

PC-CCSS Grade 2 Mathematics Standards

Operations and Algebraic Thinking [OA]

A. Represent and solve problems involving addition and subtraction.

OAT 1 [1] Use addition and subtraction within 100 to solve one- and two-step word problems.

B. Add and subtract within 20.

OAT 2 [2] Fluently add and subtract within 20 using mental strategies.

C. Work with equal groups of objects to gain foundations for multiplication.

OAT 3 [3] Determine whether a group of objects (up to 20) has an odd or even number of members.

OAT 4 [4] Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns.

Number and Operations in Base Ten [NBT]

A. Understand place value.

NBT 5 [1-2] Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. Count within 1000; skip-count by 5s, 10s, and 100s.

NBT 6 [3] Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

NBT 7 [4] Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using $>$, $=$, and $<$ symbols.

B. Use place value understanding and properties of operations to add and subtract.

NBT 8 [5] Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

NBT 9 [6] Add up to four two-digit numbers using strategies based on place value and properties of operations.

NBT 10 [7] Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

NBT 11 [8] Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

NBT 12 [9] Explain why addition and subtraction strategies work, using place value and the properties of operations.

Measurement and Data [MD]

A. Measure and estimate lengths in standard units.

MDA 13 [1] Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MDA 14 [2] Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

MDA 15 [3] Estimate lengths using units of inches, feet, centimeters, and meters.

MDA 16 [4] Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

C. Relate addition and subtraction to length.

MDA 17 [5] Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units.

MDA 18 [6] Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100. -

D. Work with time and money.

MDA 19 [7] Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

MDA 20 [8] Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately.

E. Represent and interpret data.

MDA 21 [9] Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. -

MDA 22 [10] Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories.

Geometry [G]

A. Reason with shapes and their attributes.

GEO 23 [1] Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

GEO 24 [2] Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

GEO 25 [3] Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc.

PC-CCSS Grade 3 Mathematics Standards**Operations and Algebraic Thinking [OA]**

A. Represent and solve problems involving multiplication and division.

OAT 1 [1] Interpret products of whole numbers.

OAT 2 [2] Interpret whole-number quotients of whole numbers.

OAT 3 [3] Use multiplication and division with 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.

OAT 4 [4] Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

B. Understand properties of multiplication and the relationship between multiplication and division.

OAT 5 [5] Apply properties of operations as strategies to multiply and divide.

OAT 6 [6] Understand division as an unknown-factor problem.

OAT 7 [7] Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.

C. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

OAT 8 [8] Solve two-step word problems using the four operations, a letter variable, mental computation and estimation strategies including rounding.

OAT 9 [9] Identify arithmetic patterns and explain them using properties of operations.

Number and Operations in Base Ten [NBT]

A. Use place value understanding and properties of operations to perform multi-digit arithmetic.

NBT 10 [1] Use place value understanding to round whole numbers to the nearest 10 or 100.

NBT 11 [2] Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

NBT 12 [3] Multiply one-digit whole numbers by multiples of 10 in the range 10–90 using strategies based on place value and properties of operations.

Number and Operations—Fractions [NF]

A. Develop understanding of fractions as numbers.

NFR 13 [1] Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

NFR 14 [2] Understand a fraction as a number on the number line; represent fractions on a number line diagram.

NFR 15 [3] Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size; use the symbols $>$, $=$, or $<$.

Measurement and Data [MD]

A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

MDA 16 [1] Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.

MDA 17 [2] Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l); solve one-step word problems.

B. Represent and interpret data.

MDA 18 [3] Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories; solve one- and two-step problems using information presented in scaled bar graphs.

MDA 19 [4] Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch; show the data by making a line plot.

C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

MDA 20 [5] Recognize area as an attribute of plane figures and understand concepts of area measurement.

MDA 21 [6] Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

MDA 22 [7] Relate area to the operations of multiplication and addition; use rectangles and rectilinear figures to solve real world problems.

D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

MDA 23 [8] Solve real world and mathematical problems involving perimeters of polygons.

Geometry [G]

A. Reason with shapes and their attributes.

GEO 24 [1] Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category: rhombuses, rectangles, and squares as quadrilaterals.

GEO 25 [2] Partition shapes into parts with equal areas; express the area of each part as a unit fraction of the whole.

PC-CCSS Grade 4 Mathematics Standards**Operations and Algebraic Thinking [OA]**

A. Use the four operations with whole numbers to solve problems.

OAT 1 [1] Interpret a multiplication equation as a comparison.

OAT 2 [2] Multiply or divide to solve word problems involving multiplicative comparison by using drawings and equations with a symbol for the unknown number.

OAT 3 [3] Solve multistep word problems using the four operations and a letter variable; assessing the reasonableness of answers by using estimation strategies including rounding.

B. Gain familiarity with factors and multiples.

OAT 4 [4] When given a whole number in the range 1-100, find all factor pairs, or determine whether the number is a multiple, prime or composite.

C. Generate and analyze patterns.

OAT 5 [5] Generate a number or shape pattern that follows a given rule and identify features of the pattern that were not explicit in the rule itself.

Number and Operations in Base Ten [NBT] (whole numbers less or equal to 1,000,000)

A. Generalize place value understanding and for multi-digit whole number.

NBT 6 [1,2] Recognize in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right; read and write multi-digit numbers using base-ten numerals, number names, and expanded form; compare two multi-digit numbers using $>$, $=$, and $<$

NBT 7 [3] Use place value understanding to round multi-digit whole numbers to any place.

B. Use place value understanding and properties of operations to perform multi digit arithmetic.

NBT 8 [4] Fluently add and subtract multi-digit whole numbers.

NBT 9[5] Multiply a whole number of up to four digits by a one digit whole number and multiply two digit numbers. Illustrate and explain by using equations, rectangular arrays, and/or area models.

NBT 10 [6] Find whole-number quotients and remainders with up to 4 digit dividends and one-digit divisors. Illustrate and explain by using equations, rectangular arrays, and/or area models.

Number and Operations—Fractions [NF] (fractions with denominators 2, 4, 6, 8, 10, 12, 100)

A. Extend understanding of fraction equivalence and ordering.

NFR 11 [1, 2] Explain why a fraction a/b is equivalent to a fraction by using fraction models; recognize and generate equivalent fractions; compare two fractions with different numerators and denominators using $>$, $=$, $<$ or visual models.

B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

NFR 12 [3] Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$; add and subtract fractions and mixed numbers with like denominators in equations and story problems

NFR 13 [4] Apply and extend pervious understandings of multiplication to multiply a fraction by a whole number in equations and story problems.

C. Understand decimal notation for factions, and compare decimal fractions.

NFR 14 [5] Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to be able to add the fractions.

NFR 15 [6, 7] Use decimal notation for fractions with denominators 10 or 100; compare two decimals to hundredths using $>$, $=$, $<$ or visual models.

Measurement and Data [MD]

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit

MDA 16 [1] Know relative sizes of measurement units within one system of units; express measurements in a larger unit in terms of a smaller unit; record in a two-column table.

MDA 17 [2] Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money; represent measurement quantities using diagrams.

MDA 18 [3] Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

B. Represent and interpret data

MDA 19 [4] Make a line plot to display a data set of measurements in fractions of a unit; use information to solve problems involving addition and subtraction of fractions.

C. Geometric measurement: understand concepts of angle and measure angles.

MDA 20 [5] Recognize angles as geometric shapes, and understand concepts of angle measurement

MDA 21 [6] Measure angles using a protractor. Sketch angles of specific measure.

MDA 22 [7] Recognize angle measure as additive; use this knowledge to find the measure of unknown angles.

Geometry [G]

A. Reason with shapes and their attributes.

GEO 23 [1] Draw points, lines, line segments, rays, angles, and perpendicular and parallel lines. Identify these in two-dimensional figures.

GEO 24 [2] Classify two-dimensional figures. Identify right triangles.

GEO 25 [3] Recognize a lines of symmetry, line symmetric figures and draw lines of symmetry for two-dimensional shapes.

PC-CCSS Grade 5 Mathematics Standards

Operations and Algebraic Thinking [OA]

A. Write and interpret numerical expressions.

OAT 1 [1] Use and evaluate numerical expressions with parentheses, brackets, or braces.

OAT 2 [2] Write and interpret (without evaluating) simple expressions that record calculations with numbers.

B. Analyze patterns and relationships.

OAT 3 [3] Generate two numerical patterns using two given rules. Identify corresponding relationships, form ordered pairs, and graph on a coordinate plane.

Number and Operations in Base Ten [NBT]

A. Understand the place value system.

NBT 4 [1] Recognize in a multi-digit number, a digit in one place represents ten times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in its place to its left.

NBT 5 [2] When multiplying or dividing by powers of ten, explain patterns of zeros or the placement of a decimal point. Use whole-number exponents to denote powers of 10.

NBT 6 [3] Read, write, and compare decimals to thousandths.

NBT 7 [4] Use place value understanding to round decimals to any place.

B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

NBT 8 [5] Fluently multiply multi-digit whole numbers using the standard algorithm.

NBT 9 [6] Find whole number quotients of whole numbers with up to four-digit dividends and two digit divisors; illustrate and explain using equations, arrays, and/or models.

NBT 10 [7] Add, subtract, multiply, and divide decimals to hundredths.

Number and Operations—Fractions [NF]

A. Use equivalent fractions as a strategy to add and subtract fractions

NFR 11 [1] Add and subtract fractions with unlike denominators (including mixed numbers).

NFR 12 [2] Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators.

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

NFR 13 [3] Interpret a fraction as division of the numerator by the denominator. Solve word problems with the division of whole numbers resulting in an answer of a fraction or whole number.

NFR 14 [4] Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. Interpret products of fractions and/or be able to display such products in arrays.

NFR 15 [5] Interpret multiplication of fractions as scaling (resizing)

NFR 16 [6] Solve real world problems involving multiplication of fractions and mixed numbers using models or equations.

NFR 17 [7] Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

Measurement and Data [MD]

A. Convert like measurement units within a given measurement system.

MDA 18 [1] Convert among different-sized standard measurement units within a given measurement system, and use in solving multi-step problems.

B. Represent and interpret data.

MDA 19 [2] Make a line plot to display a data set of measurements in fractions of a unit; use operations on fractions to solve problems.

C. Geometric measurement: understand concepts of volume and relate volume to multiplication and addition.

MDA 20 [3] Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

MDA 21 [4] Measure volumes by counting unit cubes; using cubic cm. in, ft, and improvised units.

MDA 22 [5] Relate volume to the operations of multiplication and addition and solve problems involving volume.

Geometry [G]

A. Graph points on the coordinate plane to solve real-world and mathematical problems.

GEO 23 [1] Use axes to define a coordinate system, understand the parts of a coordinate system and the process involved in locating and representing ordered pairs.

GEO 24 [2] Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

B. Classify two-dimensional figures into categories based on their properties.

GEO 25 [3,4] Classify two-dimensional figures in a hierarchy based on properties; understand that attributes belonging to a category of 2D figures also belong to all subcategories of that category.

PC-CCSS Grade 6 Mathematics Standards**Ratios & Proportional Relationships [RP]**

A. Understand ratio concepts and use ratio reasoning to solve problems

RPR 1 [1] Understand the concept of a ratio and use language to describe a ratio relationship between two quantities.

RPR 2 [2] Understand the concept of a unit rate associated with a ratio (limited to non-complex fractions).

RPR 3 [3] Use ratio and rate reasoning to solve real-world and mathematical problems.

The Number System [NS]

A. Apply and extend previous understandings of multiplication and division to divide fraction by fractions.

NSY 4 [1] Interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions.

B. Compute fluently with multi-digit numbers and find common factors and multiples.

NSY 5 [2] Fluently divide multi-digit numbers using the standard algorithm.

NSY 6 [3] Fluently add, subtract, multiply, and divide multi-digit decimals using standard algorithms.

NSY 7[4] Find the GCF of two numbers ≤ 100 and the LCM of two numbers ≤ 12 . Use the distributive property to express a sum of two whole numbers with a common factor.

C. Apply and extend previous understandings of numbers to the system of rational numbers.

NSY 8 [5, 6] Understand a rational number as a point on a number line. Extend number lines and coordinates to include negative numbers; understanding that used together positive and negative numbers describe quantities having opposite directions or values.

NSY 9 [7] Understand ordering and absolute value of rational numbers.

NSY 10 [8] Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane; using absolute value to find distances between points with the same first or second coordinate.

Expressions & Equations (EE)

A. Apply and extend previous understandings of arithmetic to algebraic expressions.

EEQ 11 [1, 2] Write and evaluate expressions involving exponents. Write, read, and evaluate expressions in which letters stand for numbers.

EEQ 12 [3, 4] Apply properties of operations to generate equivalent expressions. Identify when two equations are equivalent.

B. Reason about and solve one-variable equations and inequalities

EEQ 13 [5] Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

EEQ 14 [6] Use variables to represent numbers and write expressions; understand that a variable can represent an unknown number.

EEQ 15 [7] Solve real-world and mathematical problems by writing and solving equations.

EEQ 16 [8] Write inequalities to represent a constraint or condition. Recognize inequalities have infinitely many solutions; represent solutions of inequalities on number line diagrams.

C. Represent and analyze quantitative relationships between dependent and independent variables.

EEQ 17 [9] Use variables to represent two quantities that change in relationship to one another.

Analyze the relationship between the two using graphs and tables, and relate these to the equation.

Geometry (G)

A. Solve real-world and mathematical problems involving area, surface area, and volume.

GEO 18 [1] Find the area of triangles, quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes..

GEO 19 [2] Find the volume of a rectangular prism with fractional edge lengths by packing it with unit cubes. Apply the formulas $V=lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths.

GEO 20 [3] Draw polygons in the coordinate plane given coordinates for the vertices.

GEO 21 [4] Represent 3D figures using nets made of rectangles and triangles, and use the nets to find the surface area of these figures. Apply techniques to real-world and mathematical problems.

Statistics and Probability (SP)

A. Develop understanding of statistical variability.

SPR 22 [1, 2] Recognize a statistical question anticipates variability in the data related to the question.

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape

SPR 23 [3] Recognize the difference between a measure of center and a measure of variation.

SPR 24 [4] Display numerical data in plots on a number line, including dot plots, histograms, and box plots

SPR 25 [5] Summarize numerical data sets in relation to their context.

PC-CCSS Grade 7 Mathematics Standards

Ratios and Proportional Relationships [RP]

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

RPR 1 [1] Compute unit rates associated with ratios of fractions, including lengths, areas and other quantities measured in like or different units.

RPR 2 [2] Recognize and represent proportional relationships between quantities; identify constant of proportionality; represent with equations; explain (x,y) in the graph of a proportional relationship.

RPR 3 [3] Use proportional relationships to solve multistep ratio and percent problems.

The Number System [NS]

A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

NSY 4 [1] Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

NSY 5 [2] Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers; change fraction to decimal using long division.

NSY 6 [3] Solve real-world and mathematical problems involving the four operations with rational numbers.

Expressions and Equations [EE]

A. Use properties of operations to generate equivalent expressions.

EEQ 7 [1] Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

EEQ 8 [2] Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

EEQ 9 [3] Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form; convert between forms as appropriate; assess reasonableness of answers using mental computation and estimation.

EEQ 10 [4] Use variables to represent quantities in a real-world or mathematical problem; construct and solve simple equations and inequalities to solve problems by reasoning about the quantities.

Geometry [G]

A. Draw, construct, and describe geometrical figures and describe the relationships between them.

GEO 11 [1] Solve problems involving scale drawings of geometric figures, compute actual lengths and areas from a scale drawing; reproduce a scale drawing at a different scale.

GEO 12 [2] Draw (freehand, ruler and protractor, technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

GEO 13 [3] Describe the two-dimensional figures that result from slicing three-dimensional figures.

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

GEO 14 [4] Know the formulas for and solve problems using the area and circumference of a circle; give an informal derivation of the relationship between circumference and area of a circle.

GEO 15 [5] Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

GEO 16 [6] Solve real-world and mathematical problems involving area, volume, surface area of two- and three-dimensional objects made of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics and Probability [SP]

A. Use random sampling to draw inferences about a population.

SPR 17 [1] Understand that statistics are used to gain information about a population by examining a sample of the population; generalizations from a sample are valid only if the sample is representative of that population; understand random sampling.

SPR 18 [2] Use data from a random sample to draw inferences about a population with an unknown characteristic; Generate multiple samples of the same size to gauge the variation in estimates or predictions.

B. Draw informal comparative inferences about two populations.

SPR 19 [3] Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measure the difference between the centers by expressing it as a multiple of a measure of variability.

SPR 20 [4] Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

C. Investigate chance processes and develop, use, and evaluate probability models.

SPR 21 [5] Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.

SPR 22 [6] Approximate the probability of a chance event by collecting data on the chance process that produces it; predict the approximate relative frequency given the probability.

SPR 23 [7] Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; explain possible sources of discrepancy.

SPR 24 [8] Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

PC-CCSS Grade 8 Mathematics Standards

The Number System [NS]

A. Know that there are numbers that are not rational, and approximate them by rational numbers.

NSY 1 [1] Know that numbers that are not rational are called irrational. Understand that every number has a decimal expansion and convert a repeating decimal into a rational number.

NSY 2 [2] Use rational approximations of irrational numbers to compare irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

Expressions and Equations [EE]

A. Work with radicals and integer exponents.

EEQ 3 [1] Know and apply the properties of integer exponents to generate equivalent numerical expressions.

EEQ 4 [2] Use square root and cube root symbols to represent solutions to equations ($x^2 = p$; $x^3 = p$). Evaluate roots of small perfect squares and cubes. Know that $\sqrt{2}$ is irrational.

EEQ 5 [3] Use numbers in the form of a single digit times an integer power of 10 to estimate very large or small quantities; express how many times as much one is than the other.

EEQ 6 [4] Use and perform operations with numbers expressed in scientific notation, including problems using both decimal and scientific notation.

B. Understand the connections between proportional relationships, lines, and linear equations.

EEQ 7 [5] Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

EEQ 8 [6] Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line; derive the equations $y = mx$ and $y = mx + b$

C. Analyze and solve linear equations and pairs of simultaneous linear equations.

EEQ 9 [7] Solve linear equations in one variable, including those with 0, 1 or infinitely many solutions, rational coefficients, and requiring distributive property and collecting like terms.

EEQ 10 [8] Analyze and solve pairs of simultaneous linear equations algebraically, graphically; solve real world problems using two linear equations in two variables.

Functions [F]

A. Define, evaluate, and compare functions.

FUN 11 [1-2] Understand that a function is a rule that assigns to each input exactly one output; compare properties of two functions represented in different ways: algebraically, graphically, tables, verbal descriptions.

FUN 12 [3] Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

B. Use functions to model relationships between quantities.

FUN 13 [4] Construct a function to model a linear relationship or situation. Determine and interpret the rate of change and initial value from a description or two (x, y) values; from a table or graph.

FUN 14 [5] Describe qualitatively the functional relationship between two quantities by analyzing a graph; sketch a graph that that represents a function that has been described verbally.

Geometry [G]

A. Understand congruence and similarity using physical models, transparencies, or geometry software.

GEO 15 [1] Verify experimentally the properties of rotations, reflections, and translations.

GEO 16 [2] Understand that two-dimensional figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and translations; describe a congruence sequence.

GEO 17 [3] Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

GEO 18 [4] Understand that two-dimensional figures are similar if one can be obtained from another by a sequence of rotations, reflections, translations, and dilations; describe a similarity sequence.

GEO 19 [5] Informally establish facts about the angle sum and exterior angle of triangles, angles created when parallel lines and a transversal, and the angle-angle criterion for similar triangles.

B. Understand and apply the Pythagorean Theorem.

GEO 20 [6] Explain a proof of the Pythagorean Theorem and its converse.

GEO 21 [7-8] Apply the Pythagorean Theorem to determine side lengths in right triangles in real-world and math problems in two and three dimensions and find the distance between two points.

C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

GEO 22 [9] Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability [SP]

A. Investigate patterns of association in bivariate data.

SPR 23 [1] Construct and interpret scatter plots for bivariate measurement data. Describe patterns (clustering, outliers, positive or negative association, linear association, nonlinear association).

SPR 24 [2-3] Informally fit a straight line for scatterplots that suggest a linear relationship, assess the fit by judging the closeness of the data points to the line; use the equation to solve problems.

SPR 25 [4] Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects; describe possible association between the two variables.

PC-CCSS Mathematics: Algebra I – Conceptual Categories

Number and Quantity [N]

A. The Real Number System [RN]

NAQ 1 [1-2] Extend the properties of exponents to rational exponents.

NAQ 2 [3] Use properties of rational and irrational numbers.

B. Quantities [Q]

NAQ 3 [1-3] Reason quantitatively and use units to solve problems.

Algebra [A]

A. Seeing Structure in Expressions [SSE]

ALG 4 [1-2] Interpret the structure of expressions: linear, exponential, quadratic.

ALG 5 [3] Write expressions in equivalent forms to solve problems: quadratic and exponential.

B. Arithmetic with Polynomials and Rational Expressions [APR]

ALG 6 [1] Perform arithmetic operations on polynomials: linear and quadratic.

C. Creating Equations [CED]

ALG 7 [1-4] Create equations that describe numbers or relationships: Linear, quadratic, and exponential (integer inputs only; linear only for 3).

D. Reasoning with Equations and Inequalities [REI]

ALG 8 [1] Understand solving equations as a process of reasoning and explain the reasoning: master linear; learn as general principle.

ALG 9 [3-4] Solve equations and inequalities in one variable: linear inequalities; literal that are linear in the variables being solved for; quadratics with real solutions.

ALG 10 [5-7] Solve systems of equations: Linear-linear and linear-quadratic.

ALG 11 [10-12] Represent and solve equations and inequalities graphically: Linear and exponential; learn as general principle.

Functions [F]

A. Interpreting Functions [IF]

FUN 12 [1-3] Understand the concept of a function and use function notation: Learn as general principle; focus on linear and exponential and on arithmetic and geometric sequences.

FUN 13 [4-6] Interpret functions that arise in applications in terms of a context: Linear, exponential, and quadratic.

FUN 14 [7-9] Analyze functions using different representations. Linear, exponential, quadratic, absolute value, step, piecewise defined.

B. Building Functions [BF]

FUN 15 [1-2] Build a function that models a relationship between two quantities: linear, exponential, and quadratic.

FUN 16 [3-4] Build new functions from existing functions: Linear, exponential, quadratic, and absolute value; linear only for 4a.

C. Linear, Quadratic, and Exponential Models [LE]

FUN 17 [1-3] Construct and compare linear, quadratic, and exponential models and solve problems.

FUN 18 [5] Interpret expressions for functions in terms of the situation they model: Linear and exponential of form $f(x)=bx+k$.

Statistics and Probability [S]

A. Interpreting Categorical and Quantitative Data [ID]

SAP 19 [1-3] Summarize, represent, and interpret data on a single count or measurement variable.

SAP 20 [5-6] Summarize, represent, and interpret data on two categorical and quantitative variables: Linear focus, discuss general principles.

SAP 21 [7-9] Interpret linear models.

**NOTE: Conceptual categories target clusters of specific standards within domains In the Ohio Department of Education mathematics model curriculum.*

PC-CCSS Mathematics: Algebra II – Conceptual Categories

Number and Quantity [N]

A. The Complex Number System [CN]

NAQ 1 [1-2] Perform arithmetic operations with complex numbers

NAQ 2 [7-9+] Use complex numbers in polynomial identities and equations: Polynomials with real coefficients.

Algebra [A]

A. Seeing Structure in Expressions [SSE]

ALG 3 [1-2] Interpret the structure of expressions: polynomial and rational.

ALG 4 [4] Write expressions in equivalent forms to solve problems.

B. Arithmetic with Polynomials and Rational Expressions [APR]

ALG 5 [1] Perform arithmetic operations on polynomials: beyond quadratic.

ALG 6 [2-3] Understand the relationship between zeros and factors of polynomials.

ALG 7 [4-5+] Use polynomial identities to solve problems.

ALG 8 [6-7+] Rewrite rational expressions: linear and quadratic denominators.

C. Creating Equations [CED]

ALG 9 [1-4] Create equations that describe numbers or relationships: equations using all available types of expressions, including simple root functions.

D. Reasoning with Equations and Inequalities [REI]

ALG 10 [2] Understand solving equations as a process of reasoning and explain the reasoning: simple radical and rational.

ALG 11 [11] Represent and solve equations and inequalities graphically: combine polynomial, rational, radical, absolute value, and exponential functions.

Functions [F]

A. Interpreting Functions [IF]

FUN 12 [4-6] Interpret functions that arise in applications in terms of a context: emphasize selection of appropriate models.

FUN 13 [7-9] Analyze functions using different representations: focus on using key features to guide selection of appropriate type of model function.

B. Building Functions [BF]

FUN 14 [1] Build a function that models a relationship between two quantities: include all types of functions studied.

FUN 15 [3-4] Build new functions from existing functions: include simple radical, rational, and exponential functions; emphasize common effect of each transformation across function types.

C. Linear, Quadratic, and Exponential Models [LE]

FUN 16 [4] Construct and compare linear, quadratic, and exponential models and solve problems: logarithms as solutions for exponentials.

C. Trigonometric Functions [TF]

FUN 17 [1-2] Extend the domain of trigonometric functions using the unit circle..

FUN 18 [5] Model periodic phenomena with trigonometric functions.

FUN 19 [8] Prove and apply Trigonometric identities.

Statistics and Probability [S]

A. Interpreting Categorical and Quantitative Data [ID]

SAP 20 [4] Summarize, represent, and interpret data on a single count or measurement variable.

B. Making Inferences and Justifying Conclusions [IC]

SAP 21 [1-2] Understand and evaluate random processes underlying statistical experiments

SAP 22 [5-6] Make inferences and justify conclusions from sample surveys, experiments and observational studies.

C. Conditional Probability and the Rules of Probability [CP]

SAP 23 [1-5] Understand independence and conditional probability and use them to interpret data: link to data from simulations or experiments.

SAP 24 [6-9+] Use the rules of probability to compute probabilities of compound events in a uniform probability model.

D. Using Probability to Make Decisions. [MD]

SAP 25 [+6-7] Use probability to evaluate outcomes of decisions: include more complex situations.

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PC-CCSS Mathematics: Geometry – Conceptual Categories

Geometry [G]

A. Congruence [CO]

- GEO 1 [1-5] Experiment with transformations in the plane.
- GEO 2 [6-8] Understand congruence in terms of rigid motions.
- GEO 3 [9-11] Prove geometric theorems.
- GEO 4 [12-13] Make geometric constructions.

B. Similarity, Right Triangles, and Trigonometry [SRT]

- GEO 5 [1-3] Understand similarity in terms of similarity transformations.
- GEO 6 [4-5] Prove theorems involving similarity.
- GEO 7 [6-8] Define trigonometric ratios and solve problems involving right triangles.
- GEO 8 [9-11] Apply trigonometry to general triangles.

C. Circles [C]

- GEO 9 [1-4+] Understand and apply theorems about circles.
- GEO 10 [5] Find arc lengths and areas of sectors of circles: radian introduced only as unit of measure.

D. Expressing Geometric Properties with Equations [GPE]

- GEO 11 [1-2] Translate between the geometric description and the equation for a conic section.
- GEO 12 [4-7] Use coordinates to prove simple geometric theorems algebraically: include distance formula; relate to Pythagorean theorem.

E. Geometric Measurement and Dimension [GMD]

- GEO 13 [1~3] Explain volume formulas and use them to solve problems.
- GEO 14 [4] Visualize the relation between two-dimensional and three-dimensional objects.

F. Modeling with Geometry [MG]

- GEO 15 [1-3] Apply geometric concepts in modeling situations.

Statistics and Probability [S]

A. Conditional Probability and the Rules of Probability [CP]

- SAP 16 [1-5] Understand independence and conditional probability and use them to interpret data: link to data from simulations or experiments.
- SAP 17 [6-9+] Use the rules of probability to compute probabilities of compound events in a uniform probability model.

B. Using Probability to Make Decisions [MD]

- SAP 18 [+6-7] Use probability to evaluate outcomes of decisions: introductory; apply counting rules.

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PC-CCSS Integrated Mathematics I – Conceptual Categories

Number and Quantity [N]

A. Quantities [Q]

NAQ 1 [1-3] Reason quantitatively and use units to solve problems

Algebra [A]

A. Seeing Structure in Expressions [SSE]

ALG 2 [1] Interpret the structure of expressions: linear, exponential, with integer exponents.

B. Creating Equations [CED]

ALG 3 [1-4] Create equations that describe numbers or relationships: Linear, exponential (integer inputs only; linear only for 3).

C. Reasoning with Equations and Inequalities [REI]

ALG 4 [1] Understand solving equations as a process of reasoning and explain the reasoning.

ALG 5 [3] Solve equations and inequalities in one variable.

ALG 6 [5-6] Solve systems of equations: Linear system.

ALG 7 [10-12] Represent and solve equations and inequalities graphically: Linear and exponential.

Functions [F]

A. Interpreting Functions [IF]

FUN 8 [1-3] Understand the concept of a function and use function notation: Focus on linear and exponential.

FUN 9 [4-6] Interpret functions that arise in applications in terms of a context.

FUN 10 [7-9] Analyze functions using different representations.

B. Building Functions [BF]

FUN 11 [1-2] Build a function that models a relationship between two quantities.

FUN 12 [3] Build new functions from existing functions: Linear, exponential; focus on vertical translations for exponential.

C. Linear, Quadratic, and Exponential Models [LE]

FUN 13 [1-3] Construct and compare linear, quadratic, and exponential models and solve problems: linear and exponential.

FUN 14 [5] Interpret expressions for functions in terms of the situation they model.

Geometry [G]

A. Congruence [CO]

GEO 15 [1-5] Experiment with transformations in the plane.

GEO 16 [6-8] Understand congruence in terms of rigid motions.

GEO 17 [12-13] Make geometric constructions.

B. Expressing Geometric Properties with Equations [GPE]

GEO 18 [4-7] Use coordinates to prove simple geometric theorems algebraically: include distance formula; relate to Pythagorean theorem.

Statistics and Probability [S]

A. Interpreting Categorical and Quantitative Data [ID]

SAP 19 [1-3] Summarize, represent, and interpret data on a single count or measurement variable.

SAP 20 [5-6] Summarize, represent, and interpret data on two categorical and quantitative variables: Linear focus, discuss general principles.

SAP 21 [7-9] Interpret linear models.

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C-CCSS Integrated Mathematics 2 – Conceptual Categories

Number and Quantity [N]

A. The Real Number System [RN]

NAQ 1 [1-2] Extend the properties of exponents to rational exponents.

NAQ 2 [3] Use properties of rational and irrational numbers.

B. The Complex Number System [CN]

NAQ 3 [1-2] Perform arithmetic operations with complex numbers.

NAQ4 [7-9+] Use complex numbers in polynomial identities and equations: quadratics with real coefficients.

Algebra [A]

A. Seeing Structure in Expressions [SSE]

ALG 5 [1-2] Interpret the structure of expressions: quadratic and exponential.

ALG 6 [3] Write expressions in equivalent forms to solve problems: quadratic and exponential.

B. Arithmetic with Polynomials and Rational Expressions [APR]

ALG 7 [1] Perform arithmetic operations on polynomials: polynomials that simplify to quadratics.

C. Creating Equations [CED]

ALG 8 [1-4] Create equations that describe numbers or relationships: include formulas involving quadratic terms.

D. Reasoning with Equations and Inequalities [REI]

ALG 9 [4] Solve equations and inequalities in one variable: quadratics with real coefficients.

ALG 10 [7] Solve systems of equations: linear-quadratic systems.

Functions [F]

A. Interpreting Functions [IF]

FUN 11 [4-9] Interpret functions that arise in applications in terms of a context; and analyze functions using different representations.

B. Building Functions [BF]

FUN 12 [1-4] Build a function that models a relationship between two quantities; and build new functions from existing functions.

C. Linear, Quadratic, and Exponential Models [LE]

FUN 13 [3] Construct and compare linear, quadratic, and exponential models and solve problems: including quadratic.

C. Trigonometric Functions [TF]

FUN 14 [8] Prove and apply trigonometric identities.

Geometry [G]

A. Congruence [CO]

GEO 15 [9-11] Prove geometric theorems.

B. Similarity, Right Triangles, and Trigonometry [SRT]

GEO 16 [1-5] Understand similarity in terms of similarity transformations and prove theorems involving similarity

GEO 17[6-8] Define trigonometric ratios and solve problems involving right triangles.

C. Circles [C]

GEO 18[1-4] Understand and apply theorems about circles.

GEO 19[5] Find arc lengths and areas of sectors of circles: radian introduced only as unit of measure.

D. Expressing Geometric Properties and Equations [GPE]

GEO 20 [1-2] Translate between the geometric description and the equation for a conic section.

GEO 21 [4] Use coordinates to prove simple geometric theorems algebraically: include simple circle theorems.

E. Geometric Measurement and Dimension [GMD]

GEO 22 [1-3] Explain volume formulas and use them to solve problems.

Statistics and Probability [S]

A. Conditional Probability and the Rules of Probability [CP]

SAP 23 [1-5] Understand independence and conditional probability and use them to interpret data.

SAP 24 [6-9+] Use the rules of probability to compute probabilities of compound events in a uniform probability model.

B. Using Probability to Make Decisions. [MD]

SAP 25 [+6-7] Use probability to evaluate outcomes of decisions.

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PC-CCSS Integrated Mathematics 3 – Conceptual Categories

Number and Quantity [N]

A. Complex Number System [CN]

NAQ 1 [8-9] Use complex numbers in polynomial identities and equations.

Algebra [A]

A. Seeing Structure in Expressions [SSE]

ALG 2 [1-2] Interpret the structure of expressions: polynomial and rational.

ALG 3 [4] Write expressions in equivalent forms to solve problems.

B. Arithmetic with Polynomials and Rational Expressions [APR]

ALG 4 [1] Perform arithmetic operations on polynomials: beyond quadratic..

ALG 5 [2-3] Understand the relationship between zeros and factors of polynomials.

ALG 6 [4-5+] Use polynomial identities to solve problems.

ALG 7 [6-7+] Rewrite rational expressions: linear and quadratic denominators.

B. Creating Equations [CED]

ALG 8 [1-4] Create equations that describe numbers or relationships: equations using all available types of expressions including simple root functions.

C. Reasoning with Equations and Inequalities [REI]

ALG 9 [2] Understand solving equations as a process of reasoning and explain the reasoning: simple radical and rational.

ALG 10 [11] Represent and solve equations and inequalities graphically: combine polynomial, rational, radical, absolute value, and exponential functions.

Functions [F]

A. Interpreting Functions [IF]

FUN 11 [4-6] Interpret functions that arise in applications in terms of a context: include rational, square root and cube root; emphasize selection of appropriate models.

FUN 12 [7-9] Analyze functions using different representations: include rational and radical; focus on using key features to guide selection of appropriate type of model function.

B. Building Functions [BF]

FUN 13 [1] Build a function that models a relationship between two quantities: include all types of functions studied.

FUN 14 [3-4] Build new functions from existing functions: include simple radical, rational, and exponential functions; emphasize common effect of each transformation across function types.

C. Linear, Quadratic, and Exponential Models [LE]

FUN 15 [4] Construct and compare linear, quadratic, and exponential models and solve problems: logarithms as solutions for exponentials.

D. Trigonometric Functions [TF]

FUN 16 [1-2] Extend the domain of trigonometric functions using the unit circle.

FUN 17 [5] Model periodic phenomena with trigonometric functions.

Geometry [G]

A. Similarity, Right Triangles, and Trigonometry [SRT]

GEO 18 [9-11] Apply trigonometry to general triangles.

B. Geometric Measurement and Dimension [GMD]

GEO 19 [4] Visualize the relation between two-dimensional and three-dimensional objects.

C. Modeling with Geometry [MG]

GEO 20 [1-3] Apply geometric concepts in modeling situations.

Statistics and Probability [S]

A. Interpreting Categorical and Quantitative Data [ID]

SAP 21 [4] Summarize, represent, and interpret data on a single count or measurement variable.

B. Making Inferences and Justifying Conclusions [IC]

SAP 22 1-2] Understand and evaluate random processes underlying statistical experiments.

SAP 23 [3-6] Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

C. Using Probability to Make Decisions [MD]

SAP 24 [6-7] Use probability to evaluate outcomes of decisions: include more complex situations.

**NOTE: Conceptual categories target clusters of specific standards within domains In the Ohio Department of Education mathematics model curriculum.*