Time	Unit 1 Patterns of Change Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(6 weeks) 11 days	**Lesson 1 Cause and Effect** <u>Investigation 1 Physics and Business at Five Star Amusement Park</u> *How is the stretch of a bungee cord related to the weight of the bungee jumper?* *How are number of customers and income for a bungee jump related to price charged for a jump?* *How can data tables, graphs, and rules relating variables be used to answer questions about such relationships between variables?* Vocab.: scatterplot, independent variable, dependent variable, income, data plots, algebraic rules <u>Investigation 2 Taking Chances</u> *What is the pattern of change relating profit to number of players in the die-tossing game?* *How is that pattern of change illustrated in tables and graphs of data from plays of the games?* *How is the pattern of change in profit similar to, and different from, the patterns of change in bungee jump cord length and number of bungee jump customers?* Vocab.: profit, cumulative <u>Investigation 3 Trying to Get Rich Quick</u> *Why are the relationships involved in these problems called nonlinear patterns of change?* *How do the dependent variables change as the independent variables increase?* Vocab.: nonlinear, average	Develop disposition to look for cause-and-effect relationships between variables Review and develop skills in organizing data in tables and graphs and using words to describe patterns of change shown in those representations Review or begin to develop knowledge about common patterns of change (linear, inverse, exponential, quadratic) and ability to use symbolic rules to represent and reason about those patterns Use tables, graphs, and rules to solve problems of cause-and-effect change	N Q 2 A SSE 3 A REI 10 F IF 4 F IF 5 F IF 7 F IF 8 F BF 8 F LE 1 F LE 1b F LE 1c F LE 5 S ID 6 S ID 6a S ID 7 S CP 8 S MD 5	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

9 days	**Lesson 2 Change Over Time** Investigation 1 Predicting Population Change *What data and calculations are needed to predict human and animal populations into the future?* Vocab.: Now-Next rule, recursion, population, percent increase, birth rate, death rate	Develop ability to recognize recursive patterns of change Develop ability to use calculators to iterate stages in a recursive pattern Develop ability to write Now-Next rules to represent recursive patterns	A SSE 1b A REI 10 F IF 3 F IF 5 F IF 7 F IF 8 F IF 8b F BF 1 F BF 1a F BF 2 F LE 1 F LE 2 S ID 6 S ID 6a S ID 9 S CP 7	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

8 days (2 days)	**Lesson 3 Tools for Studying** Patterns of Change Investigation 1 Communicating with Symbols *What are some effective strategies for finding symbolic expressions and rules that represent relationships between variables?* Vocab.: symbolic expression, translating, algebraic rules, formulas, Pythagorean Theorem, parallelogram, right triangle, perimeter, area Investigation 2 Quick Tables, Graphs, and Solutions *How can you use calculator or computer tools to produce tables, graphs, and symbolic manipulations, which can help you to study relationships between variables?* Vocab.: tables, graphs, symbolic manipulations. Investigation 3 The Shapes of Algebra *How do the forms of algebraic rules give useful information about the patterns in tables and graphs produced by those rules?* Vocab.: patterns of change (Lesson 4 Looking Back)	Develop skill in writing rules that express problem conditions Review perimeter and area formulas for triangles, parallelograms, and circles, and the Pythagorean Theorem Develop skill in producing tables and graphs for functions Develop skill in using function tables, graphs, and computer algebra manipulations to solve problems that involve functional relationships, especially solving equations in one variable Develop informal knowledge about connections among function rules, tables, and graphs for linear, inverse, exponential, and quadratic relations (Review and synthesize the major objectives of the unit)	N Q 3 A REI 10 F IF 7 F IF 8 F BF 1 F LE 1 S ID 6 S ID 6a	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Time	Unit 2 Patterns in Data Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(6 weeks) 12 days	**Lesson 1 Exploring Distributions** <u>Investigation 1 Shapes of Distributions</u> *How can you produce and interpret plots of data and use those plots to compare distributions?* Vocab.: data, distributions, dot plots, shape, spread, center, approximately normal, symmetric, skewed, tail, range, summary statistics, mean, median, mode, histograms, frequency. <u>Investigation 2 Measures of Center</u> *How do you decide whether to use the mean or median in summarizing a set of data?* Vocab.: mean, median, sigma, outliers, resistant, sensitive, frequency table	Construct dot plots, histograms, and relative frequency histograms. Describe the shape of a distribution Compute and interpret the mean, median, and mode (from a list of values and from a frequency table) Estimate the mean and median from a histogram Use the relationship between the mean, total, and number of values to find a missing value given the mean and the other value	S ID 1 S ID 2 S ID 3	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

16 days (2 days)	**Lesson 2 Variability** <u>Investigation 1 Measuring Position</u> *How do you find and interpret percentiles and quartiles*? Vocab.: variability, percentile, quartile - upper, lower, middle <u>Investigation 2 Measuring and Displaying Variability: The Five Number Summary and Box Plots</u> *How can you use the interquartile range to measure variability?* *How can you use plots of the five-number summary to compare distributions?* Vocab.: five-number summary, minimum, maximum, interquartile range, box plot, box-and-whisker plot, extreme value <u>Investigation 3 Identifying Outliers</u> *What should you do when you identify one or more outliers in a set of data?* Vocab.: outlier, modified box plot, dot plot, <u>Investigation 4 Measuring Variability: The Standard Deviation</u> *How can you determine and interpret the standard deviation of an approximately normal distribution?* Vocab.: Standard deviation, deviation – from the mean, variation (Lesson 3 Looking Back)	Find and interpret percentiles and quartiles as measures of the position of a value in a distribution Find the five-number summary and the interquartile range (IQR) and interpret the IQR as a measure of variability Determine if a value is an outlier Construct and interpret a box plot Compute and interpret deviations from the mean Compute or estimate the standard deviation as a measure of spread Predict the effect on the shape, center, and spread of a distribution when the same number is added to each value or when each value is multiplied by the same number (Review and synthesize the major objectives of the unit)	N QF 1 S ID 1 S ID 2 S ID 3	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Time	Unit 3 Linear Functions Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(6 weeks) 10 days	**Lesson 1 Modeling Linear Relationships** <u>Investigation 1 Getting Credit</u> *How are patterns in tables of values, graphs, symbolic rules, and problem conditions for linear functions related to each other?* Vocab.: linear functions, symbolic rules, rate of change, slope, y-intercept <u>Investigation 2 Symbolize It</u> *How do you use information in a table, a graph, or the conditions of a problem to write a symbolic rule for a linear function?* Vocab.: coefficient, constant term, notation, depreciation, inflation, slope-intercept form <u>Investigation 3 Fitting Lines</u> *How can you produce and use function rules to represent data patterns that are not perfectly linear?* Vocab.: linear, mathematical models, (regression, correlation)	Calculate the rate of change in one variable as another variable increases Describe the relationships among the graph, symbolic rule, table of vales, and related situation for a linear function Interpret the meaning of the slope and y-intercept of the graph of a linear function in a context Write a rule for a linear function given its graph, two points, or a table of sample values Use linear functions to answer questions about the situations that they describe Estimate the graph an function rule for a line that fits a given set of data Use a linear model to predict the value of one variable given the value of the other and describe the rate of change in one variable as the other increases in a meaningful way Use a calculator or computer software to find the linear regression model for a set of data	A SSE 1 A SSE 1a A SSE 3 F IF 3 F IF 4 F IF 5 F IF 6 F IF 7 F IF 7a F IF 8 F BF 1 F BF 1a F BF 2 F BF 3 F LE 1 F LE 1b F LE 2 F LE 5 S ID 6 S ID 6a S ID 6c S ID 7	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

11 days	**Lesson 2 Linear Equations and Inequalities** <u>Investigation 1 Who Will Be the Doctor</u> *How do you represent questions about linear functions symbolically? How can you use tables and graphs to estimate solutions of equations and inequalities?* Vocab.: Solve, equations, inequalities, estimate, solutions <u>Investigation 2 Using Your Head</u> *Why does solving linear equations by reasoning like that of Natasha and Michael make sense? (Natasha uses balancing equation idea, Michael uses more of an inverse idea)* *How can reasoning like that of Natasha and Michael be used to solve other linear equations algebraically?* Vocab.: algebraically <u>Investigation 3 Using Your Head … More or Less</u> *How can you solve a linear inequality algebraically?* Vocab.: operation, <u>Investigation 4 Making Comparisons</u> *How can you represent and solve problems involving comparisons of two linear functions?* Vocab.: systems of linear equations, solving the system, simultaneous solution,	Write linear equations and inequalities to express questions about linear functions Estimate solutions to linear equations and inequalities by inspecting appropriate graphs and tables of values and interpret the meaning of the solution in the real-world context Use "undoing" and "balancing" methods to solve simple linear equations and inequalities Use tables of values, graphs, and symbolic reasoning to solve systems of linear equations of the form y = a + bx and y = c + dx	N Q 1 A SSE 1 A CED 1 A CED 2 A REI 1 A REI 3 A REI 6 A REI 10 A REI 11 F IF 4 F IF 5 F IF 7 F IF 8 F BF 1 F LE 1 S ID 6	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

7 days (2 days)	**Lesson 3 Equivalent Expressions** <u>Investigation 1 Different, Yet the Same</u> *What operations on linear expressions lead to different, but equivalent, expressions?* Vocab.: expressions, equivalent <u>Investigation 2 The Same, Yet Different</u> *How can algebraic properties of numbers and operations be used to verify the equivalence of expressions and to write equivalent expressions?* Vocab.: Properties of Real Numbers – Distributive Property (of mult. over add.), Commutative Property, Associative Property, expanding, factoring, combining like terms, algebraic reasoning. (Lesson 4 Looking Back)	Write multiple expressions to represent a variable quantity from a real-world situation Use tables, graphs, and properties of numbers and operations to reason about the equivalence of expressions Rewrite linear expressions in equivalent forms by expanding, combining like terms, and factoring (Review and synthesize the major objectives of the unit)	A REI 3 A REI 6 F IF 7 F IF 8 F BF 1 F LE 1 S ID 6 S ID 6a S ID 6c	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Time	Unit 5 Exponential Functions Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(6 weeks) 13 days	**Lesson 1 Exponential Growth** <u>Investigation 1 Counting in Tree Graphs</u> *What are the basic patterns of exponential growth in variations of the Pay It Forward process?* *How can those patterns be expressed with symbolic rules?* Vocab.: tree graph <u>Investigation 2 Getting Started</u> *What are the forms of Now-Next and "y = " rules for basic exponential functions?* *How can those rules be modified to model other similar patterns of change?* Vocab.: exponential growth, common ratio <u>Investigation 3 Compound Interest</u> *How can you represent and reason about functions involved in investments paying compound interest?* Vocab.: compound interest, balance, principal, rates, periods <u>Investigation 4 Modeling Data Patterns</u> *What are some useful strategies for finding functions modeling patterns of change that are only approximately exponential?* Vocab.: regression models <u>Investigation 5 Properties of Exponents I</u> *How can the definition of exponent be used to discover and justify other properties of exponents that make useful algebraic manipulations possible?* Vocab.: base, exponent, power, products of powers, power of a power, power of a product	Develop disposition to look for and ability to recognize exponential growth patterns and phenomena Develop ability to model exponential functions with rules in the form $y = a(b^x)$ where $a>0$ and $b>1$ Develop ability to write Now-Next rules for exponential growth patterns Develop ability to use tables and graphs to solve problems about exponential growth Develop ability to use reasoning, estimation, and curve-fitting utilities to model data patterns exhibiting exponential-type trends Develop skill in use of standard rules for writing exponential expressions in equivalent forms	N Q 1 A SSE 1 A SSE 1b A SSE 3 A SSE 3c A CED 1 A CED 2 F IF 3 F IF 4 F IF 7 F IF 7e F IF 8 F IF 8b F BF 1 F BF 1a F BF 2 F LE 1 F LE 1c F LE 2 F LE 5 S ID 6 S ID 6a	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

14 days	**Lesson 2 Exponential Decay** Investigation 1 More Bounce to the Ounce *What mathematical patterns in tables, graphs, and symbolic rules are typical of exponential decay relations?* Vocab.: exponential decay Investigation 2 Medicine and Mathematics How can you interpret and estimate or calculate values of expressions involving fractional or decimal exponents? How can you interpret and estimate or calculate the half-life of a substance that decays exponentially? Vocab.: half-life Investigation 3 Modeling Decay *What clues in problem conditions are helpful in deriving function models for experimental data involving decay?* *How can logical analysis of an experiment be used as a check of a function model produced by your calculator or computer curve-fitting software?* Vocab.: curve-fitting software, logical analysis, experimental data Investigation 4 Properties of Exponents II *What exponent properties provide shortcut rules for calculating powers of fractions, quotients of powers, and negative exponents?* Vocab.: Powers of a fraction, quotients of powers, integer, Investigation 5 Square Roots and Radicals *How can you use your understanding of properties of exponents to guide your thinking about one-half powers, square roots, radical expressions, and rules for operating with them?*	Develop ability to recognize patterns of change characterizing exponential decay phenomena Develop ability to write explicit $y - a(b^x)$ and Now-Next rules for exponential decay functions Develop ability to interpret zero and fractional exponents and to calculate or estimate values of expressions with those exponents Develop ability to interpret half-life of decay phenomena and to use symbolic rules, tables, and graphs to estimate those values Develop ability to use reasoning, estimation, and curve-fitting utilities to model exponential decay Develop skill in use of standard rules for writing exponential expressions in equivalent forms Develop skill in simplifying radicals	N RN 1 N RN 2 N Q 2 A SSE 1 A SSE 3c F IF 3 F IF 4 F IF 5 F IF 7 F IF 8 F BF 1 F BF 2 F LE 1 F LE 1c F LE 2 F LE 5 S ID 6 S ID 6a	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

(3 days)	Vocab.: radical, square root, diagonal (Lesson 3 Looking Back)	(Review and synthesize the major objectives of the unit)			

Time	Unit 6 Patterns In Shape Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(6 weeks) 9 days	**Lesson 1 Two-Dimensional Shapes** <u>Investigation 1 Shape and Function</u> *What conditions on side lengths are needed to build triangles and quadrilaterals? What additional constraints are needed to build special quadrilaterals?* *Why and how are triangles used in the design of structures like bridge trusses?* *Why and how are quadrilaterals used in the design of devices like windshield wipers?* Vocab.: Triangle inequality, scalene, isosceles, equilateral, quadrilateral, parallelogram, convex, nonconvex, kite, rhombus, rigid <u>Investigation 2 Congruent Shapes</u> *How can you test whether two shapes are congruent?* *What combination of side or angle measures is sufficient to determine if two trusses or other triangular shapes are congruent?* Vocab.: congruent, orientation, Triangle Angle Sum Property, base angles, SSS, SAS, ASA <u>Investigation 3 Reasoning with Shapes</u> *What strategies are useful in reasoning about properties of shapes?* *What are some additional properties of triangles and quadrilaterals that have important applications?* Vocab.: perpendicular bisector, opposite angles, vertical angles, bisect, interior <u>Investigation 4 Getting the Right Angle</u> *Why is the Pythagorean Theorem true for all right triangles?* *Is the converse of the Pythagorean Theorem true and, if so, why?* Vocab.: converse, if-then	Discover and apply the Triangle Inequality and its analog for quadrilaterals Investigate rigidity of two-dimensional shapes Discover and apply properties of quadrilateral linkages, including those with rotating bars Discover and apply combinations of side and angle conditions that are sufficient for testing the congruence of two triangles: side-Side-Side(SSS), Side-Angle-Side (SAS), Angle-Side-Angle (ASA) Use congruence conditions to reason about properties of isosceles triangles and select properties of parallelograms Use area and congruence relationships to justify why the Pythagorean Theorem and its converse are true, and use these results to solve problems involving right triangles Recall, justify derivations of, and use formulas to find areas of triangles and special quadrilaterals	G CO 1 G CO 2 G CO 6 G CO 8 G CO 9 G CO 10 G CO 13 G SRT 5 G MG 1 S CP 9	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

8 days	**Lesson 2 Polygons and Their Properties** <u>Investigation 1 Patterns in Polygons</u> *How can you accurately draw or build a regular polygon?* *How can you describe the symmetry of a regular polygon and other shapes?* Vocab.: polygon, regular, central angle, rotational symmetry, reflection, line symmetry, mirror symmetry, n-gon, penta-hexa-septa-octa-nona-deca-gon <u>Investigation 2 The Triangle Connection</u> *How are the measures of angles of any polygon related to the number of sides?* Vocab.: interior angles, exterior angles <u>Investigation 3 Patterns with Polygons</u> *Which polygons or combinations of polygons will tile the plane?* Vocab.: tiling, tessellation, translation symmetry, regular tessellations, semiregular tessellations, vertex	Discover and apply properties of the interior, exterior, and central angles of polygons Recognize and describe line and rotational symmetries and polygons and other two-dimensional shapes (Re) discover which triangles, quadrilaterals, and regular polygons will tile a plane and explore semiregular tessellations Recognize and describe symmetries of tessellations, including translation symmetry	G CO 3 G MG 1	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

10 days	**Lesson 3 Three-Dimensional Shapes** Investigation 1 Recognizing and Constructing Three-Dimensional Shapes *What are important characteristics of common three-dimensional shape?* *How can three-dimensional models of these shapes be constructed?* Vocab.: Three-dimensional, edges, polyhedron, convex polyhedron, cube, prism, pyramid, apex, lateral faces, base, right prisms, oblique prisms, vertex, Euler's formula for polyhedral, cones, cylinders, faces Investigation 2 Visualizing and Sketching Three-Dimensional Shapes *What are some effective ways to sketch three-dimensional shapes?* *What information does each kind of sketch provide about the shape?* Vocab.: orthographic drawing, front view, right side view, top view, oblique drawing Investigation 3 Patterns in Polyhedra *How are properties of polyhedra such as symmetry and rigidity related to corresponding properties of polygons?* Vocab.: symmetry plane, mirror plane, axis of symmetry, rotation axis, rigidity, vertex angle defect, Descartes' Theorem Investigation 4 Regular Polyhedra *How many differently shaped regular polyhedral are possible and why?* *What are some of the properties of these polyhedra?* \Vocab.: regular polyhedron, Platonic solid, nets, partial nets, tetrahedron, hexahedron, icosahedron, dodecahedron, octahedron	Identify and describe important characteristics of common three-dimensional shapes including prisms, pyramids, cones, and cylinders Construct three-dimensional models of these shapes Sketch three=dimensional shapes using different methods and recognize the advantages and disadvantages of each method Recognize and describe the plane and rotational symmetries of polyhedral Recognize whether a polyhedral is rigid and how to reinforce a polyhedron to produce one that is rigid Explore consequences of the Euler relationship involving the numbers of vertices, faces, and edges and of Descartes' Theorem concerning the face angles in any convex polyhedron Construct models for regular polyhedral and understand why there are just five regular polyhedron Recall, justify derivations of, and use formulas for finding surface area and volume of common three=dimensional shapes	G GMD 4 G MG 1	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

(3 days)	(Lesson 4 Looking Back)	(Review and synthesize the major objectives of the unit)			

Time	Unit 7 Quadratic Functions Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(5 weeks) 10 days	**Lesson 1 Quadratic Patterns** Investigation 1 Pumpkins in Flight *What patterns of change appear in tables and graphs of (time, height0 values for flying pumpkins and other projectiles?* *What functions model those patterns of change?* Vocab.: initial height, initial velocity, upward velocity, quadratic model, Investigation 2 Golden Gate Quadratics *How can tables, graphs, and rules for quadratic functions be used to answer questions about the situations they represent?* *What patterns of change appear in tables and graphs of quadratic functions?* Vocab.: break-even point, parabolic Investigation 3 Patterns in Tables, Graphs, and Rules *How are the values of a, b, and c related to patterns in the graphs and tables of values for quadratic functions $y = ax^2 + bx + c$?* Vocab.: coefficient, factored, expanded form, linear term, parabola, y-intercept, x-intercepts, vertex, minimum, maximum	Determine patterns of change associated with quadratic functions Use tables of values and graphs to estimate answers for questions about situations modeled by quadratic functions Describe the effects of each parameter in the function $y = ax^2 + bx + c$	A SSE 1 A SSE 1a A SSE 3 A SSE 3a A REI 4 F IF 4 F IF 5 F IF 7 F IF 7a F IF 8 F IF 8a F BF 1 F BF 1a F BF 1b F BF 3 G GMD 4 S ID 6 S ID 6a	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

7 days	**Lesson 2 Equivalent Quadratic Expressions** <u>Investigation 1 Finding Expressions for Quadratic Patterns</u> *What strategies are useful in finding rules for quadratic functions?* *In deciding whether tow quadratic expressions are equivalent?* *In deciding when one type of quadratic expression is more useful than another?* Vocab.: expression, equivalent <u>Investigation 2 Reasoning to Equivalent Expressions</u> *What strategies can be used to transform quadratic expressions into useful equivalent forms?* Vocab.: Distributive property of multiplication over addition, factoring, expanding	Find symbolic rules for quadratic functions using data modeling and reasoning Determine whether two given quadratic expressions are equivalent Decide on most useful equivalent forms of quadratics for different question types Create equivalent quadratic expressions by expanding products of linear factors Factor quadratic expressions by extracting common linear factors	A SSE 1 A SSE 1b A SSE 2 A SSE 3a A REI 4 F IF 7 F IF 8 F BF 1 S ID 6 S ID 6a	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

10 days	**Lesson 3 Solving Quadratic Equations** Investigation 1 Solving $ax^2 + c = d$ and $ax^2 + bx = 0$ *What are some effective methods for solving quadratic equations algebraically?* Vocab.: algebraically, solutions, zeroes, roots, x-intercepts, square root Investigation 2 The Quadratic Formula *What calculations in the quadratic formula give information on the number of solutions of the related quadratic equation?* *What calculations provide information on the x-intercepts and maximum or minimum point of the graph of the related quadratic function?* Vocab.: Quadratic Formula, vertex, x-intercepts, zeroes, roots, discriminant	Write quadratic equations and inequalities to express questions about quadratic functions Find exact values of solutions for quadratic equations in the form $ax^2 + c = d$ and $ax^2 + bx = 0$ by reasoning and factoring Relate factored forms of quadratic expressions to x-intercepts of graphs for the related functions Solve quadratic equations by using the quadratic formula Describe the possible number of real solutions for quadratic equations and illustrate the possibilities with graphs	A SSE 1b A SSE 3a A REI 4 F IF 7 F IF 8 F BF 1 S ID 6	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
(3 days)	(Lesson 4 Looking Back)	(Review and synthesize the major objectives of the unit)			

Time	Unit 8 Patterns in Chance Essential Q's/Vocabulary	CPMP Lesson Objective	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
(1 week) 5 days	**Lesson 1 Calculating Probabilities** <u>Investigation 1 Probability Distributions</u> *How can you find and organize the probabilities associated with random events like that roll of two dice?* Vocab.: probability, probability distribution, outcomes, equally likely, sample space, <u>Investigation 2 The Addition Rule</u> *Under what conditions can you add individual probabilities to find the probability that a related event happens?* Vocab.: event, addition rule, disjoint, mutually exclusive	Construct sample spaces for chance situations involving equally likely outcomes Construct probability distributions from sample spaces Identify mutually exclusive (disjoint) events Compute P(A and B) using the Addition Rule or its special case for mutually exclusive events	S ID 1 S ID 3 S ID 5 S CP 1 S CP 7 S MD 2 S MD 3 S MD 4	Close reading, teacher/student think aloud, contextual problem solving and turn and talk.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.