MATH PROBLEM CHECKLIST

NUMBER & OPERATIONS STANDARD FOR GRADES PRE-K – 2

PLEASE CHECK YES FOR THE AREAS THAT REQUIRE INTERVENTION	YES
Count with understanding and recognize "how many" in sets of objects	
Use multiple models to develop initial understandings of place value and the base-ten number system	
Develop understanding of the relative position and magnitude of whole numbers and of ordinal and cardinal numbers and their connections	
Develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers	
Connect number words and numerals to the quantities they represent, using various physical models and representations	
Understand and represent commonly used fractions, such as 1/4, 1/3, and 1/2	
Understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations	
Understand the effects of adding and subtracting whole numbers	
Understand situations that entail multiplication and division, such as equal groupings of objects and sharing equally	
Develop and use strategies for whole-number computations, with a focus on addition and subtraction	
Develop fluency with basic number combinations for addition and subtraction	
Use a variety of methods and tools to compute, including objects, mental computation, estimation, paper and pencil, and calculators	

ALGEBRA STANDARD FOR GRADES PRE-K – 2

	YES
Sort, classify, and order objects by size, number, and other properties	
Recognize, describe, and extend patterns such as sequences of sounds and shapes or simple numeric patterns and translate from one representation to another	
Analyze how both repeating and growing patterns are generated	
Illustrate general principles and properties of operations, such as commutativity, using specific numbers	
Use concrete, pictorial, and verbal representations to develop an understanding of invented and conventional symbolic notations	
Model situations that involve the addition and subtraction of whole numbers, using objects, pictures, and symbols	
Describe qualitative change, such as a student's growing taller	
Describe quantitative change, such as a student's growing two inches in one year	

GEOMETRY STANDARD FOR GRADES PRE-K – 2

	YES
Recognize, name, build, draw, compare, and sort two- and three-dimensional shapes	
Describe attributes and parts of two- and three-dimensional shapes	
Investigate and predict the results of putting together and taking apart two- and three-dimensional shapes	
Describe, name, and interpret relative positions in space and apply ideas about relative position	
Describe, name, and interpret direction and distance in navigating space and apply ideas about direction and distance	
Find and name locations with simple relationships such as "near to" and in coordinate systems such as maps	
Recognize and apply slides, flips, and turns	
Recognize and create shapes that have symmetry	
Create mental images of geometric shapes using spatial memory and spatial visualization	
Recognize and represent shapes from different perspectives	
Relate ideas in geometry to ideas in number and measurement	
Recognize geometric shapes and structures in the environment and specify their location	

MEASUREMENT STANDARD FOR GRADES PRE-K – 2

	YES
Recognize the attributes of length, volume, weight, area, and time	
Compare and order objects according to these attributes	
Understand how to measure using nonstandard and standard units	
Select an appropriate unit and tool for the attribute being measured	
Measure with multiple copies of units of the same size, such as paper clips laid end to end	
Use repetition of a single unit to measure something larger than the unit, for instance, measuring the length of a room with a single meter stick	
Use tools to measure	
Develop common referents for measures to make comparisons and estimates	

DATA ANALYSIS AND PROBABILITY STANDARD FOR GRADES PRE-K – 2

	YES
Pose questions and gather data about themselves and their surroundings	
Sort and classify objects according to their attributes and organize data about the objects	
Represent data using concrete objects, pictures, and graphs	
Describe parts of the data and the set of data as a whole to determine what the data show	
Discuss events related to students' experiences as likely or unlikely	

PROBLEM SOLVING STANDARD FOR GRADES PRE-K – 2

	YES
Build new mathematical knowledge through problem solving	
Solve problems that arise in mathematics and in other contexts	
Apply and adapt a variety of appropriate strategies to solve problems	
Monitor and reflect on the process of mathematical problem solving	

REASONING AND PROOF STANDARD FOR GRADES PRE-K – 2

	YES
Recognize reasoning and proof as fundamental aspects of mathematics	
Make and investigate mathematical conjectures	
Develop and evaluate mathematical arguments and proofs	
Select and use various types of reasoning and methods of proof	

COMMUNICATIONS STANDARD FOR GRADES PRE-K – 2

	YES
Organize and consolidate their mathematical thinking through communication	
Communicate their mathematical thinking coherently and clearly to peers, teachers, and others	
Analyze and evaluate the mathematical thinking and strategies of others	
Use the language of mathematics to express mathematical ideas precisely	

CONNECTIONS STANDARD FOR GRADES PRE-K – 2

	YES
Recognize and use connections among mathematical ideas	
Understand how mathematical ideas interconnect and build on one another to produce a coherent whole	
Recognize and apply mathematics in contexts outside of mathematics	

REPRESENTATION STANDARD FOR GRADES PRE-K – 2

	YES
Create and use representations to organize, record, and communicate mathematical ideas	
Select, apply, and translate among mathematical representations to solve problems	
Use representations to model and interpret physical, social, and mathematical phenomena	

NUMBER AND OPERATIONS STANDARD FOR GRADES 3-5

	YES
Understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals;	
Recognize equivalent representations for the same number and generate them by decomposing and composing numbers;	
Develop understanding of fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers;	
Use models, benchmarks, and equivalent forms to judge the size of fractions;	
Recognize and generate equivalent forms of commonly used fractions, decimals, and percents;	
Explore numbers less than 0 by extending the number line and through familiar applications;	
Describe classes of numbers according to characteristics such as the nature of their factors.	
Understand various meanings of multiplication and division;	
Understand the effects of multiplying and dividing whole numbers;	
Identify and use relationships between operations, such as division as the inverse of multiplication, to solve problems;	
Understand and use properties of operations, such as the distributivity of multiplication over addition.	
Develop fluency with basic number combinations for multiplication and division and use these combinations to mentally compute related problems, such as 30 x 50;	
Develop fluency in adding, subtracting, multiplying, and dividing whole numbers;	

Develop and use strategies to estimate the results of whole-number computations and to judge the reasonableness of such results;	
Develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience;	
Use visual models, benchmarks, and equivalent forms to add and subtract commonly used fractions and decimals;	
Select appropriate methods and tools for computing with whole numbers from among mental computation, estimation, calculators, and paper and pencil according to the context and nature of the computation and use the selected method or tools.	

ALGEBRA STANDARD FOR GRADES 3–5

	YES
Describe, extend, and make generalizations about geometric and numeric patterns;	
Represent and analyze patterns and functions, using words, tables, and graphs.	
Identify such properties as commutativity, associativity, and distributivity and use them to compute with whole numbers;	
Represent the idea of a variable as an unknown quantity using a letter or a symbol;	
Express mathematical relationships using equations.	
Model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.	
Investigate how a change in one variable relates to a change in a second variable;	
Identify and describe situations with constant or varying rates of change and compare them.	

GEOMETRY STANDARD FOR GRADES 3–5

	YES
Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes;	
Classify two- and three-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles and pyramids;	
Investigate, describe, and reason about the results of subdividing, combining, and transforming shapes;	
Explore congruence and similarity;	
Make and test conjectures about geometric properties and relationships and develop logical arguments to justify conclusions.	
Describe location and movement using common language and geometric vocabulary;	
Make and use coordinate systems to specify locations and to describe paths;	
Find the distance between points along horizontal and vertical lines of a coordinate system.	
Predict and describe the results of sliding, flipping, and turning two-dimensional shapes;	
Describe a motion or a series of motions that will show that two shapes are congruent;	
Identify and describe line and rotational symmetry in two- and three-dimensional shapes and designs.	
Build and draw geometric objects;	
Create and describe mental images of objects, patterns, and paths;	

Revised 11-28-06

Identify and build a three-dimensional object from two-dimensional representations of that object;	
Identify and draw a two-dimensional representation of a three-dimensional object;	
Use geometric models to solve problems in other areas of mathematics, such as number and measurement;	
Recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.	

MEASUREMENT STANDARD FOR GRADES 3–5

	YES
Understand such attributes as length, area, weight, volume, and size of angle and select the appropriate type of unit for measuring each attribute;	
Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems;	
Carry out simple unit conversions, such as from centimeters to meters, within a system of measurement;	
Understand that measurements are approximations and how differences in units affect precision;	
Explore what happens to measurements of a two-dimensional shape such as its perimeter and area when the shape is changed in some way.	
Develop strategies for estimating the perimeters, areas, and volumes of irregular shapes;	
Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles;	
Select and use benchmarks to estimate measurements;	
Develop, understand, and use formulas to find the area of rectangles and related triangles and parallelograms;	
Develop strategies to determine the surface areas and volumes of rectangular solids.	

DATA ANALYSIS AND PROBABILITY STANDARD FOR GRADES 3-5

	YES
Design investigations to address a question and consider how data-collection methods affect the nature of the data set;	
Collect data using observations, surveys, and experiments;	
Collect data using observations, surveys, and experiments;	
Recognize the differences in representing categorical and numerical data.	
Describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed;	
Use measures of center, focusing on the median, and understand what each does and does not indicate about the data set;	
Compare different representations of the same data and evaluate how well each representation shows important aspects of the data.	
Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.	
Describe events as likely or unlikely and discuss the degree of likelihood using such words as *certain, equally likely,* and *impossible;*	
Predict the probability of outcomes of simple experiments and test the predictions;	
Understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.	

PROBLEM SOLVING STANDARD FOR GRADES 3–5

	YES
Build new mathematical knowledge through problem solving;	
Solve problems that arise in mathematics and in other contexts;	
Apply and adapt a variety of appropriate strategies to solve problems;	
Monitor and reflect on the process of mathematical problem solving.	

NUMBER AND OPERATIONS STANDARD FOR GRADES 6–8

	YES
Work flexibly with fractions, decimals, and percents to solve problems;	
Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line;	
Develop meaning for percents greater than 100 and less than 1;	
Understand and use ratios and proportions to represent quantitative relationships;	
Develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation;	
Use factors, multiples, prime factorization, and relatively prime numbers to solve problems;	
Develop meaning for integers and represent and compare quantities with them.	
Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers;	
Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals;	
Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.	
Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods;	
Develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use;	

Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results;	
Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios.	

ALGEBRA STANDARD FOR GRADES 6–8

	YES
Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules;	
Relate and compare different forms of representation for a relationship;	
Identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations.	
Develop an initial conceptual understanding of different uses of variables;	
Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope;	
Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships;	
Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations	
Model and solve contextualized problems using various representations, such as graphs, tables, and equations.	
Use graphs to analyze the nature of changes in quantities in linear relationships.	

GEOMETRY STANDARD FOR GRADES 6–8

	YES
Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties;	
Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects;	
Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the pythagorean relationship.	
Use coordinate geometry to represent and examine the properties of geometric shapes;	
Use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides.	
Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling;	
Examine the congruence, similarity, and line or rotational symmetry of objects using transformations.	
Draw geometric objects with specified properties, such as side lengths or angle measures;	
Use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume;	
Use visual tools such as networks to represent and solve problems;	
Use geometric models to represent and explain numerical and algebraic relationships;	
Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life.	

MEASUREMENT STANDARD FOR GRADES 6–8

	YES
Understand both metric and customary systems of measurement;	
Understand relationships among units and convert from one unit to another within the same system;	
Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.	
Use common benchmarks to select appropriate methods for estimating measurements;	
Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision;	
Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and develop strategies to find the area of more-complex shapes;	
Develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders;	
Solve problems involving scale factors, using ratio and proportion;	
Solve simple problems involving rates and derived measurements for such attributes as velocity and density.	

DATA ANALYSIS AND PROBABILITY STANDARDS FOR GRADES 6-8

	YES
Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;	
Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatter plots.	
Find, use, and interpret measures of center and spread, including mean and interquartile range;	
Discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatter plots.	
Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken;	
Make conjectures about possible relationships between two characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit;	
Use conjectures to formulate new questions and plan new studies to answer them.	
Understand and use appropriate terminology to describe complementary and mutually exclusive events;	
Understand and use appropriate terminology to describe complementary and mutually exclusive events;	

Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models.	

NUMBER AND OPERATIONS STANDARD FOR GRADES 9-12

	YES
Develop a deeper understanding of very large and very small numbers and of various representations of them	
Compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions	
Understand vectors and matrices as systems that have some of the properties of the real-number system	
Use number-theory arguments to justify relationships involving whole numbers	
Judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities	
Develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices	
Develop an understanding of permutations and combinations as counting techniques	
Develop fluency in operations with real numbers, vectors, and matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more-complicated cases	
Judge the reasonableness of numerical computations and their results	

ALGEBRA STANDARD FOR GRADES 9-12

	YES
Generalize patterns using explicitly defined and recursively defined functions	
Understand relations and functions and select, convert flexibly among, and use various representations for them	
Analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior	
Understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions	
Understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions	
Interpret representations of functions of two variables	
Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations	
Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases	
Use symbolic algebra to represent and explain mathematical relationships	
Use a variety of symbolic representations, including recursive and parametric equations, for functions and relations	
Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology	
Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships	

Revised 11-28-06

Use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts	
Draw reasonable conclusions about a situation being modeled	
Approximate and interpret rates of change from graphical and numerical data	

GEOMETRY STANDARD FOR GRADES 9-12

	YES
Analyze properties and determine attributes of two- and three-dimensional objects	
Explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them	
Establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others	
Use trigonometric relationships to determine lengths and angle measures	
Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations	
Investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates	
Understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices	
Use various representations to help understand the effects of simple transformations and their compositions	
Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools	
Visualize three-dimensional objects and spaces from different perspectives and analyze their cross sections	
Use vertex-edge graphs to model and solve problems	
Use geometric models to gain insights into, and answer questions in, other areas of mathematics	
Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture	

MEASUREMENT STANDARD FOR GRADES 9-12

	YES
Make decisions about units and scales that are appropriate for problem situations involving measurement	
Analyze precision, accuracy, and approximate error in measurement situations	
Understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders	
Apply informal concepts of successive approximation, upper and lower bounds, and limit in measurement situations	
Use unit analysis to check measurement computations	

DATA ANALYSIS AND PROBABILITY STANDARD FOR GRADES 9-12

	YES
Understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each	
Know the characteristics of well-designed studies, including the role of randomization in surveys and experiments	
Understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable	
Understand histograms, parallel box plots, and scatter plots and use them to display data	
Compute basic statistics and understand the distinction between a statistic and a parameter	
For univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics	
For bivariate measurement data, be able to display a scatter plot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools	
Display and discuss bivariate data where at least one variable is categorical	
Recognize how linear transformations of univariate data affect shape, center, and spread	
Identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled	
Use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions	
Understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference	

Evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions	
Understand how basic statistical techniques are used to monitor process characteristics in the workplace	
Understand the concepts of sample space and probability distribution and construct sample spaces and distributions in simple cases	
Use simulations to construct empirical probability distributions	
Compute and interpret the expected value of random variables in simple cases	
Understand the concepts of conditional probability and independent events	
Understand how to compute the probability of a compound event	