SOUTH CAROLINA DEPARTMENT OF EDUCATION

2025 SC CCR Mathematics Vertical Alignment

Office of Assessment and Standards

January, 2025

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State Superintendent of Education

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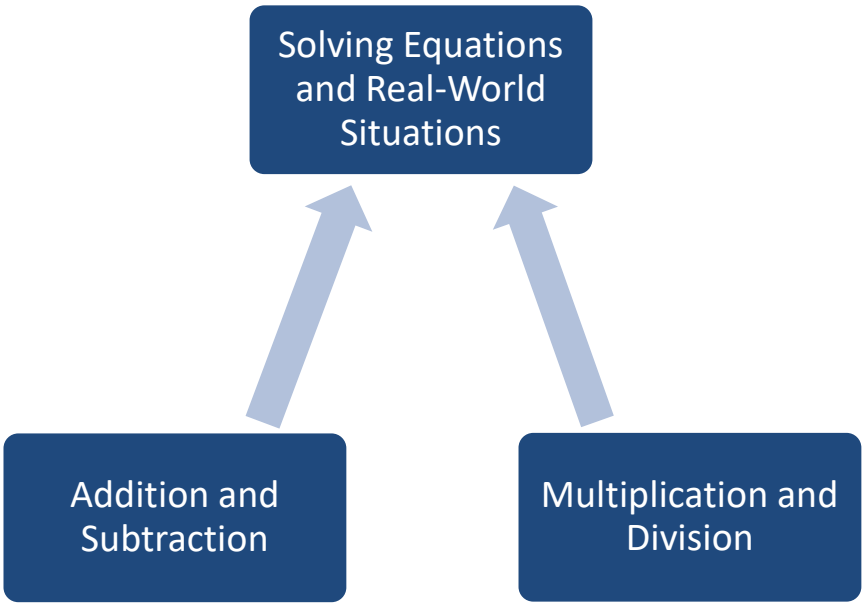
How to Read this Document

This document is intended to help educators see the content connections within the 2025 SC CCR Mathematics Standards.

Why does the document move from High School to Kindergarten instead of Kindergarten to High School? We are beginning with the end in mind. If we know where the learning is going, we better prepare students for what is coming next.

The document is divided into strands to reflect the standards document. However, because of the overlapping nature of math content, the focus is on how the content fits together, not where it came from. Some indicators align with content in multiple locations; this is not a mistake.

There are 3 groups near the end that are related. Both Addition and Subtraction and Multiplication and Division scaffold the work in Solving Equations and Real-World Situations. See the diagram below.



Data, Probability, and Statistical Reasoning (DPSR)

Data Displays

A1.DPSR.2.3 Use a linear model to Interpolate and extrapolate unknown values close to the data set.

A1.DPSR.2.1 Use two-way frequency tables to make inferences and interpret the data in terms of real-world or mathematical situations.

A1.DPSR.1.4 For linear associations, use technology to determine the correlation coefficient, evaluate the strength of the association, and find the line of best fit.

A1.DPSR.1.3 Find a linear function for a scatter plot that suggests a linear association.

A1.DPSR.1.2 Summarize quantitative data in a table and on a scatter plot and describe how the variables are associated. Limit to linear data.

A1.DPSR.1.1 Summarize categorical data in two-way frequency tables, interpret relative frequencies in real-world situations, and informally determine possible associations and trends in the data.

GS.DPSR.2.1 Distinguish between correlation and causation.

GS.DPSR.1.3 Conduct an investigation for a statistical question, interpret statistical significance in the context of a situation, and answer investigative questions appropriately.

GS.DPSR.1.2 Use two representative points from the data to find an approximate line of fit and compare it to the line of best fit.

GS.DPSR.1.1 Represent data for two quantitative variables on a scatter plot and describe how the variables are related.

8.DPSR.1.4 For two data sets (numerical or graphical), compare and interpret the centers, spreads, and overlap of data to draw inferences about data in mathematical and real-world situations. Limit displays to double line graphs, back-to-back stem-and-leaf plots, and double box plots.

8.DPSR.1.3 Describe how adding and deleting data throughout the data set can affect the mean, median, mode, and distribution of the data set.

8.DPSR.1.2 Draw inferences about data sets from two populations using the shape of the distribution, measures of center, and measures of variability. Limit measures to *mean, median, mode, range, mean absolute deviation*, and *interquartile range*.

8.DPSR.1.1 Create and analyze scatter plots to represent numerical data sets in mathematical and real-world situations.

7.DPSR.1.3 Calculate and interpret the measures of center (*mean, median, mode*) and spread (*mean absolute deviation, interquartile range, range*) in mathematical and real-world situations.

7.DPSR.1.2 Use the shape of the graph to select the measure of center (mean, median, or mode) that best describes the data set.

7.DPSR.1.4 Create histograms to represent data sets and interpret histograms to answer questions or draw conclusions about data sets.

7.DPSR.1.1 Create stem-and-leaf plots to represent numerical data sets in mathematical and real-world situations.

6.DPSR.1.4 Calculate and interpret the median, mode, range, interquartile range in mathematical and real-world situations.

6.DPSR.1.3 Use the shape of the graph to determine whether median or mode best describes the data set.

6.DPSR.1.2 Create box plots to represent numerical data sets in mathematical and real-world situations.

5.DPSR.1.3 Analyze categorical and numerical data in graphical displays to make predictions or draw conclusions. Limit displays to tables, bar graphs, dot plots, line graphs, and circle graphs with scales of whole numbers, halves, fourths, and eighths.

5.DPSR.1.2 Solve two-step, real-world situations using whole number and fractional data represented in tables, line graphs, scaled bar graphs, or dot plots. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

5.DPSR.1.1 Describe data by determining the range and mode, including whole numbers, fractional data, and decimal data. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, and 10, and limit decimals to decimals through the hundredths place.

4.DPSR.1.2 Solve one-step, real-world situations using whole number and fractional data represented in tables, scaled picture graphs, scaled bar graphs, or dot plots. Limit to like denominators of 2, 3, 4, 5, 6, 8, and 10.

4.DPSR.1.1 Collect and organize numerical and categorical data based on observations, investigations, surveys, and experiments using tables, scaled bar graphs, or dot plots. Use titles and labels. Scales to include whole numbers, halves, and fourths.

3.DPSR.1.2 Solve one-step, real-world situations using whole number data represented in tables, scaled picture graphs, scaled bar graphs, or dot plots. Limit scales to multiples of 1, 2, 5, and 10.

3.DPSR.1.1 Collect and organize categorical and numerical data based on observations, surveys, experiments, and investigations with whole number values using tables, scaled picture graphs, scaled bar graphs, or dot plots. Use titles and labels. Limit scales to multiples of 1, 2, 5, and 10.

2.DPSR.1.1 Create a survey question and collect data with up to four categories. Create tally charts, picture graphs, dot plots, and bar graphs with a single-unit scale to read the graph, answer questions, and draw conclusions. Limit to one-step add-to, take-from, part-part-whole, and comparison questions.

1.DPSR.1.2 Create a survey question and collect data with up to three categories. Create charts and graphs with a single unit scale to display the data. Use the graph to draw conclusions. Limit to one-step add-to, take-from, and part-part-whole questions.

1.DPSR.1.1 Sort pictures or objects into at least three categories (not to exceed 10 items in each category).

K.DPSR.1.2 Answer questions about data organized in a t-chart, object graph, or picture graph.

K.DPSR.1.1 Sort pictures or objects into at least two categories. Count to determine how many are in each category. Limit to 20 pictures or objects.

Probability

A2.DPSR.2.4 Use permutations and combinations to determine the number of possible outcomes in a sample space.

A2.DPSR.2.3 Apply the general *Multiplication Rule* in a uniform probability model, P(A and B) = P(A)·P(B|A) = P(B)·P(A|B) and interpret the answer in terms of the model.

A2P.DPSR.2.2 Apply the *Addition Rule*, P(A or B) = P(A) + P(B) − P(A and B) and interpret the answer in terms of the model.

A2P.DPSR.2.1 Find the conditional probability of A given B as the fraction of *B*'s outcomes that also belong to *A* and interpret the answer in terms of the model.

A2P.DPSR.1.4 Recognize and explain the concepts of conditional probability and independence.

A2P.DPSR.1.3 Determine whether the conditional probability of A given B as P(A and B)/P(B) and interpret independence of A and B as saying that the conditional probability of given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B in mathematical and real-world situations.

A2P.DPSR.1.2 Explain whether two events, A and B, are independent if and only if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.

A2P.DPSR.1.1 Describe events as subsets of a sample space using characteristics or categories of the outcomes, or as *unions, intersections*, or *complements of other events*.

GS.DPSR.3.3 Apply the *Multiplication Rule* to determine the probability of independent events and interpret the answers in context.

GS.DPSR.3.2 Apply the *Addition Rule* to find the probability of both mutually exclusive and not mutually exclusive events and interpret the answers in context.

GS.DPSR.3.1 Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events.

8.DPSR.2.2 Calculate and interpret the probability of compound independent and dependent events.

8.DPSR.2.1 Determine the sample space for a compound event.

7.DPSR.2.4 Compare and contrast the experimental and theoretical probabilities for a simple experiment.

7.DPSR.2.3 Calculate and interpret the experimental probability of a random event related to a simple experiment.

7.DPSR.2.2 Calculate and interpret the theoretical probability of a simple random event.

7.DPSR.2.1 Identify the sample space for a simple event.

6.DPSR.2.3 Given the probability of an event, identify and calculate the complement of that event.

6.DPSR.2.2 Find the probability of simple events in mathematical and real-world situations. Limit denominators to 2, 4, 5, 8, 10, 25, 50, and 100.

6.DPSR.2.1 Given the probability of a random event, expressed as a number from 0 to 1, state the likelihood of the event occurring.

6.DPSR.1.1 Identify the sample size for a numerical set of data in mathematical and real-world situations.

5.DPSR.2.1 Represent the probability of a simple event as 0, a fraction, or 1. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 20, and 25.
4.DPSR.2.1 Determine the possible outcomes of a simple event and record the probability as certain, possible, or impossible.
3.DPSR.2.1 Identify the possible outcomes of a simple event.

Measurement, Geometry, and Spatial Reasoning (MGSR)

Money
4.MGSR.2.1 Calculate the value of a collection of coins and bills in real-world situations to determine whether there is enough money to make a purchase. Justify based on comparison of money amounts.
3.MGSR.2.1 Determine the value of any collection of coins, not to exceed $5. Write the amount in the form of dollars and cents using the decimal notation. Limit to penny, nickel, dime, and quarter.
2.MGSR.1.3 Determine the value of mixed sets of coins or bills in mathematical and real-world situations and record the value using a ¢ or $ symbol. Limit to pennies, nickels, dimes, and quarters up to a dollar; one-dollar bills, five-dollar bills, ten- dollar bills, and twenty-dollar bills up to $100, and add-to or take-from problem types.
1.MGSR.1.5 Count a collection of like coins to determine the total value of the set. Limit to pennies, nickels, and dimes with values not to exceed a dollar.
1.MGSR.1.4 Identify and write the values of a coin or a bill using a ¢ symbol for coin values or $ symbol for bills. Limit to penny, nickel, dime, quarter, one-dollar bill, five-dollar bill, and ten-dollar bill.
K.MGSR.1.1 Identify a penny, nickel, dime, and quarter.

Measurement
7.PAFR.2.4 Use dimensional analysis to convert units between metric and customary systems.
6.PAFR.2.9 Use one-step dimensional analysis to convert units within the metric or customary systems.
5.MGSR.2.2 Estimate and measure lengths to the nearest eighth of an inch or nearest millimeter.
5.MGSR.2.1 Given the unit equivalencies, convert within a single system of measurement from larger units to smaller units and smaller units to larger units for length, weight, liquid volume, and time. Use these conversions in solving real-world situations. Limit units to inches, feet, yards, ounces, pounds, fluid ounces, cups, pints, quarts, gallons, seconds, minutes, hours, milli-, centi-, kilo-, and base units (grams, liters, meters).
4.MGSR.2.5 Convert customary units of length, weight, and liquid volume from a larger unit to a smaller unit, given direct comparisons of the two measurements and/or the unit equivalencies within a single system of measurement. Limit to inches, feet, yards,

ounces, pounds, fluid ounces, cups, pints, quarts, and gallons when given unit equivalencies.

4.MGSR.2.4 Measure weight in customary units and metric units to the nearest whole unit. Limit to ounces, pounds, grams, and kilograms.

4.MGSR.2.2 Solve real-world situations involving addition and subtraction of time intervals within 60 minutes to find elapsed time, start time, or end time.

4.MGSR.2.3 Measure length to the nearest quarter inch.

3.MGSR.2.5 Determine which unit of liquid volume is most appropriate to measure in real-world situations. Limit to fluid ounces, cups, pints, quarts, gallons, milliliters, and liters.

3.MGSR.2.3 Solve problems involving addition and subtraction of time intervals to determine elapsed time to the nearest half hour.

3.MGSR.2.2 Use analog and digital clocks to tell and record time to 1-minute intervals, identifying AM and PM.

3.MGSR.2.4 Estimate and measure length/distance to the nearest half inch and nearest whole centimeter.

2.MGSR.1.2 Use analog and digital clocks to tell and record time in five-minute intervals, identifying AM and PM.

2.MGSR.1.1 Select and use appropriate tools to estimate and measure length of an object or distance to the nearest customary unit. Limit to inches, feet, and yards.

1.MGSR.1.3 Use analog and digital clocks to tell and record time to the hour and half hour.

1.MGSR.1.2 Use nonstandard physical objects to estimate and then measure the length of an item as the number of same size units of length with no gaps or overlaps.

1.MGSR.1.1 Order three objects by length from shortest to longest and longest to shortest using direct comparison.

K.MGSR.2.2 Describe relative positions of objects by appropriately using terms including *below, above, beside, between, inside, outside, in front of,* or *behind*.

K.MGSR.1.2 Directly compare two objects using words including *shorter, longer, taller, lighter,* and *heavier*.

Perimeter, Area, Volume

GS.PAFR.1.1 Discover and apply the formulas for the length of an arc and the area of a sector in a circle to develop mathematical models and solve mathematical and real-world situations.

GS.PAFR.1.2 Analyze and apply the derivations of the formulas for the circumference of a circle, area of a circle, and volume of a cylinder, pyramid, and cone to model real phenomena and solve mathematical and real-world situations.

GS.MGSR.1.1 Apply area and volume formulas of two- and three-dimensional figures to solve real-world situations.

GS.PAFR.2.1 Apply surface area and volume formulas for prisms, cylinders, pyramids, cones, spheres, and/or compositions of figures to solve problems and justify results.

8.MGSR.1.1 Given the geometric formulas, find the volume of cones, cylinders, and spheres in mathematical and real-world situations.

7.MGSR.1.3 Solve mathematical and real-world situations involving circumference or area of circles.
7.MGSR.1.5 In mathematical and real-world situations, find the volume of right prisms and right pyramids having triangular or quadrilateral bases.
7.MGSR.1.6 In mathematical and real-world situations, find the surface area of right prisms and right pyramids having triangular or quadrilateral bases.
6.MGSR.1.5 Calculate the volume of a right rectangular prism using the formula (V = Bh) in mathematical and real-world situations.
6.MGSR.1.3 Calculate the surface area of rectangular prisms, right triangular prisms, rectangular pyramids, and right triangular pyramids using two-dimensional nets.
6.MGSR.1.2 Create nets to represent three- dimensional shapes.
6.MGSR.1.4 Find the area of composite figures by decomposing them into triangles and rectangles to solve mathematical and real-world situations.
6.MGSR.1.1 Find the area of a triangle, square, rectangle, parallelogram, and trapezoid.
5.MGSR.1.2 Estimate and measure the volume of a right rectangular prism with whole-number side lengths by filling it with unit cubes.
5.MGSR.1.1 Solve problems involving area and perimeter of composite figures by decomposing with rectangles.
4.MGSR.1.2 Apply area formulas for rectangles to solve real-world situations. Use square units to label area measurements.
4.MGSR.1.1 Apply perimeter formulas for rectangles to solve real-world situations including finding the perimeter, given the side lengths, and finding an unknown side length.
3.MGSR.1.3 Determine if a real-world situation is an example of the need for finding the area or the perimeter of a figure.
3.MGSR.1.2 Determine the perimeter of regular and irregular triangles and quadrilaterals with known side lengths.
3.MGSR.1.1 Determine the area of squares and rectangles presented in relevant problems by covering the space with square units and counting the total number of units needed.

Attributes of Two- and Three-Dimensional Shapes
GS.MGSR.1.3 Use cross-sections of three-dimensional figures to model and solve mathematical and real-world situations.
GS.MGSR.1.2 Identify the shape of a two-dimensional cross-section of a three-dimensional figure.
GS.MGSR.7.2 Investigate and apply relationships in circles, inscribed angles, radii, secants, and chords; among inscribed angles, central angles, and circumscribed angles; and between radii and tangents to circles.
GS.MGSR.5.3 Apply the attributes of quadrilaterals, including diagonals, sides, and angles, to prove that a given quadrilateral is a parallelogram in mathematical and real-world situations.
GS.MGSR.5.2 Apply the attributes of triangles in mathematical and real-world situations.
7.MGSR.1.2 Describe the relationship between the *radius, diameter,* and *circumference of a circle*.

7.MGSR.1.1 Identify the parts of a circle. Limit the parts to *center, radius, diameter,* and *chord*.
4.MGSR.3.2 Classify quadrilaterals in a hierarchy based on their shared attributes.
4.MGSR.3.1 Classify triangles according to side length (isosceles, equilateral, scalene) and angle measure (acute, obtuse, right, equiangular).
3.MGSR.3.1 Describe and draw right, acute, obtuse, and straight angles. Identify these angle types in two-dimensional figures including triangles and quadrilaterals.
3.MGSR.3.2 Identify, describe, and draw points, lines, line segments, rays, intersecting lines, perpendicular lines, and parallel lines. Identify these in two-dimensional figures.
2.MGSR.2.3 Classify two-dimensional shapes as triangles or quadrilaterals and justify each classification.
2.MGSR.2.2 Classify shapes as polygons or non-polygons and defend that determination based on their attributes.
2.MGSR.2.1 Identify and describe a given shape in everyday situations to include two-dimensional shapes and three- dimensional shapes. Limit to triangle, quadrilateral, pentagon, hexagon, octagon, circle, cone, cube, cylinder, rectangular prism, square pyramid, and sphere.
1.MGSR.2.5 Analyze and compare a pair of two- dimensional shapes or a pair of three-dimensional shapes of assorted sizes and orientations using formal mathematical language. Limit to triangle, square, rectangle, rhombus, hexagon, circle, cone, cube, cylinder, square pyramid, and sphere.
1.MGSR.2.4 Classify shapes as two-dimensional/flat or three-dimensional/solid and explain the reasoning using formal mathematical language. Limit to triangle, square, rectangle, rhombus, hexagon, circle, cone, cube, cylinder, square pyramid, and sphere.
1.MGSR.2.3 Identify and describe a given shape in everyday situations to include two-dimensional shapes and three- dimensional shapes. Limit to triangle, square, rectangle, rhombus, hexagon, circle, cone, cube, cylinder, square pyramid, and sphere.
1.MGSR.2.2 Identify and describe the attributes of two-dimensional shapes and three-dimensional shapes. Limit to triangle, square, rectangle, rhombus, hexagon, circle, cone, cube, cylinder, square pyramid, and sphere.
1.MGSR.2.1 Sort a mixed set of polygons and describe the reasoning used while sorting the polygons.
K.MGSR.2.1 Identify and describe the attributes of triangles, squares, rectangles, circles, cubes, and spheres to include everyday situations.

Angle Explorations
GS.MGSR.7.1 Use angle and segment relationships in circles to solve mathematical and real-world situations.
GS.MGSR.5.1 Justify and apply the attributes of angle relationships/lines in mathematical and real-world situations.

GS.MGSR.4.3 Recognize that the criteria for showing triangles are similar using a similarity transformation that maps one figure to the other and justify the two triangles are similar by applying the *Angle-Angle, Side- Side-Side,* and *Side-Angle-Side* similarity conditions.
GS.MGSR.3.3 Recognize the criteria for showing triangles are congruent using a sequence of rigid motions that map one triangle to another and justify that the two triangles are congruent by applying the *Side-Side- Side, Side-Angle-Side, Angle-Side-Angle, Angle-Angle-Side,* and *Hypotenuse-Leg* congruence conditions.
8.MGSR.2.3 Identify the congruent corresponding angles of similar polygons.
8.MGSR.2.4 Discover and apply the *Exterior Angle Theorem* of triangles to find a missing angle.
8.MGSR.2.1 Determine missing angle measurements created when parallel lines are cut by a transversal.
7.MGSR.2.4 Write and solve equations to solve mathematical and real-world situations involving the relationships among angles formed by two intersecting lines. Limit to supplementary, complementary, vertical, and adjacent relationships.
7.MGSR.2.3 Identify the relationships and measures among angles formed by two intersecting lines, given the measure of one angle. Limit to supplementary, complementary, vertical, and adjacent relationships.
7.MGSR.2.1 Determine the measure of the third angle given the measure of the other two angles of a triangle using the *Triangle Sum Theorem*.
6.MGSR.2.2 Determine the measure of angles using a protractor.
6.MGSR.2.1 Determine if two angles are complementary or supplementary.
4.MGSR.3.2 Classify quadrilaterals in a hierarchy based on their shared attributes.
4.MGSR.3.1 Classify triangles according to side length (*isosceles, equilateral, scalene*) and angle measure (*acute, obtuse, right, equiangular*).
3.MGSR.3.1 Describe and draw right, acute, obtuse, and straight angles. Identify these angle types in two-dimensional figures including triangles and quadrilaterals.
3.MGSR.3.2 Identify, describe, and draw points, lines, line segments, rays, intersecting lines, perpendicular lines, and parallel lines. Identify these in two-dimensional figures.

Transformations and the Coordinate Plane
A1.MGSR.1.1 Identify any limitations specific to a real-world situation.
GS.MGSR.4.2 Justify experimentally that a dilation of a line segment is longer or shorter, given the ratio.
GS.PAFR.3.1 Use coordinates to prove simple geometric theorems algebraically.
GS.MGSR.4.1 Demonstrate experimentally the properties of dilations given by a center and a scale factor.
GS.MGSR.3.2 Demonstrate that triangles and quadrilaterals are congruent by a combination of translations, rotations, and reflections.
GS.MGSR.3.1 Identify types of symmetry of polygons, including line, point, rotational, and self-congruence, and use symmetry to analyze mathematical situations.
GS.MGSR.2.2 Describe and apply a sequence of transformations that maps a preimage onto its image.

GS.MGSR.2.1 Describe the results of transformations on a given figure using geometric terminology from the definitions of the transformations.
GS.PAFR.3.2 Determine distance and midpoint of segments in a coordinate plane to find areas of triangles and quadrilaterals, when given coordinates.
8.MGSR.3.7 Describe the effect of a series of transformations, including *dilations, translations, rotations,* and *reflections*, on two-dimensional figures using coordinates on the coordinate plane.
8.MGSR.3.6 Create a dilation using a given scale factor and describe the effect of a dilation.
8.MGSR.3.5 Rotate geometric figures 90, 180, and 270 degrees, both clockwise and counterclockwise, about the origin in a coordinate plane.
8.MGSR.3.4 Reflect geometric figures with respect to the *x*-axis and/or *y*-axis.
8.MGSR.3.3 Translate geometric figures vertically and/or horizontally.
8.MGSR.3.2 Identify congruent angles and congruent line segments of a preimage and its image.
8.MGSR.3.1 Identify the transformation as a rotation, reflection, and/or translation. Limit rotations to multiples of 90 degrees centered on the origin.
8.MGSR.1.2 Find the distance between any two points in the coordinate plane using the *Pythagorean Theorem*.
7.MGSR.3.1 Find distances between ordered pairs on the coordinate plane, limited to the same x-coordinate or the same y-coordinate.
6.MGSR.3.2 Graph a polygon on a coordinate plane given the coordinates of the vertices.
6.MGSR.3.2 Graph a polygon on a coordinate plane given the coordinates of the vertices.
6.MGSR.3.1 Plot ordered pairs in all four quadrants and identify points on a graph by writing ordered pairs.
5.MGSR.3.2 Represent mathematical and real-world situations by graphing, labeling, and interpreting points in the first quadrant of the coordinate plane.
5.MGSR.3.1 Identify the origin, *x*-axis, and *y*-axis in the coordinate system. Write, plot, and label ordered pairs, including values in a function table, in the first quadrant of the coordinate plane.
K.MGSR.2.2 Describe relative positions of objects by appropriately using terms including *below, above, beside, between, inside, outside, in front of,* or *behind*.

Triangle Applications
A2P.MGSR.1.1 Build the unit circle for sine and cosine functions using right triangle definitions.
GS.MGSR.6.5 Apply trigonometric ratios (sine, cosine, tangent) and the *Pythagorean Theorem* to solve right triangle problems in real-life situations.
GS.MGSR.6.1 Discover and apply the converse of the *Pythagorean Theorem*.
8.MGSR.1.2 Find the distance between any two points in the coordinate plane using the *Pythagorean Theorem*.
8.MGSR.1.3 Given the *Pythagorean Theorem*, determine unknown side lengths in right triangles in mathematical and real-world situations.
8.MGSR.1.4 Determine if a given set of sides forms a right triangle.

7.MGSR.1.4 Determine if three given side lengths can form a triangle using the *Triangle Inequality Theorem*.

Numerical Reasoning (NR)

Representing Numbers

8.NR.2.2 Classify and order the subsets of real numbers in the number system including natural, whole, integer, rational, and irrational numbers.

6.NR.2.3 Represent quantities with integers in real-world situations and explain the meaning of zero.

5.NR.1.1 Read, write, and represent multi-digit numbers from 0 to 999 with decimals to the thousandths place. Use pictorial, word, standard, or expanded form with fraction or decimal notation.

4.NR.2.1 Represent fractions with denominators of 10 and 100 in words, models, and decimal notations.

4.NR.1.1 Read and write whole numbers through the millions period (0 to 999,999,999) in word, standard, and equations in expanded form.

3.NR.2.3 Express whole numbers as fractions and identify fractions that are equivalent to whole numbers. Limit denominators to 1, 2, 3, 4, 6, and 8.

3.NR.1.1 Read, write, and represent whole numbers through the thousands period (0 to 999,999) on a number line and in standard, base ten language, word, and equations in expanded form.

2.NR.1.2 Represent and explain that whole numbers 1 through 999 are organized into groups of hundreds, tens, and ones, and a digit has a different value depending on its placement.

2.NR.1.1 Read, write, and represent numbers up to 999 using concrete models, drawings, standard form, base ten language, and equations in expanded form.

1.NR.1.2 Represent and explain that whole numbers 1 through 99 are organized into groups of tens and ones, and a digit has a different value depending on its placement.

1.NR.1.1 Read, write, and represent numbers to 100 using concrete models, drawings, standard form, base ten language, and equations in expanded form.

K.NR.1.1 Read, write, and represent the numerals 0 to 20 and represent the written numeral with concrete models.

K.NR.2.4 Given a number from 0 to 20, count out that many objects.

K.NR.2.3 Given a group of up to 20 objects, count the number of objects in that group and represent the number of objects with a written numeral. State the number of objects in a rearrangement of that group without recounting.

Composing and Decomposing Numbers

4.NR.2.4 Represent the composition and decomposition of fractions with the same denominator, including mixed numbers and fractions greater than 1, using multiple representations. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

3.NR.2.4 Compose fractions between the whole numbers 0 and 5 using unit fractions. Record the composition as a mixed number or fraction greater than 1. Limit denominators to 2, 3, 4, 6, and 8.

3.NR.2.1 Identify unit fractions as the quantity formed by one part when a whole is partitioned into 2, 3, 4, 6, or 8 equal-sized parts. Express each part as a unit fraction of the whole.

3.NR.1.2 Compose and decompose 4-digit whole numbers in multiple ways using thousands, hundreds, tens, and ones.

2.NR.1.3 Compose and decompose whole numbers from 1 through 999 in more than one way using hundreds, tens, and ones. Explain and demonstrate each composition or decomposition with the use of concrete models, drawings, and equations.

1.NR.1.3 Compose and decompose whole numbers from 1 through 99 in more than one way using tens and ones. Explain and demonstrate each composition or decomposition with the use of concrete models, drawings, and/or equations.

K.NR.1.2 Compose and decompose numbers from 11 to 19 into tens and ones by using concrete objects, pictorial models, or drawings to demonstrate understanding that the teen numbers are composed of one set of ten ones and a few more ones.

Rounding Numbers

5.NR.1.3 Round decimal numbers up to 999 with decimals to the thousandths place to the nearest hundredth, tenth, or whole number.

4.NR.1.2 Estimate sums, differences, products, and quotients of multi-digit whole numbers, using rounding and place value to determine the reasonableness of real-world problem solutions. Write an equation for the estimate.

3.NR.1.4 Round whole numbers from 0 to 1,000 to the nearest 10 or 100.

2.NR.3.2 When given a two-digit number, identify which multiple of 10 the number is closest to.

1.NR.2.2 Skip count by fives and tens from any multiple of five to 100, identifying place value patterns in the sequence.

Number Systems

A2P.NR.1.2 Add, subtract, and multiply complex numbers.

A2P.NR.2.1 Perform operations with matrices including addition, subtraction, and scalar multiplication.

A2P.NR.1.1 Understand that there is an imaginary unit i such that $i^2 = -1$ and explain the structure of a complex number as $a + bi$, where a and b are real.

A1.NR.2.1 Translate between rational exponents and radical expressions of irrational and rational numbers. Use properties of addition, subtraction, multiplication, and division to simplify radical and rational expressions. Limit to square and cube roots.

A1.NR.1.1 Rewrite numerical and algebraic expressions of irrational and rational numbers involving radicals, including addition, subtraction, multiplication, and division. Limit to square and cube roots.

GS.NR.1.1 Rewrite numerical expressions of irrational and rational numbers involving radicals, including addition, subtraction, multiplication, and division, to recognize geometric patterns.

8.NR.1.1 Convert any form of a rational number to any other form including fractions (mixed numbers), decimals, and percentages.

7.NR.1.1 Convert rational numbers into equivalent forms among fractions (including mixed numbers), decimals, and percentages. Exclude the conversion of repeating decimals to fractions.

6.NR.1.1 Convert positive rational numbers into equivalent forms among terminating decimals, fractions (including mixed numbers), and percentages. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200.

4.NR.2.5 Explain and demonstrate how a mixed number is equivalent to a fraction greater than 1 and how a fraction greater than 1 is equivalent to a mixed number. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

4.NR.2.3 Generate equivalent fractions, including fractions greater than 1, using multiple representations. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

4.NR.2.1 Represent fractions with denominators of 10 and 100 in words, models, and decimal notations.

3.NR.2.5 Recognize two fractions are equivalent based on the same size whole. Limit denominators to 2, 3, 4, 6, and 8, and fractions should be limited to fractions between 0 and 1.

3.NR.2.3 Express whole numbers as fractions and identify fractions that are equivalent to whole numbers. Limit denominators to 1, 2, 3, 4, 6, and 8.

3.NR.2.2 Represent fractions from 0 to 1 using concrete, set, area, and linear models, and write them in standard form and word form. Limit denominators to 2, 3, 4, 6, and 8.

3.NR.2.1 Identify unit fractions as the quantity formed by one part when a whole is partitioned into 2, 3, 4, 6, or 8 equal-sized parts. Express each part as a unit fraction of the whole.

2.NR.4.2 Explain that when partitioning a square, rectangle, or circle into two or four equal parts, the parts become smaller as the number of parts increases.

2.NR.4.1 Partition in multiple ways squares, rectangles, and circles into two or four equal sized parts, and describe the parts using the words *halves, fourths, a half of,* and *a fourth of* (not quarters).

1.NR.4.1 Partition in multiple ways squares, rectangles, and circles into two or four equal-sized parts. Name the pieces as halves and fourths.

Comparing Numbers

8.NR.2.1 Compare real numbers and write statements using *is equal to (=)*, *is not equal to (≠)*, *is less than (<)*, *is greater than (>)*, *is greater than or equal to (≥)*, or *is less than or equal to (≤)*.

7.NR.2.1 Compare two rational numbers and write statements using *is equal to (=)*, *is not equal to (≠)*, *is less than (<), is greater than (>), is greater than or equal to (≥),* and/or *is less than or equal to (≤)* in mathematical and real-world situations.

6.NR.2.4 Identify and compare the opposite value and absolute value of positive and negative rational numbers.

6.NR.2.2 Sort a set of positive rational numbers in ascending and/or descending order in mathematical and real-world situations. Limit sets to no more than 5 numbers. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200.

6.NR.2.1 Compare two positive rational numbers and write statements using the symbols for *is equal to (=), is not equal to (≠), is less than (<),* and/or *is greater than (>)* in mathematical and real-world situations. Limit fractions to denominators of 2, 4, 5, 8, 10, 20, 25, 50, 100, and 200.

5.NR.2.1 Compare fractions and mixed numbers with like and unlike denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, and 100 using equivalence to create a common denominator. Use the symbols for *is less than (<), is more than (>),* or *is equal to (=)* to record the comparison.

4.NR.2.2 Compare decimal numbers to the hundredths using the benchmarks 0, 0.5, and 1.0, concrete area, and linear models. Use the symbols for *is equal to (=), is less than (<),* and/or *is greater than (>)*.

4.NR.2.6 Compare fractions and mixed numbers with like and unlike denominators applying benchmark fractions such as 0, 1/2, and 1 using the symbols for *is equal to (=), is less than (<),* or *is greater than (>).* Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

4.NR.1.3 Order whole numbers within 999,999 (no more than 3) in ascending or descending order and record the comparison(s) using symbols for *is less than (<)* and/or *is greater than (>)*.

3.NR.2.6 Compare two fractions with the same numerator or same denominator based on the same size whole by reasoning about their size. Use the symbols for *is equal to (=), is less than (<),* or *is greater than (>).* Limit denominators to 2, 3, 4, 6, and 8, and fractions should be limited to fractions between 0 and 1.

3.NR.1.3 Compare two whole numbers up to 999,999 based on the place value of the digits using the symbols for *is equal to (=), is less than (<),* or *is greater than (>)*.

2.NR.3.1 Compare representations of whole numbers up to 999 and write a comparison statement using words and symbols. Limit to *is equal to (=), is less than (<),* and/or *is greater than (>)*.

1.NR.3.1 Compare representations of two numbers up to 100 using the phrases *is greater than, is less than,* or *is equal to (the same value as)*.

K.NR.3.1 Compare up to 10 objects in one set to another set of up to 10 objects using the phrases *more than, fewer than,* or *the same as*.

Patterns, Algebraic, and Functional Reasoning (PAFR)

Functions

A2P.PAFR.5.1 Graph piecewise functions and describe their key features.

A2P.PAFR.4.1 Identify the effect on the graph of replacing *f(x)* by *kf(x)*, *f(x) + k*, *f(x - k)*, *f(kx)* for any real number *k* including multiple transformations; write an equation of a transformed parent function given its graph. Extend to equations involving rational, polynomial, radical, exponential, and piecewise.

A1.PAFR.4.2 Given a real-world or mathematical situation, determine the parent graph that best models the situation.

A1.PAFR.4.1 Describe the effect of the transformations *kf(x)*, *f(x) + k*, *f(x – k)*, and combinations of such transformations on the graph of parent function *y = f(x)* for any real number *k*; find the value of *k* given the graphs; and write the equation of a transformed parent function given its graph.

A1.PAFR.3.3 Translate among graphical, tabular, verbal, and symbolic representations in function notation, to identify intercepts, intervals where the function is increasing, decreasing, constant, maximums and minimums, and symmetries and explain their meanings in real-world and mathematical situations.

A1.PAFR.3.1 Recognize that *f(x)* denotes the output of function *f* that corresponds to the input *x*, and this corresponds to the set of all the ordered pairs *(x, y)* that satisfy the equation *y = f(x)* both tabularly and graphically.

A1.PAFR.3.2 Use the definition of a function to analyze the domain and range of a function in relation to its graph, mapping, table, verbal, and/or symbolic description and, where applicable, using interval and set notation.

A1.PAFR.2.5 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

8.PAFR.1.6 Translate among the multiple representations, including mappings, tables, graphs, verbal description, and equations (only when linear) of a function.

8.PAFR.1.5 Use multiple representations including mappings, tables, graphs, verbal description, and equations (only when linear) of two functions to compare the functions and draw conclusions.

8.PAFR.1.4 Describe the key features of given functions, including domain, range, intervals of increasing or decreasing, constant, discrete, continuous, and intercepts.

8.PAFR.1.3 Determine if a graph, table, mapping, or verbal description is a function (linear or nonlinear) or not a function.

8.PAFR.1.1 Define an equation in slope-intercept form (*y = mx + b*) as being a linear function.

7.PAFR.1.2 Create a model with functions that address a proportional relationship in real-world situations.

6.PAFR.1.2 Identify the independent and dependent variable of a function in mathematical and real-world situations.

6.PAFR.1.1 Use tables, graphs, verbal descriptions, and equations to represent the relationship between independent and dependent variables of functions.

5.NR.1.4 Use patterns to explain the exponents when multiplying and dividing by powers of 10, not to exceed the thousandths place.
5.NR.1.2 Explain how the value of a digit in a multi-digit number changes if the digit moves one or more places to the left or right in the base ten system. Include decimals to the thousandths place.
5.PAFR.3.3 Identify a rule that can describe the pattern from the data of a function table and write it as an expression.
4.PAFR.3.2 Describe and extend a numerical pattern that follows a rule using function tables and real-world situations.
3.PAFR.2.3 Identify, create, and extend numerical patterns to determine the next three terms in an addition or subtraction sequence.
2.PAFR.2.2 Create, describe, and extend an appropriate one-step rule for number patterns using addition and subtraction within 100.
2.NR.1.4 Apply place value reasoning to identify the number that is 10 more, 10 less, 100 more, and 100 less than a given three- digit number through 999.
2.PAFR.2.1 Describe, extend, and create a growing shape pattern with up to three terms within a sequence.
2.PAFR.1.8 Sort a collection of 20 or fewer objects into two groups to determine if the number of objects is even or odd.
2.NR.2.1 Count forward and backward by ones, tens, and hundreds from any number within 999 and identify patterns in the sequence.
1.NR.2.2 Skip count by fives and tens from any multiple of five to 100, identifying place value patterns in the sequence.
1.NR.1.4 Apply place value reasoning to identify the number that is one more and one less, ten more, and ten less than a given number with up to two digits.
1.NR.2.1 Count by ones forward or backward starting at any number up to 120 making accurate decade transitions.
1.PAFR.2.1 Create, describe, and extend (to the next term) a growing shape pattern.
1.PAFR.2.2 Create, describe, and extend (to three terms within a sequence) repeating patterns using *AB*, *AAB*, *ABB*, and *ABC* type patterns.
K.NR.2.1 Count forward by ones and tens to 100 and backward from 10 by ones.
K.PAFR.2.1 Describe, extend, and create (to the next term) simple repeating patterns in the form of *AB*, *AAB*, *ABB*, and *ABC*.

Expressions
A2P.PAFR.3.2 Find the sum of the terms of arithmetic and geometric sequences.
A2P.PAFR.2.2 Perform arithmetic operations on rational expressions, including problems in context, and express rational expressions in irreducible form.
A2P.PAFR.1.5 Recognize perfect squares and perfect cubes and use them to describe the structure of polynomials.
A1.PAFR.2.10 Analyze the growth/decay rate between linear and exponential functions specifically between consecutive integers.

A1.PAFR.2.6 Create symbolic representations of linear and exponential functions, including arithmetic and geometric sequences, given graphs, verbal descriptions, and tables.

A1.PAFR.1.4 Add, subtract, and multiply polynomials with initial terms up to a degree of 2.

8.PAFR.3.3 Apply laws of exponents to simplify algebraic expressions involving no more than three variables and integer exponents.

8.PAFR.3.2 Approximate non-perfect square roots and cube roots to the nearest tenth. Limit to square roots less than or equal to 400 and cube roots less than or equal to 1,000.

8.PAFR.3.1 Analyze patterns of perfect squares and perfect cubes to evaluate square roots and cube roots. Limit to square roots less than or equal to 400 and cube roots less than or equal to 1,000.

7.PAFR.3.4 Factor linear expressions with integer coefficients using the greatest common factor (GCF).

7.PAFR.3.3 Recognize that algebraic expressions may have a variety of equivalent forms and determine an appropriate form for a given real-world situation.

7.PAFR.3.2 Identify linear expressions that are equivalent.

7.PAFR.3.1 Simplify numerical expressions that include integer exponents using the laws of exponents: *the Product of Powers, Quotient of Powers, Power of a Power, Power of a Product, Power of a Quotient, Zero Power,* and *Negative Exponent*.

7.PAFR.2.2 Write and evaluate expressions in one variable that model mathematical and real- world situations.

6.PAFR.3.2 Identify the multiplicative inverse of a number and multiply multiplicative inverses to find their product is equal to 1.

6.PAFR.3.4 Apply the properties of operations to create equivalent algebraic expressions and justify the properties used. Limit properties to the Identity, Inverse, Commutative, Associative, and Distributive Properties.

6.PAFR.3.3 Identify the additive inverse of a number and add additive inverses to find their sum is equal to zero.

6.PAFR.2.4 Write and evaluate expressions using variables to represent quantities in mathematical and real-world situations.

6.PAFR.2.3 Evaluate numerical expressions with positive whole number bases and positive whole number exponents using the Order of Operations.

6.PAFR.2.2 Write and evaluate numerical expressions containing powers. Limit to positive whole number bases and positive whole number exponents.

6.PAFR.2.1 Identify parts of an algebraic expression using the mathematical terms sum, difference, term, variable, product, factor, quotient, coefficient, and constant.

5.PAFR.3.4 Translate a two-step real-world situation into a numerical expression using parentheses as grouping symbols and evaluate the expression.

Equations and Inequalities

A2P.PAFR.6.1 Find the inverse of functions and verify graphically.

A2P.PAFR.3.1 Create, solve, and graph exponential functions, including those that model real-life situations.

A2P.PAFR.2.3 Create and solve rational and radical equations in one variable, including those that model real-life situations, and verify solutions to identify extraneous solutions if they appear.

A2P.PAFR.2.1 Graph rational and radical functions and describe their key features. Limit to square roots and cube roots only.

A2P.PAFR.1.3 Graph and analyze polynomial functions in mathematical and real-world situations.

A2P.PAFR.1.1 Graph, identify roots, and analyze quadratic functions in mathematical and real-world situations.

A1.PAFR.4.3 Given different representations of two different functions, compare key features including intercepts, domain and range, intervals of increasing and decreasing, constant, average rate of change, and maximum and minimum values.

A1.PAFR.2.7 Use graphs to obtain exact and/or approximate solutions of equations, inequalities, and systems of linear equations in two variables (given or obtained by using technology).

A1.PAFR.2.4 Create, solve, and graph linear inequalities in two variables.

A1.PAFR.2.1 Transform linear, quadratic, exponential, and linear absolute value functions to equivalent forms to identify slope and *y*-intercept for linear, vertex, and roots (if any) for quadratic and linear absolute value, and *y*-intercept for exponential.

A1.PAFR.1.2 Solve literal equations and formulas for a specified variable including equations and formulas that arise in a variety of disciplines.

A1.PAFR.1.1 Transform an equation in one variable to create new equations that have the same solution as the original and justify the steps taken.

8.PAFR.2.2 Describe single-variable equations as having one solution, no solution, or an infinite number of solutions.

8.PAFR.2.1 Solve multi-step one-variable equations and inequalities with variables on both sides with rational coefficients.

7.PAFR.2.1 Write and solve multi-step equations and inequalities in one variable involving rational numbers in mathematical and real-world situations.

6.PAFR.3.1 Represent the solutions of inequalities on a number line and explain that the solution set may contain an infinite number of solutions. Limited to the symbols for is less than (<) and is greater than (>).

6.PAFR.2.5 Write and solve one-step equations and inequalities with one variable involving positive rational numbers in mathematical and real-world situations.

Proportional Reasoning and Slope

A2P.MGSR.1.2 Use models of periodic phenomena to evaluate and analyze the graph of sine and cosine functions.

A2P.PAFR.6.2 Calculate and interpret the average rate of change of the function over a specified interval, given a function in graphical, symbolic, or numerical form.

A1.DPSR.2.2 Interpret the slope and the intercept of a linear model in the context of the data.

A1.PAFR.3.4 Interpret how lead coefficients impact the shape of a function's graph.

GS.MGSR.6.5 Apply trigonometric ratios (sine, cosine, tangent) and the Pythagorean Theorem to solve right triangle problems in real-life situations.

GS.MGSR.6.4 Determine the sine, cosine, and tangent of an acute angle in a right triangle in the context of mathematical and real-world situations.

GS.MGSR.6.3 Define the trigonometric ratios using the properties of similar right triangles.

GS.MGSR.6.2 Discover and apply the constant ratios of the sides in 30-60-90 and 45-45-90 right triangles.

GS.PAFR.2.3 Determine the equation of a line passing through a given point that is parallel or perpendicular to a given line.

GS.PAFR.2.2 Analyze slopes of lines to determine whether lines are parallel, perpendicular, or neither.

8.MGSR.2.5 Apply proportional reasoning to find the missing side lengths of two similar figures.

8.MGSR.2.2 Determine if two-dimensional figures are congruent or similar.

8.MGSR.3.6 Create a dilation using a given scale factor and describe the effect of a dilation.

8.PAFR.2.5 Given a table or a graph, identify the slope and the y-intercept of a line and write a linear equation to express that line.

8.PAFR.2.4 Explain why the slope, m, is the same between any two distinct points on a linear graph.

8.PAFR.2.3 Identify the rate of change for a linear function as the slope of the line.

8.PAFR.1.2 Identify and describe the constant rate of change and the y-intercept of a linear function.

7.MGSR.2.2 Solve mathematical and real-world situations involving dimensions and areas of geometric figures including scale drawings and scale factors.

7.PAFR.2.3 Compute unit rates, including those involving complex fractions with like or different units.

7.PAFR.1.3 Identify the constant of proportionality within proportional relationships.

7.PAFR.1.1 Apply proportional reasoning to solve problems in mathematical and real-world situations involving ratios and percentages.

6.PAFR.2.8 Solve ratio and rate problems in real- world situations.

6.PAFR.2.7 Explain the relationship between ratios and rates, including unit rates.

6.PAFR.2.6 Interpret the concept of a ratio as the relationship between two quantities, including part-to-part and part-to-whole.

<u>Addition and Subtraction</u> (This group can attach to the bottom of the following group)

5.PAFR.1.3 Use a strategy to compute sums and differences of decimal numbers to the hundredths

5.PAFR.2.1 Use a strategy to compute sums and differences of fractions and mixed numbers with unlike denominators and justify the sum or difference to include real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

4.PAFR.2.2 Use fraction and decimal equivalencies to add and subtract tenths and hundredths, to include mixed numbers and fractions greater than 1.

4.NR.2.4 Represent the composition and decomposition of fractions with the same denominator, including mixed numbers and fractions greater than 1, using multiple representations. Limit fractions to denominators of 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.

4.PAFR.2.1 Use a strategy to accurately compute sums and differences of fractions with like denominators and justify the reasonableness of the answer. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 25, and 100.

4.PAFR.1.1 Use a strategy to accurately compute sums and differences of whole numbers up to 100,000 and justify the sum or difference.

3.NR.2.4 Compose fractions between the whole numbers 0 and 5 using unit fractions. Record the composition as a mixed number or fraction greater than 1. Limit denominators to 2, 3, 4, 6, and 8.

3.PAFR.1.1 Use a strategy to compute sums and differences up to 1,000.

2.PAFR.1.3 Solve one-step add-to, take-from, part- part-whole, and additive comparison real- world situations through 99 with the unknown in any position.

2.PAFR.1.1 Use a strategy to accurately find sums and differences of two-digit numbers within 100 and justify the sum or difference.

2.PAFR.1.4 For any number from 0 to 99, find the number that makes 100 when added to the given number.

2.PAFR.1.7 Determine the unknown number in addition and subtraction equations within 20, with the unknown in any position.

2.PAFR.1.6 Apply the *Associative Property of Addition* to find the sum (through 20) of three addends and explain that the value can be found using various grouping strategies.

2.PAFR.1.2 Determine and explain if an equation (within 20) is true using a variety of equation formats.

2.PAFR.1.5 Add and subtract number combinations flexibly and accurately within 20.

1.PAFR.1.8 Find the difference between two numbers that are multiples of 10, both in the range 10–90, and write the corresponding equation. Explain the reasoning used.

1.PAFR.1.7 Find the sum of a two-digit number and a one-digit number or a two-digit number and a multiple of 10 (1–99) using concrete models, drawings, and strategies that reflect place value understanding, the inverse relationship of addition and subtraction, and the properties of the operations to justify the sum.

1.PAFR.1.5 Apply and explain the *Commutative Property of Addition* to find the sum (through 20) of two addends and explain that the value does not change when the order of the two numbers changes.

1.PAFR.1.3 Solve add-to, take-from, and part-part- whole real-world situations to find sums and differences within 20. Situations include result or change unknown, both addends unknown, and total or one part unknown.
1.PAFR.1.2 Compose and decompose numbers less than or equal to 20 in more than one way. Record each composition or decomposition as an equation.
1.PAFR.1.1 Determine and explain if an equation within 10 is true using a variety of equation formats.
1.PAFR.1.6 Determine an unknown number in addition and subtraction equations within 10.
1.PAFR.1.4 Add and subtract number combinations flexibly and accurately within 10.
K.PAFR.1.4 Solve add-to/joining, take-from/separating, part-part-whole (total unknown), part-part-whole (both addends unknown) real-world situations to find sums and differences within 10.
K.PAFR.1.3 Compose and decompose numbers up to 10 in different ways. Record using objects or drawings.
K.PAFR.1.2 Create a sum of 10 using objects and drawings when given one of two addends 0–9, to include real-world situations.
K.PAFR.1.1 Add and subtract number combinations within 5.
K.NR.2.2 Subitize a quantity of up to 10 objects in an organized arrangement without counting, explaining how one grouped the objects within the set to determine the total quantity.

<u>Solving Equations and Real-World Situations</u> (this group is where the previous and subsequent groups come together)
A2P.PAFR.6.3 Use linear programming to solve systems of equations and inequalities by addressing the constraints that arise in real-world situations.
A2P.PAFR.5.2 Solve linear absolute value inequalities.
A2P.PAFR.1.4 Solve polynomial inequalities that model mathematical and real-world situations.
A2P.PAFR.1.2 Solve quadratic inequalities that model mathematical and real-world situations.
A1.PAFR.2.9 Solve systems of linear equations algebraically and graphically.
A1.PAFR.2.8 Solve an equation of the form $f(x) = g(x)$ graphically by identifying the x-coordinate(s) of the point(s) of intersection of the graphs of $y = f(x)$ and $y = g(x)$.
A1.PAFR.2.3 Solve and graph linear, quadratic, exponential, and linear absolute value equations given in tabular, symbolic, and/or verbal forms using intercepts, domain and range, intervals of increasing and decreasing, vertex (maximum and minimum), end-behavior, and symmetry, and interpret these in terms of mathematical and real-world situations.
A1.PAFR.2.2 Solve quadratic equations by completing the square, factoring, and the quadratic formula, explaining the connection between the zeros of the function derived from the equation, its linear factors (if it factors), the x-intercepts of its graph (if they exist), and the solutions (if any) to the corresponding quadratic equation.

A1.PAFR.1.3 Solve mathematical and real-world situations using linear, quadratic, exponential (same bases), and linear absolute value equations in one variable.
7.PAFR.3.5 Apply all operations with rational numbers to solve problems in mathematical and real-world situations.
6.PAFR.3.5 Add, subtract, multiply, and divide integers in mathematical and real-world situations.
6.PAFR.3.6 Add, subtract, multiply, and divide positive fractions, including mixed numbers in mathematical and real-world situations.
6.PAFR.3.7 Add, subtract, multiply, and divide multi-digit positive decimals, up to the thousandths place, to solve problems in mathematical and real-world situations.
4.PAFR.3.4 Solve two-step, real-world situations using the four operations involving whole number answers. Represent the problem using an equation with a variable as the unknown in any position.
3.PAFR.2.2 Solve one- and two-step real-world situations using addition and subtraction up to 1,000.

Multiplication and Division (This group can attach to the bottom of the previous group)
5.PAFR.2.3 Interpret and represent division of a whole number dividend by a unit fraction divisor and a unit fraction dividend by a whole number divisor and apply to real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, and 12.
5.PAFR.2.2 Use a strategy to multiply a fraction by a fraction or a fraction by a whole to include real-world situations. Limit denominators to 2, 3, 4, 5, 6, 8, 10, and 12.
5.PAFR.1.4 Use a strategy to multiply a one-digit whole number by a decimal to the hundredths and divide a decimal to the hundredths (dividend) by a one-digit whole number (divisor). Justify the calculation.
5.PAFR.1.2 Use a strategy to compute the quotient of a multi-digit whole number dividend divided by a two-digit whole number divisor, with and without remainders, to include real-world situations. Limit the dividend to four digits.
5.PAFR.1.1 Use a strategy to compute the product of a two- or three-digit factor times a two-digit factor to include real-world situations.
5.PAFR.3.1 Determine the least common multiple (LCM) to find a common denominator. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 20, 25, 50, and 100.
5.PAFR.3.2 Determine the greatest common factor (GCF) of two numbers both less than or equal to 50 to simplify a fraction into its standard form.
4.PAFR.2.3 Represent and compute the product of a whole number times a unit fraction. Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12, 25, and 100.
4.PAFR.2.4 Interpret a fraction as an equal sharing division situation, where a quantity (the numerator) is divided into equal parts (the denominator) to include real-world situations.
4.PAFR.1.4 Use a strategy to divide up to a four-digit dividend by a one-digit divisor, with and without remainders. Justify the calculation.
4.PAFR.1.3 Decompose numbers by the value of each digit to multiply whole numbers up to four digits by a one-digit number and two 2- digit whole numbers.

4.PAFR.1.2 Compute the product of a one-digit whole number times a multiple of 10 (from 10 to 90) and 100 (from 100 to 900) based on place value and properties of operations.

4.PAFR.3.3 Solve real-world situations involving multiplicative comparison situations and write equations to represent the problem using a variable for the unknown.

4.PAFR.3.1 Find all factor pairs for a whole number in the range 1–50. Determine whether the whole number is prime or composite.

3.PAFR.2.4 Recognize that a whole number is a multiple of each of its factors 1–10.

3.PAFR.2.1 Determine the unknown whole number in a multiplication or division real-world situation relating three whole numbers when the unknown is a missing factor, product, dividend, divisor, or quotient.

3.PAFR.1.3 Multiply two whole numbers from 0 to 10 and divide using related facts flexibly and accurately.

3.PAFR.1.2 Multiply whole numbers (factors 0–10) and divide whole numbers (divisors 1–10) using a model and write a corresponding equation.

2.PAFR.1.9 Find the total number of objects arranged in equal groups or in a rectangular array and write an addition equation to express the total as a sum (up to 25) of equal addends.