Illinois Mathematics Assessment Framework Grades 3–8

State Assessments Beginning
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Introduction to the Illinois Mathematics Assessment Framework Grades 3–8

The Illinois Mathematics Assessment Framework is designed to assist educators, test developers, policy makers, and the public by clearly defining those elements of the Illinois Learning Standards that are suitable for state testing. It is not designed to replace a local mathematics curriculum and should not be considered a state mathematics curriculum. The Framework defines the mathematics content that will be assessed in the Illinois Standards Achievement Test (ISAT) beginning with the 2005-2006 school year.

Assessment Objectives
The Framework contains assessment objectives, clear and concise statements of testable material at each grade level assessed. Each assessment objective aligns to the Illinois Learning Standards and, in many cases, to the Performance Descriptors posted on the Illinois State Board of Education Web site (www.isbe.net/ils). Each year's assessment will measure a sample of the content in the Framework with sufficient overlap from year to year to allow for annual comparisons. The assessment objectives listed for each grade level may be measured on any given assessment in any given year. One should not presume that every objective will be measured every year. The Framework communicates the range of objectives that may be assessed at a given grade level. Objectives to be assessed flow in and out of the Framework so it is clear when an objective will start being assessed and when it will no longer be assessed.

Content Emphasis
While the precise content on each year's tests will vary from year to year, the relative emphasis on the State Goals and Illinois Learning Standards will not. The proportion of each year's tests devoted to each category is clearly specified in the Mathematics Content Category Table on page 13. These percents are estimates used to guide the general distribution of items throughout the test.

Framework Structure
This document employs a general organizational structure designed for ease of use. Each State Goal for mathematics is the main organizer, followed by the Illinois Learning Standards for mathematics within each of these State Goals. A shaded column to the left of the assessment objectives lends additional guidance for navigating topics within the Illinois Learning Standards. Each assessment objective has a unique identifier with three components.

Example: 6.3.01

6	*3*	*01*
State Goal	***Grade Level***	***Objective Number***

The first component, *"6,"* indicates the numbered State Goal as defined in the Illinois Learning Standards. The second component, *"3,"* indicates the grade level. The third component, *"01,"* indicates that this is the first assessment objective for this State Goal at this grade level.

Cognitive Complexity

Items on the assessment will represent three levels of complexity: low, moderate, and high[1]. The mathematical complexity of an item is not directly related to its format (multiple–choice, short constructed–response, or extended–response). Items requiring students to generate a response tend to make somewhat heavier demands on students than multiple–choice items, but that is not always the case. Any type of item can deal with mathematics of greater or less depth and sophistication. There are multiple–choice items that can assess complex mathematics and constructed–response items that can assess routine mathematical ideas. The ideal balance sought for the mathematics assessment is not necessarily the balance one would wish for curriculum or instruction in mathematics education. Balance here must be considered in the context of the constraints of this assessment, including its timed nature and its paper–and–pencil format. Items of all three types are essential to assess the full range of students' mathematical achievement. Within that context, the ideal balance would be that about half of the items are of moderate complexity, with the remainder of the items being equally distributed between low and high complexity. This balance would apply for all grade levels.

Low Complexity	***Moderate Complexity***	***High Complexity***
This category relies heavily on the recall and recognition of previously–learned concepts and principles. Items typically specify what the student is to do, which is often to carry out some procedure that can be performed mechanically. It is not left to the student to come up with an original method or solution. The following are some, but not all, of the demands that items in the low–complexity category might make:	Items in the moderate–complexity category involve more flexibility of thinking and choice among alternatives than do those in the low–complexity category. They require a response that goes beyond the habitual, is not specified, and may require more than a single step. The student is expected to decide what to do, using informal methods of reasoning and problem–solving strategies, and to bring together skill and knowledge from various domains. The following illustrate some of the demands that items of moderate complexity might make:	High–complexity items make heavy demands on students, who must engage in more abstract reasoning, planning, analysis, judgment, and creative thought. A satisfactory response to the item requires that the student think in an abstract and sophisticated way. The following illustrate some of the demands that items of high complexity might make:
• Recall or recognize a fact, term, or property • Recognize an example of a concept • Compute a sum, difference, product, or quotient • Recognize an equivalent representation • Perform a specified procedure • Evaluate an expression in an equation or formula for a given variable • Solve a one–step word problem • Draw or measure simple geometric figures • Retrieve information from a graph, table, or figure	• Represent a situation mathematically in more than one way • Select and use different representations, depending on situation and purpose • Solve a word problem requiring multiple steps • Compare figures or statements • Provide a justification for steps in a solution process • Interpret a visual representation • Extend a pattern • Retrieve information from a graph, table, or figure and use it to solve a problem requiring multiple steps • Formulate a routine problem, given data and conditions • Interpret a simple argument	• Describe how different representations can be used for different purposes • Perform a procedure having multiple steps and multiple decision points • Analyze similarities and differences between procedures and concepts • Generalize a pattern • Formulate an original problem, given a situation • Solve a novel problem • Solve a problem in more than one way • Explain and justify a solution to a problem • Describe, compare, and contrast solution methods • Formulate a mathematical model for a complex situation • Analyze the assumptions made in a mathematical model • Analyze or produce a deductive argument • Provide a mathematical justification

[1] These levels and their descriptions are adapted from *Mathematics Framework for the 2005 National Assessment of Educational Progress*, author National Assessment Governing Board (September 2004).

Calculators
The consideration of calculator usage on large–scale assessments is a topic that has received considerable attention over the past three decades. Many discussions about the appropriate use of such technology in a mathematics assessment context generally center on the topic of what constitutes "basic mathematical skills" and what students need to be able to do without the aid of technology. At the same time, students are being educated to function in a world that is becoming increasing reliant on technology. The balance of focusing on new processes while still holding some historical expectations is difficult, both for parents and teachers in such an era of flux and transition.

Research on student use of calculators in mathematics classes shows that students who have appropriate instruction on when and how to use calculators coupled with practice using them in learning mathematics have better attitudes toward mathematics and feel empowered. Using a calculator allows students to shift from allocating a lot of time and energy to calculations during working to solve problems. The use of calculators also allows teachers to present the students with more realistic problems. Further, students who know when and how to use mental mathematics, estimation, paper–and–pencil algorithms, or technology achieve far higher scores than students who are relegated to programs that focus on memorization and practice of traditional skills in the absence of technology[2].

For these reasons, the state mathematics assessment takes a varied approach to the use of technology across grades 3–8. In grade 3, students are not allowed to use calculators on any part of the mathematics assessment, unless it is a documented accommodation for a student with an Individualized Education Program (IEP). In grades 4 through 8, students are allowed to use a calculator on any part of the mathematics assessment. This policy was developed in light of the continued work on the development of algorithms and the basic facts of whole numbers in grade 3 and the general lighter use of technology in classrooms at this level. Teachers in classrooms must continue to help students learn when and how to solve problems without the aid of technology as well.

Students are allowed to use any calculator they normally use in their mathematics classes. Schools, teachers, and parents should be advised that when students attempt to use calculators with which they are unfamiliar, their performance may suffer. In a like manner, students who are not taught when and how to use a calculator as part of their regular mathematics instructional program are also at risk. At grade 3, the assessment will focus on students' knowledge as assessed without access to technology.

Other Assessment Tools
All students in grades 3 through 8 will be provided with a ruler to use during the mathematics assessment. This ruler will allow students to measure in both inches and centimeters. All students in grades 7 and 8 will be provided with a reference sheet to use during the mathematics assessment. This reference sheet includes any necessary formulas for items at those grades.

Item Formats
Historically, large–scale assessments of mathematics have employed a series of multiple–choice items. This item format was used because it was viewed as contributing to higher reliability, providing objectivity, reducing scoring costs, and easing administration requirements.

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[2] Mullis, I.V.S., Dossey, J. A., Owen, E. H., & Phillips, G. W. (1991). *The State of Mathematics Achievement: NAEP's 1990 Assessment of the Nation and the Trial Assessment of the States.* Washington, DC: National Center for Education Statistics.
Braswell, J. S., Lutkus, A. D., Grigg, W. S., Santapau, S. L., Tay–Lim, B. S., & Johnson, M. S. (2001). *The Nation's Report Card: Mathematics 2000*. Washington, DC: National Center for Education Statistics.

However, research in assessment and learning indicates that valid evaluations of students' abilities to reason, problem solve, and communicate their mathematical knowledge and capabilities require more extensive records of students' work. Hence, the mathematics assessments must employ a wider selection of items formats in assessing Illinois students' capabilities to solve problems, communicate their knowledge, show their reasoning, and reflect their ability to translate among representations for mathematical concepts and processes. Thus, in addition to continued use of multiple–choice items, the mathematics assessments will include extended–response and short constructed–response items.[3] Each of these item formats is described below.

Multiple–Choice Items

Multiple–choice (MC) items require students to read, reflect, or compute and then to select the alternative that best expresses what they believe the answer to be. This format is appropriate for quickly determining whether students have achieved certain knowledge and skills. Well–designed multiple–choice items can measure student knowledge and understanding, as well as students' selection and application of problem–solving strategies. A carefully constructed multiple–choice item can assess any of the levels of mathematical complexity from simple procedures to sophisticated concepts. They can be designed to reach beyond the ability of students to "plug–in" alternatives or eliminate choices to determine a correct answer. Such items are limited in the extent to which they can provide evidence of the depth of students' thinking.

Extended–Response Items

Extended–response (ER) items require students to consider a situation that demands more than a numerical response or a short verbal communication. They ask students to model, as much as possible, real problem solving in a large scale assessment context. When an ER item proposes a problem to solve, the student is asked to understand what is required to "solve" the situation, choose a plan of attack, carry out the attack, and interpret the solution derived in terms of the original situation. Students are expected to clearly communicate their decision–making processes in the context of the task proposed by the item (e.g., through writing, pictures, diagrams, or well–ordered steps).

Short Constructed–Response Items

Short constructed–response (SCR) items pose similar questions as multiple–choice items and provide a reliable and valid basis for extrapolating about students' approaches to problems. These items reduce the concern about guessing that accompanies multiple–choice items.

Scoring Extended– and Short Constructed–Response Items

Extended and short constructed–response items are evaluated according to an established scoring scale, called a rubric, developed from a combination of expert expectations and a sample of actual student responses. Such rubrics must be particularized by expected work and further developed by examples of student work in developing a guide for scorers.

[3] Dossey, J. A., Mullis, Ina V.S., Jones, Chancey O. (1993). *Can Students Do Problem Solving?: Results from Constructed-Response Questions in NAEP's 1992 Mathematics Assessment.* Washington, DC: National Center for Education Statistics.

Excerpt from *Illinois Learning Standards*[4]

The *Illinois Learning Standards for Mathematics* were developed by Illinois teachers for Illinois schools. These goals, standards and benchmarks are an outgrowth of the 1985 Illinois State Goals for Learning influenced by the latest thinking in school mathematics. This includes the National Council of Teachers of Mathematics; *Curriculum and Evaluation Standards for School Mathematics*; ideas underlying recent local and national curriculum projects; results of state, national, and international assessment findings; and the work and experiences of Illinois school districts and teachers.

Mathematics is a language we use to identify, describe and investigate the patterns and challenges of everyday living. It helps us to understand the events that have occurred and to predict and prepare for events to come so that we can more fully understand our world and more successfully live in it.

Mathematics encompasses arithmetic, measurement, algebra, geometry, trigonometry, statistics, probability and other fields. It deals with numbers, quantities, shapes and data, as well as numerical relationships and operations. Confronting, understanding and solving problems is at the heart of mathematics. Mathematics is much more than a collection of concepts and skills; it is a way of approaching new challenges through investigating, reasoning, visualizing and problem solving with the goal of communicating the relationships observed and problems solved to others.

All students in Illinois schools need to have the opportunity to engage in learning experiences that foster mastery of these goals and standards. Knowledge of mathematics and the ability to apply math skills to solve problems can be an empowering force for all students—both while in school and later in their lives. Students reaching these goals and standards will have an understanding of how numbers are used and represented. They will be able to use basic operations (addition, subtraction, multiplication, division) to both solve everyday problems and confront more involved calculations in algebraic and statistical settings. They will be able to read, write, visualize and talk about ways in which mathematical problems can be solved in both theoretical and practical situations. They will be able to communicate relationships in geometric and statistical settings through drawings and graphs. These skills will provide all Illinois students with a solid foundation for success in the workplace, a basis for continued learning about mathematics, and a foundation for confronting problem situations arising throughout their lives.

APPLICATIONS OF LEARNING

Through Applications of Learning, students demonstrate and deepen their understanding of basic knowledge and skills. These applied learning skills cross academic disciplines and reinforce the important learning of the disciplines. The ability to use these skills will greatly influence students' success in school, in the workplace and in the community.

SOLVING PROBLEMS

Recognize and investigate problems; formulate and propose solutions supported by reason and evidence.
The solving of problems is at the heart of "doing mathematics." When people are called on to apply their knowledge of numbers, symbols, operations, measurement, algebraic approaches, geometric concepts and relationships, and data analysis, mathematics' power emerges. Sometimes problems appear well structured, almost like textbook exercises, and simply require the application of an algorithm or the interpretation of a relationship. Other times, particularly in occupational settings, the problems are non–routine and require some imagination and careful reasoning to solve. Students must have experience with a wide variety of problem–solving methods and opportunities for solving a wide range of problems. The ability to link the problem–solving methods learned in mathematics with a knowledge of objects and concepts from other academic areas is a fundamental survival skill for life.

[4] Illinois State Board of Education (1997). *Illinois Learning Standards*

COMMUNICATING

Express and interpret information and ideas.

Everyone must be able to read and write technical material to be competitive in the modern workplace. Mathematics provides students with opportunities to grow in the ability to read, write and talk about situations involving numbers, variables, equations, figures and graphs. The ability to shift between verbal, graphical, numerical and symbolic modes of representing a problem helps people formulate, understand, solve and communicate technical information. Students must have opportunities in mathematics classes to confront problems requiring them to translate between representations, both within mathematics and between mathematics and other areas; to communicate findings both orally and in writing; and to develop displays illustrating the relationships they have observed or constructed.

USING TECHNOLOGY

Use appropriate instruments, electronic equipment, computers and networks to access information, process ideas and communicate results.

Technology provides a means to carry out operations with speed and accuracy; to display, store and retrieve information and results; and to explore and extend knowledge. The technology of paper and pencil is appropriate in many mathematical situations. In many other situations, calculators or computers are required to find answers or create images. Specialized technology may be required to make measurements, determine results or create images. Students must be able to use the technology of calculators and computers including spreadsheets, dynamical geometry systems, computer algebra systems, and data analysis and graphing software to represent information, form conjectures, solve problems and communicate results.

WORKING ON TEAMS

Learn and contribute productively as individuals and as members of groups.

The use of mathematics outside the classroom requires sharing expertise as well as applying individual knowledge and skills. Working in teams allows students to share ideas, to develop and coordinate group approaches to problems, and to share and learn from each other in communicating findings. Students must have opportunities to develop the skills and processes provided by team problem–solving experiences to be prepared to function as members of society and productive participants in the workforce.

MAKING CONNECTIONS

Recognize and apply connections of important information and ideas within and among learning areas.

Mathematics is used extensively in business; the life, natural and physical sciences; the social sciences; and in the fine arts. Medicine, architecture, engineering, the industrial arts and a multitude of occupations are also dependent on mathematics. Mathematics offers necessary tools and ways of thinking to unite the concepts, relationships and procedures common to these areas. Mathematics provides a language for expressing ideas across disciplines, while, at the same time, providing connections linking number and operation, measurement, geometry, data and algebra within mathematics itself. Students must have experiences which require them to make such connections among mathematics and other disciplines. They will then see the power and utility that mathematics brings to expressing, understanding and solving problems in diverse settings beyond the classroom.

STATE GOAL 6: Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.

Why This Goal Is Important: Numbers and operations on numbers play fundamental roles in helping us make sense of the world around us. Operations such as addition, subtraction, multiplication and division, as well as the ability to find powers and roots, extend the notion of numbers to create tools to model situations and solve problems in our everyday lives. Discussing and solving problems related to budgets, comparing prices on merchandise, understanding the nature of interest charges, measuring fuel consumption and calculating the trajectory for space travel would all be impossible without a sense of numbers and numerical operations. All people must develop this sense of numbers and operations and be able to use it to solve problems using mental computation, paper–and–pencil algorithms, calculators and computers.

STANDARD 6A
Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.

STANDARD 6B
Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships.

STANDARD 6C
Compute and estimate using mental mathematics, paper–and–pencil methods, calculators and computers.

STANDARD 6D
Solve problems using comparison of quantities, ratios, proportions and percents.

STATE GOAL 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

Why This Goal Is Important: Measurement provides a way to answer questions about "how many," "how much" and "how far." It is an indispensable component of business, manufacturing, art, medicine and many other aspects of daily life. We describe the sizes, capacities and values of many things, from the large distances involved in space travel, to the very small quantities in computer design and microbiology, to the varying values of currencies in international monetary exchange. All people must be able to choose an appropriate level of accuracy for a measurement; to select what measuring instruments to use and to correctly determine the measures of objects, space and time. These activities require people to be able to use standard instruments including rulers, volume and capacity measures, timers and emerging measurement technologies found in the home and workplace.

STANDARD 7A
Measure and compare quantities using appropriate units, instruments and methods.

STANDARD 7B
Estimate measurements and determine acceptable levels of accuracy.

STANDARD 7C
Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings.

STATE GOAL 8: Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.

Why This Goal Is Important: Algebra unites patterns and quantities in patterns with the means of describing change through the use of variables and functions. Its concepts and analytical methods allow people to consider general solutions to problems with common characteristics and develop related formulas. Algebra provides verbal, symbolic and graphical formats for discussing and representing settings as diverse as the pricing patterns of merchandise in a store, the behavior of a car as it accelerates or slows down, the changes in two chemicals as they react with one another, or the type of variation existing in a comparison of two factors in the economy. All people must be able to use algebraic methods to construct and examine tables of values; to interpret the relationships expressed by patterns in these tables; to relate change and variation in graphs and formulas; to reason about changes in quantities and the relationships involved in changes; and to find solutions to everyday problems using algebra's symbolic manipulation and formulas.

STANDARD 8A
Describe numerical relationships using variables and patterns.

STANDARD 8B
Interpret and describe numerical relationships using tables, graphs and symbols.

STANDARD 8C
Solve problems using systems of numbers and their properties.

STANDARD 8D
Use algebraic concepts and procedures to represent and solve problems.

STATE GOAL 9: Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes and space.

Why This Goal Is Important: Geometry provides important methods for reasoning and solving problems with points, lines, planes and space. The word "geometry" comes from Greek words meaning "measurement of the Earth." While we use modern technology and employ a wider variety of mathematical tools today, we still study geometry to understand the shapes and dimensions of our world. The applications of geometry are widespread in construction, engineering, architecture, mapmaking and art. Historically, geometry is a way to develop skill in forming convincing arguments and proofs. This goal of developing a means of argument and validation remains an important part of our reasons for studying geometry today.

STANDARD 9A
Demonstrate and apply geometric concepts involving points, lines, planes and space.

STANDARD 9B
Identify, describe, classify and compare relationships using points, lines, planes and solids.

STANDARD 9C
Construct convincing arguments and proofs to solve problems.

STANDARD 9D
Use trigonometric ratios and circular functions to solve problems.

STATE GOAL 10: Collect, organize and analyze data using statistical methods; predict results; and interpret uncertainty using concepts of probability.

Why This Goal Is Important: The ability to understand and interpret data (e.g., opinion polls, stock prices, tax rates, crime statistics, scientific studies, weather reports) grows more important each day. Students must be able to organize data, make sense of variables and patterns, and judge the logical reasonableness of any claims and interpretations made. Even very young students can count objects and communicate their findings with charts and graphs. Students of all ages can collect, display and interpret data to answer specific questions. They also must construct and analyze arguments that involve data and its interpretation. All students need to understand and apply the role probability plays in data collection and decision making. Data analysis and use are important abilities necessary for all careers.

STANDARD 10A
Organize, describe and make predictions from existing data.

STANDARD 10B
Formulate questions, design data collection methods, gather and analyze data and communicate findings.

STANDARD 10C
Determine, describe and apply the probabilities of events.

Mathematics Content Category Table

In grade 3, calculator use is not allowed during any part of the mathematics assessment. In grades 4 through 8, calculator use is allowed during any part of the mathematics assessment.

Grade	3	4	5	6	7	8
	Calculators Not Allowed	Calculators Allowed	Calculators Allowed	Calculators Allowed	Calculators Allowed	Calculators Allowed
State Goal 6 – Number Sense	**35%**	**35%**	**30%**	**25%**	**25%**	**20%**
Standard 6A Representations and Ordering	15%	15%	10%	5%	5%	5%
Standards 6B, 6C Computation, Operations, Estimation, and Properties	20%	20%	15%	15%	15%	10%
Standard 6D Ratios, Proportions, and Percents	0%	0%	5%	5%	5%	5%
State Goal 7 – Measurement	**20%**	**20%**	**15%**	**15%**	**15%**	**15%**
Standards 7A, 7B, 7C Units, Tools, Estimation, and Applications	20%	20%	15%	15%	15%	15%
State Goal 8 – Algebra	**10%**	**10%**	**20%**	**25%**	**25%**	**30%**
Standard 8A Representations, Patterns, and Expressions	5%	5%	8%	10%	10%	10%
Standard 8B Connections Using Tables, Graphs, and Symbols	0%	2%	5%	7%	7%	10%
Standards 8C, 8D Writing, Interpreting, and Solving Equations	5%	3%	7%	8%	8%	10%
State Goal 9 – Geometry	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**
Standard 9A Properties of Single Figures and Coordinate Geometry	15%	15%	10%	10%	10%	10%
Standard 9B Relationships Between and Among Multiple Figures	5%	5%	10%	10%	10%	10%
Standard 9C Justifications of Conjectures and Conclusions	***This standard is not assessed in isolation. Rather, its essence is assessed indirectly through problems that require this type of thinking.***					
Standard 9D Trigonometry	***This standard is not assessed on the state assessment until grade 11.***					
State Goal 10 – Data Analysis, Statistics, and Probability	**15%**	**15%**	**15%**	**15%**	**15%**	**15%**
Standards 10A, 10B Data Analysis and Statistics	10%	10%	10%	10%	8%	8%
Standard 10C Probability	5%	5%	5%	5%	7%	7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Standard 6A – Representations and Ordering

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Read, Write, and Represent Numbers	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	6.3.01 Read, write, recognize, and model equivalent representations of whole numbers and their place values up to 100,000.	**6.4.01** Read, write, recognize, and model equivalent representations of whole numbers and their place values up to 1,000,000.	**6.5.01** Read, write, recognize, and model equivalent representations of whole numbers and their place values up to 100,000,000.	**6.6.01** Read, write, recognize, and model equivalent representations of whole numbers and their place values.	**6.7.01** Read, write, and recognize equivalent representations of positive powers of 10.	**6.8.01** Read, write, and recognize equivalent representations of integer powers of 10.
	6.3.02 Identify and write (in words and standard form) whole numbers up to 100,000.	**6.4.02** Identify and write (in words and standard form) whole numbers up to 1,000,000.	**6.5.02** Read, write, recognize, model, and interpret numerical expressions from a given description or situation.	**6.6.02** Read, write, recognize, model, and interpret numerical expressions from a given description or situation.	**6.7.02** Read, write, recognize, model, and interpret integers, including translating numerical expressions.	**6.8.02** Read, write, recognize, model, and interpret integers, including translating numerical expressions.
	6.3.03 Recognize a fraction represented with a pictorial model.	**6.4.03** Read, write, recognize, and model equivalent representations of fractions; divide regions or sets to represent a fraction.	**6.5.03** Read, write, recognize, and model equivalent representations of fractions, including improper fractions and mixed numbers.	**6.6.03** Read, write, recognize, and model equivalent representations of fractions, including improper fractions and mixed numbers.		
			6.5.04 Recognize, translate between, and model multiple representations of decimals, fractions less than one (halves, quarters, fifths, and tenths), and percents (0%, 25%, 50%, 75%, and 100%).	**6.6.04** Recognize, translate between, and apply multiple representations of decimals, fractions, percents (less than 100%), and mixed numbers (halves, quarters, fifths, and tenths).	**6.7.03** Recognize, translate between, and apply multiple representations of rational numbers (decimals, fractions, mixed numbers, and percents less than 100%).	**6.8.03** Recognize, translate between, and apply multiple representations of rational numbers (decimals, fractions, mixed numbers, percents, and roots).
			6.5.05 Read, write, recognize, and model decimals and their place values through thousandths.	**6.6.05** Read, write, recognize, and model equivalent representations of decimals and their place values through thousandths.		**6.8.04** Use scientific notation to represent numbers and solve problems.
	6.3.04 Represent multiplication as repeated addition.	**6.4.04** Represent multiplication as repeated addition.	**6.5.06** Represent multiplication as repeated addition.	**6.6.06** Represent repeated factors using exponents.	**6.7.04** Represent repeated factors using exponents.	**6.8.05** Represent repeated factors using exponents.

Standard 6A – Representations and Ordering (Continued)

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Order and Compare Numbers	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	6.3.05 Order and compare whole numbers up to 10,000 using symbols (>, <, or =) and words (e.g., greater (more) than, less than, equal to, between).	**6.4.05** Order and compare whole numbers up to 100,000.	**6.5.07** Order and compare whole numbers up to 1,000,000.	**6.6.07** Order and compare whole numbers.	**6.7.05** Order and compare integers, terminating decimals, fractions, and mixed numbers.	**6.8.06** Order and compare rational numbers.
	6.3.06 Order and compare decimals expressed using monetary units.	**6.4.06** Order and compare decimals through hundredths.	**6.5.08** Order and compare decimals through hundredths.	**6.6.08** Order and compare decimals through thousandths.		
		6.4.07 Order and compare fractions having like denominators with or without models.	**6.5.09** Order and compare fractions having like or unlike denominators with or without models.	**6.6.09** Order and compare fractions and mixed numbers having like or unlike denominators.		
Number Line	**6.3.07** Identify and locate whole numbers and halves on a number line.	**6.4.08** Identify and locate whole numbers, halves, and fourths on a number line.	**6.5.10** Identify and locate whole numbers, halves, fourths, and thirds on a number line.	**6.6.10** Identify and locate decimals, fractions, and mixed numbers on a number line.	**6.7.06** Identify and locate integers, decimals, and fractions/mixed numbers on a number line, and estimate the locations of square roots.	**6.8.07** Identify and locate rational and irrational numbers (e.g., π, $\sqrt{2}$, $\sqrt{5}$) on a number line.
Classifications of Numbers	**6.3.08** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., odd/even, factors/multiples, greater than, less than).	**6.4.09** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., odd/even, factors/multiples, greater than, less than).	**6.5.11** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., odd/even, factors/multiples, greater than, less than, square numbers).	**6.6.11** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., odd/even, factors/multiples, greater than, less than, square numbers, primes).	**6.7.07** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., square numbers, prime/composite, prime factorization, greatest common factor, least common multiple).	**6.8.08** Solve problems involving descriptions of numbers, including characteristics and relationships (e.g., exponents, roots, prime/composite, prime factorization, greatest common factor, least common multiple).

Standards 6B, 6C – Computation, Operations, Estimation, and Properties

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Number Operations	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	6.3.09 Solve problems and number sentences involving addition and subtraction with regrouping.	**6.4.10** Solve problems and number sentences involving addition and subtraction with regrouping and multiplication (up to three–digit by one–digit).	**6.5.12** Solve problems and number sentences involving addition, subtraction, multiplication, and division using whole numbers.	**6.6.12** Solve problems and number sentences involving addition, subtraction, multiplication, and division using whole numbers.	**6.7.08** Solve problems and number sentences involving addition, subtraction, multiplication, and division using integers, fractions, and decimals.	**6.8.09** Solve problems and number sentences involving addition, subtraction, multiplication, and division using rational numbers, exponents, and roots.
	6.3.10 Solve problems involving the value of a collection of bills and coins whose total value is $10.00 or less, and make change.	**6.4.11** Solve problems involving the value of a collection of bills and coins whose total value is $100.00 or less, and make change.	**6.5.13** Solve problems and number sentences involving addition and subtraction of decimals through hundredths (with or without monetary labels).	**6.6.13** Solve problems and number sentences involving addition, subtraction, and multiplication of decimals.		
	6.3.11 Model and apply basic multiplication facts (up to 10×10), and apply them to related multiples of 10 (e.g., 3×4=12, 30×4=120).	**6.4.12** Model and apply basic multiplication and division facts (up to 12×12), and apply them to related multiples of 10 (e.g., 3×9=27, 30×9=270, 6÷3=2, 600÷3=200).				
		6.4.13 Model situations involving addition and subtraction of fractions with like denominators.	**6.5.14** Model situations involving addition and subtraction of fractions.	**6.6.14** Solve problems involving addition and subtraction of fractions and mixed numbers, and express answers in simplest form.		
				6.6.15 Identify and apply order of operations to simplify numeric expressions involving whole numbers.	**6.7.09** Identify and apply order of operations to simplify numeric expressions involving whole numbers (including exponents), fractions, and decimals.	**6.8.10** Identify and apply order of operations to simplify numeric expressions involving integers (including exponents and roots), fractions, and decimals.

Standards 6B, 6C – Computation, Operations, Estimation, and Properties (Continued)

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Properties	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	6.3.12 Use the inverse relationships between addition and subtraction to complete basic fact sentences and solve problems (e.g., 5 + 3 = 8 and 8 – 3 = __).	**6.4.14** Solve problems involving the commutative and distributive properties of operations on whole numbers [e.g., 8 + 7 = 7 + 8, 27 × 5 = (20×5) + (7×5)].	**6.5.15** Solve problems involving the commutative, distributive, and identity properties of operations on whole numbers (e.g., 37 × 46 = 46 × 37, 270×5= (200×5) + (70×5)].	**6.6.16** Solve problems involving the commutative, distributive, and associative properties of operations on whole numbers [e.g., (5×7)×2 = 5×(7×2)].	**6.7.10** Identify and apply the following properties of operations with rational numbers: • the commutative and associative properties for addition and multiplication; • the distributive property; • the additive and multiplicative identity properties; • the additive and multiplicative inverse properties; and • the multiplicative property of zero.	**6.8.11** Identify and apply the following properties of operations with rational numbers: • the commutative and associative properties for addition and multiplication; • the distributive property; • the additive and multiplicative identity properties; • the additive and multiplicative inverse properties; and • the multiplicative property of zero.
	6.3.13 Solve problems involving the multiplicative identity of one (e.g., 3×1 =3) and the additive identity of zero (e.g., 3+0 =3).	**6.4.15** Use the inverse relationships between addition/subtraction and multiplication/division to complete basic fact sentences and solve problems (e.g., 4×3=12, 12÷3=__).			**6.7.11** Demonstrate and apply the relationships between addition/subtraction and multiplication/division with rational numbers.	**6.8.12** Describe the effect of multiplying and dividing by numbers, including the effect of multiplying or dividing a rational number by: • a number less than zero; • zero; • a number between zero and one; and • a number greater than one.

Standards 6B, 6C – Computation, Operations, Estimation, and Properties (Continued)

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Estimation	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	6.3.14 Make estimates appropriate to a given situation with whole numbers.	**6.4.16** Make estimates appropriate to a given situation with whole numbers.	**6.5.16** Make estimates appropriate to a given situation with whole numbers, fractions, and decimals.	**6.6.17** Make estimates appropriate to a given situation, and analyze what effect the estimation method used has on the accuracy of results.	**6.7.12** Make estimates appropriate to a given situation, and analyze what effect the estimation method used has on the accuracy of results.	**6.8.13** Select, use, and justify appropriate operations, methods, and tools to compute or estimate with rational numbers. Verify solutions and determine the reasonableness of results.
					6.7.13 Estimate the square root of a number less than 1,000 between two whole numbers (e.g., $\sqrt{41}$ is between 6 and 7)	**6.8.14** Estimate the square or cube root of a number less than 1,000 between two whole numbers (e.g., $\sqrt[3]{200}$ is between 5 and 6).

Standard 6D – Ratios, Proportions, and Percents

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Identify and Express Ratios	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
			6.5.17 Identify and express ratios using appropriate notation (i.e., a/b, a to b), and identify equivalent ratios.	**6.6.18** Identify and express ratios using appropriate notation (i.e., a/b, a to b, a:b), identify equivalent ratios, and explain ratios that represent a given situation.	**6.7.14** Create and explain ratios that represent a given situation.	**6.8.15** Use ratios to describe problem situations.
Proportional Reasoning			**6.5.18** Solve problems involving proportional relationships, including unit pricing (e.g., one apple costs 20¢, so four apples cost 80¢).	**6.6.19** Solve problems involving proportional relationships, including unit pricing (e.g., seven apples cost $1.40, so nine apples cost $1.80).	**6.7.15** Use proportional reasoning to model and solve problems.	**6.8.16** Use proportional reasoning to model and solve problems.
Percents			**6.5.19** Read, write, recognize, and model percents (0%, 25%, 50%, 75%, and 100%).	**6.6.20** Read, write, recognize, and model percents from 0% to 100%.	**6.7.16** Read, write, recognize, model, and interpret percents from 0% to 100%.	**6.8.17** Read, write, recognize, model, and interpret percents, including those less than 1% and greater than 100%.
				6.6.21 Solve number sentences and problems involving percents.	**6.7.17** Solve number sentences and problems involving fractions, decimals, and percents (e.g., 50% of 10 is the same as 1/2 of 10 is the same as 0.5×10, sales tax, tips, interest, discounts).	**6.8.18** Solve number sentences and problems involving fractions, decimals, and percents (e.g., percent increase and decrease, interest rates, tax, discounts, tips).

Standards 7A, 7B, 7C – Units, Tools, Estimation, and Applications

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
	Calculators Not Allowed	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
Elapsed Time	**7.3.01** Solve problems involving simple elapsed time in compound units (e.g., hours, minutes, days).	**7.4.01** Solve problems involving elapsed time in compound units (e.g., 1 hour and 40 minutes) that occur in the same half day (a.m. only or p.m. only).	**7.5.01** Solve problems involving elapsed time in compound units.			
Measurement Tools	**7.3.02** Select and use appropriate standard units and tools to measure length (to the nearest inch or cm), time (to the nearest minute), and temperature (to the nearest degree).	**7.4.02** Select and use appropriate standard units and tools to measure length (to the nearest ½ inch or ½ cm), time, and temperature.	**7.5.02** Select and use appropriate standard units and tools to measure length (to the nearest ¼ inch or mm), mass/weight, capacity, and angles.	**7.6.01** Select and use appropriate standard units and tools to measure length, mass/weight, capacity, and angles. Sketch, with given specifications, line segments, angles, triangles, and quadrilaterals.	**7.7.01** Select and use appropriate standard units and tools to measure length, mass/weight, capacity, and angles. Sketch, with given specifications, line segments, angles, triangles, and quadrilaterals.	**7.8.01** Select and use appropriate standard units and tools to solve measurement problems, including measurements of polygons and circles.
Area , Perimeter, and Circumference	**7.3.03** Solve problems involving the perimeter of a polygon with given side lengths or a given non–standard unit (e.g., paperclip). **7.3.04** Solve problems involving the area of a figure when whole and half square units are shown within the figure.	**7.4.03** Solve problems involving the perimeter of a polygon with given side lengths and the area of a square, rectangle, or irregular shape composed of rectangles using diagrams, models, and grids or by measuring (may include sketching a figure from its description).	**7.5.03** Solve problems involving the perimeter and area of a triangle, rectangle, or irregular shape using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).	**7.6.02** Solve problems involving the perimeter and area of a triangle, parallelogram, or irregular shape using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).	**7.7.02** Solve problems involving the perimeter and area of polygons and composite figures using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).	**7.8.02** Solve problems involving perimeter/circumference and area of polygons, circles, and composite figures using diagrams, models, and grids or by measuring or using given formulas (may include sketching a figure from its description).
Estimation	**7.3.05** Compare and estimate length (including perimeter), area, and weight/mass using referents.	**7.4.04** Compare and estimate length (including perimeter), area, volume, and weight/mass using referents.	**7.5.04** Compare and estimate length (including perimeter), area, volume, weight/mass, and angles (0° to 180°) using referents.	**7.6.03** Compare and estimate length (including perimeter), area, volume, weight/mass, and angles (0° to 180°) using referents.	**7.7.03** Compare and estimate length (including perimeter), area, volume, weight/mass, and angles (0° to 180°) using referents.	**7.8.03** Compare and estimate length (including perimeter/circumference), area, volume, weight/mass, and angles (0° to 360°) using referents.

Standards 7A, 7B, 7C – Units, Tools, Estimation, and Applications (Continued)

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Volume and Surface Area	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	7.3.06 Determine the volume of a solid figure that shows cubic units.	**7.4.05** Determine the volume of a solid figure that shows cubic units.	**7.5.05** Determine the volume of a right rectangular prism using an appropriate formula or strategy.	**7.6.04** Determine the volume of a right rectangular prism using an appropriate formula or strategy.	**7.7.04** Determine the volume and surface area of a right rectangular prism using an appropriate formula or strategy.	**7.8.04** Solve problems involving the volume or surface area of a right rectangular prism, right circular cylinder, or composite shape using an appropriate formula or strategy.
Measurement Conversions	**7.3.07** Solve problems involving simple unit conversions within the same measurement system for time and length.	**7.4.06** Solve problems involving unit conversions within the same measurement system for time, length, and weight/mass.	**7.5.06** Solve problems involving unit conversions within the same measurement system for time, length, and weight/mass, including compound units (e.g., 5ft 5in, 2lbs 2oz).	**7.6.05** Solve problems involving unit conversions within the same measurement system for time, length, and weight/mass, including compound units (e.g., 5ft 5in, 2lbs 2oz).	**7.7.05** Solve problems involving unit conversions within the same measurement system for length, weight/mass, capacity, and square units (e.g., 1 ft^2 = 144 in^2).	**7.8.05** Solve problems involving unit conversions within the same measurement system for length, weight/mass, capacity, square units, and measures expressed as rates (e.g., converting feet/second to yards/minute).
Indirect Measurements and Scale Drawings			**7.5.07** Solve problems involving map interpretation (e.g., one inch represents five miles, so two inches represent ten miles).	**7.6.06** Solve problems involving scale drawings and maps.	**7.7.06** Solve problems involving scale drawings and maps.	**7.8.06** Solve problems involving scale drawings, maps, and indirect measurement (e.g., determining the height of a building by comparing its known shadow length to the known height and shadow length of another object).

Standard 8A – Representations, Patterns, and Expressions

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Patterns	**Calculators Not Allowed** **8.3.01** Determine a missing term in a pattern (sequence), describe a pattern (sequence), and extend a pattern (sequence) when given a description or pattern (sequence).	**Calculators Allowed** **8.4.01** Determine a missing term in a pattern (sequence), describe a pattern (sequence), and extend a pattern (sequence) when given a description or pattern (sequence).	**Calculators Allowed** **8.5.01** Determine a missing term in a sequence, extend a sequence, and identify errors in a sequence when given a description or sequence. **8.5.02** Construct and identify a rule that can generate the terms of a given sequence.	**Calculators Allowed** **8.6.01** Determine a missing term in a sequence, extend a sequence, and construct and identify a rule that can generate the terms of a given sequence (e.g., 3, 6, 9, . . . is explained by the rule $3n$, for $n \geq 1$).	**Calculators Allowed** **8.7.01** Determine a missing term in a sequence, extend a sequence, and construct and identify a rule that can generate the terms of an arithmetic or geometric sequence.	**Calculators Allowed** **8.8.01** Analyze, extend, and create sequences or linear functions, and determine algebraic expressions to describe the n^{th} term of a sequence.
Write and Simplify Expressions	**8.3.02** Write an expression to represent a given situation.	**8.4.02** Write an expression using letters or symbols to represent an unknown quantity.	**8.5.03** Write an expression using variables to represent unknown quantities.	**8.6.02** Write an expression using variables to represent unknown quantities.	**8.7.02** Write an expression using variables to represent unknown quantities. **8.7.03** Simplify algebraic expressions by identifying and combining like terms. **8.7.04** Recognize equivalent forms of algebraic expressions.	**8.8.02** Write an expression using variables to represent unknown quantities. **8.8.03** Simplify algebraic expressions. **8.8.04** Recognize and generate equivalent forms of algebraic expressions.
Evaluate Algebraic Expressions		**8.4.03** Evaluate algebraic expressions with a whole number variable value (e.g., evaluate $3 + m$ when $m = 4$).	**8.5.04** Evaluate algebraic expressions with a whole number variable value (e.g., evaluate $m + m + 3$ when $m = 4$).	**8.6.03** Evaluate algebraic expressions with up to two whole number variable values (e.g., evaluate $3m + n + 3$ when $m = 4$ and $n = 2$).	**8.7.05** Evaluate or simplify algebraic expressions with one or more integer variable values (e.g., $a^2 + b$ for $a = 3$ and $b = –4$).	**8.8.05** Evaluate or simplify algebraic expressions with one or more rational variable values (e.g., $3a^2 – b$ for $a = 3$ and $b = 7$).

Standard 8B – Connections Using Tables, Graphs, and Symbols

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Describing Change	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
		8.4.04 Identify or represent situations with well–defined patterns using words, tables, and graphs (e.g., represent temperature and time in a line graph).	**8.5.05** Demonstrate, in simple situations, how a change in one quantity results in a change in another quantity (e.g., input–output tables).	**8.6.04** Determine a rule having two operations from an input–output table (e.g., multiply by 3 and add 2).	**8.7.06** Determine how a change in one variable relates to a change in a second variable.	**8.8.06** Recognize, describe, and extend patterns using rate of change.
Coordinate System				**8.6.05** Select a table of values that satisfies a linear equation, and recognize the ordered pairs on a rectangular coordinate system.	**8.7.07** Represent linear equations and quantitative relationships on a rectangular coordinate system, and interpret the meaning of a specific part of a graph.	**8.8.07** Represent linear equations and quantitative relationships on a rectangular coordinate system, and interpret the meaning of a specific part of a graph.
Representations		**8.4.05** Translate between different representations (table, written, or pictorial) of whole number relationships.	**8.5.06** Translate between different representations (table, written, or pictorial) of whole number relationships.	**8.6.06** Translate between different representations (table, written, or pictorial) of whole number relationships.	**8.7.08** Translate between different representations (table, written, graphical, or pictorial) of whole number relationships and linear expressions.	**8.8.08** Translate between different representations (table, written, graphical, or pictorial) of whole number relationships and linear expressions.
						8.8.09 Interpret the meaning of slope and intercepts in linear situations.
Inequalities				**8.6.07** Identify graphs of inequalities on a number line.	**8.7.09** Identify, graph, and interpret inequalities on a number line.	**8.8.10** Identify, graph, and interpret up to two inequalities with a single variable (including the intersection or union of these inequalities) on a number line.

Standards 8C, 8D – Writing, Interpreting, and Solving Equations

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Write Equations and Inequalities	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	8.3.03 Represent simple mathematical relationships with number sentences (equations and inequalities).	**8.4.06** Represent simple mathematical relationships with number sentences (equations and inequalities).	**8.5.07** Represent problems with equations and inequalities.	**8.6.08** Represent problems with equations and inequalities.	**8.7.10** Represent and analyze problems with linear equations and inequalities.	**8.8.11** Represent and analyze problems with linear equations and inequalities.
Solve Equations and Inequalities	**8.3.04** Solve one–step addition and subtraction equations that have a missing number or missing operation sign (e.g., 3+□=5, 6 □ 1=7).	**8.4.07** Solve for the unknown in an equation with one operation (e.g., 10=□+3+2, □–1=3).	**8.5.08** Solve for the unknown in an equation with one operation (e.g., 2+n=20, $n \div 2$=6).	**8.6.09** Solve for the unknown in an equation with one operation (e.g., 8x = 24, $m \div 2$=25).	**8.7.11** Solve linear equations in one variable (e.g., 2x + 3 = 13) and inequalities involving < or > (e.g., 2x<6, x+7>10).	**8.8.12** Solve linear equations and inequalities in one variable over the rational numbers (e.g., 5x+7= –13, 4x–3= –7x+8, –2x+3>–5).
	8.3.05 Solve word problems involving unknown quantities.	**8.4.08** Solve word problems involving unknown quantities.	**8.5.09** Solve word problems involving unknown quantities.	**8.6.10** Solve word problems involving unknown quantities.	**8.7.12** Solve word problems involving unknown quantities.	**8.8.13** Solve word problems involving unknown quantities.

Standard 9A – Properties of Single Figures and Coordinate Geometry

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
	Calculators Not Allowed	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
Properties of Single Figures	**9.3.01** Identify, describe, and sketch two–dimensional shapes (triangles, squares, rectangles, pentagons, hexagons, and octagons) according to the number of sides, length of sides, and number of vertices.	**9.4.01** Identify, describe, and sketch two–dimensional shapes (triangles, quadrilaterals, pentagons, hexagons, and octagons) according to the number of sides, length of sides, number of vertices, and right angles.	**9.5.01** Classify, describe, and sketch two–dimensional shapes (triangles, quadrilaterals, pentagons, hexagons, and octagons) according to the number of sides, length of sides, number of vertices, and interior angles (right, acute, obtuse).	**9.6.01** Classify, describe, and sketch regular and irregular two–dimensional shapes according to the number of sides, length of sides, number of vertices, and interior angles.	**9.7.01** Classify, describe, and sketch regular and irregular two–dimensional shapes according to the number of sides, length of sides, number of vertices, and interior angles.	
	9.3.02 Identify and describe three–dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, vertices).	**9.4.02** Identify and describe three–dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, vertices).	**9.5.02** Identify and describe three–dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, vertices).	**9.6.02** Identify and describe three–dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, vertices).	**9.7.02** Solve problems involving two– and three–dimensional shapes.	**9.8.01** Solve problems involving two– and three–dimensional shapes.
		9.4.03 Differentiate between polygons and non–polygons	**9.5.03** Solve problems using properties of triangles (e.g., sum of interior angles of a triangle is 180°).	**9.6.03** Solve problems using properties of triangles and quadrilaterals (e.g., sum of interior angles of a quadrilateral is 360°).	**9.7.03** Solve problems using properties of triangles and quadrilaterals (e.g., opposite sides of a parallelogram are congruent).	**9.8.02** Solve problems that require knowledge of triangle and quadrilateral properties (e.g., triangle inequality).
						9.8.03 Find the length of any side of a right triangle using the Pythagorean theorem (whole number solutions).
Circles			**9.5.04** Identify, describe, and sketch circles, including radius and diameter.	**9.6.04** Identify, describe, and sketch circles, including radius, diameter, and chord.	**9.7.04** Identify, describe, and determine the radius and diameter of a circle.	**9.8.04** Identify, describe, and determine the radius, diameter, and circumference of a circle and their relationship to each other and to pi.

Standard 9A – Properties of Single Figures and Coordinate Geometry (Continued)

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Coordinate Geometry	**Calculators Not Allowed** **9.3.03** Locate and identify points using numbers and symbols on a grid, and describe how points relate to each other on a grid (e.g., ♥ is 2 units below ☼, point A is 3 units to the right of point B).	**Calculators Allowed** **9.4.04** Graph, locate, identify points, and describe paths using ordered pairs (first quadrant).	**Calculators Allowed** **9.5.05** Graph, locate, identify points, and describe paths using ordered pairs (first quadrant).	**Calculators Allowed** **9.6.05** Graph, locate, identify points, describe paths, and plot figures using ordered pairs (first quadrant).	**Calculators Allowed** **9.7.05** Graph points and identify coordinates of points on the Cartesian coordinate plane (all four quadrants). **9.7.06** Represent and identify geometric figures using coordinate geometry.	**Calculators Allowed** **9.8.05** Graph points, and identify coordinates of points on the Cartesian coordinate plane (all four quadrants). **9.8.06** Represent and identify geometric figures using coordinate geometry, including those resulting from transformations.
Symmetry	**9.3.04** Identify whether or not a figure has a line of symmetry, and sketch or identify the line of symmetry.	**9.4.05** Identify whether or not a figure has one or more lines of symmetry, and sketch or identify all lines of symmetry.	**9.5.06** Identify whether or not a figure has one or more lines of symmetry, and sketch or identify all lines of symmetry.			
Transformations	**9.3.05** Identify images resulting from flips (reflections), slides (translations), or turns (rotations).	**9.4.06** Identify images resulting from flips (reflections), slides (translations), or turns (rotations).	**9.5.07** Identify, describe, and predict results of reflections, translations, and rotations of two–dimensional shapes.	**9.6.06** Identify, describe, and predict results of reflections, translations, and rotations of two–dimensional shapes.	**9.7.07** Analyze the results of a combination of transformations.	**9.8.07** Analyze the results of a combination of transformations, and determine a different transformation that could produce the same result.
Lines, Segments, Rays, and Angles	**9.3.06** Identify parallel lines.	**9.4.07** Identify and sketch parallel and perpendicular lines. **9.4.08** Identify and sketch right angles.	**9.5.08** Identify and sketch parallel, perpendicular, and intersecting lines. **9.5.09** Identify and sketch acute, right, and obtuse angles.	**9.6.07** Identify and sketch parallel, perpendicular, and intersecting lines. **9.6.08** Identify and sketch acute, right, and obtuse angles.	**9.7.08** Identify or analyze relationships of angles formed by intersecting lines. **9.7.09** Identify and sketch acute, right, and obtuse angles. **9.7.10** Solve problems involving complementary and supplementary angles.	**9.8.08** Identify or analyze relationships of angles formed by intersecting lines (including parallel lines cut by a transversal) and angles formed by radii of a circle. **9.8.09** Solve problems involving vertical, complementary, and supplementary angles.

Standard 9B – Relationships Between and Among Multiple Figures

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Relationships Between Two– and Three–Dimensional Objects	**Calculators Not Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
	9.3.07 Identify the two–dimensional components of a three–dimensional object (e.g., a cube has square faces).	**9.4.09** Identify the two–dimensional components of a three–dimensional object.	**9.5.10** Identify the two–dimensional components of a three–dimensional object.			
	9.3.08 Identify a three–dimensional object from its net.	**9.4.10** Identify a three–dimensional object from its net.	**9.5.11** Identify a three–dimensional object from its net.	**9.6.09** Identify a three–dimensional object from its net.	**9.7.11** Identify a three–dimensional object from its net.	**9.8.10** Identify front, side, and top views of a three–dimensional solid built with cubes.
Composing and Decomposing Figures	**9.3.09** Predict the result of putting shapes together (composing) and taking them apart (decomposing).	**9.4.11** Predict the result of composing or decomposing shapes or figures.	**9.5.12** Predict the result of composing or decomposing shapes or figures.	**9.6.10** Recognize which attributes (such as shape, perimeter, and area) change or don't change when plane figures are composed, decomposed, or rearranged.	**9.7.12** Recognize which attributes (such as shape, perimeter, and area) change or don't change when plane figures are composed, decomposed, or rearranged.	
Congruency and Similarity	**9.3.10** Identify congruent and similar figures by visual inspection.	**9.4.12** Identify congruent and similar figures by visual inspection.	**9.5.13** Identify congruent and similar figures by visual inspection.	**9.6.11** Identify congruent and similar figures by visual inspection.	**9.7.13** Describe the difference between congruence and similarity.	**9.8.11** Solve problems involving congruent and similar figures.
			9.5.14 Determine if figures are similar, and identify relationships between corresponding parts of similar figures.	**9.6.12** Determine if figures are similar, and identify relationships between corresponding parts of similar figures.	**9.7.14** Determine if figures are similar, and identify relationships between corresponding parts of similar figures.	
Distance	**9.3.11** Determine the distance between two points on the number line in whole numbers.	**9.4.13** Determine the distance between two points on the number line in whole numbers.	**9.5.15** Determine the distance between two points on a horizontal or vertical number line in whole numbers.	**9.6.13** Determine the distance between two points on a horizontal or vertical number line.	**9.7.15** Determine the distance between two points on a horizontal or vertical number line.	**9.8.12** Relate absolute value to distance on the number line.

Standard 9C – Justifications of Conjectures and Conclusions

This standard is not assessed in isolation. Rather, its essence is assessed indirectly through problems that require this type of thinking.

Standard 9D – Trigonometry

This standard is not assessed on the state assessment until grade 11.

Standards 10A, 10B – Data Analysis and Statistics

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
	Calculators Not Allowed	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**	**Calculators Allowed**
Read and Interpret Displays	**10.3.01** Read and interpret data represented in a pictograph, bar graph, Venn diagram (with two circles), tally chart, or table.	**10.4.01** Read and interpret data represented in a pictograph, bar graph, line (dot) plot, Venn diagram (with two circles), tally chart, table, line graph, or circle graph.	**10.5.01** Read, interpret, and make predictions from data represented in a pictograph, bar graph, line (dot) plot, Venn diagram (with two circles), chart/table, line graph, or circle graph.	**10.6.01** Read, interpret, and make predictions from data represented in a bar graph, line (dot) plot, Venn diagram (with two circles), chart/table, line graph, or circle graph.	**10.7.01** Read, interpret, and make predictions from data represented in a bar graph, line (dot) plot, Venn diagram (with two circles), chart/table, line graph, scatterplot, circle graph, or histogram.	**10.8.01** Read, interpret (including possible misleading characteristics), and make predictions from data represented in a bar graph, line (dot) plot, Venn diagram (with two or three circles), chart/table, line graph, scatterplot, circle graph, stem–and–leaf plot, or histogram.
				10.6.02 Compare different representations of the same data.	**10.7.02** Compare different representations of the same data.	**10.8.02** Compare and contrast the effectiveness of different representations of the same data.
Complete and Create Displays	**10.3.02** Complete missing parts of a pictograph, bar graph, tally chart, or table for a given set of data.	**10.4.02** Create a pictograph, bar graph, tally chart, or table for a given set of data.	**10.5.02** Create a pictograph, bar graph, chart/table, or line graph for a given set of data.	**10.6.03** Create a bar graph, chart/table, line graph, or circle graph with common referents (1/4, 50%, .75) for a given set of data.	**10.7.03** Create a bar graph, chart/table, line graph, or circle graph for a given set of data.	**10.8.03** Create a bar graph, chart/table, line graph, or circle graph and solve a problem using the data in the graph for a given set of data.
Line of Best Fit					**10.7.04** Identify a reasonable approximation of the line of best fit from a set of data or a scatter plot.	**10.8.04** Identify or draw a reasonable approximation of the line of best fit from a set of data or a scatter plot, and use the line to make predictions.
Statistics	**10.3.03** Determine the mode, given a set of data or a graph.	**10.4.03** Determine the mode and range, given a set of data or a graph.	**10.5.03** Determine the mode, range, median (with an odd number of data points), and mean, given a set of data or a graph.	**10.6.04** Determine the mode, range, median, and mean, given a set of data or a graph.	**10.7.05** Determine and use the mode, range, median, and mean to interpret data.	**10.8.05** Analyze and apply measures of central tendency (mode, range, median, and mean) in problem–solving situations.

Standard 10C – Probability

	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Probability	**Calculators Not Allowed** **10.3.04** Classify events using words such as certain, most likely, equally likely, least likely, possible, and impossible.	**Calculators Allowed** **10.4.04** Classify events using words such as certain, most likely, equally likely, least likely, possible, and impossible.	**Calculators Allowed** **10.5.04** Solve problems involving the probability of a simple event, including representing the probability as a fraction between zero and one.	**Calculators Allowed** **10.6.05** Solve problems involving the probability of a simple event, including representing the probability as a fraction, decimal, or percent.	**Calculators Allowed** **10.7.06** Solve problems involving the probability of a simple or compound event, including representing the probability as a fraction, decimal, or percent.	**Calculators Allowed** **10.8.06** Solve problems involving the probability of an event composed of repeated trials, compound events (including independent events), or future events with or without replacement.
	10.3.05 Describe the chances associated with a context presented visually, including using the response format "3 out of 4."	**10.4.05** Describe the chances associated with a context presented visually, including using the response format "3 out of 4" or ¾.				
Outcomes and Counting Principles			**10.5.05** Apply the fundamental counting principle in a simple problem (e.g., How many different combinations of one–scoop ice cream cones can be made with 3 flavors and 2 types of cones?).	**10.6.06** Apply the fundamental counting principle in a simple problem (e.g., How many different 3–digit numbers can be made with the digits 1, 2, and 2?).	**10.7.07** Represent all possible outcomes for simple events.	**10.8.07** Represent all possible outcomes (sample space) for simple or compound events (e.g., tables, grids, tree diagrams).
					10.7.08 Solve simple problems involving the number of ways objects can be arranged (permutations and combinations).	**10.8.08** Solve simple problems involving the number of ways objects can be arranged (permutations and combinations).