

MATH

Number and Operations

1. Understand numbers, ways of representing numbers, relationships among numbers and number systems.

Grade Kindergarten

1. Rote count to 100

Recognize numbers to 31

2. Understand the concept of fractions with various models.

Recognize fraction of $\frac{1}{2}$ in various models

3. Represent quantities using concrete objects

Use manipulatives to create and break numbers apart to form equivalent values to 10 ex. $4=3+1$ $4=2+2$

Grade 1

1. Read, write, and compare whole numbers less than 100.

2. Understand the concept of fractions with various models.

❖ One half

❖ One fourth

3. Compose or decompose, create or break numbers apart, whole numbers up to 20 using multiple strategies.

❖ Known facts

❖ Doubles and close to doubles

❖ Tens and ones place value

4. Skip count by 2s, 5s, and 10s.

Grade 2

1. Compare, compose, decompose and represent numbers 100-1000 by identifying place values.

2. Recognize, represent and understand the concept of unit fractions of various models.

Grade 3

1. Understand place value and be able to represent whole numbers by decomposing and composing whole numbers up to 10,000.

2. Classify numbers by odd and even.

3. Use various models for the understanding of fractions.

Grade 4

- 1. Judge the size of fractions using models, benchmarks, and equivalent fractions.**
- 2. Classify and describe multiples and factors.**
- 3. Read, write, and compare numbers up to 100,000.**

Grade 5

- 1. Recognize, compare, and generate whole numbers from 100,000 to 1,000,000**
- 2. Recognize, compare, and generate commonly used fractions and decimals to the hundredths.**
- 3. Characterize whole numbers, including common factors and multiples, prime, composite, or square.**

Grade 6

- 1. Compare fractions, decimals and percents in order and place on a number line.**

Grade 7

- 1. Compare and order fractions, decimals, percent and locate each on a number line.**
- 2. Write equivalent values for fractions, decimals, percent.**

Grade 8

- 1. Use flexibility to evaluate and solve problems involving fractions, decimals, and percents.**

Grade – Algebra I

- 1. Compare and contrast the properties of numbers and number systems.**
- 2. Understand different ways of representing very large and very small numbers.**

Grade – Algebra II

- 1. Compare and contrast the properties of rational and irrational numbers and number systems including finding their approximate locations on a number line.**
- 2. Understand complex numbers as solutions to quadratic equations that do not have real solutions.**

3. Understand matrices as systems that have some of the properties of the real number system.
4. Use number theory arguments to justify relationships involving whole numbers.

II. Understand meanings of operations and how they relate to one another.

Grade – Kindergarten

1. Use manipulatives to solve problems.

Grade 1

1. Represent / model a given situation involving addition and subtraction of whole numbers using pictures, objects, or symbols.
2. Solve word problems for addition and subtraction.
3. Write a number sentence, using pictures, objects, symbols to show your answer.

Grade 2

1. Solve a variety of 2 digit addition and subtraction problems using various models.

Grade 3

1. Use problem solving strategies to show the relationship between addition and subtraction.

Grade 4

1. Represent and recognize multiplication and related division using various models. (sets, arrays)
2. Show the relationship between multiplication and division.

Grade 5

1. Represent division of 3 digits by 2 digits using quotative and partitive models (number of groups or size of group).

Grade 6

1. Identify common cubes and roots.
2. Realize the effects of multiplication and division on fractions and decimals.

Grade 7

- 1. Understand inverse operations and distributive property in order to apply rules of order of operations with rational numbers.**

Grade 8

- 1. Apply properties of operations to all rational numbers including order of operations and opposite operations.**

Grade Algebra I

- 1. Judge the effects of operations such as multiplication, division, and computing powers and roots on the magnitude of quantities.**
- 2. Develop an understanding of changing the order of set elements and combinations as counting techniques.**

Grade Algebra II

- 1. Develop an understanding of permutations and combinations as counting techniques.**
- 2. Develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices.**
- 3. Apply arithmetic operators to matrices and complex numbers.**

III. Compute fluently and make reasonable estimates.

Grade Kindergarten

- 1. Connect number words (orally) and quantities they represent.**
- 2. Given a number orally, student will find the correct represented quantity.**

Grade 1

- 1. Represent the mental strategy used to compute addition and subtraction problems fluently for sums up to 20.**

Grade 2

- 1. Use a variety of models and strategies to add and subtract 2 digit numbers including mental computation and estimation.**

Grade 3

- 1. Using pictures, arrays, or repeated addition/subtraction, develop fluency with multiplication and division up to factors of 9.**
- 2. Apply and describe strategies used to compute up to a 3 digit addition or subtraction problem.**

3. Estimate and justify sums and differences of whole numbers.

Grade 4

- 1. Develop fluency with basic number relationship (facts) of multiplications and division using factors from 10-12.**
- 2. Estimate, justify and compute up to 2 digit x 2 digit multiplication using various strategies.**
- 3. Compute 3 x 1 digit division using various strategies ending with a common algorithm.**

Grade 5

- 1. Characterize common factors and common multiples.**
- 2. Demonstrate and describe procedures for adding and subtracting decimals and fractions with unlike denominators.**
- 3. Estimate products and quotients of whole numbers and the sums and differences of decimals and fractions.**

Grade 6

- 1. Multiply and divide positive rational numbers and estimate and justify the results of multiplication and division.**
- 2. Solve problems using equivalent ratios.**

Grade 7

- 1. Apply the 4 basic operations to all rational numbers.**
- 2. Solve problems involving proportions such as scaling and finding equivalent ratios.**

Grade Algebra I

- 1. Form an opinion of the reasonableness of numerical computations and their results.**

Grade Algebra II

- 1. Solve problems involving proportions**
- 2. Judge the reasonableness of numerical computations and their results, including complex numbers.**

Algebraic Relationships

1. Understand patterns, relations and functions.

Grade Kindergarten

1. Recognize, repeat, create, and/or continue patterns of various kinds.

Grade 1

1. Describe how simple repeating patterns of various kinds are generated using simple numeric patterns. (ABAB, 123123)

Grade 2

1. Recognize, describe and extend patterns such as simple numeric patterns (skip counting).

Grade 3

1. Extend geometric and numeric patterns.
2. Represent patterns using words, tables, and graphs.

Grade 4

1. Describe and analyze geometric and numeric patterns using words, tables, and graphs.

Grade 5

1. Represent and generalize patterns using words, table, and graphs.

Grade 6

1. Show and discuss a variety of patterns with tables, graphs, words and when possible, symbolic rules.

Grade 7

1. Compare and contrast patterns by using graphs, charts, words, and symbolic rules, including recursive notation.
2. Identify functions as linear or non-linear from graphs, tables, or equations.

Grade 8

1. Use a variable to compose graphic and numerical patterns into word or symbolic rules.

Grade Algebra I

1. Generalize patterns using explicitly defined and recursively defined functions.
2. 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.

Grade Algebra II

1. Compare properties of linear, exponential logarithmic and rational functions.
2. Develop an understanding of relations and functions and compare and contrast the properties.
3. Describe the effects of parameter changes on functions including investigating rates of change, intercepts, zeros, and asymptotes.

II. Represent and analyze mathematical situations and structures using algebraic symbols.

Grade 1

1. Write a number sentence using the commutative property ($3+4=4+3$) and the associative property ($(9+8)+2=9+(8+2)$)

Grade 2

1. Use number sentences to solve addition and subtraction problems by using commutative and associative properties.

Grade 3

1. Represent a mathematical situation as a number sentence.
2. Use the commutative, distributive, and associative properties for basic facts of whole numbers.

Grade 4

1. Use the commutative, distributive, and associative properties of addition and multiplication for multi-digit numbers.
2. Represent mathematical situations using expression or equations.

Grade 5

1. Using a letter or symbol, represent a mathematical situation as an expression or an equation with all operations.

2. Demonstrate the commutative, distributive, and associative properties for fractions and decimals.

Grade 6

1. Use symbolic algebra, commutative, distributive and associative properties to generate expressions and solve simple one step equations.

Grade 7

1. Use variables and associative, commutative, and distributive properties to solve simple expressions and one step equations that include rational numbers.

Grade 8

**1. Use variables to represent and solve linear relationships.
2. Use properties of rational numbers to rewrite equivalent forms of algebraic expressions.**

Grade Algebra I

1. Use and solve equivalent forms of equations, expressions, and relations.

Grade Algebra II

**1 Use symbolic algebra to represent and solve problems that involve exponential, quadratic, and logarithmic relations.
2. Describe and use inverse and composite functions.
3. Use and solve equivalent forms of equations and inequalities and systems of equations.**

III. Use mathematical models to represent and understand quantitative relationships.

Grade Kindergarten

1. Model situations that involve whole numbers, using pictures, objects or symbols.

Grade 1

1. Model situations that involve the addition of whole numbers, using pictures, objects or symbols.

Grade 2

1. Use illustrations, objects, or symbols to model situations that involve addition and subtraction of whole numbers.

Grade 3

1. Model problem situations for multiplication with objects or drawings.

Grade 4

1. Model problem situations using graphs, tables, or number sentences.

Grade 5

1. Model problem situations and draw conclusions using representations such as graphs, tables, or number sentences.

Grade 6

1. Use graph, tables, and charts to make algebraic equations.

Grade 7

1. Model and solve problems using various representations such as graphs, tables, and equations.

Grade – Algebra I

1. Identify quantitative relationships and determine the type or types of functions that might model the relationship.

Grade – Algebra II

1. Use linear programming to model and solve “real-life” problems.

IV. Analyze change in various contexts.

Grade 3

1. Graph the changes in a given amount over a period of time.

Grade 4

1. Identify and describe situations with a constant rate of change.

Grade 5

1. Model problem situations with constant or varying rates of change.

Grade 6

1. Compare situations with constant or varying rates of change

Grade 7

1. Compare situations with varying rates of change.

Grade 8

1. Compare slope based on the changes in the terms within a linear equation.

Grade Algebra I

1. Approximate and interpret rates of change from graphical and numerical data.

Grade Algebra II

1. Analyze exponential and logarithmic functions by investigating rates of change, intercepts, zeros.

Geometric and Spatial Relationships

1. Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Grade Kindergarten

1. Identify and describe 2 and 3 dimensional shapes using physical models that represent objects in their environment.

- ❖ Circle
- ❖ Rhombus
- ❖ Rectangle
- ❖ Triangle
- ❖ Sphere
- ❖ Rectangular prism
- ❖ Cylinder
- ❖ Pyramid
- ❖ Square
- ❖ Cube

Grade 1

1. Identify, name and describe 2 and 3 dimensional shapes using physical models.

- ❖ Circle
- ❖ Triangle
- ❖ Trapezoid
- ❖ Rectangle
- ❖ Rhombus
- ❖ Sphere
- ❖ Rectangular prism
- ❖ Cylinder
- ❖ Pyramid
- ❖ Square
- ❖ Cube

Grade 2

1. Describe attributes and parts of 2D and 3D shapes.

Grade 3

- 1. Compare 2 dimensional shapes by describing their attributes.**
- 2. Predict results of putting together or taking apart 2 and 3 dimensional shapes.**

Grade 4

- 1. Identify and name properties and attributes of 2 and 3 dimensional shapes.**
- 2. Compose and decompose shapes.**

Grade 5

- 1. Classify the attributes of 2 and 3-dimensional shapes.**
- 2. Predict and justify the results of subdividing, combining, and transforming shapes.**

Grade 6

- 1. Identify the properties of 2 and 3 dimensional shapes.**
- 2. Compare sides and angles of similar triangles.**

Grade 7

- 1. Describe and understand relationships between angles, side lengths and perimeter of similar figures.**

Grade 8

- 1. Describe, classify, and generalize relationships between 2 and 3-dimensional objects.**
- 2. Understand the usage and properties associated with the Pythagorean Theorem.**

Grade Algebra I

- 1. Apply geometric properties such as similarity and angle relationship to solve multi-step problems in 2 and 3 dimensions.**

Grade Algebra II

- 1. Use trigonometric relationships with right angles to determine lengths and angle measures.**
- 2. Examine and analyze the difference between 2 and 3- dimensional figures with regard to surface area, volume, etc.**

II. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Grade Kindergarten

- 1. Describe, name, and interpret relative positions in space (above, below, front, behind, inside, outside).**

Grade 1

- 1. Describe, name and interpret relative positions in space (left, right).**

Grade 2

- 1. Find and identify locations on a coordinate system.**

Grade 3

- 1. Describe the location of an object using geometric vocabulary, north, south, east and west.**

Grade 4

- 1. Use coordinate systems to describe movement.**

Grade 5

- 1. Use coordinate systems to specify, locate, and describe paths along the vertical and horizontal axes.**

Grade 6

1. Use coordinate geometry to construct geometric shapes.

Grade 7

1. Draw and use a coordinate grid to identify geometric shapes.

Grade 8

1. Use a coordinate grid to understand properties of right triangles and quadrilaterals (including the Pythagorean Theorem).

Algebra II

1. Make conjectures and solve problems involving 2-dimensional objects represented with Cartesian coordinates and 3-dimensional objects using x,y,z coordinates.

III. Apply transformations and use symmetry to analyze mathematical situations.

Grade 2

1. Recognize and create shapes with symmetry.

Grade 3

1. Determine if two objects are congruent through a slide, flip or turn.
2. Identify lines of symmetry in polygons.

Grade 4

1. Make translations and predict results using polygons. (flip, slide, turn)
2. Construct and identify multiple lines of symmetry.

Grade 5

1. Predict, draw, and describe the results of translating, reflecting, and rotating around a center point of a polygon.
2. Identify polygons and designs with rotational symmetry.

Grade 6

1. Use terms translation, rotation, reflection when describing figure transformations.

Grade 7

1. Describe the sizes, positions, and shapes under transformations such as magnifications, stretching and shrinking.

Grade 8

1. Draw geometric figures on a coordinate grid using reflections, rotations, and translations.

2. Describe how the scale factor alters area in a dilation (stretching/shrinking).

Grade Algebra II

1. Represent functions which have been dilated, reflected, translated, and rotated.

2. Develop an understanding and be able to demonstrate the effects of simple transformations and their compositions.

3. Determine whether a function is even or odd.

IV. Use visualization, spatial reasoning and geometric modeling to solve problems.

Grade 4

1. Identify the faces of 3-dimensional shapes.

Grade 5

1. Identify 3-D objects given the net.

Grade 6

1. Use visual tools to represent and solve problems.

2. Use spatial visualization to identify isometric representations of mat plans.

Grade 7

1. Use visual tools such as a net to represent and solve problems.

2. Use spatial visualizations to identify various 2-dimensional views of isometric drawings (mat plan).

Grade 8

1. Draw an isometric picture from a given mat plan.

2. Use visual or drawn models to represent and solve problems.

Grade Algebra I

1. Draw and construct representations of two and three dimensional geometric objects to solve problems.

Grade Algebra II

1. Draw and/or use visual models to solve problems from real-world areas such as art, business, architecture, or construction through the use of different orientations.

Measurement

- 1. Understand measurable attributes of objects and the units, systems and processes of measurement.*

Grade Kindergarten

1. Tell time on a clock to the nearest hour.
2. Describe time in terms of today, yesterday, tomorrow
3. Identify, describe, and know the value of coins.
4. Compare and order objects by size.

Grade 1

1. Tell time to the nearest half hour.
2. Count money to a dollar including half dollar.
3. Select the appropriate tool for the attribute being measured (size, temp, weight, time)

Grade 2

1. Tell time to the nearest quarter hour.
2. Make change from a dollar.

Grade 3

1. Tell time to the nearest 5 minutes.
2. Determine change from \$5.00 and add and subtract money values to \$5.00.

Grade 4

1. Determine perimeter using customary and metric.
2. Convert units within a system of linear measurements.

3. Determine time using analog and digital clocks to at least the nearest minute.
4. Determine change up to \$10.00 using computational and reasoning skills.

Grade 5

1. With both metric and customary, justify the unit of measure for area.
2. Identify the equivalent weights and capacities within a system of measurement.

Grade 6

1. Develop an understanding of and use appropriate unit of measure to measure area, volume, and perimeter.

Grade 7

1. Identify equal units of measure for area and volume.
2. Solve problems involving addition and subtraction of time.

Grade Algebra II

1. Make decisions about units, standard and metric, and scales that are appropriate for problem situations involving different types of measurement (i.e. linear, area, cubic)

II. Apply appropriate techniques, tools and formulas to determine measurements.

Grade Kindergarten

1. Measure with multiple copies of units of the same size (e.g. paper clips blocks, connecting cubes).

Grade 1

1. Measure objects using rulers to find length in inches and centimeters.

Grade 3

1. Determine the perimeter of polygons.

Grade 4

- 1. Select and use benchmarks to estimate measurements. (linear, capacity, weight)**
- 2. Determine and justify areas of polygons and nonpolygons imposed of a rectangular grid.**

Grade 5

- 1. Determine volume by finding the same size objects to fill a space completely.**
- 2. With both metric and customary, convert from one unit to another in the linear system.**

Grade 6

- 1. Convert weight from one unit to another within a system of measurement. (Customary & Metric)**
- 2. Solve problems using area or perimeter of polygons.**

Grade 7

- 1. Solve problems involving circumference/area of circle.**
- 2. Solve problems involving surface area, and volume of rectangular or triangular prism and cylinder.**
- 3. Use a protractor to measure angles to nearest degree.**
- 4. Convert from one unit to another within a system of capacity measurements.**

Grade 8

- 1. Calculate angle measures of triangles and parallel lines cast by a line (transversal).**
- 2. Determine the accuracy and the number of significant digits in measurement situations.**

Grade Algebra I

- 1. Analyze precision, accuracy, and approximate error in measurement situations.**
- 2. Use unit analysis to check measurement computations.**

Grade Algebra II

- 1. Apply concepts of approximation, upper and lower bounds, and limits with regard to precision.**

2. Use unit analysis and unit multipliers to translate from rate to another (i.e., mpg, density, etc.)

Data and Probability

1. Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.

Grade Kindergarten

1. Compare and order items according to their attributes and organize data about the objects.

Grade 1

1. Sort and classify items according to their attributes. Represent one to one correspondence data using pictures and bar graphs.
2. Gather data about themselves and surroundings.

Grade 2

1. Compose bar graphs using one-to-many correspondence and answer questions about bar graphs.

Grade 3

1. Read, interpret, and describe the shape of data from line plots and graphs.

Grade 4

1. Formulate questions that can be answered by collecting data.
2. Represent, interpret, and create tables or graphs, including line plots.

Grade 5

1. Evaluate and describe data collection methods and organize categorical and numerical data.

Grade 6

1. Create and use appropriate graphical representations of data.
2. Analyze circle graphs and create and interpret stem-and-leaf plots.

Grade 7

1. Make and use circle graphs and histograms as they apply to the data provided.

Grade 8

1. Represent data on both scatter and box and whisker plots.

Grade Algebra I

1. Develop an understanding of histograms, parallel box plots, and scatter plots and use them to display data.
2. Compute basic statistics and understand the distinction between a statistic and a parameter.

Grade Algebra II

1. Develop an understanding of the characteristics of well-designed studies, including randomized selection in surveys and experiments.

II. Select and use appropriate statistical methods to analyze data.

Grade 4

1. Describe important features of the data set including range, outliers, median, mean, and mode.

Grade 5

1. Compare related data sets

Grade 6

1. Find the mean, median, mode, and range.

Grade 7

1. Find, use, and interpret mean, median, mode and range.
2. Compare central tendencies of the same data and observe differences and importance of each.

Grade 8

1. Find, use, and interpret data using both scatter and box-and-whisker plots.
2. Compare the same data using different graphic representations.

Grade Algebra I

- 1. Recognize how linear transformations of univariate data affect shape, center, and spread.**
- 2. Identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled.**

Grade Algebra II

- 1. Display data, given its distributions describe the shape, and calculate summary statistics.**
- 2. Display scatter plots and determine linear regression equations, and find the “line of best fit”.**

III. Develop and evaluate inferences and predictions that are based on data.

Grade 3

- 1. Discuss events related to students’ experiences as likely or unlikely.**

Grade 4

- 1. Evaluate and draw conclusions from a given data set.**

Grade 5

- 1. Justify predictions with a given set of data.**

Grade 6

- 1. Use observations to make conjectures about the population from two data samples.**

Grade 7

- 1. Draw a conclusion about relationships between 2 characteristics of a sample on the basis of scatter plots of the data and approximate line of fit.**

Grade 8

- 1. Make conclusions based on both scatter and box-and-whisker plots, as well as line of best fit.**

Grade Algebra I

1. Understand that low sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference.

Grade Algebra II

1. Explore the variability of sample statistics from a given population and construct sampling distributions.

IV. Understand and apply basic concepts of probability.

Grade 4

1. Classify events as equally likely or impossible.

Grade 5

1. Describe the likelihood of events using certain, equally likely, or impossible.

Grade 6

1. Use different methods to illustrate possible outcomes of a situation.

Grade 7

1. Use basic understanding of probability to draw conclusions about the results of an experiment.

Grade Algebra II

- 1. Compute and interpret the expected value of random variables in simple cases.**
- 2. Develop an understanding of the concepts of conditional probability and independent events.**
- 3. Develop an understanding of how to compute the probability of a compound.**
- 4. Develop an understanding of the difference between probability and odds.**