Smarter Balanced Assessment System: Connecting the Mathematics Claims to Classroom Instruction Grades K-5

Connecticut State Department of Education
Fall 2014

Learning Targets

- I understand the types of learning activities and tasks that will support student mastery of the Standards for Mathematics Content and develop student expertise with the Standards for Mathematical Practice.
- I understand how my classroom instruction supports student learning.
- I understand how classroom activities and tasks align with the summative assessment.

Success Criteria

- I can explain how the Connecticut Core Standards (CCS) for Mathematics connect to the Smarter Balanced Claims.

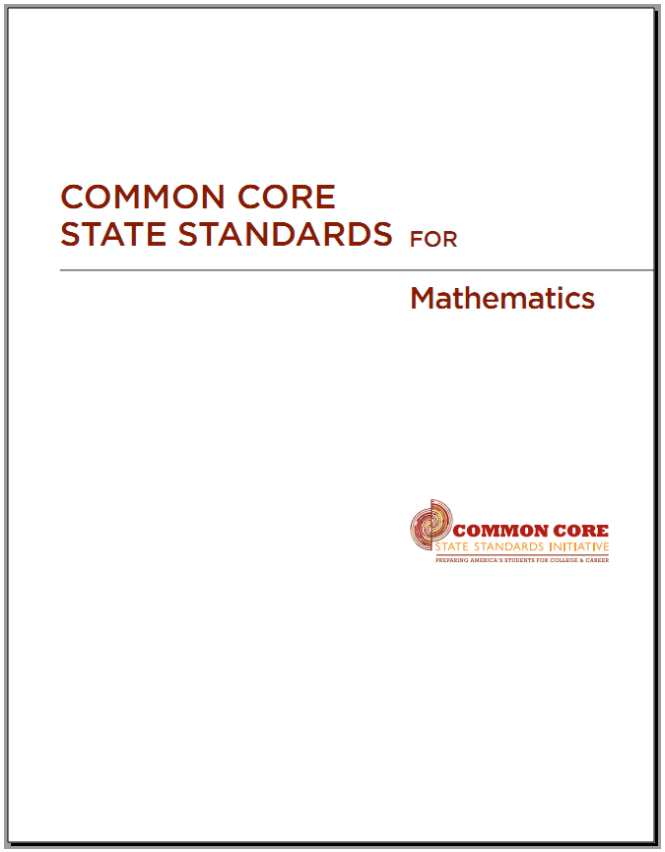
- I can meet the scope of the Content Standards and Practice Standards through best practices and by incorporating a variety of strategies and activities in my instruction.

Before We Begin…

The CCS Require Three Shifts in Mathematics

Handout 1

- **Focus** strongly where the standards focus
- **Coherence**: **Think** across grades and **link** to major topics within grades Handout
- **Rigor**: In major topics, pursue **conceptual understanding**, procedural skill and **fluency**, and **application** with equal intensity



Key Areas of Focus in Mathematics

Grade	Focus Areas in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding
K–2	Addition and subtraction - concepts, skills, and problem solving and place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional reasoning; early expressions and equations
7	Ratios and proportional reasoning; arithmetic of rational numbers
8	Linear algebra and linear functions

Shift #3: Rigor

Required Fluencies for Grades K-6

Grade	Standard	Required Fluency
K	K.OA.5	Add/subtract within 5
1	1.OA.6	Add/subtract within 10
2	2.OA.2 2.NBT.5	Add/subtract within 20 (know single-digit sums from memory) Add/subtract within 100
3	3.OA.7 3.NBT.2	Multiply/divide within 100 (know single-digit products from memory) Add/subtract within 1000
4	4.NBT.4	Add/subtract within 1,000,000
5	5.NBT.5	Multi-digit multiplication
6	6.NS.2,3	Multi-digit division Multi-digit decimal operations

The Standards for Mathematical Content

Operations and Algebraic Thinking 3.OA

Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*
2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]
4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?.*

The 8 Standards for Mathematical Practice

Handout 2

Habits of Mind of a Productive Mathematical thinker

MP1 Make sense of problems and persevere in solving them.

MP6 Attend to precision

Reasoning & Explaining

MP2 Reason abstractly and quantitatively.

MP3 Construct

Modeling & Using Tools

MP4 Model with Mathematics

MP5 Use appropriate tools strategically

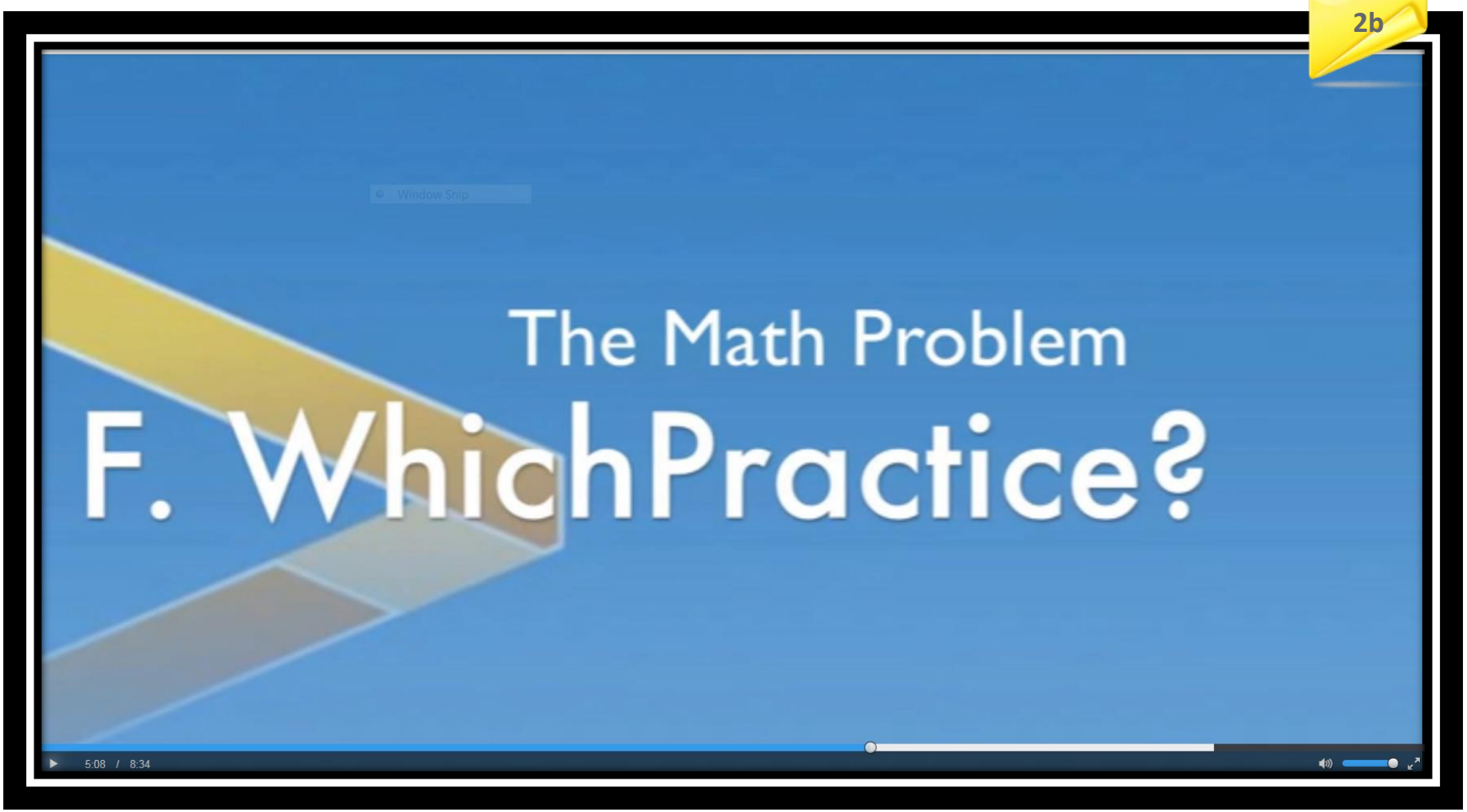
Seeing Structure & Generalizing

MP7 Look for and make use of structure

MP8 Look for and express regularity in repeated reasoning

Standards for Mathematical Practice

Handout 2b



Reminders…

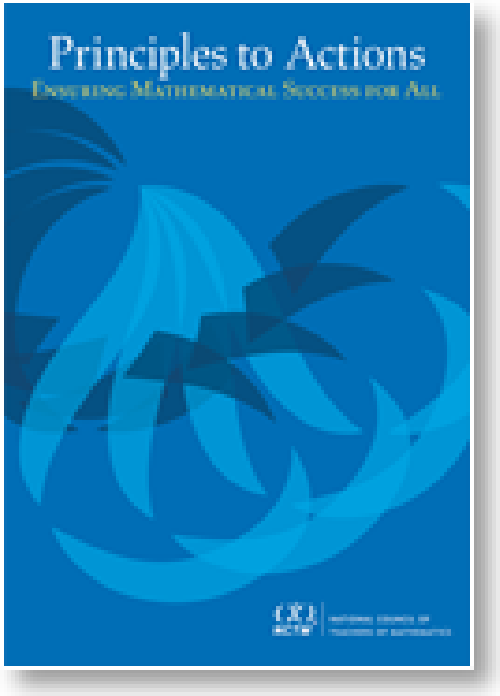
Keep in mind that the CCS for Mathematics:

- are **NOT** discrete skills to be taught in isolation.
- define both content and practices that should be included in instruction.

Cloning, drilling and killing is **not** an effective instructional practice.

High quality instruction  **Improved student achievement**

NCTM Principles to Actions: Ensuring Mathematical Success for All



The primary purpose of Principles to Actions is to fill the gap between the adoption of rigorous standards and the enactment of practices, policies, programs, and actions required for successful implementation of those standards.

NCTM. (2014). *Principles to Actions: Ensuring Mathematical Success for All.* Reston, VA: NCTM

Guiding Principles for School Mathematics

1. Teaching and Learning
2. Access and Equity
3. Curriculum
4. Tools and Technology
5. Assessment
6. Professionalism

→ **Essential Elements of Effective Mathematics Programs**

NCTM. (2014). *Principles to Actions: Ensuring Mathematical Success for All.* Reston, VA: Executive Summary http://www.nctm.org/PrinciplestoActions/

Eight Mathematics Teaching Practices

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations
4. Facilitate meaningful mathematical discourse
5. Pose purposeful questions
6. Build procedural fluency from conceptual understanding
7. Support productive struggle in learning mathematics
8. Elicit and use evidence of student thinking

NCTM. (2014). *Principles to Actions: Ensuring Mathematical Success for All.* Reston, VA: NCTM, p.10

http://www.nctm.org/PrinciplestoActions/

Standards for Mathematical Practice

The Mathematics Claims

Claims for the Mathematics Summative Assessment

Overall Claim for Grades 3-8

Students can demonstrate **progress toward** college and career readiness in mathematics.

Overall Claim for Grade 11

Students can demonstrate college and career readiness in mathematics.

Claim #1 – Concepts and Procedures	"Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency."
Claim #2 – Problem Solving	"Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies."
Claim #3 - Communicating Reasoning	"Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others."
Claim #4 - Modeling and Data Analysis	"Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

From the Smarter Balanced Mathematics Content Specifications

Smarter Balanced Assessment Consortium

Overall Claim and Mathematics Teaching Practices

Overall Claim	Mathematics Teaching Practice
Grades 3-8: • Students can demonstrate **progress toward** college and career readiness in mathematics. **Grade 11:** • Students can demonstrate college and career readiness in mathematics.	Establishing Mathematics Goals to Focus Learning Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses goals to guide instructional decisions. Elicit and use evidence of student thinking Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning

Teacher and Student Actions

Establish mathematics goals to focus learning **Teacher and student actions**	
What are *teachers* doing?	**What are *students* doing?**
Establishing clear goals that articulate the mathematics that students are learning as a result of instruction in a lesson, over a series of lessons, or throughout a unit. Identifying how the goals fit within a mathematics learning progression. Discussing and referring to the mathematical purpose and goal of a lesson during instruction to ensure that students understand how the current work contributes to their learning. Using the mathematics goals to guide lesson planning and reflection and to make in-the-moment decisions during instruction.	Engaging in discussions of the mathematical purpose and goals related to their current work in the mathematics classroom (e.g., What are we learning? Why are we learning it?) Using the learning goals to stay focused on their progress in improving their understanding of mathematics content and proficiency in using mathematical practices. Connecting their current work with the mathematics that they studied previously and seeing where the mathematics is going. Assessing and monitoring their own understanding and progress toward the mathematics learning goals.

http://www.nctm.org/PrinciplestoActions/

NCTM. (2014).Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 16

Teacher and Student Actions

Elicit and use evidence of student thinking Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Identifying what counts as evidence of student progress toward mathematics learning goals. Eliciting and gathering evidence of student understanding at strategic points during instruction. Interpreting student thinking to assess mathematical understanding, reasoning, and methods. Making in-the-moment decisions on how to respond to students with questions and prompts that probe, scaffold, and extend. Reflecting on evidence of student learning to inform the planning of next instructional steps.	Revealing their mathematical understanding, reasoning, and methods in written work and classroom discourse. Reflecting on mistakes and misconceptions to improve their mathematical understanding. Asking questions, responding to, and giving suggestions to support the learning of their classmates. Assessing and monitoring their own progress toward mathematics learning goals and identifying areas in which they need to improve.

http://www.nctm.org/PrinciplestoActions/

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 56

Smarter Balanced Assessment Consortium

Making the Classroom Connection

- Standards for Mathematical Practice
- Smarter Balanced Claims
- Mathematics Teaching Practices

Claim 1
Concepts and Procedures

Claim 1: Concepts and Procedures

"Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency."

Smarter Balanced Assessment Targets

- Provide more detail about the range of content and Depth of Knowledge levels.

- Intended to support the development of high-quality items and tasks that contribute evidence to the claims.

Smarter Balanced Cognitive Rigor Matrix

Depth of Thinking (Webb) + Type of Thinking (Revised Bloom)	DOK Level 1 Recall & Reproduction	DOK Level 2 Basic Skills & Concepts	DOK Level 3 Strategic Thinking & Reasoning	DOK Level 4 Extended Thinking
Remember	- Recall conversions, terms, facts			
Understand	-Evaluate an expression -Locate points on a grid or number on number line -Solve a one-step problem -Represent math relationships in words, pictures, or symbols	- Specify, explain relationships -Make basic inferences or logical predictions from data/observations -Use models /diagrams to explain concepts -Make and explain estimates	-Use concepts to solve non-routine problems -Use supporting evidence to justify conjectures, generalize, or connect ideas -Explain reasoning when more than one response is possible -Explain phenomena in terms of concepts	-Relate mathematical concepts to other content areas, other domains -Develop generalizations of the results obtained and the strategies used and apply them to new problem situations
Apply	-Follow simple procedures -Calculate, measure, apply a rule (e.g., rounding) -Apply algorithm or formula -Solve linear equations -Make conversions	-Select a procedure and perform it -Solve routine problem applying multiple concepts or decision points -Retrieve information to solve a problem -Translate between representations	-Design investigation for a specific purpose or research question - Use reasoning, planning, and supporting evidence -Translate between problem & symbolic notation when not a direct translation	-Initiate, design, and conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze	-Retrieve information from a table or graph to answer a question -Identify a pattern/trend	-Categorize data, figures -Organize, order data -Select appropriate graph and organize & display data -Interpret data from a simple graph -Extend a pattern	-Compare information within or across data sets or texts -Analyze and draw conclusions from data, citing evidence -Generalize a pattern -Interpret data from complex graph	-Analyze multiple sources of evidence or data sets
Evaluate			-Cite evidence and develop a logical argument -Compare/contrast solution methods -Verify reasonableness	-Apply understanding in a novel way, provide argument or justification for the new application
Create	- Brainstorm ideas, concepts, problems, or perspectives related to a topic or concept	-Generate conjectures or hypotheses based on observations or prior knowledge and experience	-Develop an alternative solution -Synthesize information within one data set	-Synthesize information across multiple sources or data sets -Design a model to inform and solve a practical or abstract situation

Claim 1 Assessment Targets

GRADE 3 Summative Assessment Targets
Providing Evidence Supporting Claim #1

Claim #1: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content for this claim may be drawn from any of the Grade 3 clusters represented below, with a much greater proportion drawn from clusters designated "m" (major) and the remainder drawn from clusters designated "a/s" (additional/supporting) – with these items fleshing out the major work of the grade. Sampling of Claim #1 assessment targets will be determined by balancing the content assessed with items and tasks for Claims #2, #3, and #4.[5] Grade level content emphases are summarized in Appendix A and CAT sampling proportions for Claim 1 are given in Appendix B.

Operations and Algebraic Thinking

Target A [m]: Represent and solve problems involving multiplication and division.[6] (DOK 1)
Items/tasks for this target require students to use multiplication and division within 100 to solve straightforward, one-step contextual word problems in situations involving equal groups, arrays, and measurement quantities such as length, liquid volume, and masses/weights of objects. These problems should be of the equal-groups and arrays-situation types, but can include more difficult measurement quantity situations. All of these items/tasks will code straightforwardly to standard 3.OA.3. Few of these tasks coding to this standard will make the method of solution a separate target of assessment. Other tasks associated with this target will probe student understanding of the meanings of multiplication and division (3.OA.1,2).[7]

Non-contextual tasks that explicitly ask the student to determine the unknown number in a multiplication or division equation relating three whole numbers (3.OA.4) will support the development of items that provide a range of difficulty necessary for populating an adaptive item bank (see section *Understanding Assessment Targets in an Adaptive Framework,* below, for further explication).

Target B [m]: Understand properties of multiplication and the relationship between multiplication and division. (DOK 1)
Whereas Target A focuses more on the practical uses of multiplication and division, Target B focuses more on the mathematical properties of these operations, including the mathematical relationship between multiplication and division.

From the Smarter Balanced Mathematics Content Specifications

Claim 1 and the Mathematics Teaching Practices

Claim 1	Mathematics Teaching Practices
Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency	**Use and connect mathematical representations** Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving. **Build procedural fluency from conceptual understanding** Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Teacher and Student Actions

Use and connect mathematical representations Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Selecting tasks that allow students to decide which representations to use in making sense of the problems.	Using multiple forms of representations to make sense of and understand mathematics.
Allocating substantial instructional time for students to use, discuss, and make connections among representations.	Describing and justifying their mathematical understanding and reasoning with drawings, diagrams, and other representations.
Introducing forms of representations that can be useful to students.	Making choices about which forms of representations to use as tools for solving problems.
Asking students to make math drawings or use other visual supports to explain and justify their reasoning.	Sketching diagrams to make sense of problem situations.
Focusing students' attention on the structure or essential features of mathematical ideas that appear, regardless of the representation.	Contextualizing mathematical ideas by connecting them to real-world situations.
Designing ways to elicit and assess students' abilities to use representations meaningfully to solve problems.	Considering the advantages or suitability of using various representations when solving problems.

http://www.nctm.org/PrinciplestoActions/

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 29

Teacher and Student Actions

Build procedural fluency from conceptual understanding Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Providing students with opportunities to use their own reasoning strategies and methods for solving problems. Asking students to discuss and explain why the procedures that they are using work to solve particular problems. Connecting student-generated strategies and methods to more efficient procedures as appropriate.	Making sure that they understand and can explain the mathematical basis for the procedures that they are using. Demonstrating flexible use of strategies and methods while reflecting on which procedures seem to work best for specific types of problems. Determining whether specific approaches generalize to a broad class of problems.

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p.47-48

Activity 1

Illustrative Mathematics Task

3.OA Valid Equalities? (Part 2)

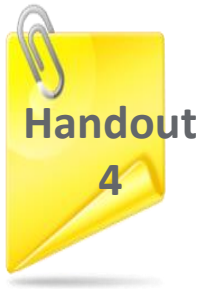
Activity 1

Decide if the equations are true or false. Explain your answer.

a) $4 \times 5 = 20$
b) $34 = 7 \times 5$
c) $3 \times 6 = 9 \times 2$
d) $5 \times 8 = 10 \times 4$
e) $6 \times 9 = 5 \times 10$
f) $2 \times (3 \times 4) = 8 \times 3$
g) $8 \times 6 = 7 \times 6 + 6$
h) $4 \times (10 + 2) = 40 + 2$

https://www.illustrativemathematics.org/illustrations/1821

Bringing It Back to the Standards



Using the "Bringing it Back to the Standards and the Teaching Practices" graphic organizer, identify which standards and teaching practices were addressed in Activity 1:

- Standards for Mathematical Content
- Standards for Mathematical Practice
- Mathematics Teaching Practices (including teacher/student actions)

Bringing it Back to the Assessment

1985

Which expression is equal to 3×7?

A $(2 \times 7) + (1 \times 7)$

B $(7 \times 5) - 2$

C $(3 \times 4) + (3 \times 5)$

D $(3 \times 4) \times 3$

From the Smarter Balanced Grade 3 Practice Test

Claim 2
Problem Solving

Claim 2: Problem-Solving

"Students can solve a range of complex, well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies."

Rationale for Claim 2

- Assessment items and tasks focused on Claim 2 include problems in pure mathematics and problems set in context.
- Problems are presented as items and tasks that are well-posed (that is, problem formulation is not necessary) and for which a solution path is not immediately obvious.
- These problems require students to construct their own solution pathway rather than follow a provided one. Such problems will therefore be less structured than items and tasks presented under Claim 1. Students will need to select appropriate conceptual and physical tools to use.

Claim 2 Assessment Targets

Target A: Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (DOK 2, 3)

Target B: Select and use appropriate tools strategically. (DOK 1, 2)

Target C: Interpret results in the context of a situation. (DOK 2)

Target D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (DOK 1, 2, 3)

Claim 2 Content Standards by Grade Level						
Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**	**High School**
3.OA.A	4.OA.A	5.NBT.B	6.RP.A	7.RP.A	8.EE.B	N-Q.A
3.OA.D	4.NBT.B	5.NF.A	6.NS.A	7.NS.A	8.EE.C	A-SSE.A
3.NBT.A*	4.NF.A	5.NF.B	6.NS.C	7.EE.A	8.F.A	A-SSE.B
3.NF.A	4.NF.B	5.MD.A*	6.EE.A	7.EE.B	8.F.B*	A-CED.A
3.MD.A	4.NF.C	5.MD.C	6.EE.B	7.G.A*	8.G.A	A-REI.2
3.MD.B*	4.MD.A*	5.G.A*	6.EE.C	7.G.B*	8.G.B	A-REI.B
3.MD.C	4.MD.C*		6.G.A*		8.G.C*	A-REI.C
3.MD.D*						A-REI.D
						F-IF.A
						F-IF.B
						F-IF.C
						F-BF.A
						G-SRT.C
						S-ID.C
						S-CP.A

* Denotes additional and supporting clusters

Claim 2 and the Mathematics Teaching Practices

Claim 2	Mathematics Teaching Practices
Students can solve a range of complex, well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.	Implement tasks that promote reasoning and problem solving Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and that allow for multiple entry points and varied solution strategies.

Teacher and Student Actions

Implement tasks that promote reasoning and problem solving Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Motivating students' learning of mathematics through opportunities for exploring and solving problems that build on and extend their current mathematical understanding. Selecting tasks that provide multiple entry points through the use of varied tools and representations. Posing tasks on a regular basis that require a high level of cognitive demand. Supporting students in exploring tasks without taking over student thinking. Encouraging students to use varied approaches and strategies to make sense of and solve tasks.	Persevering in exploring and reasoning through tasks. Taking responsibility for making sense of tasks by drawing on and making connections with their prior understanding and ideas. Using tools and representations as needed to support their thinking and problem solving. Accepting and expecting that their classmates will use a variety of solution approaches and that they will discuss and justify their strategies to one another.

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 24

Activity 2

The Locker Game and The Very Hungry Caterpillar

Illustrative Mathematics

The Locker Game

The 20 students in Mr. Wolf's 4th grade class are playing a game in a hallway that is lined with 20 lockers in a row.

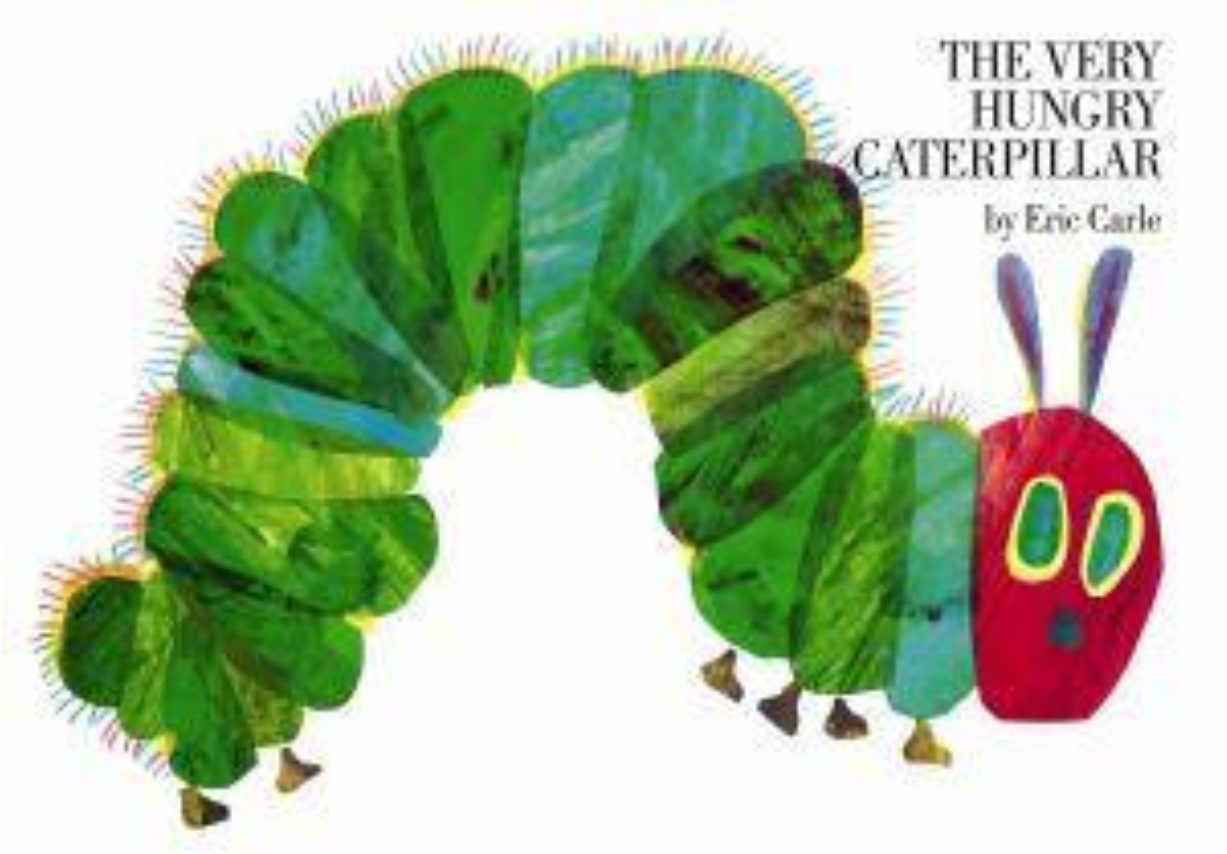
- The **first** student starts with the first locker and goes down the hallway and opens all the lockers.
- The **second** student starts with the second locker and goes down the hallway and shuts every other
- locker.
- The **third** student stops at every third locker and opens the locker if it is closed or closes the locker if it
- is open.
- The f**ourth** student stops at every fourth locker and opens the locker if it is closed or closes the locker if it is open.

This process continues until all 20 students in the class have passed through the hallway.

1. Which lockers are still open at the end of the game? Explain your reasoning.
2. Which lockers were touched by only two students? Explain your reasoning.
3. Which lockers were touched by only three students? Explain your reasoning.
4. Which lockers were touched the most?

https://www.illustrativemathematics.org/illustrations/938

The Very Hungry Caterpillar



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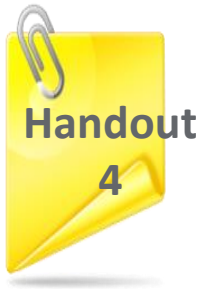
Bringing It Back to the Standards



Using the "Bringing it Back to the Standards and the Teaching Practices" graphic organizer, identify which standards and teaching practices were addressed in Activity 2:

- Standards for Mathematical Content
- Standards for Mathematical Practice
- Mathematics Teaching Practices (including teacher/student actions)

Bringing it Back to the Assessment

6

Connor is buying tickets to a concert. The concert he and his friends want to see costs $4.75 per ticket. Connor has $26.00 total.

What is the **greatest** number of tickets Connor can buy?

Ⓐ 4

Ⓑ 5

Ⓒ 6

Ⓓ 7

From the Smarter Balanced Grade 5 Practice Test

Claim 3
Communicating Reasoning

Claim 3: Communicating Reasoning

"Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others."

Rationale for Claim 3

- Claim 3 refers to a recurring theme in the CCS for Mathematics content and practice standards—the ability to construct and present a clear, logical, convincing argument.
  - For older students, this may take the form of a rigorous, deductive proof based on clearly stated axioms.
  - For younger students, this will involve more informal justifications .
- Assessment tasks that address this claim will typically present a claim or a proposed solution to a problem and will ask students to provide an example, a justification, an explanation, or a counterexample.

Targets for Claim 3

Target A: Test propositions or conjectures with specific examples. (DOK 2).

Target B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. (DOK 3, 4).

Target C: State logical assumptions being used. (DOK 2, 3)

Target D: Use the technique of breaking an argument into cases. (DOK 2, 3)

Target E: Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is. (DOK 2, 3, 4)

Target F: Base arguments on concrete referents such as objects, drawings, diagrams, and actions. (DOK 2, 3)

Target G: At later grades, determine conditions under which an argument *does* and *does not* apply. (DOK 3, 4)

Claim 3 Standards by Grade Level

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	HS
3.OA.B	4.OA.3	5.NBT.2	6.RP.A	7.RP.2	8.EE.1	N-RN.A
3.NF.A	4.NBT.A	5.NBT.6	6.RP.3	7.NS.A	8.EE.5	N-RN.B
3.NF.1	4.NBT.5	5.NBT.7	6.NS.A	7.NS.1	8.EE.6	N-RN.3
3.NF.2	4.NBT.6	5.NF.1	6.NS.1	7.NS.2	8.EE.7a	A-SSE.2
3.NF.3	4.NF.A	5.NF.2	6.NS.C	7.EE.1	8.EE.7b	A-APR.1
3.MD.A	4.NF.1	5.NF.B	6.NS.5	7.EE.2	8.EE.8a	A-REI.A
3.MD.7	4.NF.2	5.NF.3	6.NS.6		8.F.1	A-REI.1
	4.NF.3a	5.NF.4	6.NS.7		8.F.2	A-REI.2
	4.NF.3b	5.NF.7a	6.EE.A		8.F.3	A-REI.10
	4.NF.3c	5.NF.7b	6.EE.3		8.G.1	A-REI.11
	4.NF.4a	5.MD.C	6.EE.4		8.G.2	F-IF.1
	4.NF.4b	5.MD.5a	6.EE.B		8.G.4	F-IF.5
	4.NF.C	5.MD.5b	6.EE.6		8.G.5	F-IF.9
	4.NF.7	5.G.B*	6.EE.9		8.G.6	G-CO.C
		5.G.4*			8.G.8	G-CO.9
						G-CO.10
						G-CO.11
						A-APR.B
						A-APR.4
						A-APR.6
						A-REI.C
						F-BF.3
						F-BF.4a
						F-TF.1
						F-TF.2
						F-TF.8
						G-CO.A
						G-CO.B
						G.SRT.A
						G.SRT.B

Claim 3 and the Mathematics Teaching Practices

Claim 3	Mathematics Teaching Practices
Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.	**Facilitate meaningful mathematical discourse** Effective teaching of mathematics facilitates discourse among students in order to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments. **Pose purposeful questions** Effective teaching of mathematics uses purposeful questions to assess and advance student reasoning and sense making about important mathematical ideas and relationships.

Teacher and Student Actions

Facilitate meaningful mathematical discourse Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Engaging students in purposeful sharing of mathematical ideas, reasoning, and approaches, using varied representations. Selecting and sequencing student approaches and solution strategies for whole-class analysis and discussion. Facilitating discourse among students by positioning them as authors of ideas, who explain and defend their approaches. Ensuring progress toward mathematical goals by making explicit connections to student approaches and reasoning.	Presenting and explaining ideas, reasoning, and representations to one another in pair, small-group, and whole-class discourse. Listening carefully to and critiquing the reasoning of peers, using examples to support or counterexamples to refute arguments. Seeking to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others. Identifying how different approaches to solving a task are the same and how they are different.

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 35

Teacher and Student Actions

Pose purposeful questions Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Advancing student understanding by asking questions that build on, but do not take over or funnel, student thinking. Making certain to ask questions that go beyond gathering information to probing thinking and requiring explanation and justification. Asking intentional questions that make the mathematics more visible and accessible for student examination and discussion. Allowing sufficient wait time so that more students can formulate and offer responses.	Expecting to be asked to explain, clarify, and elaborate on their thinking. Thinking carefully about how to present their responses to questions clearly, without rushing to respond quickly. Reflecting on and justifying their reasoning, not simply providing answers. Listening to, commenting on, and questioning the contributions of their classmates.

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 41

Activity 3

Composing and Decomposing Numbers

Grade 2

Activity 3

Lamar wants to make the number 261. He has plenty of hundreds blocks and ones blocks to work with, but only 4 tens blocks.

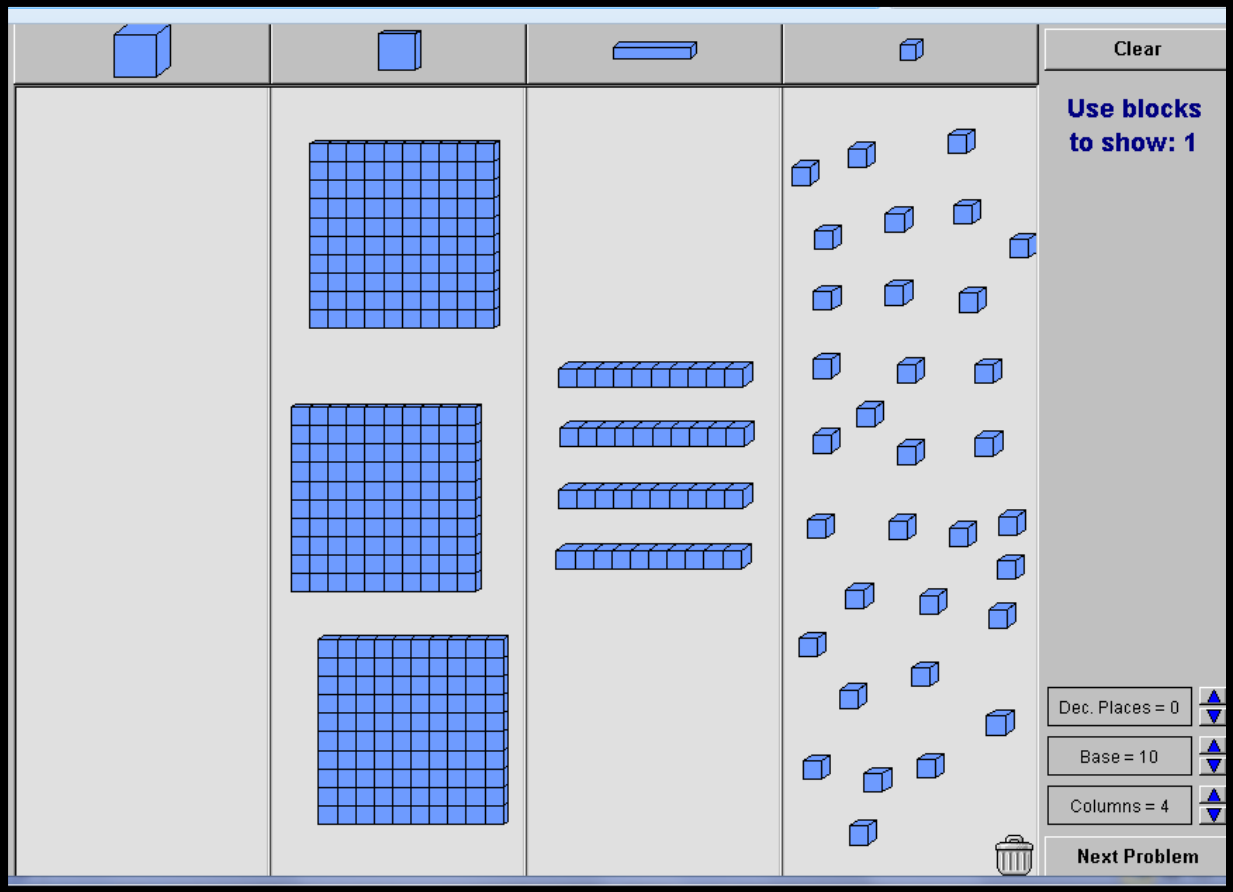
His friend Jose said,

You can still make 261 with the blocks you have.

Show or Explain how Lamar can make 261.

http://achievethecore.org/page/613/three-composing-decomposing-problems-detail-pg

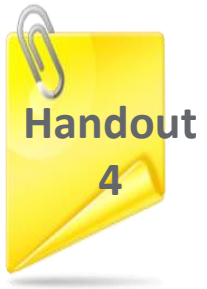
NLVM
Base Ten Blocks



http://nlvm.usu.edu/en/nav/frames_asid_152_g_1_t_1.html?from=category_g_1_t_1.html

A Passion for Fractions

Bringing It Back to the Standards



Using the "Bringing it Back to the Standards and the Teaching Practices" graphic organizer, identify which standards and teaching practices were addressed in Activity 2:

- Standards for Mathematical Content
- Standards for Mathematical Practice
- Mathematics Teaching Practices (including teacher/student actions)

Bringing it Back to the Assessment

19

Select **all** the numbers that make this inequality true.

$2\frac{1}{8} > \square + 1 + \frac{1}{8}$

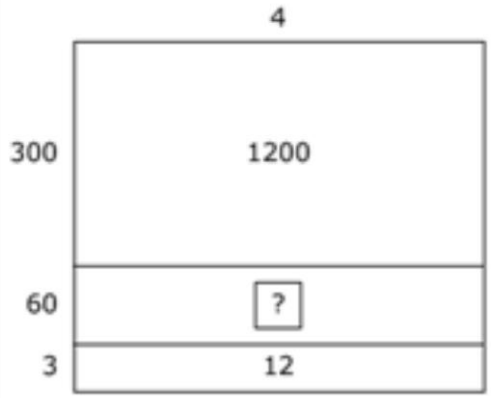
- ☐ $\frac{1}{8}$
- ☐ $\frac{4}{8}$
- ☐ $\frac{10}{8}$
- ☐ $\frac{16}{8}$

From the Smarter Balanced Grade 4 Practice Test

Bringing it Back to the Assessment

9

Jasmine solves the equation $\square \div 4 = 363$ using this area model.



Which statement explains how Jasmine should solve for the missing number in the model?

Ⓐ Jasmine should divide 60 by 4.

Ⓑ Jasmine should divide 1200 by 12.

Ⓒ Jasmine should multiply 3 times 60.

Ⓓ Jasmine should multiply 4 times 60.

From the Smarter Balanced Grade 5 Practice Test

Claim 4
Modeling and Data Analysis

Claim 4: Modeling and Data Analysis

"Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

Rationale for Claim 4

- In the real world, problems do not come neatly ”packaged.” Real-world problems are complex and often contain insufficient or superfluous data.
- Assessment tasks will involve *formulating* a problem that is tractable using mathematics; that is, formulating a model. This will usually involve making assumptions and simplifications.
- Students will need to select from the data at hand or estimate data that are missing. (Such tasks are therefore distinct from the well-formulated problem-solving tasks described in Claim 2.)
- Students will identify variables in a situation and construct relationships between them. Once students have formulated the problem, they will tackle it (often in a decontextualized manner) before interpreting their results and then checking the results for reasonableness.

Targets for Claim 4

Target A: Apply mathematics to solve problems arising in everyday life, society, and the workplace. (DOK 2, 3)

Target B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. (DOK 2, 3, 4)

Target C: State logical assumptions being used. (DOK 1, 2)

Target D: Interpret results in the context of a situation. (DOK 2, 3)

Target E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. (DOK 3, 4)

Target F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (DOK 1, 2, 3)

Target G*: Identify, analyze and synthesize relevant external resources to pose or solve problems. (DOK 3, 4)

*Assessed in Performance Tasks only

Claim 4 Clusters and Standards

Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	HS
3.OA.A	4.OA.A	5.NBT.B	6.RP.A	7.RP.A	8.EE.3	N-Q.A
3.OA.D	4.NF.B	5.NF.A	6.NS.A	7.NS.A	8.EE.4	A-SSE.B
3.MD.A	4.MD.A*	5.NF.B	6.NS.C	7.EE.B	8.EE.B	A-CED.A
3.MD.C	4.MD.B*	5.MD.A*	6.EE.B	7.G.A*	8.EE.C	A-REI.A
3.MD.D*	4.MD.C*	5.MD.B*	6.EE.C	7.G.B*	8.F.B*	A-REI.B
		5.MD.C	6.G.A*	7.SP.A*	8.G.B	F-IF.B
		5.G.A*	6.SP.A*	7.SP.B*	8.G.C*	F-IF.C
			6.SP.B*	7.SP.C*	8.SP.A*	F-BF.A
						S-ID.A
						S-ID.B
						S-IC.1
						S-IC.B
						A-REI.C
						F-LE.A
						F-LE.B
						F-TF.5
						G-GMD.3
						G-MG

*Denotes additional and supporting clusters

Claim 4 and the Mathematics Teaching Practices

Claim 4	Mathematics Teaching Practices
Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.	Support Productive Struggle in Learning Mathematics Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Teacher and Student Actions

Support productive struggle in learning mathematics Teacher and student actions	
What are *teachers* doing?	**What are *students* doing?**
Anticipating what students might struggle with during a lesson and being prepared to support them productively through the struggle. Giving students time to struggle with tasks, and asking questions that scaffold students' thinking without stepping in to do the work for them. Helping students realize that confusion and errors are a natural part of learning, by facilitating discussions on mistakes, misconceptions, and struggles. Praising students for their efforts in making sense of mathematical ideas and perseverance in reasoning through problems.	Struggling at times with mathematics tasks but knowing that breakthroughs often emerge from confusion and struggle. Asking questions that are related to the sources of their struggles and will help them make progress in understanding and solving tasks. Persevering in solving problems and realizing that is acceptable to say, "I don't know how to proceed here," but it is not acceptable to give up. Helping one another without telling their classmates what the answer is or how to solve the problem.

NCTM. (2014). Principles to Actions: Ensuring Mathematical Success for All. Reston, VA: NCTM p. 52

Activity 4

Comparing Money Raised

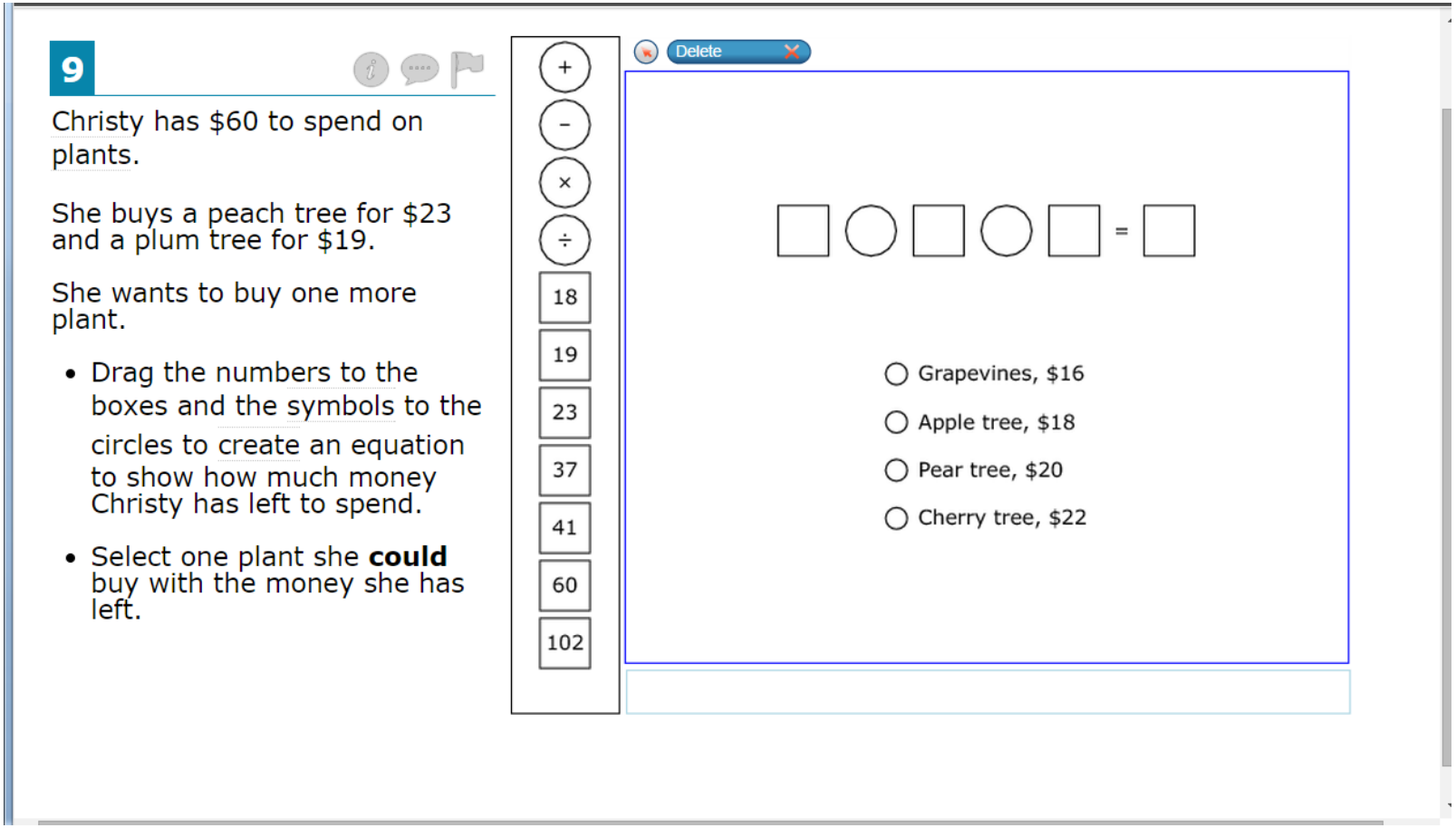
Grade 4

Activity 4

C. Luis raised $45 for the animal shelter, which was 3 times as much money as Anthony raised. How much money did Anthony raise?

https://www.illustrativemathematics.org/illustrations/263

Bringing it Back to the Assessment



From the Smarter Balanced Grade 3 Practice Test

Bringing it Back to the Assessment

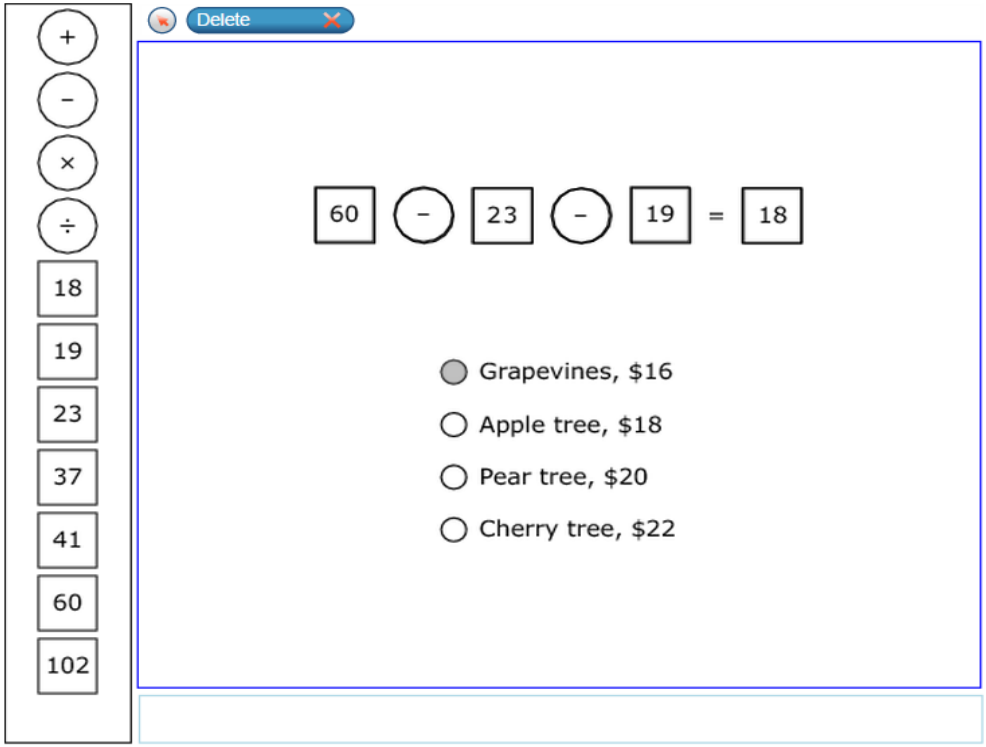
9

Christy has $60 to spend on plants.

She buys a peach tree for $23 and a plum tree for $19.

She wants to buy one more plant.

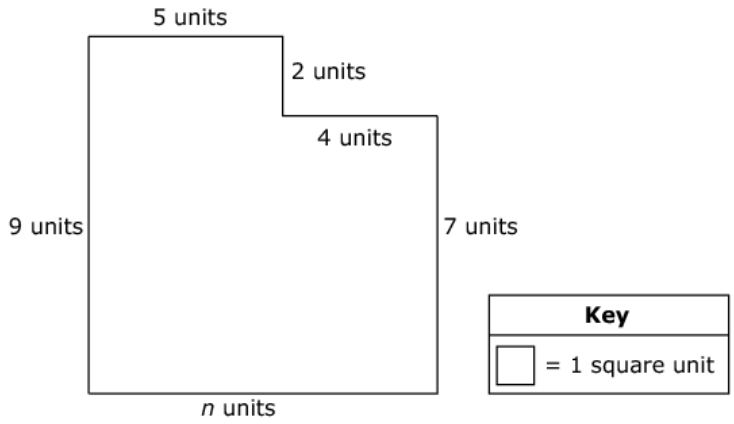
- Drag the numbers to the boxes and the symbols to the circles to create an equation to show how much money Christy has left to spend.
- Select one plant she **could** buy with the money she has left.



Bringing it Back to the Assessment

16

Juan draws a polygon with a perimeter of 36 units. He covers the area of the polygon with tiles that are each 1 square unit.



Part A: Enter an equation that could be used to find the value of n in the first response box.

Part B: Enter the number of tiles Juan uses to cover the polygon in the second response box.

Supporting Students Who Will Take the Smarter Balanced Assessments

Support for Students

- Providing high quality instruction throughout the year.
- Provide opportunities for students to engage with the Smarter Balanced Practice Tests and Training Tests.
  - Practice Tests are available by grade level
  - Practice Tests are available by grade-band
- Available on the Smarter Balanced Web site

  http://www.smarterbalanced.org/practice-test/

Purpose of the Practice Tests

- Allows teachers, students, parents, and other interested parties to experience a full grade-level assessment
- Provides an opportunity for students to become familiar with the keyboard commands and embedded universal tools, designated supports, and accommodations
- Provides an opportunity for students who use assistive technology to test the functionality prior to testing

Practice Tests

- Grade-level scoring guides are available for download
- Important Limitations
  - The Practice Tests do not encompass the full range of content that students will encounter on the operational assessments in 2015, and should not be used to guide instructional decisions.

Training Tests

- The Training Tests are designed to provide students and teachers with opportunities to quickly familiarize themselves with the software and navigational tools that they will use on the Smarter Balanced Assessments.
- The Training Tests are organized by grade bands (grades 3 to 5, 6 to 8, and high school) and each test contains 14-15 questions.
- The questions were selected to provide students with an opportunity to practice a range of question types.
- The Training Tests do not contain performance tasks. Similar to the Practice Test, the Training Tests includes all embedded universal tools, designated supports, and accommodations.

How Does the Smarter Balanced Assessment System Support Instruction?

The Smarter Balanced Assessment System

The Smarter Balanced Assessment System includes:

- Digital Library resources to help educators implement the *formative assessment process* to improve teaching and learning
- *interim assessments* to check student progress throughout the year and help teachers plan and improve instruction
- year-end *summative assessments* that are used for accountability purposes

Questions

Success Criteria

- I can explain how the Connecticut Core Standards (CCS) for Mathematics connect to the Smarter Balanced Claims.

- I can meet the scope of the Content Standards and Practice Standards through best practices and by incorporating a variety of strategies and activities in my instruction.

Resources

- CT Core Standards: http://ctcorestandards.org/
- Connecticut Dream Team 2014 ELA Resources: http://ctcorestandards.org/?page_id=869
- Connecticut Dream Team 2014 Mathematics Resources: http://ctcorestandards.org/?page_id=4566
- iCONN.org – Connecticut's **re**search engine

Resources

- Smarter Balanced Assessment Consortium: http://www.smarterbalanced.org/
- Link to CSDE Student Assessment Smarter Balanced page: http://www.sde.ct.gov/sde/cwp/view.asp?a=2748&q=334488
- Achieve the Core: http://achievethecore.org/