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Research in Mathematics Education

Imagination Station (Istation):

Universal Screener Instrument Development for Grade 5

Technical Report 11-02

Imagination Station (Istation):
Universal Screener Instrument Development for Grade 5

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Abstract

In this technical report, we describe the development of the Grade 5 Formative Assessment Item Bank for the Imagination Station (Istation). The formative assessment item bank will be used to deliver a computerized adaptive universal screening assessment to support teachers' instructional decisions. The construct underlying the items is mathematics skills and knowledge in Grade 5 as defined by state and national content standards. We include a description of the process used to identify and sample the content and levels of cognitive complexity assessed in the item bank. Next, we describe the item writing procedures. Finally, we describe the process and outcomes of an external item review to document content related evidence for validity.

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Imagination Station (Istation) Universal Screener Instrument Development for Grade 5

Introduction

The purpose of the Grade 5 Formative Assessment Item Bank for the Imagination Station (Istation) is to support teachers' instructional decisions. Specifically, the formative assessment item bank is designed to serve as a computerized adaptive universal screening assessment system. By administering this assessment system, teachers and administrators can use the results to answer two questions: (1) are students at risk of failure in Grade 5 mathematics, and (2) what is the degree of intensity of instructional support students need to be successful in Grade 5 mathematics? Because the universal screener is designed for administration in fall, winter, and early spring, these decisions can be applied over the course of Grade 5. The universal screener is intended to be administered to all students receiving grade-level instruction.

The purpose of this technical report is to describe the development of the formative assessment item bank. Included in this description is the process used to identify and sample the content and levels of cognitive complexity assessed in the item bank, the item writing process, and external review procedures and results. The test development steps used to create the Formative Assessment Item Bank are representative of the Test Standards published by the American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME) (1999), and represent best practices in test development.

Construct Definition

The construct of an assessment is considered on two dimensions: content and cognitive engagement. The content of the Grade 4 Formative Assessment Item Bank is based on the Curriculum Focal Points (CFP) published in 2006 by National Council of Teachers ofMathematics (NCTM). Using the NCTM Curriculum Focal Points as the referent standard, we aligned the mathematics content standards published by the Common Core Standards Initiative as well as from the states of Texas, Florida, New York, California, and Virginia to the CFPs. See Appendix A for the referent documents for each state. For Grade 5, we created a fourth CFP that encompasses measurement and geometry standards assessed across the states. See Appendix B for an abbreviated description of the assessed content.

The cognitive engagement dimension of the construct refers to the level of cognitive processing through which students are expected to engage with the content. The Formative Assessment Item Bank in Mathematics relies on the taxonomy of cognitive engagement published by Kilpatrick, Swafford, and Findell (2001) for the National Research Council. The five interdependent components (or strands) of students' engagement with the content provide a framework to promote mathematical proficiency.

1. Conceptual understanding pertains to the functional grasp of mathematics that a student applies to concepts, operations, and relations. It involves

being able to logically organize one's knowledge to integrate and understand concepts as part of a coherent whole.

2. Procedural fluency pertains to students' ability to accurately and appropriately carry out
skills, including being able to select efficient and flexible approaches.

3. Strategic competence involves one's ability to formulate a problem in mathematical terms, to
represent it strategically (verbally, symbolically, graphically, or numerically), as well as to
solve it effectively. It is similar to problem solving and problem formation.

4. Adaptive reasoning involves the student's capacity to think logically about a problem, which
requires reflecting on various approaches to solve a problem and deductively selecting an approach. Students who are able to do this are also able to rationalize and justify their strategy.

5. Productive disposition refers to a student's overall ability to perceive mathematics as worthwhile and to maintain a personal belief in one's own efficacy in solving problems.

The Formative Assessment Item Bank incorporates four of the five strands; productive disposition is not assessed.

The four CFPs were assessed for each of the four levels of cognitive engagement. Conceptual understanding and procedural fluency were oversampled to accurately reflect the relative emphasis in the state standards. Easy, medium, and difficult items were written for each CFP across the four levels of cognitive engagement. The content sampling matrix is presented in Figure 1.

Item Writing

Item Specifications

Approximately 400 items were written for Grade 4. Multiple-choice items were created for efficiency in the computer delivery. Each item had three distractors and one correct answer. The distractors represented plausible misconceptions or errors. Errors included computational errors, conceptual errors, procedural errors, and strategy errors. The stem included text and/or graphics. Graphics were used in instances where they explained the problem, provided a visual clue to clarify the context, or were integral to the stem or answer choices. Irrelevant graphics were not included. The reading level of the items was intentionally constrained to the 4th grade level; however, readability statistics were not calculated for each item. Whenever possible, plain language and simple, straight-forward statements were incorporated into the items.

Items are written following the principles of universal design for assessment (c.f., Ketterlin-Geller, 2005; 2008), and are amendable to accommodations. Items are scored dichotomously. The computerized adaptive test can be administered individually or in a group in an untimed setting.

Item Writers

Three item writers contributed items to the Grade 5 Formative Assessment Item Bank.

Item Writer 1. Item Writer 1 obtained a Bachelor of Public Administration degree from Texas State University – San Marcos. She worked as a long-term substitute on various high school campuses across the State of Texas teaching mathematics. Upon completing her degree she worked for the Office of the Attorney General for the State of Texas as a Child Support Officer. After almost four years working in the public sector, she was accepted into the New York City Teaching Fellows Program where she taught high school mathematics to special education students in an inner city school in Manhattan. During this time, Item Writer 1 completed a Master of Science degree in Special Education with Honors from the City College of New York. While teaching, her main focus was in a co-teaching environment instructing students with disabilities in the areas of Algebra and Geometry. After two years teaching in New York City, she left the classroom to focus on research, specifically in the area of test development for students with disabilities. She has worked on several projects and nationally funded grants in the area of educational research and is currently completing the requirements for a Ph.D. in Educational Research from Southern Methodist University.

Item Writer 2. Item Writer 2 holds a Bachelors of Science and a Masters degree in Special Education. He has been a research assistant, project coordinator and independent contractor for federally funded grants and state contracts since 2001. He assisted in the creation of a web-delivered math assessment, researching effectiveness of accommodations. Additionally, he was involved in the development of the alternate assessment for students with significant cognitive disabilities at the elementary, middle, and high school levels between 2002 and 2009. Item Writer 2 also was a member of an item writing team for creating items for math screening tests and assisted in development of accommodated versions of math items. He has been a part of several research teams conducting multi-state research projects examining comparability of performance on different alternate assessments.

Item Writer 3. Item Writer 3 earned a Master of Science in Mathematics Education and an Honors Bachelor of Science in Mathematics, both from Oregon State University. Throughout her six years of teaching, she has taught math at all levels from middle school through high school and community college. In addition to teaching, she currently works as a mathematics coach for her district. Within this position, she focuses on improving math instruction across the district by coordinating and developing curriculum that is aligned to state mathematics

standards. Her interest with assessments led her to writing mathematics assessment items.

Item Writing Training

All item writers were trained to write items that aligned with the content expectations and met the item specifications. The training included review of the Item Writing Training Manual, as well as participating in a training conference call with the researchers and project staff. The Item Writing Training Manual provides a detailed description of the principles of universal design for assessment. In addition, information was provided on the elements of high quality test design. Guidelines for writing selected response items were provided from recognized experts in item design. Moreover, sample items were provided to illustrate important components of effective items. A glossary of useful terms and a list of relevant websites were provided. The Item Writing Training Manual also included logistical information about formatting, reviewing, and submitting items.

A training conference call was conducted to review the content standards and levels of cognitive complexity for Grade 4. Project staff provided a detailed description of the content. Example items for each level of cognitive complexity were disseminated and discussed. The material in the Item Writing Training Manual was reviewed and discussed until the item writers were confident they understood the content and objectives of the project.

Item Writing Process

After completing the training and attending a project conference call, item writers were provided with the item writing template for creating items. Items were submitted and reviewed by the researchers and project staff. At least two internal reviewers provided feedback for each item. Dimensions of the review included the mathematical accuracy of the item, alignment with the content standards, appropriateness of language and graphics for students in Grade 4, and compliance with the principles of universal design. Comments were returned to the item writers; revisions were made and resubmitted for approval.

Once items were accepted, item level information was entered into an Item Database. Graphics were created by the Istation graphic design team. The finalized items were copy edited and reviewed by SMU researchers and Istation staff.

Content-Related Evidence for Validity

To evaluate the accuracy and appropriateness of the content of the Formative Assessment Item Bank for students in Grade 5, mathematicians and teachers reviewed all items.

Mathematician Review

Two mathematicians reviewed all items in Grade 5. Both reviewers were professors of mathematics at universities in Texas and had undergraduate and graduate degrees in mathematics. The years teaching and researching in mathematics ranged from 11-17 years. Both reviewers were female.

The mathematicians were asked to review each item and evaluate the accuracy of the content, precision of the vocabulary, and effectiveness of distractors. The criteria were further described as follows:

- Mathematical accuracy of content: Each item was written to reflect an integration of knowledge and skills identified by the NCTM Curriculum Focal Points. Is the item mathematically accurate?

- Precision of mathematical vocabulary: Is the mathematical vocabulary used accurately? Is the mathematical vocabulary precise?

- Appropriateness of the distractors: Most students use an eliminating process to narrow their options in the context of multiple-choice questions. The purpose of selecting appropriate distractors is to reduce the likelihood of students with misconceptions from choosing a correct answer in the elimination process. Are the distractors appropriate for the item? Are the distractors mathematically plausible misconceptions?

Items and distractors were evaluated on a 4-point scale for each criterion. A rating of 1 indicated that the item was not accurate, precise, or the distractors were not effective; a rating of 2 indicated that the item was somewhat accurate, precise, or the distractors were somewhat effective; rating of 3 indicated that the item was somewhat accurate, precise, or the distractors were mostly effective; and a rating of 4 indicated the item was somewhat accurate, precise, or the distractors were extremely effective. In instances where the reviewer assigned a score of 1 or 2 on a category, recommendations were solicited that would aid in revision.

Overall, the mathematicians rated the items as mostly to always accurate, precise, and effective. For 31 items, the mathematicians recommended revisions. One reviewer noted the following issues on 12 items: presence of typographical errors in the distractors, the possibility of multiple plausible answer choices, items in which the correct answer was missing, corrections to the stem to improve the precision of the language, and formatting for distractors that include variables. The other reviewer noted the following issues on 19 items: items in which the correct answer was missing, the possibility of multiple plausible answer choices, and distractors that are missing units of measurement. The reviewer also suggested wording of the stem of several items to improve communication of mathematical concepts, as well as creating alternate distractors that aligned with common misconceptions.

We revised all items in response to the recommendations. In instances where the mathematician did not provide a suitable suggestion, we revised the item and requested an additional review from an independent mathematician.

Teacher Review

Two teachers with experience teaching Grade 5 mathematics reviewed the items. One reviewer was a female African American who had been teaching in the state of Texas for more than seven years, with three years experience teaching grade 5. The other reviewer was from the state of

Oregon and had over 10 years of teaching experience in general and special education. She served as a Teacher on Special Assignment for three years working on mathematics related projects for her school district. She has a Masters degree in Special Education.

Teachers analyzed each item for grade-level appropriateness in terms of understandability of language and vocabulary, content or concepts, graphics, potential bias in language and/or content, clarity of directions and answers, and effectiveness of distractors. The criteria were further described as follows:

- Appropriateness of language: Is the language used in the item appropriate for students in your grade level? Are the question and response options written so that students in your grade level can understand the meaning of the problem?

- Appropriateness of mathematical vocabulary: Is the mathematical vocabulary representative of pre-requisite or instructional expectations in your grade level?

- Appropriateness of content or concepts: Is the task representative of pre-requisite or instructional expectations in your grade level?

- Appropriateness of visual representation: Is the visual representation (i.e., graphic, table, image) used in the item appropriate for students in your grade level? Can students in your grade level understand the meaning of the visual representation? Is the visual representation of the item clear?

- Bias in language or content: Does the item require background knowledge unrelated to the concept being tested that would differ for students with different backgrounds? Is the language sensitive to students from diverse backgrounds, students with limited English proficiency and students with special needs? Example: "What *is the most appropriate measurement unit for the length of a sub or hoagie?"* may be unfair for students in certain geographic regions and students with diverse background who are unfamiliar with the terms "sub or hoagie."

- Effectiveness of the distractors: Some students use an eliminating process to narrow their options in the context of multiple-choice questions. The purpose of selecting appropriate distractors is to reduce the likelihood of students with misconceptions choosing a correct answer in the elimination process. Are the distractors appropriate for the item? Do the distractors discriminate between students with specific misconceptions?

The items and distractors were rated on a scale of 1 to 4 for each criterion. A rating of 1 indicated that the item/distractors were not at all appropriate based on the criterion (or very biased); a rating of 2 indicated that the item/distractors were somewhat appropriate based on the criterion (or somewhat biased); rating of 3 indicated that the item/distractors were appropriate based on the criterion (or not biased); and a rating of 4 indicated that the item/distractors were extremely appropriate based on the criterion (or not biased *and* has multi-cultural components to it). In

instances where the teachers provided a rating of 2 or lower, they were asked to provide additional suggestions and comments to improve the item.

Overall, the teachers rated the items as mostly to always appropriate in regards to language, vocabulary content, visual representation, bias, and effectiveness of distractors. The teachers recommended revising 23 items, primarily due to language. One reviewer noted the following issues on eight items: the graphics were too small, confusing language for grade 5 students, and numbers with more than four digits should have use a comma. The other reviewer noted the following issues on 15 items: the presence of multiple plausible answers, confusing language for grade 5 students, small or unclear graphics, and possible confusion between the division symbol and the addition symbol. The research team reviewed all suggestions and made revisions based on teacher feedback. Moreover, the item developers changed all division and addition symbols to larger font to aid in discrimination.

Conclusions

The purpose of this technical report was to describe the development of the formative assessment item bank. We described the construct underlying the items in reference to the content standards and levels of cognitive complexity and described the process for sampling the content assessed in the item bank. Next, we described the item writing procedures and provided the qualifications for the item writers. Finally, we documented the process and outcomes of an external item review by mathematicians and teachers to document content related evidence for validity.

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Figure 1

Content Sampling Matrix

	Procedural fluency			Conceptual understanding			Strategic competence			Adaptive reasoning		
CFP	Easy	Medium	Difficult	Easy	Medium	Difficult	Easy	Medium	Difficult	Easy	Medium	Difficult
1	10	10	10	10	10	10	7	6	7	7	6	7
2	10	10	10	10	10	10	7	6	7	7	6	7
3	10	10	10	10	10	10	7	6	7	7	6	7
4	10	10	10	10	10	10	7	6	7	7	6	7
Total By Difficulty	40	40	40	40	40	40	28	24	28	28	24	28

Appendix A - State Content Standards Referent Sources

National Council of Teachers of Mathematics (NCTM) Curricular Focal Points

The National Council of Teachers of Mathematics (NCTM) Curricular Focal Points were retrieved from http://www.nctmmedia.org/cfp/front_matter.pdf on 4/20/2010. Additional information was also retrieved on 4/20/2010 from: www.nctm.org/focalpoints . The coding system for the NCTM Critical Focal Points can be found under Part II.

Florida

Florida's Next Generation Sunshine State Math Standards (adopted 2007) were retrieved on 4/20/2010 from http://www.floridastandards.org/Standards/FLStandardSearch.aspx. Verification of accuracy and currency of the standards was obtained on 5/5/2010 from Florida Department of Education. Big Ideas for each of the grade levels were also verified.

California

California's Math Content Standards (adopted 1997) were retrieved on 4/24/2010 from http://www.cde.ca.gov/be/st/ss/documents/mathstandard.pdf . California Green Dot Standards are the selected standards (as of 2006) that appear 85% of the time on California state tests. These green dot standards were retrieved on 4/24/2010 from http://caworldclassmath.com/high_ca_standards.html and etc.usf.edu/flstandards/math/california.ppt . Verification of accuracy and currency of the standards was obtained on 5/5/2010 from the California State Board of Education.

New York

The New York State Standards (revised on March 15, 2005) were retrieved on 4/21/2010 from: http://www.bootstrapworld.org/standards/ny/NYMathematicsCoreCurriculum.pdf .Verification of accuracy and currency of the standards was obtained on 5/5/2010 from the New York State Board of Education.

Texas

The Texas State Standards for Math (Version 2.1; revised 2010) were retrieved on 4/21/2010 from: http://ritter.tea.state.tx.us/rules/tac/chapter111/index.html. Verification of accuracy and currency of the standards was obtained on 5/5/2010 from the Texas State Board of Education. The Texas Education Agency (TEA) released a 2010 document entitled *Texas Response to Curriculum Focal Points: Kindergarten through Grade 8 Mathematics* that included coordinating TEKS.

Common Core Standards

The Common Core Standards in Mathematics were retrieved on June 10, 2011 from http://www.corestandards.org/the-standards/mathematics . These standards were published in 2010.

They were developed as part of an initiative led by National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO).

Virginia

Virginia's Standards for Learning Document for Mathematics (adopted 2009 for full implementation in 2011-12) were retrieved on June 10, 2011 from www.doe.virginia.gov/testing/sol/standards_docs/mathematics/review.shtml . Verification of accuracy and currency of the standards was obtained from Istation on June 10, 2011. The Curriculum Frameworks documents were referenced to determine the essential knowledge and skills students are expected to learn for each grade.

Appendix B - Content Description

GRADE 5 MATHEMATICS CURRICULUM FOCAL POINTS	
CFP 1: Number and Operations* and *Algebra **Developing an understanding of and fluency with division of whole numbers.**	
5.1A.1	Students apply their understanding of **models for division** as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends.
5.1A.2	Students apply their understanding of **place value** as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends.
5.1A.3	Students apply their understanding of **properties** as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends.
5.1A.4	Students apply their understanding of **the relationship of division to multiplication** as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends.
5.1B.1	Students select appropriate methods and apply them accurately to **estimate quotients or calculate them mentally,** depending on the context and numbers involved.
5.1C.1	Students **develop fluency** with efficient procedures, including the standard algorithm, for dividing whole numbers, understand why the procedures work (on the basis of place value and properties of operations), and use them to solve problems.
5.1D.1	Students consider the context in which a problem is situated to **select the most useful form of the quotient** for the solution, and they interpret it appropriately.
5.1E.1	Students use patterns, models, and relationships as contexts for **writing and solving simple equations and inequalities**.
5.1F.1	Students **create graphs** of simple equations.
5.1G.1	Students develop an understanding of the **order of operations** and use it for all operations.

5.1H.1	Students apply what they know about multiplication of whole numbers to **larger numbers**.
A5.CFP1.5	Substitute assigned values into variable expressions and evaluate using **order of operations.**
A5.CFP1.2	Compare, order, and graph integers, including integers shown on a number line.
A5.CFP1.3	Define and use appropriate terminology when referring to constants, variables, and algebraic expressions.
A5.CFP1.4	Translate simple verbal expressions into algebraic expressions
A5.CFP1.6	Solve simple one-step equations using basic whole-number facts
A5.CFP1.7	Solve and explain simple one-step equations using inverse operations involving whole numbers
A5.CFP1.9	Create and explain patterns and algebraic relationships (e,g.,2,4,6,8...) algebraically: 2n (doubling)
A5.CFP1.10	Create algebraic or geometric patterns using concrete objects or visual drawings (e.g., rotate and shade geometric shapes)
A5.CFP1.11	Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitution
A5.CFP1.12	Solve problems involving linear functions with integer values; write the equation; and graph the resulting ordered pairs of integers on a grid
CFP 2: Number and Operations **Developing an understanding of and fluency with addition and subtraction of fractions and decimals**	
A5.CFP2.1	Students **generate a fraction equivalent** to given fractions, including fractions less than, equal to, and greater than one.
A5.CFP2.8	**Compare and order fractions** including unlike denominators (with and without the use of a number line) Note: Commonly used fractions such as those that might be indicated on ruler, measuring cup, etc.
A5.CFP2.14	Simplify fractions to **lowest terms**

5.2A.1	Students apply their understandings of fractions and fraction models to represent the **addition and subtraction of fractions** with unlike denominators as equivalent calculations with like denominators.
A5.CFP2.15	**Add and subtract mixed numbers** with like denominators
A5.CFP2.20	**Solve simple problems**, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in the simplest form
5.2B.1	Students apply their understandings of **decimal models, place value, and properties** to add and subtract decimals.
5.2C.1	Students develop **fluency** with standard procedures for adding and subtracting fractions and decimals.
5.2D.1	Students make reasonable **estimates of fraction and decimal** sums and differences.
5.2E.1	Students **add and subtract fractions and decimals** to solve problems, including problems involving measurement.
A5.CFP2.19	Identify and **represent on a number line** decimals, fractions, mixed numbers, and positive and negative integers
5.2F.1	Students explore **prime and composite numbers**.
5.2F.2	Students discover concepts related to the addition and subtraction of fractions as they use factors and multiples, including applications of **common factors and common multiples.**
A5.CFP2.12	Identify the **factors** of a given number
A5.CFP2.13	Find the common **factors** and **greatest common facto**r of two numbers
5.2G.1	Students apply their understanding of whole numbers, fractions, and decimals as they construct and analyze **double-bar and line graphs.**
5.2G.2	Students apply their understanding of whole numbers, fractions, and decimals as they use **ordered pairs on coordinate grids.**
5.2H.1	Students extend their understanding of place value to **numbers through millions and millionths** in various contexts.
5.2I.1	Students also explore **contexts** that they can describe with **negative numbers** (e.g., situations of owing money or measuring elevations above and below sea level.)

A5.CFP2.2	Students use graphic displays (e.g., tables, graphs) to describe data (e.g., data derived from a probability experiment).
A5.CFP2.3	Students also describe characteristics of data presented in tables and graphs using range, median, and mode.
A5.CFP2.5	Students conduct simple probability experiments, describe their outcomes, and make predictions based on their results (e.g. rolling a number cube, etc.)
A5.CFP2.6	Read and write whole numbers to millions
A5.CFP2.7	Compare and order numbers to millions
A5.CFP2.9	Understand the concept of ratio
A5.CFP2.10	Express ratios in different forms
A5.CFP2.16	Round numbers to the nearest hundredth and up to 10,000
A5.CFP2.17	Interpret percents as a part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number
A5.CFP2.18	Understand and compute positive integer powers of nonnegative integers; compute examples as repeated multiplication
A5.CFP2.21	Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems
CFP 3: Geometry **and** ***Measurement*** **and** ***Algebra*** **Describing three-dimensional shapes and analyzing their properties, including volume and surface area.** ***Data Analysis Connections to the Focal Point*** **includes students applying their understanding of whole numbers, fractions, and decimals as they construct and analyze double-bar and line graphs and use ordered pairs on coordinate grids.**	
5.3A.1	Students **relate two-dimensional shapes to three-dimensional shapes** and analyze properties of polyhedral solids, describing them by the number of edges, faces, or vertices as well as the types of faces.
5.3B.1	Students recognize **volume as an attribute** of three-dimensional space.

5.3C.1	Students understand that they can **quantify volume** by finding the total number of same-sized units of volume that they need to fill the space without gaps or overlaps.
5.3D.1	Students understand that a cube that is **1 unit** on an edge is the **standard unit for measuring volume**.
5.3E.1	Students select appropriate units, strategies, and tools for solving problems that involve **estimating or measuring volume**.
5.3F.1	Students decompose three-dimensional shapes and **find surface areas and volumes of prisms**.
A5.CFP3.24	Construct a cube and rectangular box from two-dimensional patterns and use these patterns to **compute the surface area** for these objects
5.3G.1	Students **measure necessary attributes of shapes** to use area formulas to solve problems.
5.3H.1	As students work with surface area, they find and justify relationships among the **formulas for the areas of different polygons.**
5.3I.1	Students' experiences **connect** their work with **solids and volume to** their earlier work with **capacity and weight and mass.**
5.3J.1	Students solve problems that require attention to both **approximation and precision of measurement** (including lengths, angles, and other forms of measurement).
A5.CFP3.1	**Calculate the perimeter** of regular and irregular polygons and shapes drawn on a coordinate plane (rectangles and shapes composed of rectangles having sides with integer lengths and parallel to the axes)
A5.CFP1.8	**Evaluate the perimeter** formula for given input values
A5.CFP3.25	Differentiate between, and **use appropriate units of measures** for, two-and three-dimensional objects (i.e., find the perimeter, area, volume)
A5.CFP3.23	**Justify** the reasonableness of **measurement estimates**
A5.S.2	Differentiate between continuous and discrete data, and determine ways to represent those using graphs and diagrams.
A5.S.3	Collect and record data from a variety of sources (e.g., newspapers, magazines, polls, charts, and surveys)

A5.S.5	Calculate the mean for a given set of data and use to describe a set of data
A5.S.6	Formulate conclusions and make predictions from graphs (including line graphs, double bar graphs, other types of graphs, etc.)
A5.S.8	Record experiment results using fractions/ratios
A5.S.11	Use fractions and percentages to compare data sets of different sizes
A5.S.12	Identify ordered pairs of data from a graph and interpret the meaning of the data in terms of the situation depicted by the graph
A5.S.13	Know how to write ordered pairs correctly; for example, (x, y)
Other Standards: Geometry and Measurement	
Measurement	
A5.CFP3.15	Identify customary equivalent units of length
A5.CFP3.16	Identify equivalent metric units of length
A5.CFP3.17	Convert measurement within a given system
A5.CFP3.19	Calculate elapsed time in hours and minutes
A5.CFP3.21	Determine personal references for customary units of length (e.g., your pace is approximately 3 feet, your height is approximately 5 feet, etc.)
A5.CFP3.22	Determine personal references for metric units of length
Geometry	
A5.CFP3.2	Identify pairs of similar triangles
A5.CFP3.3	Identify the ratio of corresponding sides of similar triangles

A5.CFP3.4	Classify quadrilaterals by properties of their angles and sides
A5.CFP3.5	Know that the sum of the interior angles of a quadrilateral is 360 degrees
A5.CFP3.6	Classify triangles by properties of their angles and sides
A5.CFP3.7	Know that the sum of the interior angles of a triangle is 180 degrees
A5.CFP3.8	Find a missing angle when given two angles of a triangle
A5.CFP3.9	Identify pairs of congruent triangles
A5.CFP3.10	Identify corresponding parts of congruent triangles
A5.CFP3.11	Identify and draw lines of symmetry of basic geometric shapes
A5.CFP3.12	Identify and plot points in the first quadrant
A5.CFP3.13	Plot points to form basic geometric shapes (identify and classify)
A5.CFP3.26	Measure, identify, and draw angles, perpendicular and parallel lines, rectangles, and triangles by using appropriate tools (e.g., straightedge, ruler, compass, protractor, drawing software)