Appendix B: CAT Sampling Proportions for Claim 1

The Content Specifications suggest that the computer-adaptive selection of items and tasks for Claim #1 be divided according to those clusters identified as "major" and those identified as "additional/supporting." This breakdown of clusters for each grade level was conducted in close collaboration with lead authors of CCSSM and members of the CCSSM validation committee.

The tables below show the categorization for each cluster in CCSSM, and also show "internal relative weights" suggested by the Content Specification authors. The Consortium is encouraged to investigate the feasibility of incorporating internal relative weights into the computer adaptive administration of Smarter Balanced.

The two components envisioned for Smarter Balanced assessment of CCSSM are:

High-intensity assessed clusters, about 75%-80% of the points

- Also high-adaptivity: 3 or more questions, and can cross into neighboring grades
- Consists of the major clusters (generally the progress to algebra continuum)
- Internal relative weights used for content balancing

Low-intensity assessed clusters, about 20%-25% of the points

- Consists of the additional and supporting clusters
- Internal relative weights used in a pure sampling approach

On the following pages are grade content tables, each with the following five columns:

Component (high / low intensity)	Percent of Claim 1 Points	Cluster Code	Cluster Text	Approx. Internal Weight (within component)

Notes on the tables:

- The percent of Claim 1 points adds to 100% across the high and low intensity components combined.
- The approximate internal weight within each component adds to 100% across all of the clusters in that component. The approximate internal weight values are meant to inform content balancing in the CAT so that it reflects - as well as

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possible given psychometric constraints - the structure and emphases of the standards at each grade level.

- When a single internal weight value W refers to $N \geq 2$ clusters, it means the clusters are thought of as equally weighted (i.e., cluster weights are W/N). These groupings are made for the sake of simplicity in numbers and do not indicate mathematical or conceptual affinities between clusters. Groups are sorted in decreasing order of W.

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GRADE 3

Hi	**75%**	**3.OA.B**	**Understand properties of mu*lti*plication and the relationship between multiplication and division**	**75 %**
		3.OA.C	**Multiply and divide within 100**	
		3.MD.C	**Geometric measurement: understand concepts of area and relate area to multipl*i*cation and to addition**	
		3.MD.A	**Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects**	
		3.OA.D	**Solve problems involving the four operations, and identify and explain patterns in arithmetic**[1]	
		3.NF.A	**Develop understanding of fractions as numbers**	
		3.OA.A	**Represent and solve problems involving multiplication and division**	**25 %**

Lo	**25%**	**3.NBT.A**	**Use place value understanding and properties of operations to perform multi-digit arithmetic**	**60 %**
		3.G.A	**Reason with shapes and their attributes**	
		3.MD.B	**Represent and interpret data**	**40 %**
		3.MD.D	**Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures**	

[1] Two-step word problems (standard 3.OA.8) must strongly predominate in this category (≥80%). Addition and subtraction problem solving cannot be absent for a year, or else students will not be ready to extend addition and subtraction problem solving to fractions in Grade 4. Rather, the new operations of multiplication and division that are being introduced in Grade 3 must be integrated during the year with prior knowledge of addition and subtraction; two-step problems are the setting for this. They are also a key contextual counterpart/setting for the distributive property, which is central in Grade 3 (cf. 3.OA.5, 3.OA.7, 3.MD.7).

GRADE 4

Hi	**75%**	**4.OA.A**	**Use the four operations with whole numbers to solve problems**	**60 %**
		4.NBT.B	**Use place value understanding and properties of operations to perform multi-digit arithmetic**	
		4.NF.A	**Extend understanding of fraction equivalence and ordering**	
		4.NF.B	**Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers**	**25 %**
		4.NBT. A	**Generalize place value understanding for multi-digit whole numbers**	**10 %**
		4.NF.C	**Understand decimal notation for fractions, and compare decimal fractions**	**5%**

Lo	**25%**	**4.MD.A**	**Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit**	**50 %**
		4.MD.C	**Geometric measurement: understand concepts of angle and measure angles**	
		4.OA.B	**Gain familiarity with factors and multiples**	**30 %**
		4.OA.C	**Generate and analyze patterns**	
		4.MD.B	**Represent and interpret data**	
		4.G.A	**Draw and identify lines and angles, and classify shapes by properties of their lines and angles**	**20 %**

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GRADE 5

Hi	75%	5.NF.A	Use equivalent fractions as a strategy to add and subtract fractions	40 %
		5.MD.C	Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition	
		5.NF.B	Apply and extend previous understandings of multiplication and division to multiply and divide fractions	30 %
		5.NBT.B	Perform operations with multi-digit whole numbers and with decimals to hundredths	30 %
		5.NBT. A	Understand the place value system	

Lo	25%	5.G.A	Graph points on the coordinate plane to solve real-world and mathematical problems	60 %
		5.G.B	Classify two-dimensional figures into categories based on their properties	
		5.OA.A	Write and interpret numerical expressions	40 %
		5.OA.B	Analyze patterns and relationships	
		5.MD.A	Convert like measurement units within a given measurement system	
		5.MD.B	Represent and interpret data	

GRADE 6

Hi	75%	6.EE.A	Apply and extend previous understandings of arithmetic to algebraic expressions	40 %
		6.EE.B	Reason about and solve one-variable equations and inequalities	
		6.RP.A	Understand ratio concepts and use ratio reasoning to solve problems	25 %
		6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables	20 %
		6.NS.A	Apply and extend previous understandings of multiplication and division to divide fractions by fractions	
		6.NS.C	Apply and extend previous understandings of numbers to the system of rational numbers	15 %

Lo	25%	6.NS.B	Compute fluently with multi-digit numbers and find common factors and multiples	10 0%
		6.G.A	Solve real-world and mathematical problems involving area, surface area and volume	
		6.SP.A	Develop understanding of statistical variability	
		6.SP.B	Summarize and describe distributions	

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GRADE 7

Hi	**75%**	**7.RP.A**	**Analyze proportional relationships and use them to solve real-world and mathematical problems**	**60 %**
		7.EE.B	**Solve real-life and mathematical problems using numerical and algebraic expressions and equations**	
		7.NS.A	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers**	**40 %**
		7.EE.A	**Use properties of operations to generate equivalent expressions**	

Lo	**25%**	**7.G.A**	**Draw, construct and describe geometrical figures and describe the relationships between them**	**70 %**
		7.G.B	**Solve real-life and mathematical problems involving angle measure, area, surface area and volume**	
		7.SP.A	**Use random sampling to draw inferences about a population**	**30 %**
		7.SP.B	**Draw informal comparative inferences about two populations**	
		7.SP.C	**Investigate chance processes and develop, use, and evaluate probability models**	

GRADE 8

Hi	**75%**	**8.EE.B**	**Understand the connections between proportional relationships, lines and linear equations**	**40 %**
		8.EE.C	**Analyze and solve linear equations and pairs of simultaneous linear equations**	
		8.EE.A	**Work with radicals and integer exponents**	**40 %**
		8.F.A	**Define, evaluate and compare functions**	
		8.G.A	**Understand congruence and similarity using physical models, transparencies or geometry software**	
		8.F.B	**Use functions to model relationships between quantities**	**20 %**
		8.G.B	**Understand and apply the Pythagorean Theorem**	

Lo	**25%**	**8.NS.A**	**Know that there are numbers that are not rational, and approximate them by rational numbers**	**10 0%**
		8.G.C	**Solve real-world and mathematical problems involving volume of cylinders, cones and spheres**	
		8.SP.A	**Investigate patterns of association in bivariate data**	

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Content Emphases by Cluster--Kindergarten*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Counting and Cardinality
- **Know number names and the count sequence.**
- **Count to tell the number of objects.**
- **Compare numbers.**

Operations and Algebraic Thinking
- **Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.**

Number and Operations in Base Ten
- **Work with numbers 11-19 to gain foundations for place value.**

Measurement and Data
- **Describe and compare measureable attributes.**
- **Classify objects and count the number of objects in categories.**

Geometry
- **Identify and describe shapes.**
- **Analyze, compare, create, and compose shapes.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 1*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

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Key: Major Clusters; Supporting Clusters; Additional Clusters

Operations and Algebraic Thinking
- **Represent and solve problems involving addition and subtraction.**
- **Understand and apply properties of operations and the relationship between addition and subtraction.**
- **Add and subtract within 20.**
- **Work with addition and subtraction equations.**

Number and Operations in Base Ten
- **Extending the counting sequence.**
- **Understand place value.**
- **Use place value understanding and properties of operations to add and subtract.**

Measurement and Data
- **Measure lengths indirectly and by iterating length units.**
- **Tell and write time.**
- **Represent and interpret data.**

Geometry
- **Reason with shapes and their attributes.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 2*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Operations and Algebraic Thinking
- **Represent and solve problems involving addition and subtraction.**
- **Add and subtract within 20.**
- **Work with equal groups of objects to gain foundations for multiplication.**

Number and Operations in Base Ten
- **Understand place value.**
- **Use place value understanding and properties of operations to add and subtract.**

Measurement and Data
- **Measure and estimate lengths in standard units.**
- **Relate addition and subtraction to length.**
- **Work with time and money.**
- **Represent and interpret data.**

Geometry
- **Reason with shapes and their attributes.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 3*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Operations and Algebraic Thinking

- **Represent and solve problems involving multiplication and division.**
- **Understand properties of multiplication and the relationship between multiplication and division.**
- **Multiply and divide within 100.**
- **Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

Number and Operations in Base Ten

- **Use place value understanding and properties of operations to perform multi-digit arithmetic.**

Number and Operations—Fractions

- **Develop understanding of fractions as numbers.**

Measurement and Data

- **Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.**
- **Represent and interpret data.**
- **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.**
- **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.**

Geometry

- **Reason with shapes and their attributes.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 4*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Operations and Algebraic Thinking

- **Use the four operations with whole numbers to solve problems.**
- **Gain familiarity with factors and multiples.**
- **Generate and analyze patterns.**

Number and Operations in Base Ten

- **Generalize place value understanding for multi-digit whole numbers.**
- **Use place value understanding and properties of operations to perform multi-digit arithmetic.**

Number and Operations--Fractions

- **Extend understanding of fraction equivalence and ordering.**
- **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.**
- **Understand decimal notation for fractions, and compare decimal fractions.**

Measurement and Data

- **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**
- **Represent and interpret data**
- **Geometric measurement: understand concepts of angle and measure angles.**

Geometry

- **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 5*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Operations and Algebraic Thinking
- **Write and interpret numerical expressions.**
- **Analyze patterns and relationships.**

Number and Operations in Base Ten
- **Understand the place value system.**
- **Perform operations with multi-digit whole numbers and with decimals to hundredths.**

Number and Operations—Fractions
- **Use equivalent fractions as a strategy to add and subtract fractions.**
- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**

Measurement and Data
- **Convert like measurement units within a given measurement system.**
- **Represent and interpret data.**
- **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**

Geometry
- **Graph points on the coordinate plane to solve real-world and mathematical problems.**
- **Classify two-dimensional figures into categories based on their properties.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 6*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Ratios and Proportional Reasoning
- **Understand ratio concepts and use ratio reasoning to solve problems.**

The Number System
- **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.**
- **Compute fluently with multi-digit numbers and find common factors and multiples.**
- **Apply and extend previous understandings of numbers to the system of rational numbers.**

Expressions and Equations
- **Apply and extend previous understandings of arithmetic to algebraic expressions.**
- **Reason about and solve one-variable equations and inequalities.**
- **Represent and analyze quantitative relationships between dependent and independent variables.**

Geometry
- **Solve real-world and mathematical problems involving area, surface area, and volume.**

Statistics and Probability
- **Develop understanding of statistical variability.**
- **Summarize and describe distributions.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 7*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

Ratios and Proportional Reasoning
Analyze proportional relationships and use them to solve real-world and mathematical problems.
The Number System
Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
Expressions and Equations
Use properties of operations to generate equivalent expressions.
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
Geometry
Draw, construct and describe geometrical figures and describe the relationships between them.
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
Statistics and Probability
Use random sampling to draw inferences about a population.
Draw informal comparative inferences about two populations.
Investigate chance processes and develop, use, and evaluate probability models.

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Content Emphases by Cluster--Grade 8*

Not all of the content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than the others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. In addition, an intense focus on the most critical material at each grade allows depth in learning, which is carried out through the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. The following table identifies the Major Clusters, Additional Clusters, and Supporting Clusters for this grade.

Key: Major Clusters; Supporting Clusters; Additional Clusters

The Number System
- **Know that there are numbers that are not rational, and approximate them by rational numbers.**

Expressions and Equations
- **Work with radicals and integer exponents.**
- **Understand the connections between proportional relationships, lines, and linear equations.**
- **Analyze and solve linear equations and pairs of simultaneous linear equations.**

Functions
- **Define, evaluate, and compare functions.**
- **Use functions to model relationships between quantities.**

Geometry
- **Understand congruence and similarity using physical models, transparencies, or geometry software.**
- **Understand and apply the Pythagorean Theorem.**
- **Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.**

Statistics and Probability
- **Investigate patterns of association in bivariate data.**

* Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.