Coeur d'Alene Public Schools
DIVISION OF TEACHING AND LEARNING
INVEST | INSPIRE | INNOVATE

COURSE PACING GUIDE
2410- ALP PRE-CALCULUS
Date of Last Update: 05-April, 2019

Course Title:	ALP Pre-Calculus	**Course Number:**	2410
Department / Grade Level:	Mathematics	**Date:**	April 5, 2019

PHILOSOPHY OF INSTRUCTION:
The Coeur d'Alene School District will challenge each student to develop and extend mathematical proficiency and literacy through a focused and coherent curriculum, highest quality mathematics teaching, and assessments that meet the learning needs of each student.

Using the Common Core Standards as a foundation, the curriculum will emphasize depth over breadth with a focus on the foundational concepts and processes of mathematics. In order to address the demands of a changing world, our district 's mathematics instruction will prepare students to innovate, think critically, problem solve, communicate, and collaborate—therefore becoming inspired for future study.

COURSE DESCRIPTION:
Accelerated Precalculus is for the highly motivated student who knows he or she will take AP Calculus. Sets, functions, complex numbers, graphing, exponential and logarithmic functions, are expanded from Algebra 2. New topics introduced will include trigonometry, analytic geometry, mathematical induction, sequence and series. In semester 1, students will perfect their use of linear relations and functions, linear irregularities, graphs of polynomial and rational functions, derivative and critical points of graphs, quadratics and radical equations, remainder and factor theories, graphs of inverses, definition of trig functions, law of sines and cosines, right-triangle trigonometry, and graphs of trigonometry functions and equations for inverses. In semester 2, students will use trigonometry identities and solve trig equations, polar coordinates and complex numbers, conics, sequences series, limits, statistics and data analyses.

Materials: A scientific calculator is required. A graphing calculator is recommended.

SCOPE AND SEQUENCE:

Quarter 1 (9 Weeks) Sept-Oct	Quarter 2 (9 Weeks) Nov- ½ January	Quarter 3 (9 Weeks) Last ½ Jan-March	Quarter 4 (9 Weeks) April-June
• Unit 1: Functions • Unit 2: Polynomial and Rational Functions • Unit 3: Exponential and Logarithmic Functions	• Unit 10: Topics in Analytic Geometry • Unit 9: Sequences, Series and Probability • Unit 7: Systems of equations and inequalities (optional)	• Unit 4: Trigonometry • Unit 5: Analytic Trigonometry	• Unit 6: Additional Topics in Trigonometry • Unit 12: Limits and an introduction to calculus

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UNIT 1: FUNCTIONS				
Estimated Time Frame:	**3 weeks**			
Enduring Understandings:	identify intercepts and slopes, identify, categorize and describe functions, identify and transform parent functions			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you identify intercepts and symmetry in order to sketch graphs of equations, including graphs of circles?	X and Y intercepts Symmetry Standard form of a circle	*Pre-calculus with Limits* text, pgs 11-21	
	How do you find the slope of a line and use it to write an equation for the line?	Slope Linear equations Parallel and Perpendicular	Pgs. 22-34	
	What are the important defining characteristics and representations of a function?	Function Domain Piece-Wise Function Zeros Independent and dependent variable	Pgs. 35-48	
	How is the graph of function used to determine the key elements of a function?	Vertical line test Zeros Relative maximum or minimum Average rate of change	Pgs. 49-59	
	What are the characteristics of the most commonly used functions in algebra?	Parent Functions Cubic, square root, and reciprocal functions Absolute value, quadratic and constant function	Pgs. 60-66	
	How do you write equations and draw graphs for the simple transformations of a parent function?	Vertical and horizontal shifts Transformations: Vertical shift, horizontal shifts, reflections	Pgs. 67-76	
(+) F.BF.1c	How do you combine two parent functions to form a new function?	Composition of functions Decomposing	Pgs. 76-83	
(+) F.BF.4b,4c,4d	What is the inverse of a function and how do you represent it graphically and algebraically?	Inverse functions Horizontal line test One-to-one functions	Pgs. 84-92	

UNIT 2: POLYNOMIAL AND RATIONAL FUNCTIONS				
Estimated Time Frame:	**5 weeks**			
Enduring Understandings:	Analyze and graph polynomial and rational functions. The chapter begins with identifying key characteristics and creating graphs of quadratic and other polynomial functions. Students learn to use polynomial division to find both real and complex roots. Next they learn how to find asymptotes, intercepts, and holes as they graph rational functions. Finally, students learn how to solve problems using nonlinear inequalities.			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you sketch graphs and write equations for parabolas?	Quadratic functions Minimum and maximum values of quadratics Polynomial function Vertex X and Y intercepts	Pg. 114-123	
	How do you sketch the graphs of polynomial functions?	Leading coefficient test Zeros End behavior	Pg. 124-137	
	How do you divide a polynomial by another polynomial and interpret the result?	Long division Synthetic division Remainder theorem and Factor theorem	Pg. 138-146	
(+) N.CN.3	How do you perform operations with complex numbers?	Complex numbers Imaginary numbers Complex conjugates Complex solutions Standard form of a complex number	Pgs. 147-153	
	How do you find all the zeros of a polynomial function?	Rational zeros Complex zeros Factoring Fundamental theorem of Algebra Conjugate pairs Rational zero test Linear Factorization Theorem (factor theorem)	Pgs. 154-167	
	How do you sketch the graph of a rational function f(x)=N(x)/D(x)	Domain of rational functions Vertical asymptotes Horizontal asymptotes X and Y intercepts End behavior	Pg. 168-179	
	How do you find solutions of polynomial and rational inequalites?	Real Zeros Intervals	Pgs. 180-189	

		Inequality (less than, greater than) Interval notation Rational and polynomial inequalities		

UNIT 3: EXPONENTIAL AND LOGARITHMIC FUNCTIONS				
Estimated Time Frame:	**3-4 weeks**			
Enduring Understandings:	Students work with exponential and logarithmic functions. They begin by writing, graphing, and recognizing the basic characteristics of exponential and logarithmic functions. Students learn how to use these functions to model real-world problems including compound interest, radioactive decay, and human memory. They then expand their skills by using the properties of logarithms and exponents to manipulate expressions and solve equations.			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you write and graph functions?	Exponential equations Base Base e Compound interest formula compounding monthly, yearly, quarterly, continuously… Natural exponential function One-to-one property	Pgs. 200-210	
	How do you recognize, evaluate, and graph logarithmic functions?	Logarithmic functions One-to-one property Natural logarithmic function	Pgs. 211-220	
	How do you rewrite logarithmic expressions to simplify or evaluate them?	Change-of-Base formula Expanding and condensing Properties of logarithms	Pgs. 221-227	
(+) F.BF.5	How do you solve exponential and logarithmic equations?	Exponential equation Logarithmic equation	Pgs. 228-237	
(+) F.BF.5	How do you use a exponents and logarithms to model a variety of situations?	Exponential growth model Exponential decay model Logarithmic models Time to double Half-life	Pgs. 238-249	

UNIT 4: TRIGONOMETRY				
Estimated Time Frame:	**5 weeks**			
Enduring Understandings:	Students learn how to evaluate and graph the trigonometric functions, their inverses(use calculator to help graph), and reciprocals. The chapter begins by introducing radian measure and the definition of trigonometric functions on the unit circle. Students then learn how to find trigonometric ratios of an acute angle by drawing a right triangle and of any angle by drawing a unit circle and a reference angle. They also learn how to graph trigonometric functions and to identify the basic characteristics of the trigonometric functions, their reciprocals, and inverses. Students use trigonometric ratios to solve problems in a variety of contexts.			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you describe angles, using degrees and radians in a positive or negative direction?	Angles Radians Initial side Terminal side Positive angle/negative angle Coterminal angles Complementary and supplementary angles Arc length Area of a sector	Pgs. 262-271	
(+) F.TF.3 (+) F.TF.4	How do you evaluate trigonometric functions by using the unit circle?	Unit circle Sine, cosine, tangent, cosecant, secant, cotangent Domain and period Periodic function	Pgs. 272-278	
	How do you use trigonometry to find unknown side lengths and angles in right triangles?	Fundamental trigonometric identities Special triangle (angles) Know a 45-45-90 triangle and a 30-60-90 triangle Reciprocal identities Quotient identities Pythagorean identities	Pgs. 279-289	
	How do you evaluate trigonometric functions of any angle?	Definition of trigonometric functions of any angle Reference angle Evaluating trigonometric functions of any angle and real numbers	Pgs. 290-298	

	How do you sketch the graphs of sine and cosine functions?	Amplitude Period Translations Horizontal stretching Horizontal translation Vertical translation	Pgs. 299-309	
	How do you sketch graphs of other trigonometric equations?	Asymptotes Domain Reciprocal functions	Pgs. 310-319	
(+) F.TF.6 (+) F.TF.7	How do you evaluate and graph the inverses of trigonometric functions?	Inverse Arcsine, arccosine, etc and sin^-1(x) Domain and Range of inverse functions (restricting domain) Exact Value	Pgs. 320-329	
	How do you use trigonometric functions to solve real-life problems?	Angle of elevation Angle of depression	Pgs. 330-339	

UNIT 5: ANALYTIC TRIGONOMETRY				
Estimated Time Frame:	**4 weeks**			
Enduring Understandings:	Students learn strategies for simplifying expressions and solving equations by using trigonometric identities. First, students learn how trigonometric functions can be rewritten by using identities and how to verify identities. Next, students learn how to solve trigonometric equations written in quadratic form and equations containing more than one angle. They they study equations containing sums and differences of angles. Finally, students rewrite trigonometric expressions that contain functions of multiple or half-angles and that involve squares or products of trigonometric functions.			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you rewrite trigonometric expressions in order to simplify and evaluate functions?	Reciprocal, quotient, pythagorean identities SImplify Verify Factor Substitution	Pgs. 350-356	
	How do you verify a trigonometric identity?	Verifying Factor Common denominators	Pgs. 357-363	
	How do you solve trigonometric equations written in quadratic form or containing more than one angle?	Like terms Multiple angle equation Period Multiple solutions Interval	Pgs. 364-374	
(+) F.TF.9	How do you simplify expressions and solve equations that contain sums or differences of angles?	Sum and difference formulas Exact values Cofunction	Pgs. 375-381	
	How do you rewrite trigonometric expressions that contain functions of multiple or half-angles, or functions that involve squares or products of trigonometric expressions?	Double-angle formulas Power-reducing Half-angle formulas Exact values	Pgs. 382-390	

UNIT 6: ADDITIONAL TOPICS IN TRIGONOMETRY				
Estimated Time Frame:	**2 weeks**			
Enduring Understandings:	Students learn how to find side lengths, angles, and areas of oblique triangles by using the Law of SInes or the Law of Cosines. They also will find the area of triangles using the sine formula or Heron's formula. Finally, students learn how to write and perform operations on complex numbers in trigonometric form.			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you use trigonometry to solve and find the areas of oblique triangles?	AAS, ASA, SSA Oblique triangles Ambiguous Case Obtuse, acute	Pgs. 402-410	
	How do you use trigonometry to solve and find the areas of oblique triangles?	SSS, SAS Heron's formula	Pgs. 411-417	
	How do you represent complex numbers and perform operations on them by using trigonometry?	Complex number Trig form of a complex number Absolute value of a complex number	Pgs. 440-449	

*(OPTIONAL IF TIME ALLOWS) UNIT 7: SYSTEMS OF EQUATIONS AND INEQUALITIES				
Estimated Time Frame:	**2 weeks**			
Enduring Understandings:	**Students learn to solve systems of equations and inequalities. The chapter begins by introducing techniques to solve systems of equations by the methods of substitution and elimination and to check solutions numerically and graphically. Students learn how to find the solution of a system of inequalities.**			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you use the method of substitution and graphing to solve systems of equations?	Linear and nonlinear Substitution System of equations Solutions	Pgs. 466-475	
	How do you use the method of elimination to solve systems of equations?	Elimination Solutions No solutions Many solutions	Pgs. 476-487	
	How do you write a rational expression as the sum of two or more simpler rational expressions?	Partial Fractions Decomposition Factors Linear and Quadratic factors	Pgs. 500-507	
	How do you find the solution of a system of inequalities?	Inequality Two variables Shading and solid vs. dashed line No solutions Set of solutions Unbounded solution set	Pgs. 508-517	

UNIT 9: SEQUENCES AND SERIES				
Estimated Time Frame:	**3 weeks**			
Enduring Understandings:	**Students analyze sequences and series. Introducing methods of representing sequences and series, including summation notation. Students then model and find sums of arithmetic and geometric sequences. Mathematical induction is introduced as a method to prove summation formulas.**			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you represent a sequence of numbers or the sum of a sequence?	Sequence notation Factorial Sums of series Notation Subscripts Alternating Nth term Recursive sequence Sigma notation	Pgs. 606-615	
	How do you find the nth term of an arithmetic sequence?	Arithmetic sequence Nth term Partial sum Sum of a finite sequence Difference	Pgs. 616-624	
	How do you find terms and sums of geometric sequences?	Geometric Rate Sum of a finite sequence Sum of an infinite sequence	Pgs. 625-633	
	How do you find the expansion of a binomial $(x+y)^n$?	Pascal's triangle Coefficients Combinations Expansions	Pgs. 644-651	
	How do you count the number of ways in which an event can occur?(optional)	Counting principles Random Permutations Combinations	Pgs. 652-661	
	How do you find the probability that a series of events will occur?(optional)	Sample space Probability Experiment Outcomes Random selection	Pgs. 662-673	

		Union Mutually exclusive Independent Complement of an event		

UNIT 10: TOPICS IN ANALYTICAL GEOMETRY				
Estimated Time Frame:	**3 Weeks**			
Enduring Understandings:	**Students work with conic sections and equations in polar form. Students solve problems involving conic sections, eventually classifying a conic equation by its equation in general form. Students can graph and write equations of parabolas, ellipses, and hyperbolas. Students end the chapter by using polar coordinates to represent and solve problems involving conic sections.**			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you recognize each conic section and solve problems involving parabolas?	Circle Parabola Hyperbola Standard form Focus Directrix Vertex Completing the square	Pgs. 695-703	
(+) G.GPE.3	How do you solve problems involving ellipses?	Major and Minor axis Center Vertex Co-Vertices Foci	Pgs. 704-712	
(+) G.GPE.3	How do you solve problems involving hyperbolas and classify a conic section on the basis of its general equation?	Center Foci Asymptotes Major axis	Pgs. 713-722	
	How do you eiliminate the xy-term from the general equation for conic sections and classify a conic on the basis of its general equation if B does not equal zero	Rotation Eliminate Discriminant General form	Pgs. 723-728	
(+) N.CN.4 (+) N.CN.5 (+) N.CN.6	How do you describe the position of a point in a plane using distance and angle rather than x- and y- coordinates?	Polar coordinate Rectangular form and polar form Radius and theta Multiple representations	Pgs. 741-746	

UNIT 12: LIMITS AN INTRODUCTION TO CALCULUS				
Estimated Time Frame:	**3 weeks**			
Enduring Understandings:	**Students will be introduced to limits. They will evaluate limits and if time allows they will learn about writing a tangent line**			
Idaho Content Standard	**Essential Questions**	**Key Terms**	**Resources Needed**	**Assessment** (Tie to Enduring Understandings)
	How do you find and interpret the limit of a function for a certain value of x?	Limits Numerically Graphs Left and right behavior Unbounded (DNE) Properties of limits and direct substitution Oscillating	Pgs.814-824	
	How do you evaluate limits that cannot be solved through use of direct substitution?	Dividing out technique Rationalizing One-sided limits Approximating limits graphically Difference quotient	Pgs. 825-834	