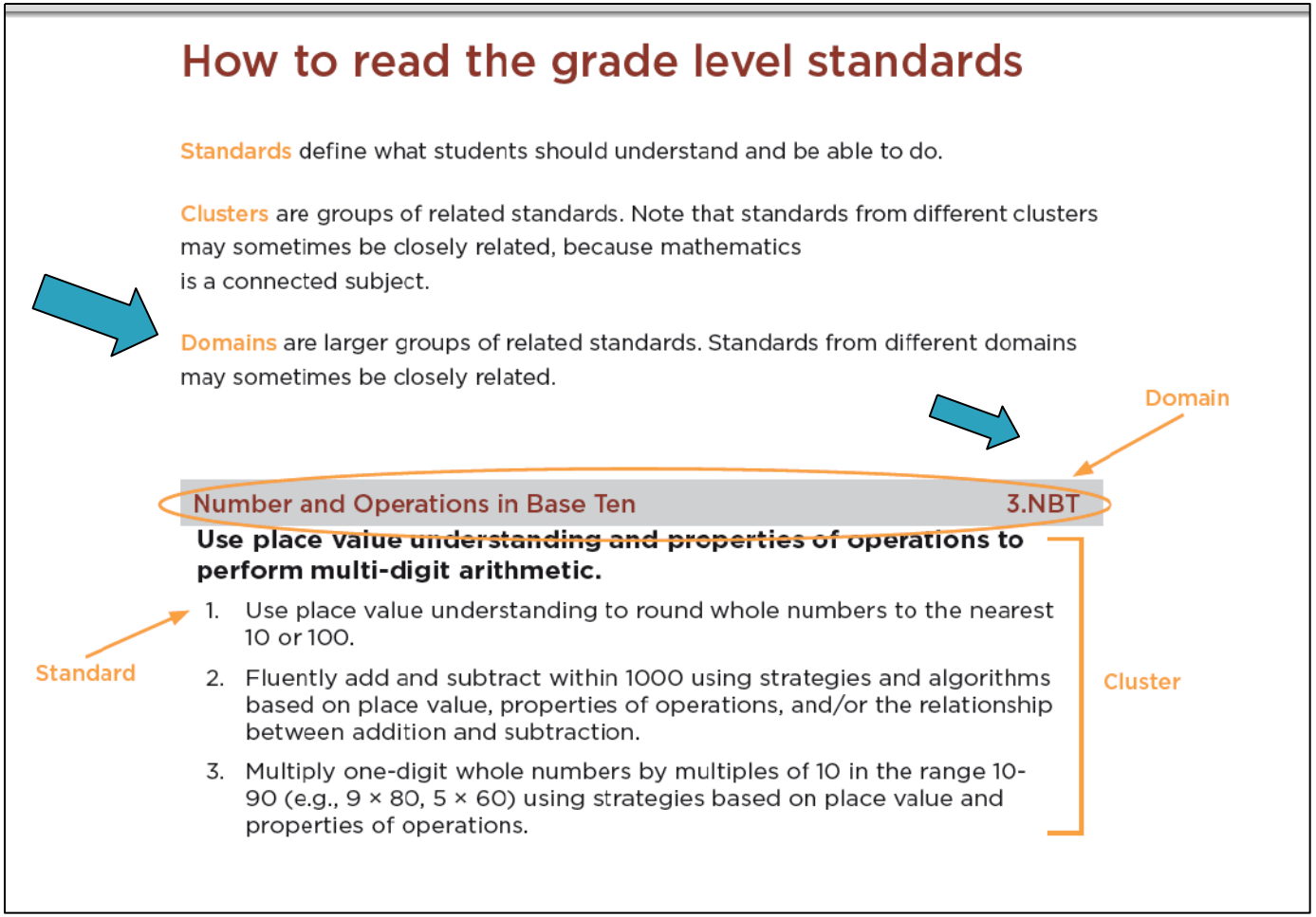
6-8 Domains

- RP = Ratios and Proportional Relationships
- NS = The Number system
- EE = Expressions and Equations
- F = Functions
- G = Geometry
- SP = Statistics and Probability

9-12 Conceptual Categories

- N = Number and Quantity
- A = Algebra
- F = Functions
- G = Geometry
- M = Modeling
- SP = Statistics and Probability

Mathematics Common Core Layout



Organization of Standards

- **Clusters** are groups of related standards.
- **Domains** or **conceptual categories** are larger groups of related standards.
- Each grade level begins with a brief narrative describing the focus on **critical areas of instruction**.

Critical Areas of Focus

Each grade level section of the Common Core contains **Critical Areas of Focus**

A description of the key areas where instruction & learning time should be focused.

Mathematics | Grade 4

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

K–8 Content Standards by Domain

DOMAINS	Counting & Cardinality	Operations & Algebraic Thinking	Number & Operations in Base Ten	Measurement & Data	Geometry	Number & Operations: Fractions	Ratios & Proportional Relationships	The Number System	Expressions & Equations	Statistics & Probability	Functions
K	X	X	X	X	X						
1		X	X	X	X						
2		X	X	X	X						
3		X	X	X	X	X					
4		X	X	X	X	X					
5		X	X	X	X	X					
6					X		X	X	X	X	
7					X		X	X	X	X	
8					X			X	X	X	X

Key Fluencies

Grade	Required Fluency
K	Add/subtract within 5
1	Add/subtract within 10
2	Add/subtract within 20 Add/subtract within 100 (pencil and paper)
3	Multiply/divide within 100 Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2×2 systems by inspection

Connecticut Standards for Mathematics (Same as CCSSM)

- Have Two Components:
  - **Math Content Standards** – which identify what should be taught.
  - **Math Practice Standards** – identify how the content should be taught.

We will now learn more about the Waterbury curriculum documents

Activities

- Exploring Waterbury **Draft** Mathematics Curriculum Documents
  - Grade Level Articulation Document
  - Unit Instructional Tool

Exploring Waterbury Mathematics Curriculum Documents

Curriculum Articulation by Grade Level

- Includes:
  - Philosophy of WPS Mathematics Department
  - Standards Overview
  - Math Practice Standards
  - Lists all the standards in that grade level.
  - Aligns standards with the Mathematical Practices that are most inherent to the standard.
  - Aligns standards with an Example and/or Explanation that illustrates the meaning of the standard.
  - Aligns standard with the Connecticut Unit it is located within.
  - Aligns standards with instructional resources teachers can use to teach the standard. (some resources have hyperlinks that link them directly to the lesson or activity ideas)
  - Aligns standards with **minimum** required strategies for teachers (meaning teachers can use other strtegies but they must utilize the identified strategies first).
  - Aligns standards with technology lessons/activities that can be used to teach the standard.
  - Identifies whether a standard has a CMT/CAPT correlation.

Full documents will be sent electronically and be available on the WPS Mathematics Department Webpage

Exploring Waterbury Mathematics Curriculum Documents

Unit Instructional Tool

- Developed based on the Instructional Unit Shells created by the CSDE using Rigorous Curriculum design Protocols.
- Includes:
  - Pacing- Days/periods
  - Identifies **Priority** vs. Supporting Standards within the unit. (All standards are important and fair game for testing but all standards are not created equal. More time must be spent on some standards than others. Those standards are in **bold** and are priority standards.)
  - Identifies the Performance Objectives that are aligned to the standards in the unit.
  - Identifies instructional strategies that are aligned to the performance objectives. (Some strategies are hyperlinked to samples and examples of the strategy)
  - Identifies the resources that are aligned to the performance objectives. (Some resources are hyperlinked to the lesson/activity/webpage associated with the resource)
  - Identifies pre-requisite knowledge the performance objectives were built upon.

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Unit 1 discussion

- Split into grade level groups.
- Examine the Unit 1 document.
- Read the first standard and the columns going across.
- Discuss.

ASSESSMENT

Where We Are and Where We Are Going?

Assessment

- CMT and CAPT will remain in place for accountability purposes through 2013-2014. (But we **will not** wait until 2014 to prepare our students. These are not standards to try to catch up to.)
- School year 2014/2015, SMARTER Balanced Assessment Consortium (SBAC) assessment system operational for students in Grades 3-8 and 11.
- CMT/CAPT Practice will be included weekly on CMT/CAPT Wednesdays.

CMT/CAPT WEDNESDAYS

- Math lesson/activity each Wednesday from Sept. 2012 thru Feb 28, 2013 devoted to CMT/CAPT math strands/categories.
- Lessons/activities must be done within CCSS framework meaning the teacher **cannot** just provide worksheets and sit back and the teacher **cannot** be the sole source of learning.
- Lessons must be interactive and student focused where students are sharing, explaining and proving their knowledge of CMT Math in multiple ways. Lessons/activities must be **planned**. Teachers are to facilitate learning.

Examples (Use CMT/CAPT materials already in your school or go to CREC.org website for materials. Teacher Login: Username: twaterbury Password: 13waterb)

- **CMT/CAPT Centers**
  - Set up centers in your classroom with different CMT/CAPT problems.
  - Group the students by ability, mixed ability, etc.
  - Very weak students stay with you while others go around with notebooks and work out the problems. Be sure to tell them they will have to explain and prove their answer somehow. You may need to have manipulatives available.
  - When you bring all students back together call on some to provide answers and explain. The student may call on other group members to help.
- **CMT/CAPT JigSaw**
  - Set up groups
  - Give each group a set of problems from a particular strand or set of strands. Each group should have problems from a different strand or set of strands.
  - Let the students work on the problems and then have them share out. They should state the problem, the answer and how they solved the problem.
  - Each group should be asked at least 2 questions from the class. Give the other groups question prompts to ask until they can start to come up with their own questions: like "Can you solve that problem another way?" or why did you use that method? Etc.
- **CMT/CAPT "I Can Prove it"**
  - Can be whole group.
  - Teacher places a problem on the board or Smartboard and the students have to work on the problem at their desk.
  - The teacher chooses student 1to provide the answer.
  - The teacher then picks student 2 and that student says "I can prove it."
  - Student 2 must come up and prove whether student 1 was correct or not.
  - If student 2 gets stuck he or she can use a life line and call another student up to help.

Examples continued….

- **CMT/CAPT "Is he/she right?"**
  - Can be a group or whole class activity.
  - Students must remove all paper and pencils from their desk. This is a mind training activity.
  - The teacher puts a problem up on the board with either the correct or incorrect problem solving steps.
  - The teacher asks is he or she right?
  - Students must explain whether the process is correct or incorrect verbally.
- **CMT/CAPT "Come up with a problem…"**
  - Can be a group or in pairs.
  - Teacher will identify the strands or conceptual categories they will use for content.
  - Teacher asks the students to come up with a problem and the solution to the problem.
  - E.g. the teacher will says "**come up with a problem"** where a student has to:
    - find the sum of two numbers
    - draw a line of symmetry through a polygon.
    - write a story problem using 2/3 x 5
    - rind the volume of a prism
    - find the slope of line given 2 points
  - The students will exchange problems with another student and have them solve it.
  - Students will check their answers and discuss.
- **CMT/CAPT "Restate the Question"**
  - Teacher will place several open-ended questions on the board and ask the students to restate the question in a form so you know what answer you are looking for.
  - Students will write restatements in their notebooks.
  - Students will share out and critique each others restatements of the problems.
- **CMT/CAPT "Pick a Strategy"**
  - Can be group or whole class activity..
  - Teacher will place a problem on the board or Smartboard.
  - Below the problem will list multiple strategies to solve the problem.
  - Students will decide which strategy to use and then use that strategy to solve the problem. If using groups; groups must discuss and come to consensus on which problem to solve.
  - Students will then share their answer, strategy chosen and why they chose that strategy.

Mathematically Proficient Students Will…

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

2. Reason abstractly and quantitatively.

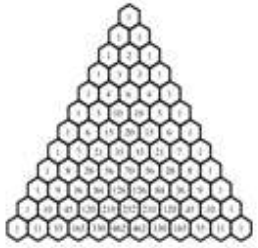
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

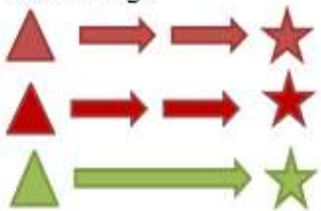
5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.



8. Look for and express regularity in repeated reasoning.



Adapted from *Inside Mathematics*

Make sense of problems and persevere in solving them

When presented with a problem, I can make a plan, carry out my plan, and evaluate its success.

BEFORE...

EXPLAIN the problem to myself.

- *Have I solved a problem like this before?*

ORGANIZE information...

- *What is the question I need to answer?*
- *What is given?*
- *What is not given?*
- *What are the relationships between known and unknown quantities?*
- *What tools will I use?*
- *What prior knowledge do I have to help me?*

DURING...

PERSEVERE

MONITOR my work

CHANGE my plan if it isn't working out

ASK myself, "Does this make sense?"

AFTER...

CHECK

- *Is my answer correct?*
- *How do my representations connect to my algorithms?*

EVALUATE

- *What worked?*
- *What didn't work?*
- *What other strategies were used?*
- *How was my solution similar to or different from my classmates'?*

Reason abstractly and quantitatively

I can use reasoning habits to help me contextualize and decontexualize problems.

CONTEXTUALIZE

I can take numbers and put them in a real-world context.

For example, if given
3 x 2.5 = 7.5
I can create a context:

I walked 2.5 miles per day for 3 days. I walked a total of 7.5 miles.

DECONTEXTUALIZE

I can take numbers out of context and work mathematically with them.

For example, if given
'I walked 2.5 miles per day for 3 days. How far did I walk?',
I can write and solve

3 x 2.5 = 7.5

Reasoning Habits include 1) creating an understandable representation of the problem solved, 2) considering the units involved, 3) attending to the meaning of quantities, and 4) using properties to help solve problems.

Construct viable arguments and critique the reasoning of others

I can make conjectures and critique the mathematical thinking of others.

I can ***construct***, ***justify***, and ***communicate*** arguments by...

- considering context
- using examples and non-examples
- using objects, drawings, diagrams and actions

I can ***critique the reasoning of others*** by...

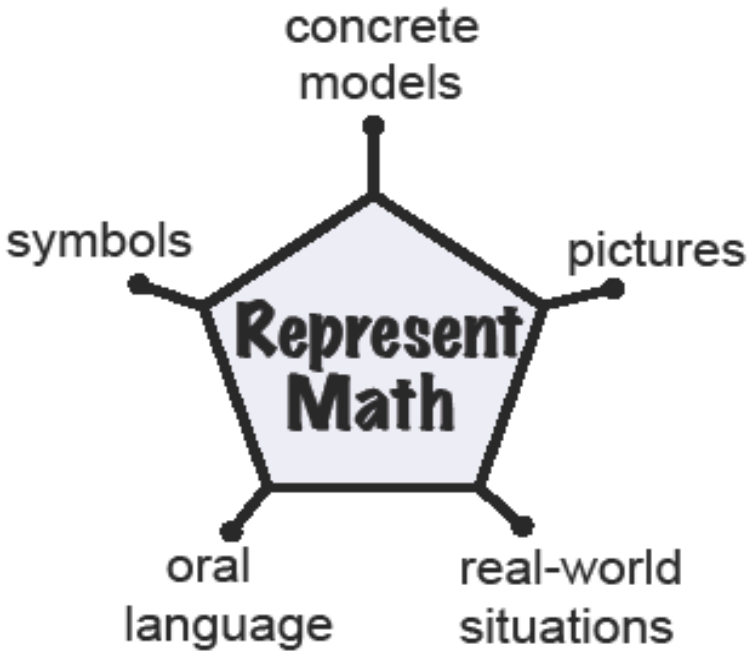
- listening
- comparing arguments
- identifying flawed logic
- asking questions to *clarify* or *improve arguments*

Model with mathematics

I can recognize math in everyday life and use math I know to solve everyday problems.

I can...

- make assumptions and estimate to make complex problems easier
- identify important quantities and use tools to show their relationships
- evaluate my answer and make changes if needed

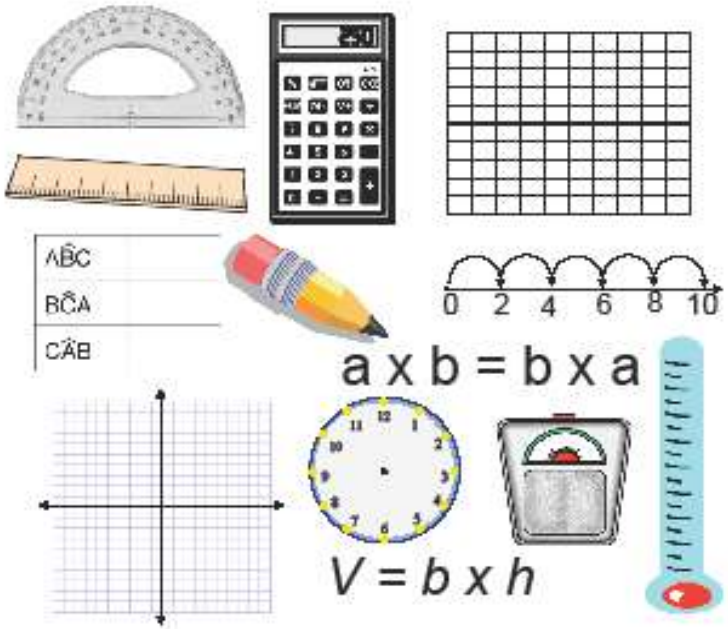


Use appropriate tools strategically

I know when to use certain tools to help me explore and deepen my math understanding.

I have a <u>math toolbox</u>.

- I know *HOW* to use math tools.
- I know *WHEN* to use math tools.
- I can reason: *"Did the tool I used give me an answer that makes sense?"*



Attend to precision

I can use precision when solving problems and communicating my ideas.

Problem Solving

- I can calculate *accurately*.
- I can calculate *efficiently*.
- My answer matches what the problem asked me to do – *estimate* or find an *exact answer*.

Communicating

- I can SPEAK, READ, WRITE, and LISTEN mathematically.
- I can correctly use...
  - math symbols
  - math vocabulary
  - units of measure

Look for and make use of structure

I can see and understand how numbers and spaces are organized and put together as parts and wholes.

Numbers

For Example:

- Base 10 structure
- operations and properties
- terms, coefficients, exponents

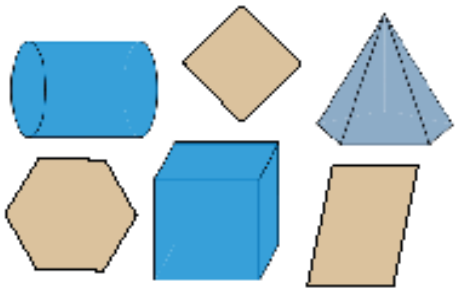
	10	+ 3
10	100	30
+		
5	50	15

13 x 15
(10 + 3) x (10 + 5)
100 + 30 + 50 + 15
195

Spaces

For Example:

- dimension
- location
- attributes
- transformation



Look for and express regularity in repeated reasoning

I can notice when calculations are repeated. Then, I can find more efficient methods and short cuts.

For example: $25 \div 11$

$$
\begin{array}{r}
2.2727 \\
11\overline{)\,25.0000} \\
-22 \\
\hline
30 \\
-22 \\
\hline
80 \\
-77 \\
\hline
30 \\
-22 \\
\hline
80 \\
-77 \\
\hline
30
\end{array}
$$

I am repeating this calculation. The quotient is a repeating decimal.

TEACHER'S ROLE IN IMPLEMENTING THE PRACTICE STANDARDS

Teachers will need to provide:

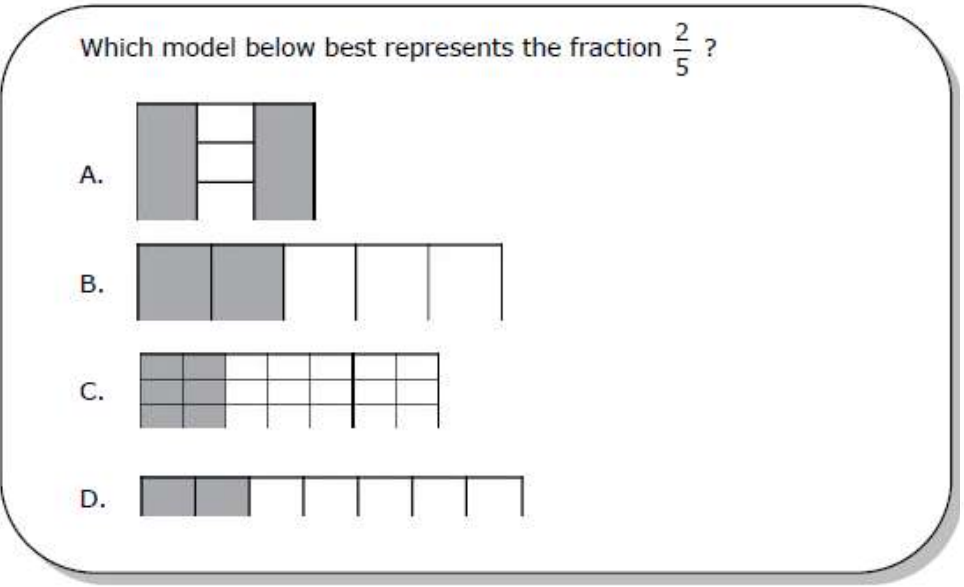
- Rich problems and tasks for students to consider.
- Time for students to reflect on their own thinking.
- Opportunities for students to dialogue with other students.
- A safe environment for students to share their solutions with other students.

Assessment Item Types

- **Selected Response**
  - Traditionally, selected-response (SR) items include a stimulus and stem followed by three to five options from which a student is directed to choose only one or best answer. By redesigning some SR items, it is often possible to both increase the complexity of the item and yield more useful information regarding the level of understanding about the mathematics that a student's response demonstrates.
- **Constructed Response**
  - The main purpose of a constructed-response (CR) item/task is to address targets and claims that are of greater complexity, requiring more analytical thinking and reasoning than an SR item can typically elicit. Additionally, fill-in-the-blank type CR items (CRs) can markedly increase the discrimination factor and reliability of comparable SR items (SRs) by virtually eliminating the "guessing" element of those items.
- **Technology Enhanced**
  - Technology-enhanced (TE) items/tasks are desirable when they can provide evidence for mathematical practices that could not be as reliably obtained from SR and CR items.
- **Performance Tasks**
  - Integrate knowledge and skills across multiple claims and targets.
  - Measure capacities such as depth of understanding, research skills, and/or complex analysis with relevant evidence.
  - Require student-initiated planning, management of information/data and ideas, and/or interaction with other materials.
  - Reflect a real-world task and/or scenario-based problem.
  - Allow for multiple approaches.
  - PTs may require up to 135 minutes to administer. This administration time includes a 45 or 90 minute classroom portion and a 45 minute computer-based portion.

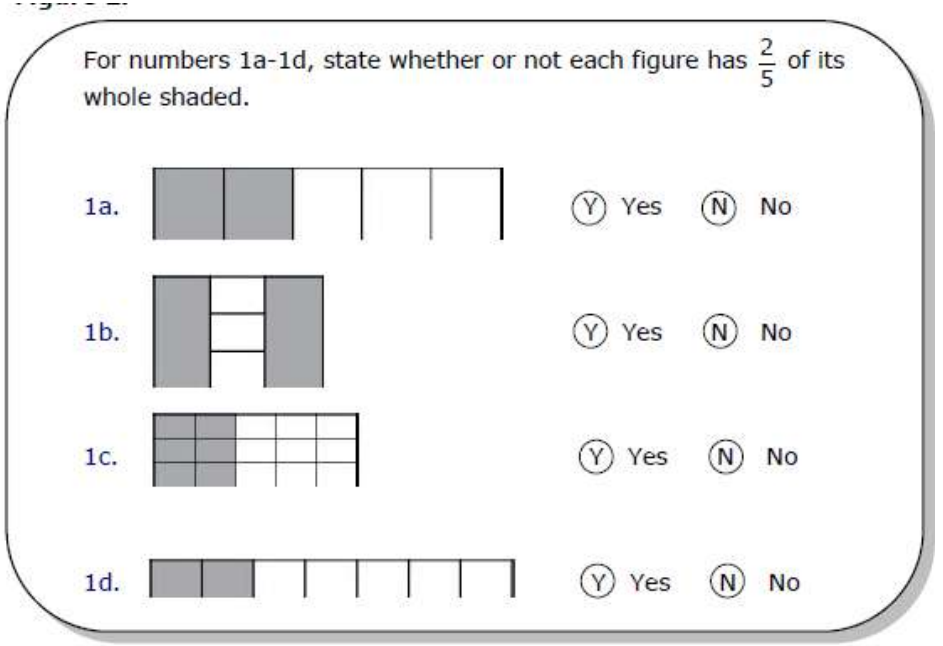
Selected Response Examples

CMT Selected Response



Even if a student does not truly have a deep understanding of what 2/5 means, he or she is likely to choose option B over the rest of the options because it looks to be a more traditional way of representing fractions.

Common Core Selected Response



This item is more complex in that a student now has to look at each part separately and decide whether 2/5 can take different forms. Score with a (0-2) Rubric.

Constructed Response

Grade 1 - Assessment Items

Unit 4 - Exploring Addition and Subtraction within 100

Write a number sentence and solve the problem. Use manipulatives (base-ten blocks, hundreds chart, number lines) or a drawing to show how to solve this problem.

Mrs. Jones needs 42 cupcakes for the class picnic.
She has 32 cupcakes.

How many more cupcakes does she need to buy?

This is how Joe found the answer to $29 + 30 + 1$

$29 + 30 + 1 = 30 + 30 = 60$

What did Joe do to solve the problem?

Technology Enhanced Items – Elem/MS

13.

The number line below is divided into equal parts. The zero (0) is already placed on the number line.

Place each of the following numbers in the proper place on number line. To place a number, click on a tile and then click on the number line. You may move and clear numbers as needed.

Reset

$\frac{2}{1}$ $\frac{3}{5}$ 1