

Building Assessment Literacy:
Classroom Assessment for Student Learning

Secondary Mathematics
March 2015

PARTICIPANT PACKET

Keys to Quality Classroom Assessment

Accurate Assessment

Key 1: Clear Purpose

What's the purpose?
Who will use the results?
What will they use the results to do?

Key 2: Clear Targets

What are the learning targets?
Are they clear?
Are they appropriate?

Key 3: Sound Design

What method?
Quality questions?
Sampled how?
Avoid bias how?

Key 4: Effective Communication

How manage information?
How report? To whom?

Key 5: Student Involvement

Students are users, too.
Students need to understand targets, too.
Students can assess, too.
Students can track progress and communicate, too.

Effectively Used

What Gives Formative Assessment Its Power?

These are the reported gains that have launched a thousand “formative assessment” products. But the size of the achievement gains is only half of the story. The other half is what occurred to cause the gains. In reviewing the interventions featured in the highest-impact studies, Black and William (1998b) make the following observations:

- “Opportunities for students to express their understanding should be designed into any piece of teaching, for this will initiate the interaction through which formative assessment aids learning” (p. 143).
- “The dialogue between pupils and teachers should be thoughtful, reflective, focused to evoke and explore understanding, and conducted so that all pupils have an opportunity to think and to express their ideas” (p. 144).
- “Feedback to any pupil should be about the particular qualities of his or her work, with advice on what he or she can do to improve, and should avoid comparisons to other pupils” (p. 143).
- “If formative assessment is to be productive, pupils should be trained in self-assessment so that they can understand the main purposes of their learning and thereby grasp what they need to do to achieve” (p. 143).

Source: J. Chappuis, R. Stiggins, S. Chappuis, and J. Arter, *Classroom Assessment for Student Learning: Doing It Right—Using It Well*, 2nd ed. (Upper Saddle River, NJ: Pearson Education, 2012), pp. 22–23.

Based on Black and Wiliam's observations, what would you say are the highest-impact formative assessment practices?

Activity 3.5 Template for Deconstructing a Content Standard

Content Standard			
Type	Knowledge ____	Reasoning ____	Skill ____ Product ____
Nouns:			Verbs:

Underpinning Learning Targets

Knowledge Targets	Reasoning Targets	Skill Targets	Product Targets

Mathematics depth-of-knowledge levels

Level 1 (Recall) includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify a Level 1 include “identify,” “recall,” “recognize,” “use,” and “measure.” Verbs such as “describe” and “explain” could be classified at different levels depending on what is to be described and explained.

Level 2 (Skill/Concept) includes the engagement of some mental processing beyond a habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Some action verbs, such as “explain,” “describe,” or “interpret” could be classified at different levels depending on the object of the action. For example, if an item required students to explain how light affects mass by indicating there is a relationship between light and heat, this is considered a Level 2. Interpreting information from a simple graph, requiring reading information from the graph, also is a Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is a Level 3. Caution is warranted in interpreting Level 2 as only skills because some reviewers will interpret skills very narrowly, as primarily numerical skills, and such interpretation excludes from this level other skills such as visualization skills and probability skills, which may be more complex simply because they are less common. Other Level 2 activities include explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

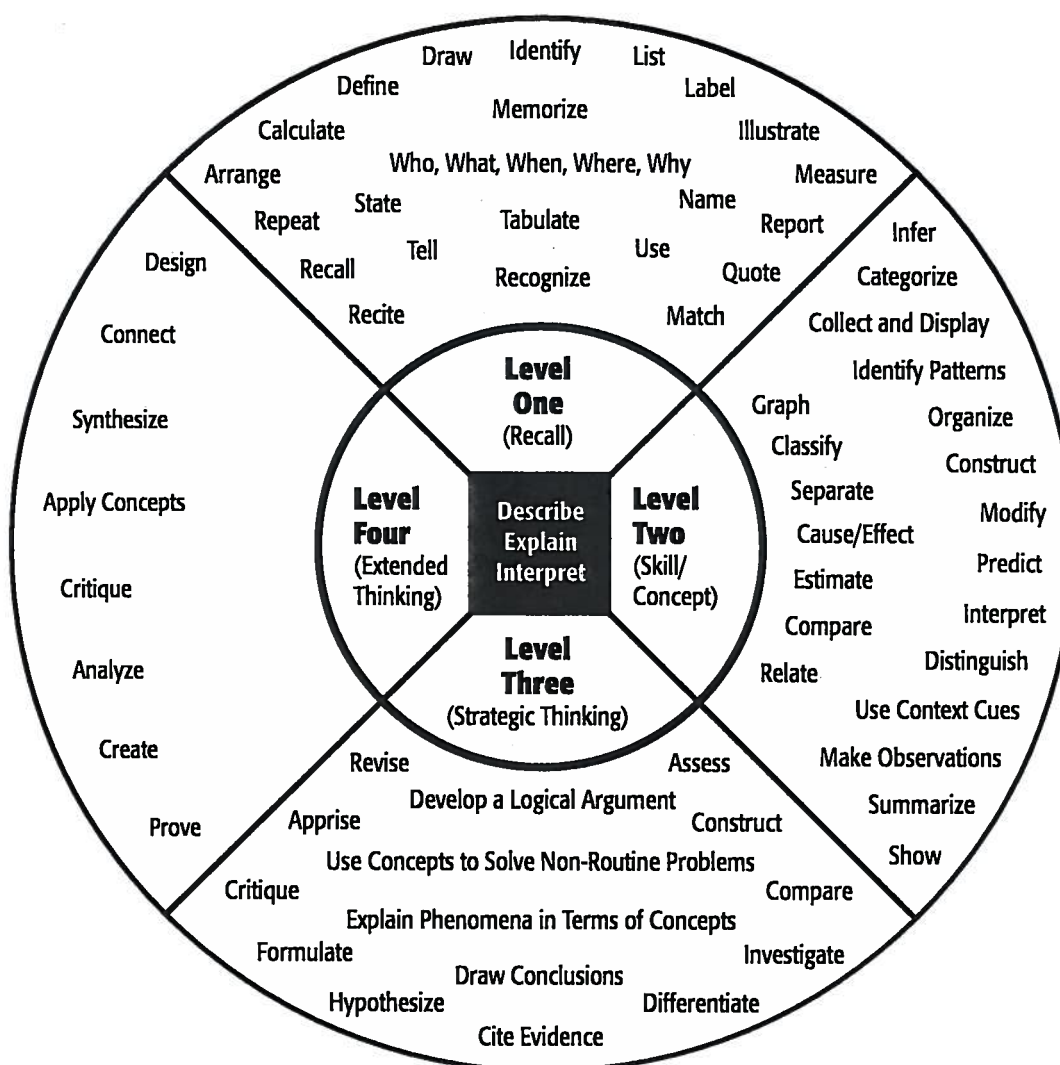
Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is a Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve problems.

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas within the content area or among content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing and conducting experiments; making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

Hess' Cognitive Rigor Matrix & Curricular Examples: Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions – M-Sci

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/ Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	- Recall, observe, & recognize facts, principles, properties - Recall/ identify conversions or among representations or numbers (e.g., customary and metric measures)			
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as from examples given), predict, compare/contrast, match like ideas, explain, construct models	- 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 - Read, write, compare decimals in scientific notation	- Specify and explain relationships (e.g., non-examples/examples; cause-effect) - Make and record observations - Explain steps followed - Summarize results or concepts - Make basic inferences or logical predictions from data/observations - Use models /diagrams to represent or explain mathematical concepts - Make and explain estimates	- Use concepts to solve <u>non-routine</u> problems - Explain, generalize, or connect ideas using supporting evidence - Make and justify conjectures - Explain thinking when more than one response is possible - Explain phenomena in terms of concepts	- Relate mathematical or scientific concepts to other content areas, other domains, or other concepts - Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task) or use (apply) to an unfamiliar task	- Follow simple procedures (recipe-type directions) - Calculate, measure, apply a rule (e.g., rounding) - Apply algorithm or formula (e.g., area, perimeter) - Solve linear equations - Make conversions among representations or numbers, or within and between customary and metric measures	- Select a procedure according to criteria and perform it - Solve routine problem applying multiple concepts or decision points - Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps - Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table) - Construct models given criteria	- Design investigation for a specific purpose or research question - Conduct a designed investigation - Use concepts to solve non-routine problems - Use & show reasoning, planning, and evidence - Translate between problem & symbolic notation when not a direct translation	- Select or devise approach among many alternatives to solve a problem - Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	- Retrieve information from a table or graph to answer a question - Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram) - Identify a pattern/trend	- Categorize, classify materials, data, figures based on characteristics - Organize or order data - Compare/ contrast figures or 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 similar files/differences between procedures or solutions	- Analyze multiple sources of evidence - analyze complex/abstract themes - Gather, analyze, and evaluate information
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique			- Cite evidence and develop a logical argument for concepts or solutions - Describe, compare, and contrast solution methods - Verify reasonableness of results	- Gather, analyze, & evaluate information to draw conclusions - Apply understanding in a novel way, provide argument or justification for the application
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce	Brainstorm ideas, concepts, or perspectives related to a topic	Generate conjectures or hypotheses based on observations or prior knowledge and experience	- Synthesize information within one data set, source, or text - Formulate an original problem given a situation - Develop a scientific/mathematical model for a complex situation	- Synthesize information across multiple sources or texts - Design a mathematical model to inform and solve a practical or abstract situation

Depth of Knowledge (DOK) Levels



Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting. Conduct basic mathematical calculations. Label locations on a map. Represent in words or diagrams a scientific concept or relationship. Perform routine procedures like measuring length or using punctuation marks correctly. Describe the features of a place or people.	Identify and summarize the major events in a narrative. Use context cues to identify the meaning of unfamiliar words. Solve routine multiple-step problems. Describe the cause/effect of a particular event. Identify patterns in events or behavior. Formulate a routine problem given data and conditions. Organize, represent and interpret data.	Support ideas with details and examples. Use voice appropriate to the purpose and audience. Identify research questions and design investigations for a scientific problem. Develop a scientific model for a complex situation. Determine the author's purpose and describe how it affects the interpretation of a reading selection. Apply a concept in other contexts.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/solutions. Apply mathematical model to illuminate a problem or situation. Analyze and synthesize information from multiple sources. Describe and illustrate how common themes are found across texts from different cultures. Design a mathematical model to inform and solve a practical or abstract situation.

Target Sampling Mathematics Grade 6						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
1. Concepts and Procedures	Priority Cluster	E. Apply and extend previous understandings of arithmetic to algebraic expressions.	1	5-6		16-19
		F. Reason about and solve one-variable equations and inequalities.	1, 2			
		A. Understand ratio concepts and use ratio reasoning to solve problems.	1, 2	3-4		
		G. Represent and analyze quantitative relationships between dependent and independent variables.	2	2		
		B. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	1, 2			
		D. Apply and extend previous understandings of numbers to the system of rational numbers.	1, 2	2		
	Supporting Cluster	C. Compute fluently with multi-digit numbers and find common factors and multiples.	1, 2			4-5
		H. Solve real-world and mathematical problems involving area, surface area, and volume.	1, 2			
		I. Develop understanding of statistical variability.	2			
		J. Summarize and describe distributions.	1, 2			

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 - For Claim 3, each student will receive at least 2 CAT items at DOK 3 or higher.
 - For combined Claims 2 and 4, each student will receive at least 2 CAT items at DOK 3 or higher.

Target Sampling Mathematics Grade 6						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
2. Problem Solving 4. Modeling and Data Analysis	Problem Solving (drawn across content domains)	A. Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.	2, 3	2		
		B. Select and use appropriate tools strategically.			1-2	
		C. Interpret results in the context of a situation.	1, 2, 3	1		
		D. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).				
	Modeling and Data Analysis (drawn across content domains)	A. Apply mathematics to solve problems arising in everyday life, society, and the workplace.	2, 3	1		8-10
		D. Interpret results in the context of a situation.				
		B. Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.	2, 3, 4	1		
		E. Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.			1-3	
		C. State logical assumptions being used.	1, 2, 3	1		
		F. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).				
		G. Identify, analyze, and synthesize relevant external resources to pose or solve problems.	3, 4	0		
3. Communicating Reasoning	Communicating Reasoning (drawn across content domains)	A. Test propositions or conjectures with specific examples.	2, 3	3		8-10
		D. Use the technique of breaking an argument into cases.				
		B. Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.	2, 3, 4	3	0-2	
		E. Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is.				
		C. State logical assumptions being used.	2, 3	2		
		F. Base arguments on concrete referents such as objects, drawings, diagrams, and actions.				
		G. At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)				

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Target Sampling Mathematics Grade 7						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
1. Concepts and Procedures	Priority Cluster	A. Analyze proportional relationships and use them to solve real-world and mathematical problems.	2	8-9	0	17-20
		D. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	1, 2			
		B. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.	1, 2	5-6		
		C. Use properties of operations to generate equivalent expressions.	1, 2			
	Supporting Cluster	E. Draw, construct, and describe geometrical figures and describe the relationship between them.	1, 2	2-3		
		F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	1, 2			
		G. Use random sampling to draw inferences about a population.	1, 2	1-2		
		H. Draw informal comparative inferences about two populations.	2			
		I. Investigate chance processes and develop, use, and evaluate probability models.	1, 2			

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Target Sampling Mathematics Grade 7						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
2. Problem Solving 4. Modeling and Data Analysis	Problem Solving (drawn across content domains)	A. Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.	2, 3	2		1-2
		B. Select and use appropriate tools strategically. C. Interpret results in the context of a situation. D. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).	1, 2, 3	1		
	Modeling and Data Analysis (drawn across content domains)	A. Apply mathematics to solve problems arising in everyday life, society, and the workplace. D. Interpret results in the context of a situation.	2, 3	1		1-3
		B. Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. E. Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.	2, 3, 4	1		
3. Communicating Reasoning	Communicating Reasoning (drawn across content domains)	C. State logical assumptions being used. F. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).	1, 2, 3	1		0-2
		G. Identify, analyze, and synthesize relevant external resources to pose or solve problems.	3, 4	0		
		A. Test propositions or conjectures with specific examples. D. Use the technique of breaking an argument into cases.	2, 3	3		
		B. Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. E. Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. C. State logical assumptions being used. F. Base arguments on concrete referents such as objects, drawings, diagrams, and actions. G. At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)	2, 3, 4	3		
			2, 3	2		8-10

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Target Sampling Mathematics Grade 8						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
1. Concepts and Procedures	Priority Cluster	C. Understand the connections between proportional relationships, lines, and linear equations.	1, 2	5-6		0 17-20
		D. Analyze and solve linear equations and pairs of simultaneous linear equations.	1, 2			
		B. Work with radicals and integer exponents.	1, 2			
		E. Define, evaluate, and compare functions.	1, 2	5-6		
		G. Understand congruence and similarity using physical models, transparencies, or geometry software.	1, 2			
		F. Use functions to model relationships between quantities.	1, 2			
		H. Understand and apply the Pythagorean Theorem.	1, 2	2-3		
	Supporting Cluster	A. Know that there are numbers that are not rational, and approximate them by rational numbers.	1, 2			
		I. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	1, 2	4-5		
		J. Investigate patterns of association in bivariate data.	1, 2			

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Target Sampling Mathematics Grade 8						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
2. Problem Solving 4. Modeling and Data Analysis	Problem Solving (drawn across content domains)	A. Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.	2, 3	2		
		B. Select and use appropriate tools strategically.				
		C. Interpret results in the context of a situation.				
		D. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).	1, 2, 3	1	1-2	
	Modeling and Data Analysis (drawn across content domains)	A. Apply mathematics to solve problems arising in everyday life, society, and the workplace.	2, 3	1		8-10
		D. Interpret results in the context of a situation.				
		B. Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.				
		E. Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.	2, 3, 4	1	1-3	
		C. State logical assumptions being used.				
		F. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).	1, 2, 3	1		
3. Communicating Reasoning	Communicating Reasoning (drawn across content domains)	G. Identify, analyze, and synthesize relevant external resources to pose or solve problems.	3, 4	0		
		A. Test propositions or conjectures with specific examples.				
		D. Use the technique of breaking an argument into cases.	2, 3	3		
		B. Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.				
		E. Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is.	2, 3, 4	3	0-2	8-10
		C. State logical assumptions being used.				
		F. Base arguments on concrete referents such as objects, drawings, diagrams, and actions.	2, 3	2		
		G. At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)				

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Smarter Balanced Summative Assessment Math Targets by Grade and by Claim

Smarter Balanced Claim #1 Targets

Claim #1 Concepts and Procedures

6th Grade Targets

Target A: Understand ratio concepts and use ratio reasoning to solve problems.

Target B: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Target C: Compute fluently with multi-digit numbers and find common factors and multiples.

Target D: Apply and extend previous understandings of numbers to the system of rational numbers.

Target E: Apply and extend previous understandings of arithmetic to algebraic expressions.

Target F: Reason about and solve one-variable equations and inequalities.

Target G: Represent and analyze quantitative relationships between dependent and independent variables.

Target H: Solve real-world and mathematical problems involving area, surface area, and volume.

Target I: Develop understanding of statistical variability.

Target J: Summarize and describe distributions.

7th Grade Targets

Target A: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Target B: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.

Target C: Use properties of operations to generate equivalent expressions.

Target D: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Target E: Draw, construct, and describe geometrical figures and describe the relationship between them.

Target F: Solve real-life and mathematical problems involving angle measure, area, surface area and volume.

Target G: Use random sampling to draw inferences about a population.

Target H: Draw informal comparative inferences about two populations.

Target I: Investigate chance processes and develop, use and evaluate probability models.

8th Grade Targets

Target A: Know that there are numbers that are not rational, and approximate them by rational numbers. (DOK 1)

Target B: Work with radicals and integer exponents. (DOK 1)

Target C: Understand the connections between proportional relationships, lines, and linear equations. (DOK 2)

Target D: Analyze and solve linear equations and pairs of simultaneous linear equations. (DOK 2)

Target E: Define, evaluate, and compare functions. (DOK 1, 2)

Target F: Use functions to model relationships between quantities. (DOK 1, 2)

Target G: Understand congruence and similarity using physical models, transparencies, or geometry software. (DOK 2)

Target H: Understand and apply the Pythagorean Theorem. (DOK 2)

Target I: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. (DOK 2)

Target J: Investigate patterns of association in bivariate data. (DOK 1,2)

Smarter Balanced Claim #2 Targets

Claim #2 Problem Solving

Target A: Apply mathematics to solve well-posed problems 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)

Smarter Balanced Claim #3 Targets

Claim #3 Communicating Reasoning

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 what 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 references 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. (For example, area increases with perimeter for squares, but not for all plane figures.) (DOK 3, 4)

Smarter Balanced Claim #4 Targets

Claim #4 Modeling and Data Analysis

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 Sampling Mathematics Grade 11						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
1. Concepts and Procedures	Priority Cluster	D. Interpret the structure of expressions.	1, 2	2		0 19-22
		E. Write expressions in equivalent forms to solve problems.	1, 2			
		F. Perform arithmetic operations on polynomials.	2	1		
		G. Create equations that describe numbers or relationships.	1, 2	4-5		
		H. Understand solving equations as a process of reasoning and explain the reasoning.	1, 2			
		I. Solve equations and inequalities in one variable.	1, 2			
		J. Represent and solve equations and inequalities graphically.	1, 2	2		
		K. Understand the concept of a function and use function notation.	1, 2	2		
		L. Interpret functions that arise in applications in terms of a context.	1, 2			
		M. Analyze functions using different representations.	1, 2, 3	3-4		
		N. Build a function that models a relationship between two quantities.	2			
		O. Define trigonometric ratios and solve problems involving right triangles.	1, 2	2		
		P. Summarize, represent, and interpret data on a single count or measurement variable.	2	1-2		
	Supporting Cluster	A. Extend the properties of exponents to rational exponents.	1, 2			
		B. Use properties of rational and irrational numbers.	1, 2	1		
		C. Reason quantitatively and use units to solve problems.	1, 2	1		

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Target Sampling Mathematics Grade 11						
Claim	Content Category	Assessment Targets	DOK	Items		Total Items
				CAT	PT	
2. Problem Solving 4. Modeling and Data Analysis	Problem Solving (drawn across content domains)	A. Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.	2, 3	2		8-10
		B. Select and use appropriate tools strategically. C. Interpret results in the context of a situation. D. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas).	1, 2, 3	1	1-2	
	Modeling and Data Analysis (drawn across content domains)	A. Apply mathematics to solve problems arising in everyday life, society, and the workplace. D. Interpret results in the context of a situation.	2, 3	1		
		B. Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. E. Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. C. State logical assumptions being used. F. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas). G. Identify, analyze, and synthesize relevant external resources to pose or solve problems.	2, 3, 4	1	1-3	
3. Communicating Reasoning	Communicating Reasoning (drawn across content domains)	A. Test propositions or conjectures with specific examples. D. Use the technique of breaking an argument into cases. B. Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. E. Distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in the argument—explain what it is. C. State logical assumptions being used. F. Base arguments on concrete referents such as objects, drawings, diagrams, and actions. G. At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.)	3, 4	0		8-10
			2, 3	3		
			2, 3, 4	3	0-2	
			2, 3	2		

- DOK: Depth of Knowledge, consistent with the Smarter Balanced Content Specifications.
- The CAT algorithm will be configured to ensure the following:
 - For Claim 1, each student will receive at least 7 CAT items at DOK 2 or higher.
 - For Claim 3, each student will receive at least 2 CAT items at DOK 3 or higher.
 - For combined Claims 2 and 4, each student will receive at least 2 CAT items at DOK 3 or higher.

Smarter Balanced Summative Assessment Math Targets by Claim

Smarter Balanced Claim #1 Targets

Claim #1 Concepts and Procedures: High School (Grade 11) Targets

- Target A: Extend the properties of exponents to rational exponents. (DOK 1, 2)
- Target B: Use properties of rational and irrational numbers. (DOK 1,2)
- Target C: Reason quantitatively and use units to solve problems. (DOK 1,2)
- Target D: Interpret the structure of expressions. (DOK 1)
- Target E: Write expressions in equivalent forms to solve problems. (DOK 1,2)
- Target F: Perform arithmetic operations on polynomials.(DOK 1)
- Target G: Create equations that describe numbers or relationships.(DOK 1,2)
- Target H: Understand solving equations as a process of reasoning and explain the reasoning. (DOK 1,2)
- Target I: Solve equations and inequalities in one variable. (DOK 1,2)
- Target J: Represent and solve equations and inequalities graphically. (DOK 1,2)
- Target K: Understand the concept of a function and use function notation. (DOK 1)
- Target L: Interpret functions that arise in applications in terms of a context. (DOK 1,2)
- Target M: Analyze functions using different representations.(DOK 1, 2, 3)
- Target N: Build a function that models a relationship between two quantities.(DOK 1,2)
- Target O: Prove geometric theorems. (DOK 2)
- Target P: Define trigonometric ratios and solve problems involving right triangles. (DOK 2)
- Target Q: Summarize, represent and interpret data on a single count or measurement variable. (DOK 2)

Smarter Balanced Claim #2 Targets

Claim #2 Problem Solving

- Target A: Apply mathematics to solve well-posed problems 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)

Smarter Balanced Claim #3 Targets

Claim #3 Communicating Reasoning

- 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 what 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 references 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. (For example, area increases with perimeter for squares, but not for all plane figures.) (DOK 3, 4)

Smarter Balanced Claim #4 Targets

Claim #4 Modeling and Data Analysis

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)

Activity 4.2 Target-Method Match Template

	Learning Target	Target Type				Assessment Method			
		K	R	S	P	SR	WR	PA	PC
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

Descriptive or Evaluative Feedback?

Mark each example of descriptive feedback with a D and each example of evaluative feedback with an E. If you believe it is neither, mark it with an X.

_____ Try harder next time.

_____ 70%

_____ You maintained eye contact with the audience throughout your whole presentation.

_____ Good job of getting ready for lunch.

_____ Table 3 is ready for lunch. They have their desks clear, they are sitting down, and they are quiet.

_____ ☺

_____ +

_____ What you have written is a hypothesis because it is a proposed explanation. You can improve it by writing it as an “if...then...” statement.

_____ B+. Good Work.

_____ You made some simple mistakes with multiplying three-digit numbers. Next time, take a few minutes when you’ve finished to check your work.

_____ Emerging

_____ Your work is consistently above average.



Activity 2.4 My Feedback Practices

After reading through the Seven Strategies of Assessment *for* Learning, think about the extent to which each of the characteristics of effective feedback is part of your regular classroom practice. Complete this personal inventory. If you are working with a partner or a team, discuss your results.

Characteristic	All	Some	Not Yet
1. My feedback to students links directly to the intended learning. Comments:			
2. My feedback points out strengths and/or offers information to guide improvement linked to the intended learning. Comments:			
3. My feedback occurs during the learning process. Comments:			
4. I have planned time for students to act on the feedback they receive. Comments:			
5. I don't use written feedback as instruction until the student's work exhibits at least partial understanding. Comments:			
6. My feedback encourages students to take action likely to lead to further learning. My intervention feedback does not do all of the thinking for the student. Comments:			
7. My intervention feedback limits correctives to the amount of advice the student can act on in the time given. Comments:			

Which of the characteristics is your highest priority for continued learning?

What resources might you use?

Name: _____ **Assignment:** _____ **Date:** _____

[illegible]

Analyzing My Results**Name:** _____ **Assignment:** _____ **Date:** _____**I AM GOOD AT THESE!**

Learning targets I got right:

I AM PRETTY GOOD AT THESE, BUT NEED TO DO A LITTLE REVIEW

Learning targets I got wrong because of a simple mistake: _____

What I can do to keep this from happening again: _____

I NEED TO KEEP LEARNING THESE

Learning targets I got wrong and I'm not sure what to do to correct them: _____

What I can do to get better at them: _____

Source: Adapted from *Seven Strategies of Assessment* for Learning (pp. 212 - 213), by J. Chappuis, 2009, Upper Saddle River, NJ: Pearson Education. Adapted by permission.

Analyzing My Results

Name: _____ Assignment: _____ Date: _____

My Strengths

To identify your areas of strength, write down the learning targets for problems you felt confident about **and** got right.

Learning Target #	Learning Target or Problem Description

My Highest Priority for Studying

To determine what you need to study most, write down the learning targets for problems you marked “Don’t Get It” (problems you got wrong NOT because of a simple mistake).

Learning Target #	Learning Target or Problem Description

What I Need to Review

To determine what you need to review, write down the learning targets for problems you got right but were unsure of and for problems on which you made simple mistakes.

Learning Target #	Learning Target or Problem Description

Source: Adapted from *Seven Strategies of Assessment for Learning* (pp. 214 - 215), by J. Chappuis, 2009, Upper Saddle River, NJ: Pearson Education. Adapted by permission.

Name _____

Per _____

Topic _____

Self-Assessment for Chapter/Unit: _____

Track your understanding of...

	Target (I can...)
1	I can identify parts of an expression.
2	I can interpret parts of an expression in terms of the context.
3	I can write one-variable equations to represent real-world problems.
4	I can solve one-variable equations.
5	I can interpret solutions (in the context of the situation modeled) and decide if they are reasonable.
6	I can solve multi-variable equations for any variable (including equations with variable coefficients).
7	I can explain each step in my solution pathway when solving an equation.
8	I can construct an argument to justify my solution pathway.

Progress (shade this in)

Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!
Starting...	Getting there...	Got it!!

CCSS Mathematics:

A.SSE.1a: Interpret parts of an expression, such as terms, factors, and coefficients.

A.CED.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A.CED.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

A.CED.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .

A.REI.1: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A.REI.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Give One and Get One



My Ideas

1. _____
2. _____
3. _____



My Partners' Ideas: Talk with 3 other people, and add one new idea from each person.

1. _____
2. _____
3. _____



More New Ideas: Jot down two new ideas from the group discussion.

1. _____
2. _____

Give One and Get One



My Ideas

1. _____
2. _____
3. _____



My Partners' Ideas: Talk with 3 other people, and add one new idea from each person.

1. _____
2. _____
3. _____



More New Ideas: Jot down two new ideas from the group discussion.

1. _____
2. _____