Time	Unit 1 Reasoning And Proof Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
5.5 weeks 8 days	**Lesson 1 Reasoning Strategies** <u>Investigation 1 Reasoned Arguments</u> *How can you determine whether a conclusion follows logically from information and facts you know are correct or on which everyone would agree?* Vocab.: Valid argument, proofs, trapezoid, parallelogram, logical <u>Lesson 1 Investigation 2 Reasoning with If-Then Statements</u> *How can you use if-then statements in deductive reasoning?* *How is deductive reasoning with if-then statements different form inductive reasoning from patterns?* Vocab.: hypothesis, conclusion, prime, If-then statement, inductive reasoning, deductive reasoning, consecutive	Recognize the role of inductive reasoning in making conjectures and recognize the limitations of inductive reasoning Recognize the need for proof and be able to create a simple deductive argument to prove a mathematical assertion Create a counterexample to prove a claim is false Write if-then statements and their converses and use if-then reasoning patterns in arguments	A SSE 1 A SSE 3 F IF 8 F BF 1 G CO 12	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 Geometric Reasoning and Proof** <u>Investigation 1 Reasoning about Intersecting Lines and Angles</u> *How a linear pairs of angles related?* *How are vertical angles related and why is that the case?* Vocab.: Linear Pair, Vertical angles, postulates, axioms, theorem, perpendicular, construction <u>Lesson 2 Investigation 2 Reasoning about Parallel Lines and Angles</u> *If two parallel lines are intersected by a transversal, what relations exist among the measures of the angles formed?* *What relations among the angles formed when two lines are cut by a transversal allow you to conclude that the lines are parallel?* Vocab.: parallel, supplementary, transversal, Interior (and exterior) angles on same side of transversal, Alternate interior (and exterior) angles, corresponding angles, parallel lines postulate	Know and be able to use the angle relationship theorems involving of two intersecting lines Know and be able to use the theorems justifying the construction of a line perpendicular to a given line parallel to a given line through a given point Know and be able to use the angle relationship theorems involving two parallel lines cut by a transversal and their converses Know and be able to use the angle sum theorem and the exterior angle theorem for triangles	A SSE 3 F IF 8 F BF 1 G CO 1 G CO 9 G CO 12	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 2-3 days	**Lesson 3 Algebraic Reasoning and Proof** Investigation 1 Reasoning with Algebraic Expressions *How can strategies for manipulating algebraic expressions into equivalent forms be used to explain interesting number patterns?* Vocab.: Algebraic reasoning, proof, logarithm, expression Lesson 3 Investigation 2 Reasoning with Algebraic Equations *How can strategies for reasoning with algebraic equations be used to explain and prove important principles in algebra, geometry, and trigonometry?* Vocab.: Law of sines, Law of cosines, Pythagorean Theorem, Commutative, Distributive, Associative, Identity, Inverse, Transitive, Zero Product Property (Lesson 5 Looking Back)	Use algebraic notation – letters, expressions, equations, and inequalities – to represent general patterns and relationships among variables Use algebraic transformations of expressions, equations, and inequalities to establish general propositions about quantitative relationships (Review and synthesize the major objectives of the unit)	A SSE 1 A SSE 3 F IF 8 F BF 1 A REI 1 A CED 4 G SRT 10 S CP 7	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 Inequalities and Linear Programming Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
4.5 weeks Days Are Approx 10 days	**Lesson 1 Inequalities in One Variable** <u>Investigation 1 Getting the Picture</u> *How can you solve inequalities in one variable?* *How can you record solutions in symbolic and graphic form?* Vocab.: Inequality, symbolic expression, number line graph <u>Lesson 1 Investigation 2 Quadratic Inequalities</u> *What are the solution possibilities for quadratic inequalities?* *How can solution strategies for quadratic equations be applied to solution of inequalities?* Vocab.: Quadratic, line of symmetry, maximum, minimum, y and x intercepts, <u>Lesson 1 Investigation 3 Complex Inequalities</u> *How can the reasoning developed to deal with inequalities involving a single function be adapted to find solutions for more complex cases?* Vocab.: Interval Notation, component functions, union, empty set	Write inequalities to express questions about functions of one or two variables Given a graph of one or more functions, solve inequalities related to the function(s) Solve quadratic inequalities in one variable by solving the corresponding equation algebraically and reasoning about the graph of the related function(s) Describe the solution set of an inequality in one variable symbolically, as a graph on a number line, and using interval notation	A SSE 3 A REI 11 A REI 2 A REI 4b A REI 7 A REI 10 A REI 12 F IF 7 F IF 7a F IF 7e F IF 8 F BF 1 S ID 6	The Core-Plus Mathematics Curriculum, by design, incorporates CCSS Mathematical Practices in to each lesson throughout units 1-8.	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 (3 days)	**Lesson 2 Inequalities with Two Variables** <u>Investigation 1 Solving Inequalities</u> *How can one find and graph the solutions of a linear inequality in two variables?* *How can one find the solutions of a system of inequalities in two variables?* Vocab.: solutions, coordinates, boundary, systems of inequalities, included/excluded/dashed <u>Lesson 2 Investigation 2 Linear Programming – A Graphic Approach</u> *How can coordinate graphs be used to display and analyze the options in linear programming decision problems?* Vocab.: Linear programming, constraints, lattice points, feasible points, region, objective, <u>Lesson 2 Investigation 3 Linear Programming – Algebraic Methods</u> *How can constraints and objectives of linear programming problems be expressed in symbolic form?* *How can algebraic and graphical methods be combined to help solve the problems?* Vocab.: Objective function, maximize, minimize (Lesson 3 Looking Back)	Graph the solution set of a linear inequality in two variables Graph the solution set of a system of inequalities in two variables Solve linear programming problems involving two independent variables (Review and synthesize the major objectives of the unit)	A SSE 1 A SSE 1a A SSE 3 A CED 2 A CED 3 A REI 2 A REI 6 A REI 12 F IF 5 F IF 7 F IF 7a F IF 8 F BF 1 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 Similarity and Congruence Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
5 weeks Days Are Approx 8 days	**Lesson 1 Reasoning about Similar Triangles** <u>Investigation 1 When are Two Polygons Similar</u>? *How can you test whether two polygons are similar?* *How can you create a polygon similar to a given polygon?* Vocab.: Similar, scale factor, quadrilateral, polygon, isosceles, equilateral, rhombuses, hexagons, <u>Investigation 2 Sufficient Conditions for Similarity of Triangles</u> *What combinations of side or angle measures are sufficient to determine that two triangles are similar?* Vocab.: Law of Sines, Law of Cosines, unique, SAS Similarity Theorem, SSS, AA, sufficient conditions <u>Investigation 3 Reasoning with Similarity Conditions</u> *What strategies are useful in solving problems using similar triangles?* Vocab.: Pantograph, trigonometric ratio, Midpoint Connector Theorem for Triangles, size transformation, magnitude	Identify similar polygons and determine the scale factor of similar polygons Review and extend understanding of the Laws of Sines and Cosines Know and be able to use the three theorems providing sufficient conditions to prove triangles are similar (SSS, SAS, AA) Continue to develop the ability to write both synthetic and analytic arguments	G MG 3 G GPE 6 G SRT 1 G SRT 1b G SRT 1a G SRT 2 G SRT 3 G SRT 4 G SRT 5	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

13 days	**Lesson 2 Reasoning about Congruent Triangles** <u>Investigation 1 Congruence of Triangles Revisited</u> *How are sufficient conditions for congruence of triangles related to sufficient conditions for similarity of triangles?* *How is reasoning with congruence conditions for triangles similar to, and different from, reasoning with similarity conditions for triangles?* Vocab.: Congruent, SSS Congruence Theorem, SAS, AAS, ASA, perpendicular bisector <u>Investigation 2 Congruence In Triangles</u> *Under what conditions will the perpendicular bisectors of the sides of a triangle be concurrent?* *Under what conditions will the bisectors of the angles of a triangle be concurrent?* *Under what conditions will the medians of a triangle be concurrent?* *What are special properties of these points of concurrency?* Vocab.: Concurrent, circumcenter, incenter, centroid, distance point to line, median, uniform density, angle bisectors, center of gravity <u>Investigation 3 Congruence in Quadrilaterals</u> *How can you use congruent triangles to establish properties of special quadrilaterals, and what are those properties?* Vocab.: quadrilaterals, kites, rhombuses, trapezoid, parallelogram, Midpoint Connector	Understand congruence of figures as a special case of similarity of figures Know and be able to use the four theorems providing sufficient conditions to prove triangles are congruent (SSS, SAS, AAS, ASA) Know and be able to use properties of the incenter, circumcenter, and centroid of a triangle Continue to develop the ability to write both synthetic and analytic arguments Know and be able to use both necessary and sufficient conditions for quadrilaterals to be (special) parallelograms Know and be able to use the Midpoint Connector Theorems for Triangles and Quadrilaterals Explore, prove, and apply properties of congruence-preserving transformations	G SRT 1 G SRT 5 G C 3 G CO 2 G CO 4 G CO 5 G CO 6 G CO 10 G CO 11 G MG 3	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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	Theorem for Quadrilaterals, diagonals, <u>Investigation 4</u> <u>Congruence-Preserving Transformations</u> *What are the connections between line reflections and translations and rotations?* *How can you prove properties of these congruence-preserving transformations without the use of coordinates and how can you use those properties to solve problems?* Vocab.: translation, rotation, reflection, transformations, (isometry) (Lesson 3 Looking Back)	(Review and synthesize the major objectives of the unit)			

Time	Unit 4 Samples and Variation Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills
2 weeks Days Are Approx 8 days	**Lesson 1 Normal Distributions** <u>Investigation 1 Characteristics of a Normal Distribution</u> *How can you use the mean and standard deviation to help you locate a measurement in a normal distribution?* Vocab.: Normal distribution, standard deviation, mean, theoretical distribution, percentile <u>Investigation 2 Standardized Values</u> *How can you use standardized values to compare values from two different normal distributions?* Vocab.: standardized value <u>Investigation 3 Using Standardized Values to find Percentiles</u> *How can you use standardized values to find the location o a value in a distribution that is normal, or approximately so?* Vocab.: Proportion	Describe characteristics of a normal distribution Understand that the number of standard deviations from athe mean is a measure of location Use standardized values and a table of the normal distribution to find probabilities	S ID 1 S ID 4 S CP 8	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

5 days	**Lesson 2 Binomial Distributions** Investigation 1 Shape, Center, and Spread *What are the shape, mean, and standard deviation of a distribution of the number of successes in a binomial situation?* Vocab.: binomial situation, expected value, expected number, randBin, binomial distribution, spread, success, trial Investigation 2 Binomial Distributions and Making Decisions *How do you decide whether a given probability of success is a plausible one for a given binomial situation?* Vocab.: rare event, statistically significant, significance test, random	Use simulation to construct an approximate binomial distribution Predict the shape of a binomial distribution Use the formulas for the expected value and standard deviation of a binomial distribution Use standardized values to find probabilities of events in binomial situations Use a random sample to decide whether a given proportion p is plausible as the proportion of successes in the population from which the sample came	S ID 3 S ID 4 S ID 6b S MD 2 S MD 3 S MD 4 S ID 2 S IC 1	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

6 days 2 days	**Lesson 3 Statistical Process Control** <u>Investigation 1 Out of Control Signals</u> *What does a run chart look like when the process has gone out of control?* Vocab.: Control Signals, run chart, plot over time, control tests, <u>Investigation 2 False Alarms</u> *How can you find the probability of getting a false alarm?* Vocab.: false alarm, Independent events, mutually exclusive events, multiplication rule for independent events <u>Investigation 3 The Central Limit Theorem</u> *What is the Central Limit Theorem and how does it allow you to use control charts even when individual measurements come from a skewed distribution?* Vocab.: probability distribution, random, simulation, sample means, Central Limit Theorem (Lesson 4 Looking Back)	Recognize when the mean and standard deviation change on a plot-over-time (run chart) Use control charts and tests for out-of-control behavior Compute the probability of a false alarm on a set of readings, that is, the probability that a test will give an out-of-control signal for a process that is under control Understand the Central Limit Theorem and how it is applied to statistical control (Review and synthesize the major objectives of the unit)	S ID 4 S CP 7 S CP 8 S ID 3 S ID 6b S MD 7	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 Polynomial and Rational Functions	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills
5 weeks Days Are Approx 8 days	**Lesson 1 Polynomial Expressions and Functions** <u>Investigation 1 Modeling with Polynomial Functions</u> *What are polynomial functions and what kinds of graphs do those functions have?* *How are rules for polynomial functions related to patterns in their graphs?* Vocab.: polynomial, expression, function, degree (of a polynomial), cubic, quadratic <u>Investigation 2 Addition, Subtraction, and Zeroes</u> *How can the rules for polynomial functions f(x) and g(x) be combined to give rules for f(x) + g(x) and f(x) – g(x)?* *How are the degrees of expressions being added or subtracted related to the degree of the result?* *How is the degree of a polynomial related to the number of zeroes for the function?* Vocab.: zeroes, roots, x-intercepts, standard polynomial form <u>Investigation 3 Zeroes and Products of Polynomials</u> *How are the zeroes of a polynomial function related to the zeroes of its factors?* *How can a product of polynomial factors be expanded to standard form?* *How is the degree of a product of polynomials related to the degrees of the factors?* Vocab.: expanded form, repeated zeros, multiplicity	Model problem situations using polynomial functions Identify patterns relating rules and graphs of polynomial functions – connecting polynomial degree to local maximum and local minimum values and zeroes Add, subtract, and multiply polynomials – connecting degrees of component polynomials to degrees of sums, differences, and products Find zeroes of polynomial functions and create polynomial functions with prescribed zeroes	A SSE 1 A SSE 1b A SSE 2 A SSE 3 A REI 4 A APR 1 A APR 3 F BF 1 F BF 1b F IF 2 F IF 4 F IF 7 F IF 7a F IF 7c F IF 8 S ID 6 S ID 6b	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

5 days	**Lesson 2 Quadratic Polynomials** <u>Investigation 1 Completing the Square</u> *How does the vertex form of a quadratic function reveal the shape and location of its graph?* *How can quadratic polynomials be expressed in vertex form?* Vocab.: Complete square, vertex form, vertex <u>Investigation 2 The Quadratic Formula and Complex Numbers</u> *How can the technique of completing the square be used to derive the quadratic formula?* *How does use of the quadratic formula suggest the need for new kinds of numbers?* Vocab.: Quadratic Formula, discriminant, complex numbers, imaginary number	Express quadratic function rules in vertex form Use vertex form of quadratic expressions to solve quadratic equations and locate the vertex of parabolic graphs Use completing the square to prove the quadratic formula Use the quadratic formula to analyze solution possibilities for quadratic equations and indicate the rationale for extending the number system to include complex numbers	A SSE 1a A SSE 1b A SSE 2 A SSE 3 A SSE 3a A SSE 3b F IF 4 F IF 7 F IF 7a F IF 7d F IF 8 F IF 8a F BF 1 A REI 1 A REI 4 A REI 4a A REI 4b A REI 7 N CN 7 N CN 9 N CN 1 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 3 Rational Expressions and Functions** <u>Investigation 1 Domains an d Graphs of Rational Functions</u> *How can polynomials like these be combined to give useful rational functions?* *What are the important features of rational functions and their graphs?* Vocab.: Domain, Range, rational function, horizontal asymptote, intercepts <u>Investigation 2 Simplifying Rational Expressions</u> *What principles and strategies help to simplify rational expressions?* *What cautions must be observed when simplifying rational expressions?* Vocab.: simplify, discontinuity, removable, vertical asymptote <u>Investigation 3 Adding and Subtracting Rational Expressions</u> *What principles and strategies guide addition and subtraction of rational expressions?* Vocab.: denominator, numerator, oblique asymptote <u>Investigation 4 Multiplying and Dividing Rational Expressions</u> *If the rules for two rational functions f(x) and g(x) are given, how can you calculate rules for the product and quotient of those functions?* *What cautions must be observed when simplifying products and quotients of rational expressions?* Vocab.: domain, range, restrictions (Lesson 4 Looking Back)	Create rational functions to model problem situations Analyze graphs of rational functions and their asymptotes Simplify rational expressions Add, subtract, multiply, and divide rational expressions (Review and synthesize the major objectives of the unit)	A SSE 1 A SSE 1a A SSE 1b A SSE 3 A SSE 3b A APR 6 A APR 7 F IF 2 F IF 4 F IF 5 F IF 7 F IF 7d F IF 8 A CED 1 F BF 1 F BF 1b A REI 4 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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)					

Time	Unit 6 Circles and Circular Functions Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
3.5 weeks Days Are Approx 7 days	**Lesson 1 Properties of Circles** *Investigation 1 Tangents to a Circle* *What are important properties of tangents to a circle, and how can they be verified?* Vocab.: concentric, chord, tangent, interior/exterior of circles, diameter, radius, distinct <u>Investigation 2 Chords, Arcs, and Central Angles</u> *What are important properties of chords, arcs, and central angles of a circle?* *How can these properties be proved and applied?* Vocab.: arc, central angle, major arc, minor arc, congruent, corresponding, midpoint, bisector, perpendicular <u>Investigation 3 Angles Inscribed in a Circle</u> *What is an inscribed angle in a circle?* *How is the measure of an inscribed angel related to the arc it intercepts?* Vocab.: inscribed angle, intercepted arc, Inscribed Angle Theorem	Determine and prove that a line tangent to a circle is perpendicular to the radius at the point of tangency and that the two tangent segments to a circle from the same external point are congruent State, prove, and apply the relationships among the measures of central angles, their chords, and their arcs State, prove, and apply the properties relating a radius, a chord, and the midpoint and perpendicular bisector of the chord State, prove, and apply the Inscribed Angle Theorem and the property that angles that intercept the same or congruent arcs are congruent	G C 2 G C 1 G CO 1 G C 5 F IF 7 F IF 8 F BF 1 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 (2 days)	**Lesson 2 Circular Motion and Periodic Functions** <u>Investigation 1 Angular and Linear Velocity</u> *How are angular and linear velocity related in circular motion?* *How do mechanical systems connect the motion of driver and follower circles?* Vocab.: angular velocity, linear velocity, driver, follower, crankset, sprocket, revolutions, rpm <u>Investigation 2 Modeling Circular Motion</u> *How can the coordinates of any point on a rotating circular object be determined from the radius and angle of rotation?* Vocab.: lines of symmetry, center of rotation, clockwise, counterclockwise, <u>Investigation 3 Revolutions, Degrees, Radians</u> *How are angles measured in radians?* *How are radians related to other units of measure for angles and rotations?* Vocab.: radians, <u>Investigation 4 Patterns of Periodic Change</u> *How can the cosine and sine functions be modified to represent the variety of important patterns of periodic change?* Vocab.: sinusoid, periodic functions, period, amplitude, y-displacement, frequency, Hertz (Lesson 3 Looking Back)	Analyze situations involving pulleys or sprockets to study angular velocity and linear velocity Use sine and cosine functions to describe rotations of circular objects Use radian and degree measures to measure angles and rotations Define sine and cosine as functions of real numbers and analyze the resulting periodic graphs Use the sine and cosine functions to model periodic patterns of change in various physical phenomena (Review and synthesize the major objectives of the unit)	G C 5 F TF 1 F TF 2 F TF 3 F TF 5 F IF 4 F IF 7 F IF 7e F IF 8 N Q 1 F BF 1 F BF 3 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 7 Recursion and Iteration Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Skills
2.5 weeks Days Are Approx 4 days	**Lesson 1 Modeling Sequential Change Using Recursion and Iteration** <u>Investigation 1 Modeling Population Change</u> *How can you construct and use a mathematical model to help you analyze a changing fish population?* Vocab.: Recursive, initial population, long-term population, annual rate <u>Investigation 2 The Power of Notation and Technology</u> *How can recursion and iteration be used to model and analyze sequential change situations?* *How can subscript, function, and spreadsheet notation be used in the modeling process?* *How can spreadsheets be used in the modeling process?* Vocab.: Recursion, iteration , discrete dynamical systems, subscripts, spreadsheet, compound interest, sequential change	Use iteration and recursion to model real-world situations involving sequential change Understand the basic concepts of recursive formulas, particularly those of the form $A_n = A_{n-1} + b$ Understand the effects of changing certain parameters on the long-term behavior of recursive formulas and the situations they model Use subscript notation and spreadsheet software to represent formulas that use the words NOW and NEXT and take advantage of this notation and spreadsheet software to analyze recursive formulas	G C 2 F BF 1 F BF 2 A SSE 1 A SSE 1a A SSE 1b A SSE 3 F IF 7e F IF 8 N VM 9 S ID 6	The Core-Plus Mathematics Curriculum, by design, incorporates CCSS Mathematical Practices in to each lesson throughout units 1-8.	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.

6 days	**Lesson 2 A Recursive View of Functions** Investigation 1 Arithmetic and Geometric Sequences *What are formulas for arithmetic and geometric sequences?* *What functions correspond to arithmetic and geometric sequences?* Vocab.: Arithmetic sequence, geometric sequence, common difference, geometric sequence, common ratio, linear function, exponential function Investigation 2 Some Sums *What are strategies for summing the terms of arithmetic and geometric sequences?* *What are formulas for these sums?* Vocab.: Accumulated, initial term, final term, series (arithmetic and geometric) Investigation 3 Finite Differences How do you construct a finite differences table for a sequence? *How can you use such a table to find a function formula for a sequence?* *What kind of function formulas can be found using finite differences tables?* Vocab.: finite, finite differences, method of undetermined coefficients, matrix methods	Understand arithmetic sequences and their connections to linear functions, using recursive formulas, function formulas, and applications Understand geometric sequences and their connections to exponential functions, using recursive formulas, function formulas, and applications Understand geometric sequences and their connections to exponential functions, using recursive formulas, function formulas, and applications Understand and apply arithmetic and geometric series (sums of sequences) Use finite differences tables to find function formulas for certain recursive formulas and to describe the connection between such tables and polynomial functions Use linear, exponential, and polynomial functions to model discrete situations	F IF 3 F IF 8 F BF 1 F BF 1a F BF 2 S ID 6a N VM 9 A REI 8 A REI 9 A SSE 1 A SSE 1a A SSE 3 A SSE 4 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

5 days (2 days)	**Lesson 3 Iterating Functions** Investigation 1 Play It Again…and Again *How do you iterate a function, and how can technology help?* *What are connections between recursive formulas and function iteration?* *What are some possibilities for long-term behavior in function iteration sequences?* Vocab.: Iterating, iterations, logistic equation, long term behavior Investigation 2 Iterating Linear Functions *How can you graphically iterate a function?* *What are all the possible long-term behaviors when iterating linear functions?* *How can you use slope to predict these behaviors?* Vocab.: Graphical iteration, fixed points – attracting, repelling, neutral, cycle (Lesson 4 Looking Back)	Iterate functions and describe the resulting patterns, the long-term behavior in particular Describe the connection between function iteration and recursive formulas Analyze long-term behavior when iterating linear functions, using graphical iteration, numerical iteration, and algebraic methods, including fixed point analysis and connections to slope. (Review and synthesize the major objectives of the unit)	A SSE 3 A SSE 4 F IF 3 F IF 8 F BF 1 F BF 1a F BF 2 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 8 Inverse Functions Essential Q's/Vocabulary	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
4 weeks Days Are Approx 4 days	**Lesson 1 What is an Inverse Function?** <u>Investigation 1 What is an Inverse Function?</u> *What properties of a mathematical function f make it possible to find a related function that reverses the domain, range, and individual assignments of f?* Vocab.: encryption, function, decode <u>Investigation 2 Finding and Using Inverse Functions</u> *Which familiar types of functions have inverses?* *How can rules for inverse functions be derived?* Vocab.: inverse, domain, range, coordinate graph, symmetry	Solve problems involving direct and inverse variation Discover conditions that guarantee existence of an inverse for a given function Develop and use strategies for recognizing invertible functions from study of tables of values and/or graphs of those functions Develop and use strategies for finding rules of inverses for linear and power functions	A SSE 3 F BF 1 F BF 4 F BF 4a F BF 4c F IF 5 F IF 7 F IF 8 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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.

6 days	**Lesson 2 Common Logarithms and Their Properties** <u>Investigation 1 Common Logarithms Revisited</u> *How can logarithms be used to solve equations involving exponential functions with base 10?* Vocab.: common (base 10) logarithm, logarithm <u>Investigation 2 Covering All the Bases</u> *How can common logarithms help in finding solutions of all exponential equations?* Vocab.: Bases, exponents, exponential functions <u>Investigation 3 Properties of Logarithms</u> *What are the important patterns in tables and graphs for the logarithm function?* *How can properties of logarithms be used tow rite algebraic expressions in useful equivalent forms?* Vocab.: properties – log of a product, log of a quotient, log of a power, log of a reciprocal	Express a positive number as a power of 10 Define and evaluate common logarithms Use logarithms to solve exponential equations Develop and use basic properties of the logarithmic function	A SSE 1 A SSE 2 A SSE 3 A SSE 3c F IF 7 F IF 7e F IF 8 F IF 8b F BF 1 F BF 5 F LE 4 A REI 1 N VM 9 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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 Inverse Trigonometric Functions** <u>Investigation 1 The Ups and Downs of the Sine</u> *How is the inverse of the sine function defined?* *How can the inverse sine function be used to solve trigonometric equations?* Vocab.: Inverse Sine function, arcsine, trigonometric, interval, degrees, radians, period, amplitude, domain, range <u>Investigation 2 Inverses of the cosine and Tangent</u> *How are the inverses of the cosine and tangent functions defined?* *How can the inverse cosine and inverse tangent functions be used to solve equations involving the cosine or tangent?* Vocab.: Inverse cosine, inverse tangent, arccosine, arctangent (Lesson 4 Looking Back)	Know and be able to use the definition of the inverse sine, inverse cosine, and inverse tangent functions Know and be able to use properties of the inverse sine, inverse cosine, and inverse tangent functions Use the inverse functions, to find one solution (when one exists) of a*f(b*x) + c = d, where f(x) is the sine, cosine, or tangent Express the general solutions of a trigonometric equation in forms such as x = k + 2(pi)n or x = k = 360n for any integer Use trigonometric equations and their solutions to model and answer questions about periodic phenomena (Review and synthesize the major objectives of the unit)	F IF 5 A SSE 1 A SSE 2 A SSE 3 F IF 4 F IF 5 F IF 7 F IF 8 F TF 6 F TF 7 F BF 1 F BF 4d A REI 1 F LE 4 S CP 7 S ID 6	Close Reading Teacher/Student Think Alouds Contextual Problem Solving 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	**Mathematics Review Unit Essential Q's/Vocabulary**	CPMP Lesson Objectives	Common Core Obj.	Literacy Activities	Skills/Mathematical Practices
2-3 weeks	*Mathematics Review and Practice of a variety of mathematics topics*	numerous selected review and practice of objectives	Variety of selected Common Common Core Objectives		