

The Common Core State Standards and Smarter Balanced Assessments for Mathematics

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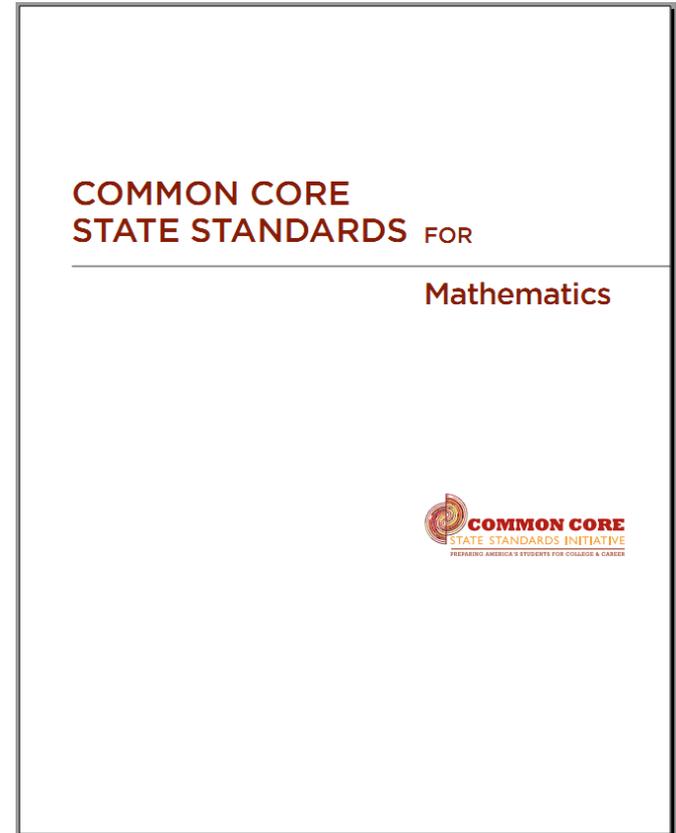
Implications for Higher Education and Teacher Preparation
January 4, 2013

Common Student Standards and Assessments

- Common Core State Standards for Math
 - What are they and what's different?
- Smarter Balanced Assessments
 - How are they different from current student assessments?

The CCSS Require Three Shifts in Mathematics

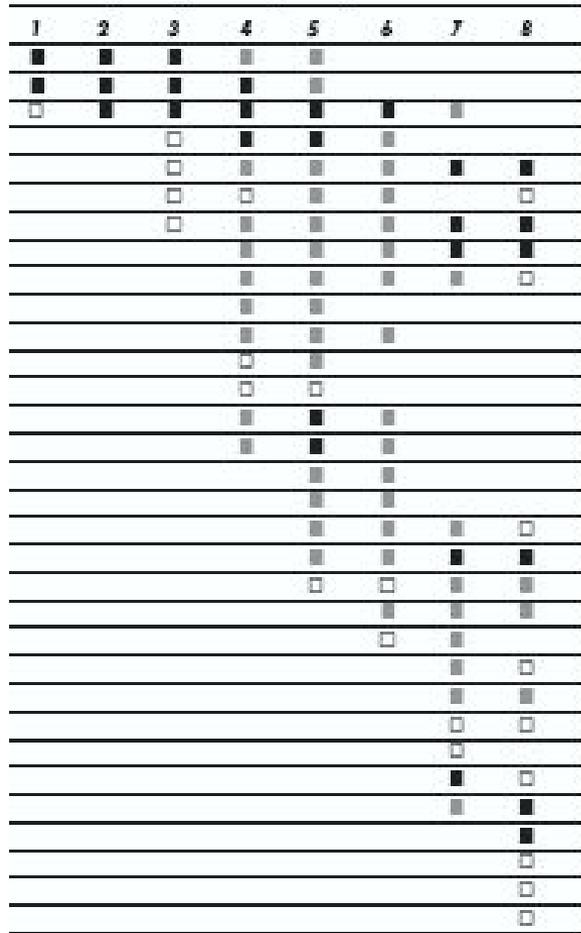
- **Focus** strongly where the standards focus
- **Coherence: Think** across grades and **link** to major topics within grades
- **Rigor:** In major topics, pursue **conceptual understanding**, procedural skill and **fluency**, and **application** with equal intensity



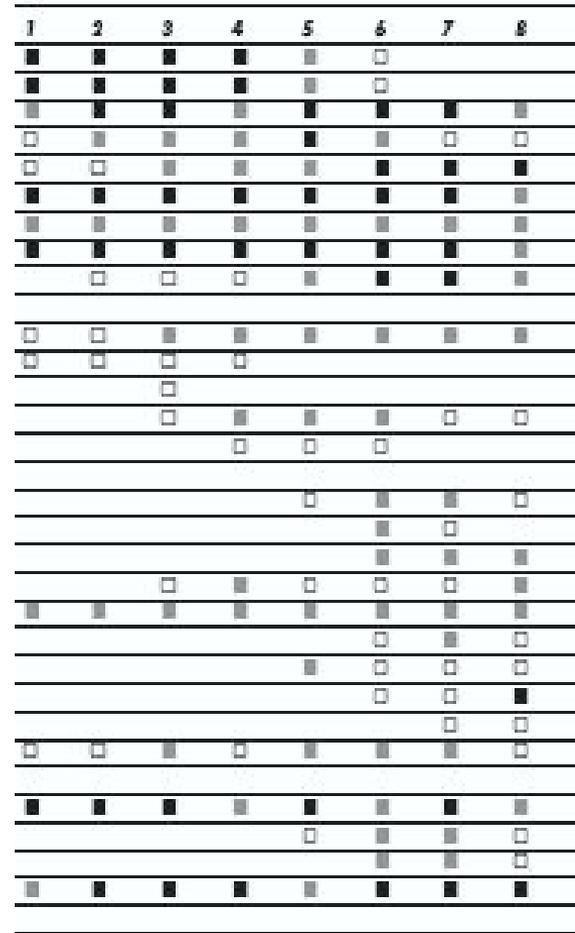
Shift #1: Focus Strongly where the Standards Focus

The shape of math in A+ countries

Mathematics topics intended at each grade by at least two-thirds of A+ countries



Mathematics topics intended at each grade by at least two-thirds of 21 U.S. states



¹ Schmidt, Houang, & Cogan, "A Coherent Curriculum: The Case of Mathematics." (2002).

Shift #1: Focus

Traditional U.S. Approach

K

12

**Number and
Operations**



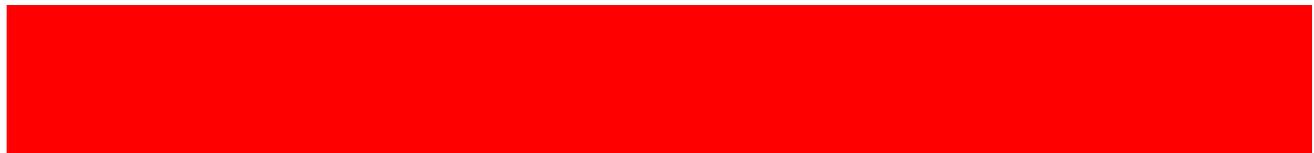
**Measurement
and
Geometry**



**Algebra and
Functions**



**Statistics and
Probability**



Shift #1: Focus

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 #1: Focus

Content Emphases by Cluster

The Smarter Balanced Content Specifications help support focus by identifying the content emphasis by cluster. The notation [m] indicates content that is major and [a/s] indicates content that is additional or supporting.

Grade 4 Cluster-Level Emphases

m = major clusters; a/s = additional and supporting clusters

Operations and Algebraic Thinking

[m] Use the four operations with whole numbers to solve problems.

[a/s] Gain familiarity with factors and multiples.

[a/s] Generate and analyze patterns.

Number and Operations in Base Ten

[m] Generalize place value understanding for multi-digit whole numbers.

[m] Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

[m] Extend understanding of fraction equivalence and ordering.

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

[m] Understand decimal notation for fractions, and compare decimal fractions.

Shift #2: Coherence

Think Across Grades, and Link to Major Topics Within Grades

- Carefully connect the learning within and across grades so that students can build new understanding on foundations built in previous years.
- Begin to count on solid conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

Shift #2: Coherence

Think Across Grades

Example: Fractions

“The **coherence** and sequential nature of mathematics dictate the foundational skills that are necessary for the learning of algebra. The most important foundational skill not presently developed appears to be proficiency with fractions (including decimals, percents, and negative fractions). **The teaching of fractions must be acknowledged as critically important and improved before an increase in student achievement in algebra can be expected.**”

Shift #2: Coherence Alignment in Context

Neighboring Grades and Progressions

One of several staircases to algebra designed in the OA domain.

Expressions and Equations 6.EE

3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.*

Operations and Algebraic Thinking 5.OA

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.*

Operations and Algebraic Thinking 3.OA

5. Apply properties of operations as strategies to multiply and divide.² *Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)*

Operations and Algebraic Thinking 1.OA

3. Apply properties of operations as strategies to add and subtract.³ *Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition.) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10 = 12$. (Associative property of addition.)*

Shift #2: Coherence

Link to major work within grade

Example: Data Representation

Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

Standard
3.MD.3

Shift #3: Rigor

In Major Topics, Pursue Conceptual Understanding, Procedural Skill and Fluency, and Application

- The CCSSM require a balance of:
 - Solid conceptual understanding
 - Procedural skill and fluency
 - Application of skills in problem solving situations
- Pursuit of all three requires equal intensity in time, activities, and resources.

Shift #3: Rigor

Solid Conceptual Understanding

- Teach more than “how to get the answer” and instead support students’ ability to access concepts from a number of perspectives
- Students are able to see math as more than a set of mnemonics or discrete procedures
- Conceptual understanding supports the other aspects of rigor (fluency and application)

Shift #3: Rigor

Procedural Skill and Fluency

- The standards require speed and accuracy in calculation.
- Teachers structure class time and/or homework time for students to practice core functions such as single-digit multiplication so that they are more able to understand and manipulate more complex concepts.

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

Shift #3: Rigor

Application

- Students can use appropriate concepts and procedures for application even when not prompted to do so.
- Teachers provide opportunities at all grade levels for students to apply math concepts in “real world” situations, recognizing this means different things in K-5, 6-8, and HS.
- Teachers in content areas outside of math, particularly science, ensure that students are using grade-level-appropriate math to make meaning of and access science content.

SUMMARY: Three Shifts for Mathematics and Implications for Assessment Design

- ***FOCUS: Assessments focus where the standards focus.***

Major content represents the majority of points and problems on assessments.

- ***COHERENCE: Assessments honor the coherence in the standards.***

Balance of tasks assessing individual standards and related standards within the context of the grade and, as relevant, the progressions.

- ***RIGOR: Assessments reflect the rigor of the standards.***

Balance of tasks assessing conceptual understanding, procedural skill and fluency, and application of mathematics to solve problems.

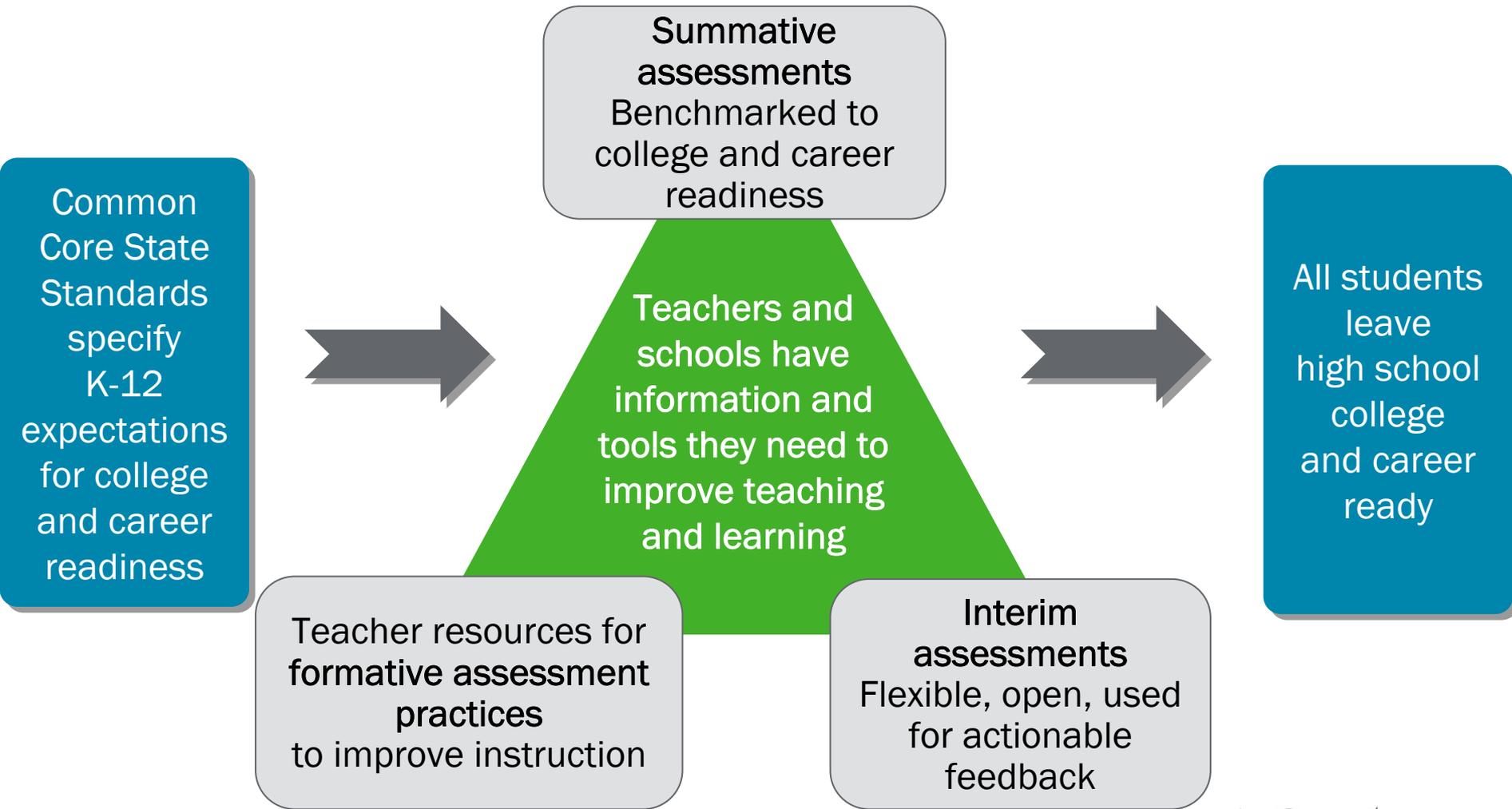
About Smarter Balanced



What is Smarter Balanced?

- A consortium of 25 states working together to build next-generation formative, interim and summative assessments for K-12 schools tied to the Common Core State Standards in English language arts/literacy and mathematics.
- Funding from the federal Race to the Top Assessment grant (~\$175M) and foundations (~\$3M).
- Governed by member states on a consensus model.

A Balanced Assessment System



Smarter Balanced and Higher Education



Why is Higher Education Involved?

- Common Core State Standards are anchored in expectations for college readiness.
- Higher education agreed when states applied for federal grant to participate in design of assessments with goal of recognizing 11th grade exam as evidence of college readiness.
- ***Opportunity to improve college readiness, reduce remediation, and boost completion.***

Common Core Standards and Assessments: Essential Components of the Completion Agenda

Research has consistently shown that the single most powerful predictor of student success in college is the rigor of academic preparation.

- Anchor K-12 experience in **real-world expectations** for success in college and careers.
- **Remove guesswork** for teachers and schools.
- Allow schools, parents and students to **track progress**.
- **Identify students who need assistance** *while still in high school*.
- **Reduce remediation** and **increase college success**.

Common Core Standards Implementation: Important Roles for Higher Education

Teacher and School
Leader Preparation
and Professional
Development

Clear Expectations
(Assessments,
Course
Requirements)

Aligned Curricula
(adult,
developmental, and
general education)

High School
Interventions (early
college, dual
enrollment, etc.)

New Curricular
Materials

A New Vision for Assessing Readiness

Readiness Testing Today

- Each college or system sets its own standards and selects its own measures.
- K-12 typically has no information about the standards.
- Students don't know about tests and don't prepare for them.
- Predictive validity of tests is often unknown.
- Students who "played by the rules" end up in remediation.



Smarter Balanced Vision

- Assessments designed around known, agreed-upon standards (Common Core).
- Proficiency standards set through an open process with substantial higher education involvement.
- Everyone (students, teachers, parents, etc.) knows the expectations.
- Students address deficiencies in high school.

Summative Assessment: Purpose, Benefits and Limitations

Purpose

- Accountability for K-12 at the state, district, school and classroom/teacher levels
- Accurate Information about individual students' achievement, growth over time, and (in 11th grade) readiness for college in English and math.

Benefits

- Far more sophisticated and comprehensive measure of student knowledge and skills than most existing K-12 accountability or placement exams.
- Linked to known, high-quality content standards (Common Core).
- Early warning for students not yet college ready.

Limitations

- Summative exams are not diagnostic in nature.
- Will not measure readiness for advanced mathematics (Calculus) requiring 12th grade instruction.

Summative Assessment: Two-pronged Approach

Computer Adaptive Test

- Assesses the full range of Common Core in English language arts/literacy and mathematics for students in grades 3-8 and 11 (interim assessments can be used in grades 9 and 10)
- Measures current student achievement and growth across time, showing progress toward college and career readiness
- Includes a variety of question types: selected response, short constructed response, extended construction response, technology enhanced

Performance Tasks

- Extended projects demonstrate real-world writing and analytical skills
- May include online research, group projects, presentations
- Require 1 to 2 class periods to complete
- Included in both English language arts/literacy and mathematics assessments
- Applicable in all grades being assessed
- Evaluated by teachers using consistent scoring rubrics

Using Computer Adaptive Technology for Summative and Interim Assessments

Increased precision

- Provides accurate measurements of student growth over time

Tailored for Each Student

- Item difficulty based on student responses

Increased Security

- Larger item banks mean that not all students receive the same questions

Shorter Test Length

- Fewer questions compared to fixed form tests

Faster Results

- Turnaround time is significantly reduced

Mature Technology

- GMAT, GRE, COMPASS (ACT), Measures of Academic Progress (MAP)

Smarter Balanced Goals for Higher Education

- Colleges and universities recognize the Smarter Balanced Grade 11 assessment as a valid measure of college-readiness as defined by the Common Core State Standards.
- Colleges and universities agree on a common performance standard in English language arts/literacy and mathematics for college readiness.
- Colleges and universities use the Smarter Balanced assessment as evidence that students are ready for credit-bearing course work and can be exempted from remediation.

Timeline for Higher Education

Sept. 2012	State Higher Education Implementation Plans Completed
March 2013	College Readiness Policy and Preliminary Achievement Level Descriptors Approved
	<ul style="list-style-type: none">• October 2012: Higher Education faculty and K-12 teachers and content experts create first draft.• November 2012 – January 2013: Draft available for review/comment• December 2012: Regional Leadership Meetings• March 2013: State Consensus Vote
Spring 2014	Full-Scale Field Testing
Summer 2014	Standard-Setting
2014-15	First Year of Operational Testing
Fall 2016	First students enter higher education with Smarter Balanced scores

Implications for Teacher Preparation



- Ensure strong knowledge of CCSS/SBAC among faculty
- Integrate training and application of CCSS in clinical experiences
- Include training at your teacher preparation institution on
 - Content knowledge (CCSS)
 - Skills/Methods specific to strategies reflected in CCSS
 - Assessment literacy including SBAC
- Utilize SBAC training webinars on-line for faculty and candidates

Find Out More

Smarter Balanced
can be found
online at:

SmarterBalanced.org

The screenshot shows the Smarter Balanced Assessment Consortium website. At the top left is the logo with the text "Smarter Balanced Assessment Consortium". To the right are navigation links: "Home", "Contact Us", and "Member States Login". Below these is a "Stay Connected" section with an email icon and a search bar containing the text "What are you looking for?". A horizontal menu below the search bar includes: "ABOUT", "SMARTER BALANCED ASSESSMENTS", "K-12 EDUCATION", "HIGHER EDUCATION", "PARENTS & STUDENTS", and "RESOURCES & EVENTS". The main content area features a large banner with the headline "Helping States Prepare for New Assessments" and a sub-headline "Smarter Balanced and PARCC are collaborating to develop a Technology Readiness Tool to support states as they transition to online assessments." Below the banner is a "Smarter Balanced Assessment Consortium" section with a paragraph and a "READ MORE" link. To the right is a "School Years" section with a list of years from 2009-2010 to 2014-2015, where 2011-2012 is highlighted. Below the "Smarter Balanced Assessment Consortium" section is a "Latest News" section with two items: "Computer Adaptive Testing Event Now Available" and "California's Young Joins Executive Committee".

Smarter Balanced Assessment Consortium
Smarter Balanced is a state-led consortium developing assessments aligned to the Common Core State Standards in English language arts/literacy and mathematics that are designed to help prepare all students to graduate high school college- and career-ready. [READ MORE](#)

Latest News
Computer Adaptive Testing Event Now Available
This recorded webinar addresses the advantages of adaptive testing and the critical decision points in designing, developing and administering an effective computer adaptive assessment to measure student achievement and growth. [READ MORE](#)

California's Young Joins Executive Committee
Dr. Beverly L. Young, assistant vice chancellor of academic affairs for the California State University System, has been named to the Consortium's Executive Committee. Young is one of two higher education representatives on the nine-member governing body and also serves as a Smarter Balanced higher education lead for California.

School Years
Smarter Balanced assessments will be implemented in the 2014-15 school year. Click below to see what's happening and when.

- 2009-2010
- 2010-2011
- 2011-2012**
What's Happening
Smarter Balanced is creating content specifications aligned to the Common Core State Standards and test development guidelines and materials. [READ MORE](#)
- 2012-2013
- 2013-2014
- 2014-2015