Development of Major Content Strands in Making Connections: Foundations for Algebra, Course 2

Chp	Working with Data	Number	Arithmetic Operations	Measurement	Ratio and Proportion
1	Students generate questions about the winning frogs in the Calaveras County frog-jumping contest that could be answered using data. Students analyze data using measures of central tendency and histograms. Students flip coins and compare experimental with theoretical probabilities.	Students examine patterns in fractions and their decimal equivalents as they consider whether 0.999... is equal to 1. Students review strategies for rewriting fractions as decimals and percents (and vice versa) in order to compare probabilities. Students also examine patterns in quotients to distinguish terminating from repeating decimals, and rewrite decimals as fractions.	Students review strategies for adding and subtracting fractions in the context of calculating probabilities.	Students solve puzzles about shapes created from square tiles, determining whether different shapes meet specific area and perimeter criteria.	Students use proportional thinking to determine how far they could jump if they were to have the abilities of a bullfrog.
2	This thread is spiraled through homework.	This thread is spiraled through homework.	Students use integer operations (addition, subtraction, and multiplication) to predict and describe the motion of points on a coordinate grid as they work with geometric transformations. They also represent integer expressions using number lines. Students use an area model to multiply fractions. Students review and apply order of operations as they evaluate expressions for the area of a trapezoid.	Students calculate areas of rectangles with fractional dimensions. Students decompose composite shapes and recompose them into rectangles in order to find their areas. Students develop and apply formulas for finding the areas of rectangles, parallelograms, triangles, and trapezoids. They also calculate the area and perimeter of composite shapes using those formulas.	An explicit focus on working with ratios and proportions begins in Chapter 4.
3	This thread is spiraled through homework.	This thread is spiraled through homework.	This thread is spiraled through homework.	Students explore the relationships between area and perimeter of rectangles with variable side lengths. Students investigate whether shapes with the same area can have different perimeters, and whether shapes with the same perimeter can have different areas.	An explicit focus on working with ratios and proportions begins in Chapter 4.
4	Students represent data sets in histograms, box-and-whisker plots and stem-and-leaf plots. They use those representations as well as measures of central tendency to describe and compare data sets and to determine which representation is most useful for different purposes. Students analyze the impact of changes to the data set on those representations.	This thread is spiraled through homework.	Students explore the impact of multiplying by numbers greater than and less than one as they scale shapes.	This thread is spiraled through homework.	Students use a linear model and equal ratios to represent part-whole relationships and solve for unknown quantities. Students find percentages given a portion and a whole, calculate portions based on information about the percentage and the whole, and find the whole given a portion and the percentage it represents. Students begin to identify scale factors between similar shapes.

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5	Students revisit concepts of data analysis in the mid-course reflection.	Students revisit their learning about number concepts in the mid-course reflection.	Students use inverse operations to analyze mathematical "magic tricks" (variable expressions that result in a specific number outcome, regardless of the initial value chosen) and to construct their own tricks.	Students learn to measure angles with a protractor. Students develop formulas for and calculate the circumference and area of circles.	Students revisit their learning about ratios, similar shapes, and part-whole relationships in the mid-course reflection.
6	Students construct and interpret circle graphs. Students build from single-variable representations of data to representing data in scatterplots and identifying whether data shows a correlation.	This thread is spiraled through homework.	This thread is spiraled through homework.	Students determine the measures of central angles in circle graphs. Students find the area of sectors of circles.	This thread is spiraled through homework.
7	Students create a scatterplot of data presented in a table and identify a trend line. Students interpret the trend to describe a general rate of change for the data.	Students compare ratios by rewriting them as equivalent ratios using common units. Students compare slope ratios to determine which is greater or if they are equivalent.	This thread is spiraled through homework.	This thread is spiraled through homework.	Students convert between different units of time and currency. Students write ratios to describe rates and calculate unit rates for a variety of relationships. Students compare rates expressed as fractions, in contextual situations, on graphs and in tables. They use rates to complete tables of values and consider how to change the quantities compared in a rate in order to increase or decrease that rate.
8	This thread is spiraled through homework.	Students use their understanding of percents and scale factors to determine percent increase, percent decrease, discounts, and markups.	Students consider the meaning of division, and in particular the meaning of dividing by a fraction, as they solve equations with fractional coefficients. Students relate dividing by a fraction to multiplying by its reciprocal. Students consider the impact of multiplying by a scale factor greater than or less then one.	This thread is spiraled through homework.	Students use rates to solve problems in context and convert rates to common units in order to compare them. Students use the concept of scaling to solve problems involving similar shapes and percent change.

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Chp	Working with Data	Number	Arithmetic Operations	Measurement	Ratio and Proportion
9	Students use pattern blocks to build similar shapes and to compare the scale factor of the side lengths to the scale factors for perimeter and area. Students generate data about the side lengths, perimeters and areas of similar rectangles as they investigate the relationship between the areas of similar shapes. Students also collect data about lengths that will form right, acute, and obtuse triangles and use the data they collect to make conjectures leading to the converse of the Pythagorean theorem.	Students are introduced to irrational numbers and square roots. Students work with perfect squares as they estimate the value of square roots of numbers that are not perfect squares.	Students apply the inverse operations of multiplication and division as they develop strategies for solving proportions. They are introduced to the operation square root, and learn how to estimate the value of different square roots.	Students use the ratio of areas of similar shapes and the linear scale factor to determine unknown areas. Students explore the Pythagorean theorem and its converse, and use them to find the lengths of missing sides of right triangles and to determine if three lengths will form a right triangle.	Students identify proportional relationships as having a constant multiplier or constant ratio between quantities, and a starting value (y-intercept) of zero. They determine whether relationships are proportional and use proportional relationships to extend tables of values. Students consider the ratio of areas and perimeters of similar shapes and determine measurements of scale models.
10	Students make conjectures about the shape of graphs of different real-world relationships such as the month of the year and the average daily hours of sunlight.	Students work with powers of 10, and identify the impact of multiplying a number by a positive or negative power of 10. Students are introduced to scientific notation and use it to represent very large and very small numbers. They use scientific notation to compare the relative size of numbers.	Students are introduced to exponents as way to represent repeated multiplication. Students expand and simplify exponent expressions including products, quotients, and products raised to a power, thereby developing rules for simplifying exponents. Students understand the meaning of raising a number to the power of zero or a negative power.	Students begin work with three-dimensional shapes. They calculate surface area and volume for rectangular prisms. They draw and analyze nets for prisms and pyramids. Students use strategies of decomposition and finding the volume of a layer to find the volume of non-rectangular prisms. They find the surface area and volume of cylinders, and volume of cones and pyramids.	This thread is spiraled through homework.
11	Students generate data about edge length, area of a face, and volume of a variety of cubes. Based on the data, students make statements about the relationship between the linear scale factor and the scale factor for the volume of similar solids. As part of course closure, students create a scatterplot of data presented in a table and identify a trend line. They also analyze the data to describe a rate and use the trend to make a prediction.	As part of course closure, students revisit their learning about rewriting fractions as they compare slope ratios to determine which describes a steeper line.	Students are introduced to absolute value through its graph and compute absolute value expressions.	Students build three-dimensional models of cubes and use those models to investigate the ratio of volumes of similar solids. Students identify the ratio of volumes as the cube of the linear scale factor and use the relationship to solve problems. As part of course closure, students use their learning about angles and the Pythagorean theorem to determine lengths and distances between a prince and a princess in a tower. They also revisit their learning about length and area measurement as they analyze a "Toothpicks and Tiles" game. Students also create similar solids and compare the volumes of different cylinders.	Students consider the ratios between edge lengths, areas of a face, and volumes of similar solids. Students use those ratios to determine the surface area and volume of similar solids based on a scale factor and information about one of the solids. As part of course closure, students use their learning about scale factors and solving proportions to determine unknown lengths based on a scale drawing. They also determine if the prices for different containers of popcorn are proportional to their volumes. Students write ratios to determine hourly rates of pay.

Development of Major Content Strands in Making Connections: Foundations for Algebra, Course 2

Chp	Symbol Sense	Solving Equations and Inequalities	Descriptive Geometry	Functions	Probability	Multiple Representations
1	An explicit focus on variables starts in Chapter 3.	Students use informal solving strategies as they play a "Guess My Number" game to find a mystery number that satisfies specific criteria.	Explicit work with different shapes begins in Chapter 2.	An explicit focus on work with functions starts in Chapter 6.	Students find probabilities of single events in a variety of contexts. They compare experimental and theoretical probabilities, determine which outcomes are more likely in different situations, and determine the probability of one or another independent events occurring.	Students use patterns in fractions and decimals as well as an area model to consider whether 0.999... is equal to 1.
2	An explicit focus on variables starts in Chapter 3.	Explicit work on formally solving inequalities and equations begins in Chapter 5.	Students explore transformations on a coordinate grid and determine what information is required to describe translations, rotations, reflections and dilations. Students identify shapes as parallelograms, trapezoids, and triangles.	An explicit focus on work with functions starts in Chapter 6.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students develop their skills with graphing in four quadrants as they represent the affect of rigid transformations and dilation on shapes. Students represent transformations on graphs symbolically using integer expressions.
3	Students explore variables and combining like terms using algebra tiles. Students represent the area and perimeter of algebra tile shapes using variable expressions and determine whether expressions are equivalent. Students use variables to represent quantities in contextual problems and write expressions to represent relationships in those problems.	Students use a structured problem-solving process to describe relationships in contextual problems. They use a method of making predictions and completing trials to solve for unknown quantities. Formally writing and solving equations using these variables is purposely delayed until Chapter 6.	This thread is spiraled through homework.	An explicit focus on work with functions starts in Chapter 6.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	This thread is spiraled through homework.
4	This thread is spiraled through homework.	This thread is spiraled through homework.	Students explore dilations and the impact of multiplying the coordinates of the vertices of a shape by a constant. Students identify the characteristics of similar shapes, and scale shapes to find missing lengths.	An explicit focus on work with functions starts in Chapter 6.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	This thread is spiraled through homework.

Development of Major Content Strands in Making Connections: Foundations for Algebra, Course 2

Chp	Symbol Sense	Solving Equations and Inequalities	Descriptive Geometry	Functions	Probability	Multiple Representations
5	Students represent expressions and operations using variables and algebra tiles. They translate verbal expressions and expressions represented with algebra tiles into symbols. Students also simplify expressions using the distributive property and on an expression mat. Students symbolically represent solutions to inequalities. Students revisit ways to represent mathematical relationships with symbols in the mid-course reflection.	Students represent mathematical magic tricks with variables and algebra tiles in order to analyze how they work. Students compare expressions on an expression mat to determine which is greater, and represent solutions to one-variable inequalities on a number line. Students revisit their learning about expressions and equations in the mid-course reflection.	Students use rigid transformations to construct parallel and perpendicular line segments. Students describe angles as right, acute, obtuse or straight, and pairs of angles as complementary or supplementary. Students complete compass and straightedge constructions. Students revisit their learning about descriptive geometry in the mid-course reflection.	An explicit focus on work with functions starts in Chapter 6.	An explicit focus on probability returns in Chapter 11. Students revisit concepts of probability in the mid-course reflection.	Students represent solutions to inequalities in symbols, using algebra tiles, and by graphing them on number lines. Students revisit concepts of graphing, and representing expressions with algebra tiles in the mid-course reflection.
6	Students continue to simplify expressions within the process of solving a variety of equations.	Students solve equations using algebra tiles on an Equation Mat and record their work in symbols. Students extend their work representing quantities in contextual problems using variables (started in Chapter 3) to writing and solving equations to solve those problems. Students examine equations for which there are infinite solutions or no solution.	Students classify shapes as triangles, parallelograms, or other quadrilaterals and represent each category as a section of a circle graph.	Students are introduced to linear rules as they analyze data in scatterplots and make predictions. Students write equations to represent values in a table and to represent contextual situations. They identify and interpret *x*- and *y*-intercepts on a graph.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students examine linear relationships represented in contextual situations, tables and graphs and use those representations to write equations.
7	Students represent patterns of repeated addition in a data table as multiplication in a variable expression, and use those patterns to facilitate writing equations.	Students write equations to represent contextual situations. They identify patterns of repeated addition in a table of values and connect those patterns to a multiplier in a linear equation. They solve systems of equations using tables of values, graphs and equations.	Work with similar shapes is spiraled through homework.	Students determine the slope of a line using a graph and a table of values. They identify slope as the rate in contextual situations. Students graph linear functions and identify positive and negative slopes and *x*- and *y*-intercepts. Students examine systems of equations represented in tables and graphs and use each representation to solve the system.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students determine rates and slope for data represented in contextual situations, tables, and graphs. Students represent contextual situations in tables, graphs and equations and interpret information presented in graphs, tables and equations in order to solve problems.

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Chp	Symbol Sense	Solving Equations and Inequalities	Descriptive Geometry	Functions	Probability	Multiple Representations
8	Students write expressions and equations to represent distance, rate and time relationships and evaluate them for different values.	Students represent distance, rate and time relationships using a linear model and equations and use those representations to find missing values. Students write equations for proportional situations using scale factors (multipliers). Students develop strategies for rewriting equations to have integer coefficients in order to solve equations with fractional and decimal coefficients.	Students use similar shape diagrams to organize information in proportional situations and relate corresponding sides in similar shapes to scaled quantities in proportional situations.	Students write linear equations to represent distance, rate and time relationships. They examine simple interest functions in multiple representations, and informally consider what makes the relationship linear.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students represent contextual situations using diagrams, graphs, tables of values and equations in order to find solutions. Students compare and contrast different representations for problems, including using linear diagrams and similar shapes, as they write equations and find missing values.
9	Students write proportions and equations using scale factors between similar shapes.	Students use multiple methods to solve proportions.	Students revisit relationships between similar shapes to explore the ratio of their areas. Students determine if three lengths will form an acute, obtuse or right triangle based on the squares of those lengths. Students also investigate when three lengths will not form a triangle (the Triangle Inequality).	Students compare and contrast proportional relationships and other linear relationships represented in tables, graphs, and situations to answer the question, "Is it proportional?"	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students examine proportional relationships in graphs, tables, equations, and situations. Students estimate square roots with a graph, numerically, and by representing the number as a side length of a square area. Students use the Pythagorean theorem to find the length of a segment on a coordinate grid.
10	Students simplify a variety of expressions that include exponents.	This strand is spiraled through homework.	Students identify solids as prisms, pyramids, cylinders, or cones. They determine whether given nets will form solids, and predict the characteristics of those solids (tall, short, wide, narrow, prism, pyramid, etc.).	Students identify patterns of growth in tables and graphs of linear and exponential functions. They use these patterns to identify whether a relationship is linear, beginning a comparison of linear and non-linear growth that is concluded in Chapter 11. Students compare and contrast simple and compound interest.	An explicit focus on probability returns in Chapter 11. This thread is spiraled through homework.	Students describe patterns of growth in a table, graph and expression. They use those patterns to compare and contrast simple and compound interest, and other linear and exponential relationships.
11	Students evaluate non-linear functions to create tables of values. As part of course closure, students write expressions to generalize the relationship between the number of tiles in a pattern and the turn number in a "Toothpicks and Tiles" game.	As part of course closure, students determine unknown values in a "Toothpicks and Tiles" game, find unknown lengths using the Pythagorean theorem, and solve proportions.	Students describe the relationships between faces and edges in a cube using geometric vocabulary such as *point*, *line*, *segment*, *plane*, and *edge*.	Students analyze non-linear functions including $y = x^2$, $y = x^3$, and absolute value. As part of course closure, students determine the slope of a trend line to describe an hourly rate of pay.	Single event probability is revisited in preparation for a focus on probability of compound events. Students use systematic lists, outcome charts, and tree diagrams to represent probabilities of multiple events. Students use multiplication to calculate compound probabilities when events are not equally likely.	Students create tables and graphs of non-linear functions to describe the patterns of growth in those functions. Students analyze the graph of $y = \|x\|$ to help them understand the meaning of absolute value. As part of course closure, students represent relationships using tables, graphs, and symbolic expressions.