

# COMMON CORE STATE STANDARDS

## Making Connections to Content

### Mathematics Essential Vocabulary



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# Making Connections to Content

## *Essential Vocabulary*

Teaching specific terms in a specific way is probably the strongest action a teacher can take to ensure that students have the academic background knowledge they need to understand the content they will encounter in school. When teachers in a school focus on the same academic vocabulary and teach it using a systematic approach the school powerfully influences students understanding of content. When all teachers in a school division embrace and use the approach, it becomes even more powerful. In Robert Marzano and Debra Pickering's book *Building Academic Vocabulary* (ASCD, 2005) their research explains that students who have direct vocabulary instruction on specific terms increase their understanding from the 50<sup>th</sup> percentile to the 83<sup>rd</sup> percentile.

Many students acquire academic background knowledge outside of school and come to subject-area classes already knowing and using terms essential for understanding content. For example, they may have traveled or been exposed to different individuals, experiences or cultures. By contrast, students from families with fewer resources may have lacked such opportunities, and thus, have not acquired important background knowledge. When these two different students enroll in school they enter with discrepancies in their academic knowledge. Unfortunately, as time progresses, the gap in academic knowledge increases. Given the fact that knowledge of vocabulary has a profound effect on student comprehension of academic content a systematic approach to vocabulary instruction is essential. This document attempts to assist educators in designing instruction for all students that will ensure their mastery of all content regardless of their knowledge when they enter school.

For your benefit, the document has been organized into two sections. The first section provides non-negotiable vocabulary by grade level with each content area separated. The second section lists essential vocabulary by content area and then sub-divided by grade level.

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# Making Connections to Content

## *Essential Vocabulary*

By Content



# Mathematics

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## *Essential Vocabulary*

### MATHEMATICS

### KINDERGARTEN

***Counting and Cardinality:*** number; count; counting on; numbers from 0 to 100; one larger than; greater than, less than; equal to; counting on

***Operations and Algebraic Thinking:*** add; put together; adding to; subtract; taking apart; taking from; separating; joining; addition equation; subtraction equation; solve; missing number

***Number and Operations in Base Ten:*** ones place; tens place (11 – 19); equation; whole number

***Measurement and Data:*** length (longer, shorter); weight (heavier, lighter); heights (taller, shorter); shapes; space; compare; more of, less of; above; below; near; far

***Geometry:*** shape; orientation; spatial relationships; two-dimensional shapes (squares, triangles, circles, rectangles, hexagons); three-dimensional shapes (cubes, cones, cylinders, spheres)

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### MATHEMATICS

### GRADE 1

***Operations and Algebraic Thinking:*** add, counting on; subtract; adding to, taking away from; putting together, taking apart; comparing; unknowns (represented by symbols); equation; Commutative property of addition; Associative property of addition; equal sign

***Number and Operations in Base Ten:*** numbers to 120; tens, ones; place value; greater than ( $>$ ); less than ( $<$ ); equal to ( $=$ ); 10 more than a number; 10 less than a number

***Measurement and Data:*** length (longest, shortest); time, hours, half-hours, analog clock, digital clock; data, category, total number, data points; how many more than; how many less than

***Geometry:*** defining attributes, closed figure; number of sides; non-defining attributes, color, orientation, size; two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, quarter-circles); three-dimensional shapes (cubes, right rectangular prisms, right circular cones, right circular cylinders); composite shape; whole, halves, fourths, quarters, equal shares; half of, fourth of, quarter of

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### MATHEMATICS

### GRADE 2

***Operations and Algebraic Thinking:*** sum, addition; adding to; taking from; putting together; subtraction; taking apart; difference; comparing; unknown; symbol; odd, even; count by 2s; addends; array; column; row

***Number and Operations in Base Ten:*** base ten system, numbers to 1000, digit, three-digit number, hundreds, tens, ones; skip count by 5s, skip count by 10s, skip count by 100s; compare,  $>$ ,  $<$ ,  $=$ ; place value

***Measurement and Data:*** length, ruler, yardstick, meterstick, measuring tape; estimate; inches, feet, centimeters, meters; whole numbers; number line diagram; time, analog clock, digital clock, minutes, a.m., p.m.; dollar bill, quarter, dime, nickel, penny, dollar (\$), cent ( $\phi$ ); line plot, horizontal scale; picture graph; bar graph, single-unit scale, categories

***Geometry:*** shapes, attributes; angles, sides; faces, equal faces; triangles, quadrilaterals, pentagons, hexagons, circles, cubes; rows, columns, same-size squares; equal shares; whole, halves, thirds, half of, a third of, etc.

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### GRADE 3

***Operations and Algebraic Thinking:*** multiply (5 groups of 7 objects each), divide (number of objects in each share when 56 objects are partitioned into equal shares of 8 objects each), quotient; Commutative property of multiplication, Associative property of multiplication, Distributive property, unknown-factor problem, equation, variable (letter for unknown); arithmetic patterns

***Number and Operations in Base Ten:*** place value, rounding (to nearest 10 or 100), fraction, number line diagram, equivalent fractions, numerator, denominator;  $<$ ,  $>$ ,  $=$

***Measurement and Data:*** time, minute, time interval, number line diagram; liquid volume, mass of an object, grams (g), kilograms (kg), liters (l); masses of volume; scaled picture graph, scaled bar graph, data set, categories; length, ruler, halves of an inch, fourths of an inch; line plot, horizontal scale, whole number halves, quarters

***Geometry:*** area, plane figure, unit square, square units (square cm, square in, square ft); area models; rectilinear figures, non-overlapping figures; perimeter of polygons; categories of shapes (types of quadrilaterals, etc.)

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### GRADE 4

***Operations and Algebraic Thinking:*** verbal statements, multiplication equation, multiplicative comparisons, additive comparisons; estimation, rounding; factors, factor pairs, prime number, composite number; number pattern, shape pattern, rule of a pattern

***Number and Operations in Base Ten:*** multi-digit whole number, place value to 1,000,000, base-ten numerals, number names, expanded form; compare numbers ( $>$ ,  $<$ ,  $=$ ), round to any place; properties of operations (distributive property), equations, rectangular arrays, area models; whole number quotients, remainders

***Numbers and Operations – Fractions:*** fraction ( $a/b$ ), equivalent fractions ( $n \times a/n \times b$ ); numerator, denominator, common denominators, different denominators, comparing fractions ( $<$ ,  $>$ ,  $=$ ); mixed numbers; decimal notation, tenths, hundredths, comparing decimals ( $<$ ,  $>$ ,  $=$ )

***Measurement and Data:*** kilometers (m), meters(m), centimeters (cm), kilograms (kg), grams (g), pounds (lb), ounces (oz), liters (l), milliliters (ml), hours (hr), minutes (min), seconds (sec); distances, intervals of time, liquid volume, masses of objects, money; number line diagrams, measurement scale; area, perimeter; line plot (using  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ); geometric shapes, angles, rays, endpoint; circle, center, degree, one-degree angle ( $\frac{1}{360}$  of a circle),protractor

***Geometry:*** points, lines, line segments, rays, angles (right, acute, obtuse); perpendicular lines, parallel lines; two-dimensional figures, triangles (right, acute, obtuse); line of symmetry, line-symmetric figures

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## *Essential Vocabulary*

### MATHEMATICS

### GRADE 5

***Operations and Algebraic Thinking:*** numerical expressions, grouping symbols (parentheses, brackets, braces); ordered pairs, coordinate plane, corresponding terms

***Number and Operations in Base Ten:*** digit in any place (is 10 times digit to right and  $\frac{1}{10}$  digit to left); decimals (tenths, hundredths, thousandths); compare decimals ( $<$ ,  $>$ ,  $=$ ); round decimals; dividends, divisors;

***Numbers and Operations – Fractions:*** whole number, fraction, numerator, denominator, mixed number, common denominators, different denominators, comparing fractions ( $<$ ,  $>$ ,  $=$ ); mixed numbers; decimal notation, tenths, hundredths, comparing decimals ( $<$ ,  $>$ ,  $=$ ); unit fraction, quotient

***Measurement and Data:*** line plot (using units of  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ); volume, solid figure, volume measurement, cube, unit cube, one cubic unit (cubic cm, cubic in, cubic ft, etc.), volume of a right rectangular prism ( $V = l \times w \times h$ ) and ( $V = b \times h$ ), non-overlapping parts

***Geometry:*** ; perpendicular number lines (axes), plane, coordinate system, origin, intersecting lines, ordered pairs, x-axis, x-coordinate, y-axis, y-coordinate, quadrants; attributes of two-dimensional shapes

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## *Essential Vocabulary*

### MATHEMATICS

### GRADE 6

***The Number System:*** ratio (a:b), unit rate (a/b), ratio, tables of equivalent ratios, tape diagrams, double number line diagrams, equations; unit pricing; constant speed; quotients of fractions; greatest common factor; least common multiple; distributive property; common factor; rational number, positive number, negative number; coordinate plane, quadrants, ordered pair; inequality; absolute value

***Expressions and Equations:*** numerical expression; mathematical expression; exponent; expression, sum, term, product, factor, quotient, coefficient, variable; Order of Operations; equivalent expressions; properties of operations (distributive property, etc.); equation; inequality; dependent variable, independent variable; constraint;

***Geometry:*** area, surface area, volume; polygon, right triangle, acute triangle, obtuse triangle, scalene triangle, isosceles triangle, equilateral triangle, equiangular triangle; quadrilaterals, square, rhombus, rectangle, parallelogram, trapezoid; right rectangular prism, edge, vertex, coordinate plane, distance between points with common x-value or y-value; three-dimensional figure, net, surface area

***Statistics and Probability:*** statistical variability; data, distribution, center spread, overall shape of a set of data; measure of variation, interquartile range, mean absolute deviation, range; number line plots, dot plot, observations, quantitative measures of center, mean (balance point), median, mode; clusters, peaks, gaps, symmetry in a set of data

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### MATHEMATICS

### GRADE 7

***Ratios and Proportional Relationships:*** unit rate; ratio (lengths, areas, other quantities); fraction; equivalent ratios; equation to express a proportional relationship; graph of a proportional relationship (incl. (0,0) and (1,r); simple interest; tax, markups; markdowns; gratuities; commissions; fees; percent increase; percent decrease; percent error

***The Number System:*** rational numbers; horizon and vertical number line diagram; opposite quantities; additive inverse; distance as absolute value; properties of operations; distributive property; integers; rational numbers as decimals

***Expressions and Equations:*** linear expression; rational coefficient; rational numbers; whole numbers; fractions; decimals; variables; equations (e.g.,  $px + q = r$  and  $p(x + q) = r$ ); algebraic solution; arithmetic solution; inequalities (e.g.,  $px + q > r$  and  $px + q < r$ );

***Geometry:*** geometrical figure; scale drawing; actual length; area; ruler; protractor; triangle; angle; side; right rectangular prism; right rectangular pyramid; two dimensional shapes resulting from slicing each previous three-dimensional figure (e.g., triangle, quadrilateral, polygon); area of a circle; circumference of a circle; angles (supplementary, complementary, vertical, adjacent); volume; surface area; cube; right prism

***Statistics and Probability:*** statistics; population; sample; valid; random sampling; representative sample; valid inference; data; simulated sample; variation, estimate; prediction; informal comparative inference; visual overlap; variability; center of data; mean; mean absolute deviation; dot plot; distribution; measures of center; measures of variability; probability; chance event; likelihood of an event; unlikely event; neither likely nor unlikely event; likely event; long-run relative frequency; approximate relative frequency; probability model; observed frequency; probability of compound events (using lists, tables, tree diagrams, simulations), simple event; compound event; sample space

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### MATHEMATICS

### GRADE 8

***The Number System:*** non-rational number; irrational number; rational number; decimal expansion; rational approximation of an irrational number; number line diagram

***Expressions and Equations:*** radicals; integer exponent; properties of integer exponents; square root; cube root; perfect square; scientific notation; proportional relationship; lines; linear equation; slope; similar triangles; y-intercept; linear equation in one variable (one solution, infinitely many solutions, no solution); rational number coefficients; simultaneous linear equations in two variables; point of intersection

***Functions:*** function; relation; input; output; ordered pair; rate of change; express a function (algebraically, graphically, table, verbally); linear function; rate of change; initial value

***Geometry:*** congruence; similarity; physical model; transformation; rotation; reflection; dilation; translation; line; line segment; parallel lines; interior and exterior angles of a triangle; angles formed by two parallel lines and transversal (e.g., alternate interior, alternate exterior, corresponding, etc.); similarity of triangles (angle-angle); Pythagorean Theorem; volume (cylinder, cone, sphere)

***Statistics and Probability:*** bivariate data; scatter plot; clustering; outlier; positive or negative association; linear association; nonlinear association; line of best fit; slope; intercept; bivariate categorical data; frequency, relative frequency; two-way table

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## *Essential Vocabulary*

### MATHEMATICS

### HIGH SCHOOL – NUMBER and QUANTITY

***The Real Number System:*** properties of exponents; rational exponents; radicals; irrational number

***Quantities:*** units; reason quantitatively; formulas; scale; origin; approximate quantities; descriptive modeling; level of accuracy; limitations

***The Complex Number System:*** complex number system; imaginary number; real number; complex number; commutative property; associative property; distributive property; conjugate of a complex number; moduli of complex numbers, quotients of complex numbers; complex plane; rectangular form; polar form; conjugation of complex numbers; complex plane; modulus; argument; average of 2 complex numbers as the midpoint of a segment; real coefficients; complex solutions; polynomial identities; Fundamental Theorem of Algebra; quadratic polynomials

***Vector and Matrix Quantities:*** vector quantities; magnitude; direction; directed line segments; symbols (e.g.,  $v$ ,  $|v|$ ,  $\|v\|$ ); components of a vector; initial point; terminal point; velocity; end-to-end; component-wise; parallelogram rule; magnitude of a sum of two vectors; vector subtraction; additive inverse; scalar; scalar multiple; matrix; dimensions; zero matrix; identity matrix; determinant; square matrix; transformation of a vector; transformation of the plane; absolute value of the determinant

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### MATHEMATICS

### HIGH SCHOOL – ALGEBRA

***Seeing Structure of Expressions:*** structure of an expression; context of an expression; Binomial Theorem; expression; term; factor; coefficient; Difference of Squares; quadratic expression; zeros of a function; maximum and minimum value of a function; properties of exponents; exponential functions; sum of an infinite geometric series; common ratio

***Arithmetic with Polynomials and Rational Functions:*** arithmetic operations on polynomials; closed system; zero of a function; factors of polynomials; Remainder Theorem; polynomial identities; Pythagorean triples; Binomial Theorem; Pascal's Triangle; simple rational expression; degree of a polynomial

***Creating Equations:*** equation; inequality; linear function; quadratic function; rational function; exponential function; coordinate axes; constraints; system of equations; system of inequalities; viable and non-viable options; modeling

***Reasoning with Equations and Inequalities:*** reasoning; viable argument; justify a solution to an equation; rational equation; radical equation; extraneous solution; linear equations and inequalities; quadratic equation; completing the square; quadratic formula; square roots; factoring; complex solution; system of equations; matrix equation; vector variable; inverse of a matrix; coordinate plane; curve; line; linear function; polynomial function; rational function; absolute value function; exponential function; logarithmic function; half-plane

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### MATHEMATICS

### HIGH SCHOOL – FUNCTIONS

***Interpreting Functions:*** function; function notation; domain; range; element; input; output; sequences (e.g., Fibonacci); recursive; intercepts; intervals; increasing; decreasing; positive, negative; relative maximum; relative minimum; symmetry; end behavior; periodicity; average rate of change; linear function; quadratic function; intercepts; maxima; minima; square root function; cube root function; piece-wise function; step function; absolute value function; polynomial function; zeros; factorization; rational function; asymptotes; exponential function; logarithmic function; trigonometric function; period; midline; amplitude; factoring; completing the square; extreme values; exponential growth; exponential decay

***Building Functions:*** explicit expression; recursive process standard function; compose functions; arithmetic sequence; geometric sequence; inverse functions; composition of functions; invertible function; non-invertible function; restricting the domain; exponents; logarithms

***Linear, Quadratic, and Exponential Models:*** linear model; exponential model; quadratic model; linear function; exponential function; equal intervals; constant rate per unit; arithmetic and geometric sequences; input-output pairs; increasing exponentially; increasing linearly; increasing quadratically; polynomial function; base; exponent; parameters

***Trigonometric Functions:*** trigonometric function; unit circle; radian; angle; arc; coordinate plane; counterclockwise; sine; cosine; tangent; odd and even symmetry; periodicity; periodic phenomena; amplitude; frequency; midline; inverse; Pythagorean Identity; trigonometric ratios; addition and subtraction formulas for sine, cosine, and tangent

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### MATHEMATICS

### HIGH SCHOOL - GEOMETRY

***Congruence*** transformations; angle, circle, perpendicular lines; parallel lines; line segment; point; line; distance along a line; distance around a circular arc; translation; horizontal stretch; rectangle; parallelogram; trapezoid; regular polygon; rotation; reflection; rotation; reflection; rigid motion; congruence; triangle congruence (ASA, SAS, SSS); theorem; vertical angles; alternate interior angles; corresponding angles; transversal; perpendicular bisector; equidistant; interior angles of a triangle; scalene triangle; isosceles triangle; equilateral triangle; midpoints; medians; congruent; parallelograms; diagonals; bisect; congruent diagonals; compass; bisect; square; regular hexagon; inscribe in a circle

***Similarity, Right Triangles, and Trigonometry:*** similarity; dilation; center; scale factor; ratio; similarity transformations; proportionality; corresponding; AA; congruence; trigonometric ratios; sine; cosine; tangent; complementary angles; Pythagorean Theorem; right triangle; area of a triangle; vertex; perpendicular; Law of Sines; Law of Cosines

***Circles:*** similarity; inscribed angles; radii; chords; central angle; circumscribed angle; diameter; radius; right angle; tangent; inscribes circles; circumscribed circles; arc length; radian measure; constant of proportionality; area of a sector

***Expressing Geometric Properties with Equations:*** equation of a circle; center; radius; Pythagorean Theorem; equation of a parabola; focus; directrix; ellipse; hyperbola; foci; directrices; proof; slope; parallel; perpendicular; directed line segment; perimeters of polygons; areas of triangles and rectangles

***Geometric Measurement and Dimension:*** volume formulas (cylinder, pyramid, cone, sphere); circumference and area of a circle; dissection argument; Cavalieri's principle; informal limit arguments; cross-sections; three-dimensional object; rotation

***Modeling with Geometry:*** density; area; volume; modeling; design problems; physical constraints; typographic grid systems;

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### MATHEMATICS

### HIGH SCHOOL – STATISTICS and PROBABILITY

***Interpreting Categorical and Quantitative Data:*** summarize; represent; interpret; real number line; dot plots; histograms; box plots; statistics; data distribution; center (mean, median); spread (interquartile range, standard deviation); spread; outliers; normal distribution; population percentages; normal curve; categorical data; two-way frequency tables; relative frequency (joint, marginal, conditional); scatter plot; function; fit of a function; linear association; linear model; slope (rate of change); intercept (constant term); correlation coefficient; correlation; causation

***Making Inferences and Justifying Conclusions:*** inference; population parameters; random sample; conclusion; sample survey; experiment; observational study; randomization; sample survey; population mean; proportion; margin of error; simulation model

***Conditional Probability and the Rules of Probability:*** independence; probability; conditional probability; event; sample space; outcome; characteristics; categories; union; intersection; complement; independent; two-way frequency tables; sample space; compound events; uniform probability model; Addition Rule; Multiplication Rule; permutation; combination

***Using Probability to Make Decisions:*** random variable; probability distribution; data distributions; expected value of a random variable; mean of the probability distribution; probability distribution for a random variable; sample space; theoretical probability; empirically; possible outcomes of a decision; payoff values; expected values; fair decision; probability concepts (e.g., product testing, medical testing, etc.)