Course: Mathematical Analysis- 1201300

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3666.aspx

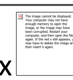
BASIC INFORMATION

Course Title:	Mathematical Analysis
Course Number:	1201300
Course Abbreviated Title:	MATH ANALYSIS
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Mathematical Analysis
Course length:	Semester (S)
Course Type:	Core
Course Level:	3
Status:	Draft - Board Approval Pending
Honors?	Yes

STANDARDS (35)

LACC.1112.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LACC.1112.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
LACC.1112.RST.3.7:	Integrate and evaluate multiple sources of information presented in

	diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LACC.1112.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.1112.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.1112.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MACC.912.A-APR.2.2:	Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
MACC.912.A-APR.2.3:	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

	Remarks/Examples **Algebra 1 Assessment Limits and Clarifications** i) Tasks are limited to quadratic and cubic polynomials in which linear and quadratic factors are available. For example, find the zeros of $(x - 2)(x^2 - 9)$. **Algebra 2 Assessment Limits and Clarifications** i) Tasks include quadratic, cubic, and quartic polynomials and polynomials for which factors are not provided. For example, find the zeros of $(x^2 - 1)(x^2 + 1)$
MACC.912.A-APR.3.4:	Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.
MACC.912.A-APR.3.5:	Know and apply the Binomial Theorem for the expansion of (x  in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
MACC.912.A-APR.4.6:	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. Remarks/Examples **Algebra 2 - Fluency Recommendations** This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases.
MACC.912.A-APR.4.7:	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
MACC.912.A-REI.3.8:	Represent a system of linear equations as a single matrix equation in a vector variable.

MACC.912.A-REI.3.9:	Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).
MACC.912.F-BF.1.1:	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* c. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* Remarks/Examples **Algebra 1, Unit 2**: Limit to F.BF.1a, 1b, and 2 to linear and exponential functions. **Algebra 1, Unit 5**: Focus on situations that exhibit a quadratic relationship. **Algebra 1 Assessment Limits and Clarifications** i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, and exponential functions with domains in the integers. **Algebra 2 Assessment Limits and Clarifications** i) Tasks have a real-world context ii) Tasks may involve linear functions, quadratic functions, and exponential functions.
MACC.912.F-BF.1.2:	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate

	between the two forms. Remarks/Examples
	Algebra 1 Honors, Unit 4: In F.BF.2, connect arithmetic sequences to linear functions and geometric sequences to exponential functions. Algebra 2, Unit 3: In F.BF.2, connect arithmetic sequences to linear functions and geometric sequences to exponential functions. [Please note this standard is not included in the Algebra 1 course; the remarks should reference Algebra 1 Honors/Unit 4 and Algebra 2/Unit 3 Instructional Notes.]
MACC.912.F-BF.2.3:	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* Remarks/Examples
	Algebra 1, Unit 2: Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard. **Algebra 1, Unit 5**: For F.BF.3, focus on quadratic functions, and consider including absolute value functions. **Algebra 1 Assessment Limit and Clarifications** i) Identifying the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x+k) for specific values of k (both positive and negative) is limited to linear and quadratic functions. ii) Experimenting with cases and illustrating an explanation of the effects on the graph using technology is limited to linear functions, quadratic functions, square root functions, cube root functions, piecewise-defined functions (including step functions and absolute value functions), and exponential functions with domains in the

	integers. iii) Tasks do not involve recognizing even and odd functions. The function types listed in note (ii) are the same as those listed in the Algebra I column for standards F-IF.4, F-IF.6, and F-IF.9. **Algebra 2 Assessment Limits and Clarifications** i) Tasks may involve polynomial, exponential, logarithmic, and trigonometric functions ii) Tasks may involve recognizing even and odd functions. The function types listed in note (i) are the same as those listed in the Algebra II column for standards F-IF.4, F-IF.6, and F-IF.9.
MACC.912.F-IF.3.7:	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. Remarks/Examples
	Algebra 1, Unit 2: For F.IF.7a, 7e, and 9 focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as $y=3^n$ and $y=100^2$

MACC.912.N-CN.3.9:	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
MACC.912.N-VM.3.10:	Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
MACC.912.N-VM.3.12:	Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.
MACC.912.N-VM.3.6:	Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
MACC.912.N-VM.3.7:	Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
MACC.912.N-VM.3.8:	Add, subtract, and multiply matrices of appropriate dimensions.
MACC.912.N-VM.3.9:	Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
MACC.912.S-CP.2.8:	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
MACC.912.S-CP.2.9:	Use permutations and combinations to compute probabilities of compound events and solve problems.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students

Course: Geometry- 1206310

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3674.aspx

BASIC INFORMATION

Course Title:	Geometry
Course Number:	1206310
Course Abbreviated Title:	GEO
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Geometry
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Type:	Core
Course Level:	2
Status:	Draft - Board Approval Pending
Version Description:	The fundamental purpose of the course in Geometry is to formalize and extend students' geometric experiences from the middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships, moving towards formal mathematical arguments. Important differences exist between this Geometry course and the historical approach taken in Geometry classes. For example, transformations are emphasized early in this course. Close attention should be paid to the introductory content for the Geometry conceptual category found in the high school CCSS. The Standards for Mathematical Practice apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas, organized into five units are as follows.

	Unit 1-Congruence, Proof, and Constructions: In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats—and solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work. **Unit 2- Similarity, Proof, and Trigonometry:** Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean theorem. Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on students' work with quadratic equations done in the first course. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles. **Unit 3- Extending to Three Dimensions:** Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line. **Unit 4- Connecting Algebra and Geometry Through Coordinates:** Building on their work with the Pythagorean theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, which relates back to work done in the first course. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola. **Unit 5-Circles With and Without Coordinates:** In this unit students

	prove basic theorems about circles, such as a tangent line is perpendicular to a radius, inscribed angle theorem, and theorems about chords, secants, and tangents dealing with segment lengths and angle measures. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for solving quadratic equations, which relates back to work done in the first course, to determine intersections between lines and circles or parabolas and between two circles.
General Notes:	During the 2013-2014 school year, Florida will be transitioning to the Common Core State Standards for Mathematics. The content standards for Geometry are based upon these new standards. During this transition year, students will be assessed using the Geometry End-of-Course Assessment aligned with the Next Generation Sunshine State Standards (NGSSS). For this reason, instruction should include the following NGSSS: MA.912.D.6.2, MA.912.D.6.3, and MA.912.D.6.4.

STANDARDS (57)

LACC.910.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LACC.910.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
LACC.910.RST.3.7:	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LACC.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’

	ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
LACC.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LACC.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LACC.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
MACC.912.G-CO.1.1:	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MACC.912.G-CO.1.2:	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

Course: Geometry for Credit Recovery-1206315

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3675.aspx

BASIC INFORMATION

Course Title:	Geometry for Credit Recovery
Course Number:	1206315
Course Abbreviated Title:	GEO CR
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Geometry
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Type:	Elective
Course Level:	2
Status:	Draft - Board Approval Pending
Version Description:	Special notes: Credit Recovery courses are credit bearing courses with specific content requirements defined by Next Generation Sunshine State Standards and/or Common Core State Standards. Students enrolled in a Credit Recovery course must have previously attempted the corresponding course (and/or End-of-Course assessment) since the course requirements for the Credit Recovery course are exactly the same as the previously attempted corresponding course. For example, Geometry (1206310) and Geometry for Credit Recovery (1206315) have identical content requirements. It is important to note that Credit Recovery courses are not bound by Section 1003.436(1)(a), Florida Statutes, requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should ONLY be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

General Notes:	
	The fundamental purpose of the course in Geometry is to formalize and extend students' geometric experiences from the middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships, moving towards formal mathematical arguments. Important differences exist between this Geometry course and the historical approach taken in Geometry classes. For example, transformations are emphasized early in this course. Close attention should be paid to the introductory content for the Geometry conceptual category found in the high school CCSS. The Standards for Mathematical Practice apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas, organized into five units are as follows. **Unit 1- Congruence, Proof, and Constructions:** In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats—and solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work. **Unit 2- Similarity, Proof, and Trigonometry:** Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean theorem. Students develop the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on students' work with quadratic equations done in the first course. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles. **Unit 3- Extending to Three Dimensions:** Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line. **Unit 4- Connecting Algebra and Geometry Through Coordinates:** Building on their work with the Pythagorean theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, which relates back to work done in the first course. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.

	Unit 5- Circles With and Without Coordinates: In this unit students prove basic theorems about circles, such as a tangent line is perpendicular to a radius, inscribed angle theorem, and theorems about chords, secants, and tangents dealing with segment lengths and angle measures. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for solving quadratic equations, which relates back to work done in the first course, to determine intersections between lines and circles or parabolas and between two circles.
Version Requirements:	During the 2013-2014 school year, Florida will be transitioning to the Common Core State Standards for Mathematics. The content standards for Geometry are based upon these new standards. During this transition year, students will be assessed using the Geometry End-of-Course Assessment aligned with the Next Generation Sunshine State Standards (NGSSS). For this reason, instruction should include the following NGSSS: MA.912.D.6.2, MA.912.D.6.3, and MA.912.D.6.4.

STANDARDS (57)

LACC.910.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LACC.910.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
LACC.910.RST.3.7:	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LACC.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned

	exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
LACC.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LACC.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LACC.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
LACC.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

	d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MA.912.D.6.2:	Find the converse, inverse, and contrapositive of a statement Remarks/Examples Example: Determine the inverse, converse and contrapositive of the statement, “If it is Thursday, there will be rain.”
MA.912.D.6.3:	Determine whether two propositions are logically equivalent. Remarks/Examples Example: Determine whether the propositions and are logically equivalent.
MA.912.D.6.4:	Use methods of direct and indirect proof and determine whether a short proof is logically valid. Remarks/Examples Example: If somebody argues, “If it’s Thursday, it is raining.” along with “It is raining” implies that "it is Thursday.", is this a valid or invalid argument? Explain your answer.
MACC.912.G-C.1.1:	Prove that all circles are similar.
MACC.912.G-C.1.2:	Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
MACC.912.G-C.1.3:	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
MACC.912.G-C.2.5:	Derive using similarity the fact that the length of the arc intercepted

	by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
MACC.912.G-CO.1.1:	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MACC.912.G-CO.1.2:	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
MACC.912.G-CO.1.3:	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MACC.912.G-CO.1.4:	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
MACC.912.G-CO.1.5:	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
MACC.912.G-CO.2.6:	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
MACC.912.G-CO.2.7:	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MACC.912.G-CO.2.8:	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
MACC.912.G-CO.3.10:	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
MACC.912.G-CO.3.11:	Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are*

	parallelograms with congruent diagonals.
MACC.912.G-CO.3.9:	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
MACC.912.G-CO.4.12:	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.* Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the use of construction tools, physical and computational, helps students draft a model of a geometric phenomenon and can lead to conjectures and proofs.
MACC.912.G-CO.4.13:	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
MACC.912.G-GMD.1.1:	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
MACC.912.G-GMD.1.3:	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MACC.912.G-GMD.2.4:	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
MACC.912.G-GPE.1.1:	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
MACC.912.G-GPE.2.4:	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given*

	points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). Remarks/Examples
	Geometry - Fluency Recommendations Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-GPE.2.5:	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). Remarks/Examples
	Geometry - Fluency Recommendations Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-GPE.2.6:	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
MACC.912.G-GPE.2.7:	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. Remarks/Examples
	Geometry - Fluency Recommendations Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.

MACC.912.G-MG.1.1:	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
MACC.912.G-MG.1.2:	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
MACC.912.G-MG.1.3:	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)
MACC.912.G-SRT.1.1:	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MACC.912.G-SRT.1.2:	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
MACC.912.G-SRT.1.3:	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
MACC.912.G-SRT.2.4:	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
MACC.912.G-SRT.2.5:	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the triangle congruence and similarity criteria will help

	students throughout their investigations of triangles, quadrilaterals, circles, parallelism, and trigonometric ratios. These criteria are necessary tools in many geometric modeling tasks.
MACC.912.G-SRT.3.6:	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
MACC.912.G-SRT.3.7:	Explain and use the relationship between the sine and cosine of complementary angles.
MACC.912.G-SRT.3.8:	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two

	complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the

	workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the

	calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

RELATED GLOSSARY TERM DEFINITIONS (4)

Contrapositive:	Switching the hypothesis and conclusion of a conditional statement and negating both. “If p, then q.” becomes “If not q, then not p.” The contrapositve has the same truth value as the original statement.
Converse:	Switching the hypothesis and conclusion of a conditional statement. “If p, then q.” becomes “If q, then p.”
Equivalent:	Having the same value.
Proof:	A logical argument that demonstrates the truth of a given statement. In a formal proof, each step can be justified with a reason; such as a given, a definition, an axiom, or a previously proven property or theorem. A mathematical statement that has been proven is called a theorem.

LACC.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MA.912.D.6.2:	Find the converse, inverse, and contrapositive of a statement Remarks/Examples Example: Determine the inverse, converse and contrapositive of the statement, "If it is Thursday, there will be rain."
MA.912.D.6.3:	Determine whether two propositions are logically equivalent. Remarks/Examples Example: Determine whether the propositions and are logically equivalent.
MA.912.D.6.4:	Use methods of direct and indirect proof and determine whether a short proof is logically valid.

	Remarks/Examples Example: If somebody argues, “If it’s Thursday, it is raining.” along with “It is raining” implies that "it is Thursday.", is this a valid or invalid argument? Explain your answer.
MACC.912.G-C.1.1:	Prove that all circles are similar.
MACC.912.G-C.1.2:	Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
MACC.912.G-C.1.3:	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
MACC.912.G-C.2.5:	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
MACC.912.G-CO.1.3:	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MACC.912.G-CO.1.4:	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
MACC.912.G-CO.1.5:	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
MACC.912.G-CO.2.6:	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
MACC.912.G-CO.2.7:	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MACC.912.G-CO.2.8:	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
MACC.912.G-CO.3.10:	Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides*

	of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
MACC.912.G-CO.3.11:	Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*
MACC.912.G-CO.3.9:	Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
MACC.912.G-CO.4.12:	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.* Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the use of construction tools, physical and computational, helps students draft a model of a geometric phenomenon and can lead to conjectures and proofs.
MACC.912.G-CO.4.13:	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
MACC.912.G-GMD.1.1:	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
MACC.912.G-GMD.1.3:	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MACC.912.G-GMD.2.4:	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

MACC.912.G-GPE.1.1:	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
MACC.912.G-GPE.2.4:	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).* Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-GPE.2.5:	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-GPE.2.6:	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
MACC.912.G-GPE.2.7:	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. Remarks/Examples **Geometry - Fluency Recommendations**

	Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-MG.1.1:	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
MACC.912.G-MG.1.2:	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
MACC.912.G-MG.1.3:	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)
MACC.912.G-SRT.1.1:	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MACC.912.G-SRT.1.2:	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
MACC.912.G-SRT.1.3:	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
MACC.912.G-SRT.2.4:	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
MACC.912.G-SRT.2.5:	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

	Remarks/Examples
	Geometry - Fluency Recommendations Fluency with the triangle congruence and similarity criteria will help students throughout their investigations of triangles, quadrilaterals, circles, parallelism, and trigonometric ratios. These criteria are necessary tools in many geometric modeling tasks.
MACC.912.G-SRT.3.6:	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
MACC.912.G-SRT.3.7:	Explain and use the relationship between the sine and cosine of complementary angles.
MACC.912.G-SRT.3.8:	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify

	correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask

	useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient

	students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

RELATED GLOSSARY TERM DEFINITIONS (4)

Contrapositive:	Switching the hypothesis and conclusion of a conditional statement and negating both. "If p, then q." becomes "If not q, then not p." The contrapositve has the same truth value as the original statement.
Converse:	Switching the hypothesis and conclusion of a conditional statement. "If p, then q." becomes "If q, then p."
Equivalent:	Having the same value.
Proof:	A logical argument that demonstrates the truth of a given statement. In a formal proof, each step can be justified with a reason; such as a given, a definition, an axiom, or a previously proven property or theorem. A mathematical statement that has been proven is called a theorem.

	might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects,

	drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing

	calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they

Course: Analysis of Functions- 1201310

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse2451.aspx

BASIC INFORMATION

Course Title:	Analysis of Functions
Course Number:	1201310
Course Abbreviated Title:	ANALYSIS OF FUNC
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Mathematical Analysis
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Type:	Core
Course Level:	3
Status:	State Board Approved
Honors?	Yes

STANDARDS (28)

LACC.1112.RST.2 Craft and Structure

LACC.1112.RST.2.4 :	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date

Course: Informal Geometry- 1206300

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3672.aspx

BASIC INFORMATION

Course Title:	Informal Geometry
Course Number:	1206300
Course Abbreviated Title:	INF GEO
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Geometry
Course length:	Year (Y)
Course Type:	Core
Course Level:	2
Status:	Draft - Board Approval Pending
Version Description:	The fundamental purpose of the course in Informal Geometry is to extend students' geometric experiences from the middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships. Important differences exist between this Geometry course and the historical approach taken in Geometry classes. For example, transformations are emphasized early in this course. Close attention should be paid to the introductory content for the Geometry conceptual category found in the high school CCSS. The Standards for Mathematical Practice apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations. The critical areas, organized into five units are as follows. **Unit 1- Congruence, Proof, and Constructions:** In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions: translations, reflections, and rotations and have used these to develop notions about what it means for two objects to be congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. Students informally prove theorems—using a variety of formats—and solve problems about triangles, quadrilaterals, and other

	polygons. They apply reasoning to complete geometric constructions and explain why they work. **Unit 2- Similarity, Proof, and Trigonometry:** Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles, with particular attention to special right triangles and the Pythagorean theorem. **Unit 3- Extending to Three Dimensions:** Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area and volume formulas. **Unit 4- Connecting Algebra and Geometry Through Coordinates:** Building on their work with the Pythagorean theorem in 8th grade to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, which relates back to work done in the first course. **Unit 5- Circles With and Without Coordinates:** In this unit students study the Cartesian coordinate system and use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for solving quadratic equations, which relates back to work done in the first course, to determine intersections between lines and circles or parabolas.
General Notes:	**Important Note:** This Informal Geometry course content does not align with the End-of-Course Assessment required for graduation.

STANDARDS (41)

LACC.910.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LACC.910.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
LACC.910.RST.3.7:	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LACC.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
LACC.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LACC.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LACC.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
LACC.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

	b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MACC.912.G-C.1.1:	Prove that all circles are similar.
MACC.912.G-C.1.2:	Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
MACC.912.G-CO.1.1:	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MACC.912.G-CO.1.2:	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
MACC.912.G-CO.1.3:	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
MACC.912.G-CO.1.4:	Develop definitions of rotations, reflections, and translations in terms

	of angles, circles, perpendicular lines, parallel lines, and line segments.
MACC.912.G-CO.1.5:	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
MACC.912.G-CO.2.6:	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
MACC.912.G-CO.2.7:	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
MACC.912.G-CO.2.8:	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
MACC.912.G-GMD.1.1:	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
MACC.912.G-GMD.1.3:	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MACC.912.G-GMD.2.4:	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
MACC.912.G-GPE.2.4:	Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).* Remarks/Examples
	Geometry - Fluency Recommendations Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.

MACC.912.G-GPE.2.6:	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
MACC.912.G-GPE.2.7:	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the use of coordinates to establish geometric results, calculate length and angle, and use geometric representations as a modeling tool are some of the most valuable tools in mathematics and related fields.
MACC.912.G-MG.1.1:	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
MACC.912.G-MG.1.2:	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
MACC.912.G-MG.1.3:	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)
MACC.912.G-SRT.1.1:	Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MACC.912.G-SRT.1.2:	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

MACC.912.G-SRT.1.3:	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
MACC.912.G-SRT.2.5:	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Remarks/Examples **Geometry - Fluency Recommendations** Fluency with the triangle congruence and similarity criteria will help students throughout their investigations of triangles, quadrilaterals, circles, parallelism, and trigonometric ratios. These criteria are necessary tools in many geometric modeling tasks.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**.

	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.**

	Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of

	concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are

	repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

	Adopted or Revised: 12/10 Belongs to: Craft and Structure

LACC.1112.RST.3 Integration of Knowledge and Ideas

LACC.1112.RST.3.7 :	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Integration of Knowledge and Ideas

LACC.910.RST.2 Craft and Structure

LACC.910.RST.2.4 :	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Craft and Structure

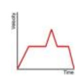
LACC.910.RST.3 Integration of Knowledge and Ideas

LACC.910.RST.3.7 :	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Integration of Knowledge and Ideas

MA.912.A.2 Relations and Functions

MA.912.A.2.1 :	Create a graph to represent a real-world situation. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples
	Example 1: Conduct an experiment as follows. Take a beverage out of a refrigerator and place it in a warm room. Measure its temperature every two minutes. Plot the temperature of the beverage as a function of time. What does the graph show about

	the temperature change of this beverage? Example 2: A child walks to school at a steady pace. Plot her distance from home as a function of time. Now plot her distance to the school as a function of time.
MA.912.A.2.10 :	Describe and graph transformations of functions Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples Example: Describe how you would graph $f(x) = -2(x+1)^2 - 3$ from the graph of $g(x) = x^2$.
MA.912.A.2.11 :	Solve problems involving functions and their inverses. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples Example: Find the inverse of the $f(x)=x^3-1$ function. Sketch the graph of the function and its inverse
MA.912.A.2.13 :	Solve real-world problems involving relations and functions. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples Example 1: You and your parents are going to Boston. You will rent a car at Boston's Logan International Airport on a Monday morning and drop the car off in downtown Providence, RI, on the following Wednesday afternoon. Find the rates from two national car companies and plot the costs on a graph. You may choose limited or unlimited mileage plans. Decide which company offers the best deal. Explain your answer. Example 2: A cab company charges a fixed flag rate of $20 and

	$1.40 for every mile covered. Write an expression for the total cab fare as a function of distance driven. Then solve for the total fare after the cab traveled for 36 miles.
MA.912.A.2.2 :	Interpret a graph representing a real-world situation. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples
	Example: Jessica is riding a bicycle in a straight line. The graph below shows her speed as it relates to the time she has spent riding. Assign appropriate units to the labels of the axes and insert numbers to the axes. Describe what might have happened to account for this graph. 
MA.912.A.2.4 :	Determine the domain and range of a relation. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples
	Example: Determine the domain and range of $f(x)=\sqrt{x}$ so that f(x) is a function.
MA.912.A.2.6 :	Identify and graph common functions (including but not limited to linear, rational, quadratic, cubic, radical, absolute value). Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Relations and Functions Remarks/Examples
	Example: Graph

Course: Explorations in Mathematics 2- 1205510

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3629.aspx

BASIC INFORMATION

Course Title:	Explorations in Mathematics 2
Course Number:	1205510
Course Abbreviated Title:	EXPLORS IN MATH 2
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** General Mathematics
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Level:	1
Status:	Draft - Board Approval Pending
Version Description:	**Graduation Requirements:** *Fundamental courses are academic skill-building courses which support a student's participation in general education classes by allowing them more time to build the necessary skills for success. Students with disabilities may earn elective credit towards a standard diploma for the successful completion of a fundamental course.* *A student for which the IEP Team has determined the general education curriculum with accommodations and supports is not appropriate but is ineligible to participate in access courses may take fundamental courses to earn credit towards a special diploma, in accordance with the district's student progression plan. These courses are appropriate for these students as general education courses may not be modified for this purpose.*

STANDARDS (38)

LACC.910.RST.1 Key Ideas and Details

LACC.910.RST.1.3 :	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Key Ideas and Details

LACC.910.RST.2 Craft and Structure

LACC.910.RST.2.4 :	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Craft and Structure

LACC.910.RST.3 Integration of Knowledge and Ideas

LACC.910.RST.3.7 :	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Integration of Knowledge and Ideas

LACC.910.SL.1 Comprehension and Collaboration

LACC.910.SL.1.1 :	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by

	referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration
LACC.910.SL.1.2 :	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration
LACC.910.SL.1.3 :	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration

LACC.910.SL.2 Presentation of Knowledge and Ideas

LACC.910.SL.2.4 :	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date

	Adopted or Revised: 12/10 Belongs to: Presentation of Knowledge and Ideas

LACC.910.WHST.1 Text Types and Purposes

LACC.910.WHST.1.1 :	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. Cognitive Complexity: Level 4: Extended Thinking &Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Text Types and Purposes

LACC.910.WHST.2 Production and Distribution of Writing

LACC.910.WHST.2.4 :	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Production and Distribution of Writing

LACC.910.WHST.3 Research to Build and Present Knowledge

LACC.910.WHST.3.9 :	Draw evidence from informational texts to support analysis,

	reflection, and research. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Research to Build and Present Knowledge

MACC.7.EE.1 Use properties of operations to generate equivalent expressions.

MACC.7.EE.1.1 :	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 12/10 Belongs to: Use properties of operations to generate equivalent expressions.
MACC.7.EE.1.2 :	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Use properties of operations to generate equivalent expressions.

MACC.7.EE.2 Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

MACC.7.EE.2.3 :	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. Remarks/Examples
	Fluency Expectations or Examples of Culminating Standards

	Students solve multistep problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. This work is the culmination of many progressions of learning in arithmetic, problem solving and mathematical practices. **Examples of Opportunities for In-Depth Focus** This is a major capstone standard for arithmetic and its applications.
MACC.7.EE.2.4 :	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 12/10 Belongs to: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. Remarks/Examples **Fluency Expectations or Examples of Culminating Standards**

	In solving word problems leading to one-variable equations of the form px + q = r and p(x + q) = r, students solve the equations fluently. This will require fluency with rational number arithmetic (7.NS.1.1–1.3), as well as fluency to some extent with applying properties operations to rewrite linear expressions with rational coefficients (7.EE.1.1). **Examples of Opportunities for In-Depth Focus** Work toward meeting this standard builds on the work that led to meeting 6.EE.2.7 and prepares students for the work that will lead to meeting 8.EE.3.7.

MACC.7.G.2 Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

MACC.7.G.2.4 :	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MACC.7.G.2.6 :	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Remarks/Examples **Examples of Opportunities for In-Depth Focus** Work toward meeting this standard draws together grades 3–6 work with geometric measurement.

MACC.7.NS.1 Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

MACC.7.NS.1.1 :	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. d. Apply properties of operations as strategies to add and subtract rational numbers. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. Remarks/Examples
	Fluency Expectations or Examples of Culminating Standards Adding, subtracting, multiplying, and dividing rational numbers is the culmination of numerical work with the four basic operations. The number system will continue to develop in grade 8, expanding to become the real numbers by the introduction of irrational numbers, and will develop further in high school, expanding to become the complex numbers with the introduction of imaginary numbers. Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.

MACC.7.NS.1.2 :	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts. c. Apply properties of operations as strategies to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. Remarks/Examples
	Fluency Expectations or Examples of Culminating Standards Adding, subtracting, multiplying, and dividing rational numbers is the culmination of numerical work with the four basic operations. The number system will continue to develop in grade 8, expanding to become the real numbers by the introduction of irrational numbers, and will develop further in high school, expanding to become the complex numbers with the introduction of imaginary numbers. Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.

MACC.7.RP.1 Analyze proportional relationships and use them to solve real-world and mathematical problems.

MACC.7.RP.1.1 :	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 12/10 Belongs to: Analyze proportional relationships and use them to solve real-world and mathematical problems.
MACC.7.RP.1.2 :	Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.* d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 12/10 Belongs to: Analyze proportional relationships and use them to solve real-world and mathematical problems. Remarks/Examples
	Examples of Opportunities for In-Depth Focus Students in grade 7 grow in their ability to recognize, represent, and analyze proportional relationships in various ways, including by using tables, graphs, and equations.

MACC.7.RP.1.3 :	Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Analyze proportional relationships and use them to solve real-world and mathematical problems.

MACC.8.EE.1 Work with radicals and integer exponents.

MACC.8.EE.1.1 :	Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times$ = *=1/3³=1/27* Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 12/09 Belongs to: Work with radicals and integer exponents.
MACC.8.EE.1.2 :	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 12/10 Belongs to: Work with radicals and integer exponents.

MACC.8.EE.2 Understand the connections between proportional relationships, lines, and linear equations.

MACC.8.EE.2.5 :	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Understand the connections between proportional relationships, lines, and linear equations. Remarks/Examples
	Examples of Opportunities for In-Depth Focus When students work toward meeting this standard, they build on

	grades 6–7 work with proportions and position themselves for grade 8 work with functions and the equation of a line.

MACC.8.EE.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

MACC.8.EE.3.8 :	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.* c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Analyze and solve linear equations and pairs of simultaneous linear equations. Remarks/Examples
	Examples of Opportunities for In-Depth Focus When students work toward meeting this standard, they build on what they know about two-variable linear equations, and they enlarge the varieties of real-world and mathematical problems they can solve.

MACC.8.F.1 Define, evaluate, and compare functions.

MACC.8.F.1.1 :	Understand that a function is a rule that assigns to each input

	exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Define, evaluate, and compare functions.

MACC.8.G.1 Understand congruence and similarity using physical models, transparencies, or geometry software.

MACC.8.G.1.1 :	Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Understand congruence and similarity using physical models, transparencies, or geometry software.
MACC.8.G.1.3 :	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Understand congruence and similarity using physical models, transparencies, or geometry software.

MACC.8.G.2 Understand and apply the Pythagorean Theorem.

MACC.8.G.2.7 :	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 11/10 Belongs to: Understand and apply the Pythagorean Theorem. Remarks/Examples
	Examples of Opportunities for In-Depth Focus The Pythagorean theorem is useful in practical problems, relates to

	grade-level work in irrational numbers and plays an important role mathematically in coordinate geometry in high school.

MACC.8.NS.1 Know that there are numbers that are not rational, and approximate them by rational numbers.

MACC.8.NS.1.1 :	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 12/10 Belongs to: Know that there are numbers that are not rational, and approximate them by rational numbers.

MACC.K12.MP.1 Make sense of problems and persevere in solving them.

MACC.K12.MP.1.1 :	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify

	correspondences between different approaches. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Make sense of problems and persevere in solving them.

MACC.K12.MP.2 Reason abstractly and quantitatively.

MACC.K12.MP.2.1 :	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Reason abstractly and quantitatively.

MACC.K12.MP.3 Construct viable arguments and critique the reasoning of others.

MACC.K12.MP.3.1 :	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about

	data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Construct viable arguments and critique the reasoning of others.

MACC.K12.MP.4 Model with mathematics.

MACC.K12.MP.4.1 :	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its

	purpose. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Model with mathematics.

MACC.K12.MP.5 Use appropriate tools strategically.

MACC.K12.MP.5.1 :	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Use appropriate tools strategically.

MACC.K12.MP.6 Attend to precision.

MACC.K12.MP.6.1 :	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others

	and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Attend to precision.

MACC.K12.MP.7 Look for and make use of structure.

MACC.K12.MP.7.1 :	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Look for and make use of structure.

MACC.K12.MP.8 Look for and express regularity in repeated reasoning.

MACC.K12.MP.8.1 :	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning I Date Adopted or Revised: 12/10 Belongs to: Look for and express regularity in repeated reasoning.

Course: Explorations in Mathematics 1- 1205500

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3626.aspx

BASIC INFORMATION

Course Title:	Explorations in Mathematics 1
Course Number:	1205500
Course Abbreviated Title:	EXPLORS IN MATH 1
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** General Mathematics
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Level:	1
Status:	Draft - Board Approval Pending
Version Description:	***Graduation Requirements:*** *Fundamental courses are academic skill-building courses which support a student's participation in general education classes by allowing them more time to build the necessary skills for success. Students with disabilities may earn elective credit towards a standard diploma for the successful completion of a fundamental course.* *A student for which the IEP Team has determined the general education curriculum with accommodations and supports is not appropriate but is ineligible to participate in access courses may take fundamental courses to earn credit towards a special diploma, in accordance with the district's student progression plan. These courses are appropriate for these students as general education courses may not be modified for this purpose.*

STANDARDS (42)

LACC.910.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LACC.910.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
LACC.910.RST.3.7:	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LACC.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

LACC.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LACC.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LACC.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
LACC.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MACC.6.EE.1.1:	Write and evaluate numerical expressions involving whole-number

	exponents.
MACC.6.EE.1.2:	Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.*
MACC.6.EE.1.3:	Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* Remarks/Examples **Examples of Opportunities for In-Depth Focus** By applying properties of operations to generate equivalent expressions, students use properties of operations that they are familiar with from previous grades' work with numbers — generalizing arithmetic in the process.
MACC.6.EE.1.4:	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y*

	are equivalent because they name the same number regardless of which number y stands for.
MACC.6.EE.2.5:	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
MACC.6.EE.2.6:	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MACC.6.EE.2.7:	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all non-negative rational numbers. Remarks/Examples
	Examples of Opportunities for In-Depth Focus When students write equations of the form $x + p = q$ and $px = q$ to solve real-world and mathematical problems, they draw on meanings of operations that they are familiar with from previous grades' work. They also begin to learn algebraic approaches to solving problems.[16] [16] For example, suppose Daniel went to visit his grandmother, who gave him \$5.50. Then he bought a book costing \$9.20 and had \$2.30 left. To find how much money he had before visiting his grandmother, an algebraic approach leads to the equation $x + 5.50 – 9.20 = 2.30$. An arithmetic approach without using variables at all would be to begin with 2.30, then add 9.20, then subtract 5.50. This yields the desired answer, but students will eventually encounter problems in which arithmetic approaches are unrealistically difficult and algebraic approaches must be used.
MACC.6.EE.3.9:	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

	For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.
MACC.6.G.1.1:	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
MACC.6.G.1.2:	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
MACC.6.NS.1.1:	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* Remarks/Examples
	Examples of Opportunities for In-Depth Focus This is a culminating standard for extending multiplication and division to fractions. **Fluency Expectations or Examples of Culminating Standards** Students interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. This completes the extension of operations to fractions.

MACC.6.NS.2.2:	Fluently divide multi-digit numbers using the standard algorithm. Remarks/Examples **Fluency Expectations or Examples of Culminating Standards** Students fluently divide multidigit numbers using the standard algorithm. This is the culminating standard for several years' worth of work with division of whole numbers.
MACC.6.NS.2.3:	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Remarks/Examples **Fluency Expectations or Examples of Culminating Standards** Students fluently add, subtract, multiply, and divide multidigit decimals using the standard algorithm for each operation. This is the culminating standard for several years' worth of work relating to the domains of Number and Operations in Base Ten, Operations and Algebraic Thinking, and Number and Operations — Fractions.
MACC.6.NS.2.4:	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*
MACC.6.NS.3.5:	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
MACC.6.NS.3.6:	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

	a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
MACC.6.NS.3.7:	Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ºC > –7 ºC to express the fact that –3 ºC is warmer than –7 ºC.* c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*
MACC.6.NS.3.8:	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

	Remarks/Examples
	Examples of Opportunities for In-Depth Focus When students work with rational numbers in the coordinate plane to solve problems, they combine and consolidate elements from the other standards in this cluster.
MACC.6.RP.1.1:	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*
MACC.6.RP.1.2:	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*
MACC.6.RP.1.3:	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. Remarks/Examples

	Examples of Opportunities for In-Depth Focus When students work toward meeting this standard, they use a range of reasoning and representations to analyze proportional relationships.
MACC.6.SP.1.1:	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*
MACC.6.SP.1.2:	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
MACC.6.SP.2.5:	Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if

	necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the

	arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a

	spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the

	distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

RELATED CERTIFICATIONS (2)

Option 1:	044 MATH 1: Grades 6-12
Option 2:	Any 315 MG MATH Certification **plus** 315 MG MATH C: Middle Grades (5-9)

Course: Consumer Mathematics- 1205370

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3632.aspx

BASIC INFORMATION

Course Title:	Consumer Mathematics
Course Number:	1205370
Course Abbreviated Title:	CONSUMER MATH
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** General Mathematics
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Level:	1
Status:	Draft - Board Approval Pending

STANDARDS (36)

LACC.910.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LACC.910.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
LACC.910.RST.3.7:	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate

	information expressed visually or mathematically (e.g., in an equation) into words.
LACC.910.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
LACC.910.SL.1.2:	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
LACC.910.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
LACC.910.SL.2.4:	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
LACC.910.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from

	alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MA.912.F.1.1:	Explain the difference between simple and compound interest. Remarks/Examples Example: Compare the similarities and differences for calculating the final amount of money in your savings account based on simple interest or compound interest.
MA.912.F.1.2:	Solve problems involving compound interest. Remarks/Examples Example: Find the amount of money on deposit at the end of 5 years if you started with $500 and it was compounded quarterly at 6 % interest. Example: Joe won $25,000 in the lottery. How many years will it take at 6% interest compounded yearly for his money to double?
MA.912.F.1.3:	Demonstrate the relationship between simple interest and linear

	growth. Remarks/Examples
	Example: Find the account balance at the end of each month for a 5 month span for $1500 @ 3 % interest based on simple interest for 1 year. Graph this scenario and explain if this is a linear or exponential problem.
MA.912.F.1.4:	Demonstrate the relationship between compound interest and exponential growth. Remarks/Examples
	Example: Using an exponential function, find the account balance at the end of 4 years if you deposited $1300 in an account paying 3.5% interest compounded annually. Graph the scenario.
MA.912.F.3.1:	Compare the advantages and disadvantages of using cash versus a credit card. Remarks/Examples
	Example: Compare paying for a tank of gasoline in cash or paying with a credit card over a period of time.
MA.912.F.3.2:	Analyze credit scores and reports. Remarks/Examples
	Example: Explain how each of the following categories affects a credit score: 1) past payment history, 2) amount of debt, 3) public records information, 4) length of credit history, and 5) the number of recent credit inquiries.
MA.912.F.3.3:	Calculate the finance charges and total amount due on a credit card bill. Remarks/Examples
	Example: Calculate the finance charge each month and the total amount paid for 5 months if you charged $500 on your credit card but you can only afford to pay $100 each month. Your credit card has a monthly periodic finance rate of .688% and an annual finance rate of 8.9%.
MA.912.F.3.4:	Compare the advantages and disadvantages of deferred payments. Remarks/Examples

	Example: Compare paying on a college loan between a Stafford loan or a PLUS loan two years after graduation
MA.912.F.3.5:	Calculate deferred payments. Remarks/Examples
	Example: You want to buy a sofa that cost $899. Company A will let you pay $100 down and then pay the remaining amount over 3 years at 22% interest. Company B will not make you pay a down payment and they will defer payments for one year. However, you will accrue interest at a rate of 20 % interest during that first year. Starting the second year you will have to pay the new amount for 2 years at a rate of 26 % interest. Which deal is better and why? Calculate the total amount paid for both deals. Example: An electronics company advertises that you don't have to pay anything for 2 years. If you bought a big screen TV for $2999 on January 1st what would your balance be two years later if you haven't made any payments assuming an interest rate of 23.99%? What would your monthly payments be to pay the TV off in 2 years? What did the TV really cost you?
MA.912.F.3.9:	Calculate the total amount to be paid over the life of a fixed rate loan. Remarks/Examples
	Example: Calculate the total amount to be paid for a $275,000 loan at 5.75% interest over 30 years
MA.912.F.4.1:	Develop personal budgets that fit within various income brackets. Remarks/Examples
	Example: Develop a budget worksheet that includes typical expenses such as housing, transportation, utilities, food, medical expenses, and miscellaneous expenses. Add categories for savings toward your own financial goals, and determine the monthly income needed, before taxes, to meet the requirements of your budget.
MA.912.F.4.2:	Explain cash management strategies including debit accounts, checking accounts, and savings accounts. Remarks/Examples
	Example: Explain the difference between a checking account and a savings account. Why might you want to have both types of

	accounts? Why might you want to have only one or the other type? Why is it rare to find someone who has a savings account but no checking account?
MA.912.F.4.3:	Calculate net worth. Remarks/Examples Example: Jose is trying to prepare a balance sheet for the end of the year. His balances and details for the year are given in the table below. Write a balance sheet of Jose's liabilities and assets, and compute his net worth.
MA.912.F.4.4:	Establish a plan to pay off debt. Remarks/Examples Example: Suppose you currently have a balance of $4500 on a credit card that charges 18% annual interest. What monthly payment would you have to make in order to pay off the card in 3 years, assuming you do not make any more charges to the card?
MA.912.F.4.5:	Develop and apply a variety of strategies to use tax tables, and to determine, calculate, and complete yearly federal income tax. Remarks/Examples Example: Suppose that Joe had income of $40,000 in 2005, and had various deductions totaling $6,240. If Joe filed as a single person, how much income tax did he have to pay that year?
MA.912.F.4.6:	Compare different insurance options and fees.
MA.912.F.4.7:	Compare and contrast the role of insurance as a device to mitigate risk and calculate expenses of various options. Remarks/Examples Example: Explain why a person might choose to buy life insurance. Are there any circumstances under which one might not want life insurance?
MA.912.F.4.8:	Collect, organize, and interpret data to determine an effective retirement savings plan to meet personal financial goals. Remarks/Examples Example: Investigate historical rates of return for stocks, bonds,

	savings accounts, mutual funds, as well as the relative risks for each type of investment. Organize your results in a table showing the relative returns and risks of each type of investment over short and long terms, and use these data to determine a combination of investments suitable for building a retirement account sufficient to meet anticipated financial needs.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in

	order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically

	proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately.

	They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem,

	mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

RELATED GLOSSARY TERM DEFINITIONS (8)

Compound Interest:	A method of computing interest in which interest is computed from the up-to-date balance. That is, interest is earned on the interest and not just on original balance.
Difference:	A number that is the result of subtraction
Length:	A one-dimensional measure that is the measurable property of line segments.
Net:	A two-dimensional diagram that can be folded or made into a three-dimensional figure.
Rate:	A ratio that compares two quantities of different units.
Similarity:	A term describing figures that are the same shape but are not necessarily the same size or in the same position.
Table:	A data display that organizes information about a topic into categories using rows and columns.
Exponential Function:	A function of the form $y = ab^{cx+b} + e$, where a,b,c,d,e,x are real numbers, a, b, c are nonzero, b≠1, and b>0.

Course: Pre-Calculus Honors- 1202340

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3613.aspx

BASIC INFORMATION

Course Title:	Pre-Calculus Honors
Course Number:	1202340
Course Abbreviated Title:	PRE-CALC HON
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Calculus
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Type:	Core
Course Level:	3
Status:	Draft - Board Approval Pending
Honors?	Yes

STANDARDS (59)

LACC.1112.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LACC.1112.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or

	technical context relevant to grades 11–12 texts and topics.
LACC.1112.RST.3.7:	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LACC.1112.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
LACC.1112.SL.1.2:	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
LACC.1112.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
LACC.1112.SL.2.4:	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed,

	and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
LACC.1112.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.1112.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.1112.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MA.912.C.1.1:	Understand the concept of limit and estimate limits from graphs and tables of values. Remarks/Examples Example 1: For , estimate by calculating the function's values for x = 2.1, 2.01, 2.001 and for x = 1.9, 1.99, 1.999. Explain your answer.

	Example 2: A dog started to chase Kathy from 100 meters away. The dog runs fast so that every minute, the distance between Kathy and the dog is halved. Make a graph that shows the distance between Kathy and the dog in meters versus the time in minutes. Write a function to determine the distance between Kathy and the dog at any given time. Will the dog ever catch Kathy? Write a statement about the distance between Kathy and the dog as the time increases. Example 3: A skydiver free falls from an airplane. The following graph shows the velocity of the skydiver. The air resistance and the gravity are the two forces that affect the velocity of a falling object. Write a paragraph that explains the graph, including but not limited to how the velocity of the skydiver changes as the time increases. You might read about the concept of terminal velocity to make an accurate explanation of the graph.
MA.912.C.1.10:	Decide if a function is continuous at a point. Remarks/Examples
	Example: Determine if the function can be made continuous by defining the function with a specific value at x=2.
MA.912.C.1.11:	Find the types of discontinuities of a function. Remarks/Examples
	Example: Suppose h(x) = . Identify and categorize any discontinuities in h(x). Explain your answer.
MA.912.C.1.12:	Understand and use the Intermediate Value Theorem on a function over a closed interval. Remarks/Examples
	Example 1: Use the Intermediate Value Theorem to show that has a zero between x = 0 and x = 3.
MA.912.C.1.13:	Understand and apply the Extreme Value Theorem: If f(x) is continuous over a closed interval, then f has a maximum and a minimum on the interval. Remarks/Examples
	Example: Use the Extreme Value Theorem to decide whether f(x)=tan(x) has a minimum and maximum on

	the interval . What about on the interval ? Explain your reasoning.
MA.912.C.1.2:	Find limits by substitution. Remarks/Examples
	Example 1: Find Example 2: Find Example 3: Find
MA.912.C.1.3:	Find limits of sums, differences, products, and quotients. Remarks/Examples
	Example: Find
MA.912.C.1.4:	Find limits of rational functions that are undefined at a point. Remarks/Examples
	Example 1: Find Example 2: The magnitude of the force between two positive charges, q1 and q2 can be described by the following function: , where *k* is a constant, called Coulomb's constant, and *r* is the distance between the two charges. Find . Interpret the answer in the context of the force between the two charges.
MA.912.C.1.5:	Find one-sided limits. Remarks/Examples
	Example 1: Find Example 2: Find

MA.912.C.1.9:	Understand continuity in terms of limits. Remarks/Examples Example 1: Show that f(x)=3x + 1 is continuous at x = 2 by finding and comparing it with f(2). Example 2: Given that the lim g(x) as x approaches to 5 exists, is the statement "g(x) is continuous at x=5" necessarily true? Provide example functions to support your conclusion.
MACC.912.A-APR.3.4:	Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.
MACC.912.A-APR.3.5:	Know and apply the Binomial Theorem for the expansion of (x in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
MACC.912.A-APR.4.6:	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. Remarks/Examples **Algebra 2 - Fluency Recommendations** This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases.
MACC.912.A-APR.4.7:	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
MACC.912.F-BF.1.1:	Write a function that describes a relationship between two quantities.

	a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* c. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* Remarks/Examples
	Algebra 1, Unit 2: Limit to F.BF.1a, 1b, and 2 to linear and exponential functions. **Algebra 1, Unit 5**: Focus on situations that exhibit a quadratic relationship. **Algebra 1 Assessment Limits and Clarifications** i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, and exponential functions with domains in the integers. **Algebra 2 Assessment Limits and Clarifications** i) Tasks have a real-world context ii) Tasks may involve linear functions, quadratic functions, and exponential functions.
MACC.912.F-BF.2.4:	Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.* b. Verify by composition that one function is the inverse of another. c. Read values of an inverse function from a graph or a table,

	given that the function has an inverse. d. Produce an invertible function from a non-invertible function by restricting the domain. Remarks/Examples
	Algebra 1 Honors, Unit 4: For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x>0$. Algebra 2, Unit 3: For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x>0$.
MACC.912.F-TF.1.1:	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MACC.912.F-TF.1.2:	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
MACC.912.F-TF.1.3:	Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number.
MACC.912.F-TF.1.4:	Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
MACC.912.F-TF.2.5:	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
MACC.912.F-TF.2.6:	Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
MACC.912.F-TF.2.7:	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
MACC.912.F-TF.3.8:	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to calculate trigonometric ratios.
MACC.912.F-TF.3.9:	Prove the addition and subtraction formulas for sine, cosine, and

	tangent and use them to solve problems.
MACC.912.G-GPE.1.1:	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
MACC.912.G-GPE.1.2:	Derive the equation of a parabola given a focus and directrix.
MACC.912.G-GPE.1.3:	Derive the equations of ellipses and hyperbolas given the foci and directrices.
MACC.912.G-SRT.3.8:	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MACC.912.G-SRT.4.10:	Prove the Laws of Sines and Cosines and use them to solve problems.
MACC.912.G-SRT.4.11:	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
MACC.912.G-SRT.4.9:	Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
MACC.912.N-CN.1.3:	Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
MACC.912.N-CN.2.4:	Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
MACC.912.N-CN.2.5:	Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + \sqrt{3}\, i)^3 = 8$ because $(-1 + \sqrt{3}\, i)$ has modulus 2 and argument 120°.
MACC.912.N-CN.3.9:	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
MACC.912.N-VM.1.1:	Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., ***v***, |***v***|, ||**v**||, ***v***).
MACC.912.N-VM.1.2:	Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

MACC.912.N-VM.1.3:	Solve problems involving velocity and other quantities that can be represented by vectors.
MACC.912.N-VM.2.4:	Add and subtract vectors. a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. c. Understand vector subtraction **v** – **w** as **v** + (–**w**), where –**w** is the additive inverse of **w**, with the same magnitude as **w** and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
MACC.912.N-VM.2.5:	Multiply a vector by a scalar. a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c = . b. Compute the magnitude of a scalar multiple c**v** using ||c**v**|| = |c|v. Compute the direction of c**v** knowing that when |c|v ≠ 0, the direction of c**v** is either along **v** (for c > 0) or against **v** (for c < 0).
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they

	need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to

	compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make

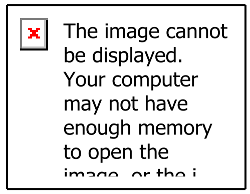
	sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the

	strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

RELATED GLOSSARY TERM DEFINITIONS (15)

Constant:	Any value that does not change.
Difference:	A number that is the result of subtraction
Estimate:	Is an educated guess for an unknown quantity or outcome based on known information. An estimate in computation may be found by rounding, by using front-end digits, by clustering, or by using

	compatible numbers to compute.
Extreme Value Theorem:	If a function f(x) is continuous on a closed interval [a, b], then f(x) has both a maximum and a minimum on [a, b]. If f(x) has a maximum or minimum value on an open interval (a, b), then the maximum or minimum value occurs at a critical point.
Intermediate Value Theorem:	If f is continuous on a closed interval [a, b], and c is any number between f(a) and f(b) inclusive, then there is at least one number x in the closed interval such that f(x)=c. The theorem states that the image of a connected set under a continuous function is connected.
Interval:	The set of all real numbers between two given numbers. The two numbers on the ends are the endpoints. If the endpoints, a and b are included, the interval is called closed and is denoted [a, b]. If the endpoints are not included, the interval is called open and denoted (a, b). If one endpoint is included but not the other, the interval is denoted [a, b) or (a, b] and is called a half-closed (or half-open interval).
Magnitude:	The amount of a quantity. Magnitude is never negative.
Point:	A specific location in space that has no discernable length or width.
Product:	The result of multiplying numbers together.
Quotient:	The result of dividing two numbers.
Sum:	The result of adding numbers or expressions together.
Table:	A data display that organizes information about a topic into categories using rows and columns.
Function:	A relation in which each value of *x* is paired with a unique value of *y*. More formally, a function from A to B is a relation *f* such that every *a* *A* is uniquely associated with an object *F*(*a*) *B*.
Limit:	A number to which the terms of a sequence get closer so that beyond a certain term all terms are as close as desired to that number. A function f(z) is said to have a limit if, for all e>0, there exists a d>0 such that whenever .
Velocity:	The time rate at which a body changes its position vector; quantity expressed by direction and magnitude in units of distance over time.


The image cannot be displayed. Your computer may not have enough memory to open the

	$f(x)=x^2$, $g(x)=\lvert x\rvert, h(x)=\frac{1}{x}$ and $k(x)=\sqrt{x}$
[MA.912.A.2.9 :](#)	Recognize, interpret, and graph functions defined piece-wise with and without technology. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: [Relations and Functions](#) Remarks/Examples
	Example: Sketch the graph of $f(x)=\begin{cases} x+2 & x\geq 0 \\ -x^2 & x<0 \end{cases}$

[MA.912.A.4 Polynomials](#)

[MA.912.A.4.10 :](#)	Use polynomial equations to solve real-world problems. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: [Polynomials](#) Remarks/Examples
	Example: You want to make an open-top box with a volume of 500 square inches from a piece of cardboard that is 25 inches by 15 inches by cutting squares from the corners and folding up the sides. Find the possible dimensions of the box.
[MA.912.A.4.5 :](#)	Graph polynomial functions with and without technology and describe end behavior. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: [Polynomials](#) Remarks/Examples
	End behavior may be interpreted as behavior of the function for very large positive or negative(absolutely) independent variables. Example 1: Graph the following equation: $y=x^3-3x^2-x+3$ Example 2: Describe the end behavior for the graph of the following equation

	$y = -13x^4 + 7x^3 - \frac{2}{3}x^2 + 6x - 9$
MA.912.A.4.6 :	Use theorems of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, the Rational Root Theorem, Descartes' Rule of Signs, and the Conjugate Root Theorem) to find the zeros of a polynomial function. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Polynomials Remarks/Examples
	Example 1: Given that 4 is a zero of the polynomial $x^3 - 5x^2 - 10x + 56$, use synthetic divison to find the remaining zeros of the polynomial. Example 2: Use the Remainder Theorem to evaluate $f(x) = 6x^3 - 5x^2 + 4x - 17$ at x=3. Explain your solution method. Example 3: Use the Rational Root Theorem to determine the possible rational roots of the equation $5x^4 + 2x^3 - 7x^2 + 3x + 2 = 1$. Example 4: Use Descartes' Rule of Signs to determine the possible number of positive real zeros and negative real zeros of the following polynomial function: $f(x) = 5x^3 + 3x^2 + x - 3$
MA.912.A.4.7 :	Write a polynomial equation for a given set of real and/or complex roots. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Polynomials Remarks/Examples
	Example: Find a polynomial equation with the lowest degree possible and with real coefficients that involves the following three roots: • 2+i

	• 3 with a multiplicity of 2
MA.912.A.4.8 :	Describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression with and without technology. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Polynomials Remarks/Examples Example: Use technology to find the solutions of the following equation: $x^3-3x^2-10x+24=0$. Relate your results to the graph of the function $f(x)=x^3-3x^2-10x+24$
MA.912.A.4.9 :	Use graphing technology to find approximate solutions for polynomial equations. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Polynomials Remarks/Examples Example: Approximate the solution(s) of $x^4-3x^3+2x-7=0$ to the nearest thousandth.

MA.912.A.5 Rational Expressions and Equations

MA.912.A.5.6 :	Identify removable and non-removable discontinuities, and vertical, horizontal, and oblique asymptotes of a graph of a rational function, find the zeros, and graph the function. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Rational Expressions and Equations Remarks/Examples Example: Identify vertical, horizontal, and oblique asymptotes, find the zeros, and graph the following rational functions: $f(x)=\frac{2x+3}{5x-1}$ $g(x)=\frac{x^2-1}{x+1}$ $h(x)=\frac{x}{x^2-4}$

MA.912.A.5.7 :	Solve real-world problems involving rational equations (mixture, distance, work, interest, and ratio). Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Rational Expressions and Equations Remarks/Examples
	Example: It takes Bob 3 hours to paint one side of a house. It takes Joe 2 hours to paint the same side of the house. How long will it take them if they work together?

MA.912.A.8 Logarithmic and Exponential Functions

MA.912.A.8.3 :	Graph exponential and logarithmic functions. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Logarithmic and Exponential Functions Remarks/Examples
	Example 1: Draw the graphs of the functions $f(x)=2^x$ and $g(x)=2^{-x}$. Explain their differences and similarities. Example 2: Draw the graphs of the functions $f(x)=\log_2 x$ and $g(x)=2^x$ and describe their relationship.
MA.912.A.8.7 :	Solve applications of exponential growth and decay. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Logarithmic and Exponential Functions Remarks/Examples
	Example: The population of a certain country can be modeled by the equation $P(t)=50e^{0.02t}$, where P(t) is the population in millions and t is the number of years after 1900. Find when the population is 100 million, 200 million, and 400 million. What do you notice about these time periods?

MA.912.T.1 Trigonometric Functions

MA.912.T.1.1 :	Convert between degree and radian measures.

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: Trigonometric Functions Remarks/Examples Example: Convert $90^\circ, 45^\circ, 30^\circ$ to radians.
MA.912.T.1.4 :	Find approximate values of trigonometric and inverse trigonometric functions using appropriate technology. Cognitive Complexity: Level 1: Recall I Date Adopted or Revised: 09/07 Belongs to: Trigonometric Functions Remarks/Examples Example: Find the approximate values for $\tan^{-1}(1.73)$ and $\sin(55^\circ)$
MA.912.T.1.6 :	Define and graph trigonometric functions using domain, range, intercepts, period, amplitude, phase shift, vertical shift, and asymptotes with and without the use of graphing technology. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning I Date Adopted or Revised: 09/07 Belongs to: Trigonometric Functions Remarks/Examples Example: Graph y=sin x and y=cos x and compare their graphs. Example: Find the asymptotes of y=tan xand find its domain. Example: Draw the graph of $y=5+\sin\left(2x-\frac{\pi}{3}\right)$
MA.912.T.1.7 :	Define and graph inverse trigonometric relations and functions. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: Trigonometric Functions Remarks/Examples Example: Graph $f(x)=\sin^{-1}x$
MA.912.T.1.8 :	Solve real-world problems involving applications of trigonometric functions using graphing technology when appropriate. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning I Date

	Adopted or Revised: 09/07 Belongs to: Trigonometric Functions Remarks/Examples
	Example: The number of hours of daylight varies through the year in any location. A graph of the number of hours of daylight throughout the year is in the form of a sine wave. In a certain location the longest day of 14 hours is on Day 175 and the shortest day of 10 hours is on Day 355. Sketch a graph of this function and find its equation. Which other day has the same length as July 4 (Day 186)?

MA.912.T.2 Trigonometry in Triangles

MA.912.T.2.1 :	Define and use the trigonometric ratios (sine, cosine, tangent, cotangent, secant, cosecant) in terms of angles of right triangles. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Trigonometry in Triangles Remarks/Examples
	Example: In triangle ABC, tan A = 1/5. Find sin A and cot A. Example: Show that the slope of a line at 135º to the x-axis is the same as the tangent of 135º.

RELATED GLOSSARY TERM DEFINITIONS (50)

Absolute value:	A number's distance form zero on a number line. Distance is expressed as a positive value.
Angle:	Two rays or two line segments extending from a common end point called a vertex. Angles are measured in degrees, in radians, or in gradians.
Approximate:	A number or measurement that is close to or near its exact value.
Asymptote:	A straight line associated with a curve such that as a point moves

	along an infinite branch of the curve the distance from the point to the line approaches zero and the slope of the curve at the point approaches the slope of the line.
Axes:	The horizontal and vertical number lines used in a coordinate plane system.
Coefficient:	The number that multiplies the variable(s) in an algebraic expression (e.g., 4xy). If no number is specified, the coefficient is 1.
Conjugate root theorem:	If P is a polynomial in one variable with real coefficients, and a + bi is a zero of P with a and b real numbers, then its complex conjugate a - bi is also a zero of P.
Cosine:	Cosine function is written as cos?. Cos(q) is the x-coordinate of the point on the unit circle so that the ray connecting the point with the origin makes an angle of q with the positive x-axis. When q is an angle of a right triangle, then cos(q) is the ratio of the adjacent side with the hypotenuse.
Descartes' Rule of Signs:	Is a technique for determining the number of positive or negative roots of a polynomial. The rule states that if the terms of a single-variable polynomial with real coefficients are ordered by descending variable exponent, then the number of positive roots of the polynomial is either equal to the number of sign differences between consecutive nonzero coefficients, or less than it by a multiple of 2.
Difference:	A number that is the result of subtraction
Dimension:	The number of coordinates used to express a position.
Domain:	The set of values of the independent variable(s) for which a function or relation is defined.
End behavior:	A function’s value for extreme values of its independent variable.
Equation:	A mathematical sentence stating that the two expressions have the same value. Also read the definition of equality.
Expression:	A mathematical phrase that contains variables, functions, numbers, and/or operations. An expression does not contain equal or inequality signs.
Factor:	A number or expression that is multiplied by one or more other numbers or expressions to yield a product.
Independent variable:	The factor that is changed in an experiment in order to study changes in the dependent variable.

Intercept:	The points where a curve or line drawn on a rectangular-coordinate-system graph intersect the vertical and horizontal axes.
Length:	A one-dimensional measure that is the measurable property of line segments.
Line:	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Oblique:	Tilted at an angle; neither vertical nor horizontal.
Plot:	To locate a point by means of coordinates, or a curve by plotted points, or to represent an equation by means of a curve so constructed.
Rate:	A ratio that compares two quantities of different units.
Relation:	A relation from A to B is any subset of the cross product (Cartesian product) of A and B.
Remainder Theorem:	If a polynomial P(x) is divided by (x-r), then the remainder is a constant given by P(r).
Right triangle:	A triangle having an interior right angle.
Root:	A root of a polynomial is a number x such that P(x)=0. A polynomial of degree n has n complex roots.
Secant:	A line, ray, or segment that intersects a circle at two points (i.e. that contains a chord). A secant to a sphere is a line, ray, or segment that intersects a sphere at two points.
Set:	A set is a finite or infinite collection of distinct objects in which order has no significance.
Side:	The edge of a polygon (e.g., a triangle has three sides), the face of a polyhedron, or one of the rays that make up an angle.
Similarity:	A term describing figures that are the same shape but are not necessarily the same size or in the same position.
Square:	A rectangle with four congruent sides; also, a rhombus with four right angles.
Theorem:	A statement or conjecture that can be proven to be true based on postulates, definitions, or other proven theorems. The process of showing a theorem to be correct is called a proof.
Transformation:	An operation on a figure by which another image is created. Common transformations include reflections (flips), translations

	(slides), rotations (turns) and dilations.
Triangle:	A polygon with three sides.
Unit:	A determinate quantity (as of length, time, heat, or value) adopted as a standard of measurement.
Degree:	The unit of measure for angles (°), equal to $^1/_{360}$ of a complete revolution. There are 360 degrees in a circle.
Function:	A relation in which each value of *x* is paired with a unique value of *y*. More formally, a function from A to B is a relation *f* such that every $a \in A$ is uniquely associated with an object $F(a) \in B$.
Fundamental Theorem of Algebra:	Every polynomial equation with degree greater than zero has at least one root in the set of complex numbers. Corollary: Every polynomial P(x) of degree n (n > 0) can be written as the product of a constant k (k ≠ 0) and n linear factors $P(x) = k (x – r_1) (x – r_2) (x – r_3)…(x – r_n)$ Thus a polynomial equation of degree n has exactly n complex roots, namely $r_1, r_2, r_3,…, r_n$.
Polynomial:	The sum or difference of terms which have variables raised to positive integer powers and which have coefficients that may be real or complex. Examples: $5x^3 – 2x^2 + x – 13$, $x^2y^3 + xy$, and $(1 + i)a^2 + ib^2$. Standard form for a polynomial in one variable: $a_nx^n + a_{n–1}x^{n–1} + ... + a^2x^2 + a_1x + a_0$ Even though the prefix poly- means many, the word polynomial refers to polynomials with 1 term (monomials), 2 terms (binomials), 3 terms, (trinomials), etc.
Polynomial Function:	A function that can be written as $f(x) = a_nx^n + a_{n-1}x^{n-1} + ... + a_1x^1 + a_0$, where might be real or complex.
Radian:	A unit for measuring angles. 180° = p radians, and 360° = 2p radians. The number of radians in an angle equals the number of radii it takes to measure a circular arc described by that angle.
Radical:	The symbol $\sqrt[n]{x}$ used to indicate a root. The expression $\sqrt[n]{x}$ is therefore read “x radical n” or "the nth root of x." A radical without an index number is understood to be a square root.
Ratio:	The comparison of two quantities, the ratio of a and b is a:b or a to b or a/b, where b ≠ 0.
Rational Function:	A function that can be written as R(x) = P(x) / Q(x) where P(x) and Q(x) are polynomials and Q(x) ≠ 0.

Course: Calculus- 1202300

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse3669.aspx

BASIC INFORMATION

Course Title:	Calculus
Course Number:	1202300
Course Abbreviated Title:	CALCULUS
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Calculus
Number of Credits:	One credit (1)
Course length:	Year (Y)
Course Type:	Core
Course Level:	3
Status:	Draft - Board Approval Pending
Honors?	Yes

STANDARDS (55)

LACC.1112.RST.1 Key Ideas and Details

LACC.1112.RST.1.3 :	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date

	Adopted or Revised: 12/10 Belongs to: Key Ideas and Details

LACC.1112.RST.2 Craft and Structure

LACC.1112.RST.2.4 :	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Craft and Structure

LACC.1112.RST.3 Integration of Knowledge and Ideas

LACC.1112.RST.3.7 :	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Integration of Knowledge and Ideas

LACC.1112.SL.1 Comprehension and Collaboration

LACC.1112.SL.1.1 :	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an

	issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration
LACC.1112.SL.1.2 :	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration
LACC.1112.SL.1.3 :	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Comprehension and Collaboration

LACC.1112.SL.2 Presentation of Knowledge and Ideas

LACC.1112.SL.2.4 :	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Presentation of Knowledge and Ideas

LACC.1112.WHST.1 Text Types and Purposes

LACC.1112.WHST.1.1 :	Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims,

	reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented. Cognitive Complexity: Level 4: Extended Thinking &Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Text Types and Purposes

LACC.1112.WHST.2 Production and Distribution of Writing

LACC.1112.WHST.2.4 :	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Production and Distribution of Writing

LACC.1112.WHST.3 Research to Build and Present Knowledge

LACC.1112.WHST.3.9 :	Draw evidence from informational texts to support analysis, reflection, and research. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Research to Build and Present Knowledge

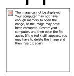
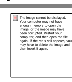
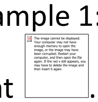
MA.912.C.1 Limits and Continuity

MA.912.C.1.6 :	Find limits at infinity. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date

	Adopted or Revised: 09/07 Belongs to: Limits and Continuity Remarks/Examples
	Example 1: Find Example 2: Find Example 3: Find
MA.912.C.1.7 :	Decide when a limit is infinite and use limits involving infinity to describe asymptotic behavior. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Limits and Continuity Remarks/Examples
	Example 1: Find Example 2: Where does the following function have asymptote(s)? Explain your answer.
MA.912.C.1.8 :	Find special limits such as Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Limits and Continuity Remarks/Examples
	Example: Use a diagram to show that is equal to 1.

MA.912.C.2 Differential Calculus

MA.912.C.2.1 :	Understand the concept of derivative geometrically, numerically, and analytically, and interpret the derivative as an instantaneous rate of change or as the slope of the tangent line. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date

	Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example: Approximate the derivative of at x=5 by calculating values of  for values of h that are very close to zero. Use a diagram to explain what you are doing and what the result means.
MA.912.C.2.10 :	Understand and use the relationship between differentiability and continuity. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example 1: Let f(x)=1/x. Is f(x) continuous at x = 0? Is f(x) differentiable at x = 0? Explain your answers. Example 2: Is f(x) = IxI continuous at x=0? Is f(x) differentiable at x=0? Explain your answers.
MA.912.C.2.11 :	Understand and apply the Mean Value Theorem. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example 1: Let . On the interval [1, 9], find the value of c such that . Example 2: At a car race, two cars join the race at the same point at the same time. They finish the race in a tie. Prove that some time during the race, the two cars had exactly the same speed. (Hint: Define f(t), g(t), and h(t), where f(t) is the distance that car 1 has traveled at time t, g(t) is the distance that car 2 has travelled at time t, and h(t) = f(t) - g(t).)
MA.912.C.2.2 :	State, understand, and apply the definition of derivative. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples

	Example 1 (related to the example given in C.2.1):Find . What does the result tell you? Use the limit given above to determine the derivative function for f(x). In other words calculate f ’(x) = for . Example 2: For the function g(x), shown on the graph, draw the graph of g’(x) by estimation. Explain how you arrived at your solution. Example 3: The graph of the function f(x) is given below. Find a function g(x) such that the derivative of g(x) will be f(x). Explain your solution.
MA.912.C.2.3 :	Find the derivatives of functions, including algebraic, trigonometric, logarithmic, and exponential functions. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example 1: Find for the function . Example 2: Find for the function y = ln(x).
MA.912.C.2.4 :	Find the derivatives of sums, products, and quotients. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example 1: Find the derivative of the function f(x)= xcos(x). Example 2: Using the quotient rule for derivatives, show that the derivative of f(x) = tan(x) is f '(x) = .
MA.912.C.2.5 :	Find the derivatives of composite functions using the Chain Rule. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples

	Example 1: Find for . Example 2: Find for .
MA.912.C.2.6 :	Find the derivatives of implicitly-defined functions. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example: For the equation , find at the point (2, 3).
MA.912.C.2.7 :	Find derivatives of inverse functions. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example: Let and find .
MA.912.C.2.8 :	Find second derivatives and derivatives of higher order. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example: Let . Find and $f'''(x)$.
MA.912.C.2.9 :	Find derivatives using logarithmic differentiation. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Differential Calculus Remarks/Examples Example 1: Find for the following equation: . Example 2: Find the derivative of .

MA.912.C.3 Applications of Derivatives

MA.912.C.3.1 :	Find the slope of a curve at a point, including points at which there are vertical tangent lines and no tangent lines. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example 1: Find the slope of the line tangent to the graph of the equation at the point (2, 8). Example 2: Find the slope of the line tangent to the graph of the function at x=1. Explain your answer. Example 3: Find the slope of the line tangent to the graph of the function at x=2. Explain your answer.
MA.912.C.3.10 :	Find the velocity and acceleration of a particle moving in a straight line. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example: A bead on a wire moves so that, after t seconds, its distance s cm from the midpoint of the wire is given by . Find its maximum velocity and where along the wire this occurs.
MA.912.C.3.11 :	Model rates of change, including related rates problems. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example: One boat is heading due south at 10 mph. Another boat is heading due west at 15 mph. Both boats are heading toward the same point. If the boats maintain their speeds and directions, they will meet in two hours. Find the rate (in miles per hour) that the distance between them is decreasing exactly one hour before they meet.
MA.912.C.3.2 :	Find an equation for the tangent line to a curve at a point and a

	local linear approximation. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example 1: Find an equation of the line tangent to the graph of the equation at the point (2, 8). Example 2: Use a local linear approximation to estimate the derivative of at x=2.
MA.912.C.3.3 :	Decide where functions are decreasing and increasing. Understand the relationship between the increasing and decreasing behavior of *f* and the sign of *f'*. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example 1: For what values of x, is the function decreasing? Example 2: The weight of a new infant baby during the first two months can be modeled by the following function: , w represents weight in pounds, and t represents time in months. When is the infant gaining weight or losing weight during the first two months? Explain your answer.
MA.912.C.3.4 :	Find local and absolute maximum and minimum points. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example 1: For the graph of the function , find the local maximum and local minimum points of f(x) on [-2, 3].
MA.912.C.3.5 :	Find points of inflection of functions. Understand the relationship

	between the concavity of f and the sign of f". Understand points of inflection as places where concavity changes. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples Example: For the graph of the function , find the points of inflection of f(x) and determine where f(x) is concave upward and concave downward.
MA.912.C.3.6 :	Use first and second derivatives to help sketch graphs. Compare the corresponding characteristics of the graphs of f, f', and f". Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples Example: Use information from the first and second derivatives to sketch the graph of .
MA.912.C.3.7 :	Use implicit differentiation to find the derivative of an inverse function. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples Example: Let and Find g'(x) using implicit differentiation.
MA.912.C.3.8 :	Solve optimization problems. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples Example 1: You want to enclose a rectangular field with an area of . Find the shortest length of fencing you can use. Example 2: The sum of the perimeters of an equilateral triangle and a square is

	20. Find the dimensions of each that will produce the least area.
MA.912.C.3.9 :	Find average and instantaneous rates of change. Understand the instantaneous rate of change as the limit of the average rate of change. Interpret a derivative as a rate of change in applications, including velocity, speed, and acceleration. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Derivatives Remarks/Examples
	Example: The vertical distance traveled by an object within the earth's gravitational field (and neglecting air resistance) is given by the equation , where g is the force on the object due to earth's gravity, V_0 is the initial velocity, X_0 is the initial height above the ground, t is the time in seconds, and down is the negative vertical direction. Determine the instantaneous speed and the average speed for an object, initially at rest, 3 seconds after it is dropped from a 100m tall cliff. What about 5 seconds after?. Use .

MA.912.C.4 Integral Calculus

MA.912.C.4.1 :	Use rectangle approximations to find approximate values of integrals. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Integral Calculus Remarks/Examples
	Example: Find an approximate value for using 6 rectangles of equal width under the graph of between x=0 and x=3. How did you form your rectangles? Compute this approximation three times using at least three different methods to form the rectangles.
MA.912.C.4.2 :	Calculate the values of Riemann Sums over equal subdivisions using left, right, and midpoint evaluation points. Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07 Belongs to: Integral Calculus Remarks/Examples
	Example 1: Find the value of the Riemann Sum over the interval [0,

	1] using 6 subintervals of equal width for evaluated at the midpoint of each subinterval. Example 2: Estimate using a Riemann midpoint sum with 4 subintervals.
[MA.912.C.4.3 :]	Interpret a definite integral as a limit of Riemann sums. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: [Integral Calculus] Remarks/Examples
	Example: Find the values of the Riemann sums over the interval [0, 1] using 12 and 24 subintervals of equal width for evaluated at the midpoint of each subinterval. Write an expression for the Riemann sums using n intervals of equal width. Find the limit of this Riemann Sums as n goes to infinity.
[MA.912.C.4.4 :]	Interpret a definite integral of the rate of change of a quantity over an interval as the change of the quantity over the interval. That is, $f'(x)dx = f(b) - f(a)$ (Fundamental Theorem of Calculus). Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 09/07 Belongs to: [Integral Calculus] Remarks/Examples
	Example: Explain why .
[MA.912.C.4.5 :]	Use the Fundamental Theorem of Calculus to evaluate definite and indefinite integrals and to represent particular antiderivatives. Perform analytical and graphical analysis of functions so defined. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: [Integral Calculus] Remarks/Examples
	Example 1: Using antiderivatives, find

Example 2: Evaluate

Example 3: Find

[MA.912.C.4.6 :]

Use these properties of definite integrals:

- [f(x) + g(x)]dx = f(x)dx + g(x)dx
- k • f(x)dx = k f(x)dx
- f(x)dx = 0
- f(x)dx = - f(x)dx
- f(x)dx + f(x)dx = f(x)dx
- If f(x) ≤ g(x) on [a, b], then f(x)dx ≤ g(x)dx

Cognitive Complexity: Level 1: Recall l Date Adopted or Revised: 09/07
Belongs to: [Integral Calculus]

Remarks/Examples

Example 1: Given and , find , , and .

Example 2: Evaluate

[MA.912.C.4.7 :]

Use integration by substitution (or change of variable) to find values of integrals.

Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07
Belongs to: [Integral Calculus]

Remarks/Examples

Example: Find

MA.912.C.4.8 :	Use Riemann Sums, the Trapezoidal Rule, and technology to approximate definite integrals of functions represented algebraically, geometrically, and by tables of values. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Integral Calculus Remarks/Examples
	Example 1: Use the Trapezoidal Rule with 6 subintervals over [0, 3] for to approximate the value of . Example 2: Find an approximation to

MA.912.C.5 Applications of Integration

MA.912.C.5.1 :	Find specific antiderivatives using initial conditions, including finding velocity functions from acceleration functions, finding position functions from velocity functions, and solving applications related to motion along a line. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 09/07 Belongs to: Applications of Integration Remarks/Examples
	Example 1: A bead on a wire moves so that its velocity (in cm/s), after t seconds, is given by v(t) = 3 cos 3t. Given that it starts 2 cm to the left of the midpoint of the wire, find its position after 5 seconds. Example 2: Carla recorded their car's speed during their trip from school to home. She plotted the data and obtained the following graph. What might the graph for distance versus time look like for their trip to home? Label the axes of your graph and explain why you think it might be a correct representation of the distance versus time for their trip.
MA.912.C.5.5 :	Use definite integrals to find the area between a curve and the x-axis or between two curves.

	Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: [Applications of Integration] Remarks/Examples Example: Find the area bounded by , y= 0, and x = 2.
[MA.912.C.5.7 :]	Use definite integrals to find the volume of a solid with known cross-sectional area, including solids of revolution. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning I Date Adopted or Revised: 09/07 Belongs to: [Applications of Integration] Remarks/Examples Example 1: A cone with its vertex at the origin lies symmetrically along the x-axis. The base of the cone is at x = 5 and the base radius is 7. Use integration to find the volume of the cone. Example 2: What is the volume of the solid created when the area between the curves $f(x) = x$ and $g(x) = x^2$ for $0 \leq x \leq 1$ is revolved around the y-axis?
[MA.912.C.5.8 :]	Apply integration to model, and solve problems in physical, biological, and social sciences. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts I Date Adopted or Revised: 09/07 Belongs to: [Applications of Integration] Remarks/Examples Example: During an acceleration trial, a test vehicle traveling in a straight line has a velocity given by the equation v(t)=sin t , where t is in seconds and velocity is in feet per second. Find the total distance traveled by the test car during the time interval from 0 seconds to 1.5 seconds.

MACC.K12.MP.1 Make sense of problems and persevere in solving them.

[MACC.K12.MP.1.1 :]	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping

	into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Make sense of problems and persevere in solving them.

MACC.K12.MP.2 Reason abstractly and quantitatively.

MACC.K12.MP.2.1 :	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

	Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Reason abstractly and quantitatively.

MACC.K12.MP.3 Construct viable arguments and critique the reasoning of others.

MACC.K12.MP.3.1 :	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Construct viable arguments and critique the reasoning of others.

MACC.K12.MP.4 Model with mathematics.

MACC.K12.MP.4.1 :	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing

	an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Model with mathematics.

MACC.K12.MP.5 Use appropriate tools strategically.

MACC.K12.MP.5.1 :	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able

	to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Use appropriate tools strategically.

MACC.K12.MP.6 Attend to precision.

MACC.K12.MP.6.1 :	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Attend to precision.

MACC.K12.MP.7 Look for and make use of structure.

MACC.K12.MP.7.1 :	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$,

	older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. Cognitive Complexity: Level 2: Basic Application of Skills & Concepts l Date Adopted or Revised: 12/10 Belongs to: Look for and make use of structure.

MACC.K12.MP.8 Look for and express regularity in repeated reasoning.

MACC.K12.MP.8.1 :	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. Cognitive Complexity: Level 3: Strategic Thinking & Complex Reasoning l Date Adopted or Revised: 12/10 Belongs to: Look for and express regularity in repeated reasoning.

RELATED GLOSSARY TERM DEFINITIONS (58)

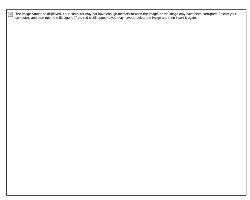
Approximate:	A number or measurement that is close to or near its exact value.
Area:	The number of square units needed to cover a surface.
Asymptote:	A straight line associated with a curve such that as a point moves along an infinite branch of the curve the distance from the point to the line approaches zero and the slope of the curve at the point approaches the slope of the line.
Axes:	The horizontal and vertical number lines used in a coordinate plane system.
Concave:	Defines a shape that curves inward; opposite of convex.
Cone:	A pyramid with a circular base.
Dimension:	The number of coordinates used to express a position.
Equal:	Having the same value (=).
Equation:	A mathematical sentence stating that the two expressions have the same value. Also read the definition of equality.
Equilateral triangle:	A triangle with three congruent sides.
Estimate:	Is an educated guess for an unknown quantity or outcome based on known information. An estimate in computation may be found by rounding, by using front-end digits, by clustering, or by using compatible numbers to compute.
Estimation:	The use of rounding and/or other strategies to determine a reasonably accurate approximation, without calculating an exact answer.
Expression:	A mathematical phrase that contains variables, functions, numbers, and/or operations. An expression does not contain equal or inequality signs.
Height:	A line segment extending from the vertex or apex of a figure to its base and forming a right angle with the base or plane that contains the base.
Implicit	Is the procedure of differentiating an implicitly defined function with

Differentiation:	respect to the desired variable x while treating the other variables as unspecified functions of x.
Infinite:	Has no end or goes on forever, not finite. A set is infinite if it can be placed in one-to-one correspondence with a proper subset of itself.
Instantaneous Rate of Change:	The rate of change at a particular moment. For a function, the instantaneous rate of change at a point is the same as the slope of the tangent line at that point.
Integral:	Integer valued.
Interval:	The set of all real numbers between two given numbers. The two numbers on the ends are the endpoints. If the endpoints, a and b are included, the interval is called closed and is denoted [a, b]. If the endpoints are not included, the interval is called open and denoted (a, b). If one endpoint is included but not the other, the interval is denoted [a, b) or (a, b] and is called a half-closed (or half-open interval).
Length:	A one-dimensional measure that is the measurable property of line segments.
Line:	A collection of an infinite number of points in a straight pathway with unlimited length and having no width.
Local Maximum:	The highest point in a particular section of a graph.
Local Minimum:	The lowest point in a particular section of a graph.
Logarithmic Differentiation:	The taking of the logarithm of both sides of an equation before differentiating.
Mean:	There are several statistical quantities called means, e.g., harmonic mean, arithmetic mean, and geometric mean. However, “mean” commonly refers to the arithmetic mean that is also called arithmetic average. Arithmetic mean is a mathematical representation of the typical value of a series of numbers, computed as the sum of all the numbers in the series divided by the count of all numbers in the series. Arithmetic mean is the balance point if the numbers are considered as weights on a beam.
Model:	To represent a mathematical situation with manipulatives (objects), pictures, numbers or symbols.
Origin:	The point of intersection of the x- and y-axes in a rectangular coordinate system, where the x-coordinate and y-coordinate are both zero. On a number line, the origin is the 0 point. In three

	dimensions, the origin is the point (0, 0, 0).
Perimeter:	The distance around a two dimensional figure.
Point:	A specific location in space that has no discernable length or width.
Points of Inflection:	See Inflection points.
Product:	The result of multiplying numbers together.
Quotient:	The result of dividing two numbers.
Radius:	A line segment extending from the center of a circle or sphere to a point on the circle or sphere. Plural radii.
Rate:	A ratio that compares two quantities of different units.
Rate of change:	The ratio of change in one quantity to the corresponding change in another quantity.
Rectangle:	A parallelogram with four right angles.
Representations:	Physical objects, drawings, charts, words, graphs, and symbols that help students communicate their thinking.
Rule:	A general statement written in numbers, symbols, or words that describes how to determine any term in a pattern or relationship. Rules or generalizations may include both recursive and explicit notation. In the recursive form of pattern generalization, the rule focuses on the rate of change from one element to the next. Example: Next = Now + 2; Next = Now x 4. In the explicit form of pattern generalization, the formula or rule is related to the order of the terms in the sequence and focuses on the relationship between the independent variable and the dependent variable. For example: $y=5t - 3$ Words may also be used to write a rule in recursive or explicit notation. Example: to find the total fee, multiply the total time with 3; take the previous number and add two to get the next number.
Square:	A rectangle with four congruent sides; also, a rhombus with four right angles.
Sum:	The result of adding numbers or expressions together.
Table:	A data display that organizes information about a topic into categories using rows and columns.
Variable:	Any symbol, usually a letter, which could represent a number. A variable might vary as in $f(x)=2x+1$, or a variable might be fixed as in

	2x+1=5.
Chain Rule:	A method for finding the derivative of a composition of functions. The formula is
Derivative:	The limit of the ratio of the change in a function to the corresponding change in its independent variable as the latter change approaches zero. Derivative of f(x) at x=a is
Exponential Function:	A function of the form $y = ab^{cx+b} + e$, where a,b,c,d,e,x are real numbers, a, b, c are nonzero, b≠1, and b>0.
Function:	A relation in which each value of *x* is paired with a unique value of *y*. More formally, a function from A to B is a relation *f* such that every *a* *A* is uniquely associated with an object *F*(*a*) *B*.
Fundamental Theorem of Calculus:	If *f* is continuous on the closed interval [a, b] and F is the antiderivative (indefinite integral) of *f* on [a, b], then
Indefinite Integral:	The set of all antiderivatives of a function, denoted by
Limit:	A number to which the terms of a sequence get closer so that beyond a certain term all terms are as close as desired to that number. A function f(z) is said to have a limit if, for all e>0, there exists a d>0 such that whenever .
Mean Value Theorem:	Let f(x) be differentiable on the open interval (a, b) and continuous on the closed interval [a, b]. Then there is at least one point c in (a, b) such that . The theorem states that the tangent line to the function f(x) at x=c is parallel to the line passing through (a, f(a)) and (b, f(b)).
Slope:	The ratio of change in the vertical axis (y-axis) to each unit change in the horizontal axis (x-axis) in the form rise/run or ?y/?x. Also the constant, *m*, in the linear equation for the slope-intercept form *y =mx + b*, where
Velocity:	The time rate at which a body changes its position vector; quantity

	expressed by direction and magnitude in units of distance over time.
Vertex:	The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron.
Volume:	A measure of the amount of space an object takes up; also the loudness of a sound or signal.
Weight:	The force with which a body is attracted to Earth or another celestial body, equal to the product of the mass of the object and the acceleration of gravity.
Width:	The shorter length of a two-dimensional figure. The width of a box is the horizontal distance from side to side (usually defined to be greater than the depth, the horizontal distance from front to back).
x-axis:	The horizontal number line on a rectangular coordinate system.
y-axis:	The vertical number line on a rectangular coordinate system



Rational Root Theorem:	If the coefficients of the polynomial $d_n x^n + d_{n-1} x^{n-1} + \ldots + d_0$ are specified to be integers, then rational roots must have a numerator which is a factor of d_0 and a denominator which is a factor of (with either sign possible).
sine:	Sine function is written as sin θ. Sin(q) is the y-coordinate of the point on the unit circle so that the ray connecting the point with the origin makes an angle of q with the positive x-axis. When q is an angle of a right triangle, then sin(q) is the ratio of the opposite side to the hypotenuse.
Slope:	The ratio of change in the vertical axis (y-axis) to each unit change in the horizontal axis (x-axis) in the form rise/run or ?y/?x. Also the constant, *m*, in the linear equation for the slope-intercept form *y =mx + b*, where $m = \frac{y_1 - y_2}{x_1 - x_2}$
Volume:	A measure of the amount of space an object takes up; also the loudness of a sound or signal.
x-axis:	The horizontal number line on a rectangular coordinate system.

	can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Course: Analysis of Functions Honors- 1201315

Direct link to this page:http://www.cpalms.org/Courses/CoursePagePublicPreviewCourse5188.aspx

BASIC INFORMATION

Course Title:	Analysis of Functions Honors
Course Number:	1201315
Course Abbreviated Title:	ANALYSIS OF FUNC HON
Course Path:	**Section:** Grades PreK to 12 Education Courses **Grade Group:** Grades 9 to 12 and Adult Education Courses **Subject:** Mathematics **SubSubject:** Mathematical Analysis
Number of Credits:	Half credit (.5)
Course length:	Semester (S)
Course Type:	Core
Course Level:	3
Status:	Draft - Board Approval Pending
Honors?	Yes

STANDARDS (34)

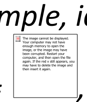
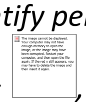
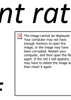
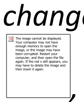
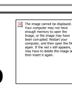
LACC.1112.RST.1.3:	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LACC.1112.RST.2.4:	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LACC.1112.RST.3.7:	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LACC.1112.SL.1.1:	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
LACC.1112.SL.1.2:	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
LACC.1112.SL.1.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
LACC.1112.SL.2.4:	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and

	informal tasks.
LACC.1112.WHST.1.1:	Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LACC.1112.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LACC.1112.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
MACC.912.A-APR.2.2:	Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
MACC.912.A-APR.4.6:	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

	Remarks/Examples **Algebra 2 - Fluency Recommendations** This standard sets an expectation that students will divide polynomials with remainder by inspection in simple cases.
MACC.912.A-APR.4.7:	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
MACC.912.F-BF.1.1:	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* c. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* Remarks/Examples **Algebra 1, Unit 2**: Limit to F.BF.1a, 1b, and 2 to linear and exponential functions. **Algebra 1, Unit 5**: Focus on situations that exhibit a quadratic relationship. **Algebra 1 Assessment Limits and Clarifications** i) Tasks have a real-world context. ii) Tasks are limited to linear functions, quadratic functions, and exponential functions with domains in the integers. **Algebra 2 Assessment Limits and Clarifications**

	i) Tasks have a real-world context ii) Tasks may involve linear functions, quadratic functions, and exponential functions.
MACC.912.F-BF.2.4:	Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) = 2x^3$ *or* $f(x) = (x+1)/(x–1)$ *for* $x \neq 1$. b. Verify by composition that one function is the inverse of another. c. Read values of an inverse function from a graph or a table, given that the function has an inverse. d. Produce an invertible function from a non-invertible function by restricting the domain. Remarks/Examples Algebra 1 Honors, Unit 4: For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x>0$. Algebra 2, Unit 3: For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x>0$.
MACC.912.F-BF.2.5:	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
MACC.912.F-IF.3.7:	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

	d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. Remarks/Examples Algebra 1, Unit 2: For F.IF.7a, 7e, and 9 focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as $y=3^n$ and $y=100^2$
MACC.912.F-IF.3.8:	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y =* *, y =* *, y =* *, y =* *, and classify them as representing exponential growth or decay.* Remarks/Examples Algebra 1, Unit 5: Note that this unit, and in particular in F.IF.8b, extends the work begun in Unit 2 on exponential functions with integer exponents.
MACC.912.F-LE.1.4:	For exponential models, express as a logarithm the solution to  = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
MACC.912.F-TF.1.3:	Use special triangles to determine geometrically the values of sine,

	cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number.
MACC.912.F-TF.1.4:	Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
MACC.912.F-TF.2.5:	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
MACC.912.F-TF.2.6:	Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
MACC.912.F-TF.2.7:	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
MACC.912.F-TF.3.8:	Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to calculate trigonometric ratios.
MACC.912.N-CN.3.9:	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
MACC.K12.MP.1.1:	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify

	correspondences between different approaches.
MACC.K12.MP.2.1:	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MACC.K12.MP.3.1:	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask

	useful questions to clarify or improve the arguments.
MACC.K12.MP.4.1:	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MACC.K12.MP.5.1:	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient

	students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
MACC.K12.MP.6.1:	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MACC.K12.MP.7.1:	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

MACC.K12.MP.8.1:	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.