

## Pre-calculus

Pre-calculus is a full-year, high school credit course that is intended for the student who has successfully mastered the core algebraic and conceptual geometric concepts covered in the prerequisite courses: Algebra I, Geometry, and Algebra II. The course primarily focuses on the skills and methods of analytic geometry and trigonometry while investigating further relationships in functions, probability, number theory, limits, and the introduction of derivatives.

Upon successfully completing the course, students should have mastered the following concepts:

- Perform operations on functions including composition and inverses.
- Graph, evaluate, and solve exponential and logarithmic functions and equations.
- Utilize the unit circle in evaluating trigonometric identities; prove trigonometric identities; graph trigonometric functions and their inverses.
- Solve application problems involving right triangle trigonometry, special right triangles, and law of sines and cosines.
- Convert between Cartesian and polar forms; graph equations in polar coordinates.
- Graph and solve quadratic equations that include conic sections.
- Calculate probabilities, combinations, and permutations.
- Calculate summations and limits of functions.
- Relate analytical operations of limits, slope of a tangent line, and the definition of a derivative.

Unit 1: Relations and Functions	
Assignments	
Pre-calculus	1. Course Overview
	2. Ordered-Pair Numbers: Relations
	3. Ordered-Pair Numbers: Functions
	4. Ordered-Pair Numbers: Rules of Correspondence
	5. Quiz 1: Relations and Functions
	6. Algebra of Functions: Notation
	7. Algebra of Functions: Arithmetic
	8. Algebra of Functions: Composition
	9. Algebra of Functions: Inverse
	10. Quiz 2: Relations and Functions
	11. Special Project*
	12. Test
	13. Alternate Test*
	14. Glossary and Credits

Unit 2: Functions	
Assignments	
Pre-calculus	1. Linear Functions: Graphs
	2. Linear Functions: Equations
	3. Quiz 1: Linear Functions
	4. 2nd-Degree Functions: Solutions
	5. Relationships Between Zeros and Coefficients
	6. Quadratic Inequalities
	7. Quiz 2: Second-Degree Functions
	8. Polynomial Functions
	9. Nth-Degree Equations
	10. Solving Polynomial Equations
	11. Quiz 3: Polynomial Functions
	12. Complex Numbers
	13. Operations with Complex Numbers
	14. Conjugates and Polynomial Identities
	15. Distance and Midpoint
	16. Quiz 4: Complex Numbers
	17. Rational Inequalities
	18. Greatest Integer Function
	19. Exponential Function
	20. Logarithmic Function
	21. Function Combinations
	22. Quiz 5: Special Functions
	23. Special Project*
	24. Test
	25. Alternate Test*
	26. Glossary and Credits

Unit 3: Trigonometric Functions		
Assignments		
calc ulus  Pre-	1. Definition of the Trigonometric Functions	10. Quiz 5: Quadrantal Angles
	2. Quiz 1: Trigonometric Functions	11. Special Angles
	3. Evaluation of Functions	12. Quiz 6: Special Angles
		13. Radian Measure
	5. Angle Location	14. Quiz 7: Radian Measure
	6. Quiz 3: Angle Location	15. Special Project*
	7. Reduction Formulas	16. Test
	8. Quiz 4: Reduction Formulas	17. Alternate Test*
	9. Quadrantal Angles	18. Glossary and Credits

Unit 4: Circular Functions and Their Graphs		
Assignments		
Pre-	1. Circular Functions	12. Amplitude of Circular Functions
	2. Quiz 1: Circular Functions	13. Quiz 6: Amplitude of Circular Functions
	3. Circular Functions of Special Angles	14. Period of Circular Functions
	4. Quiz 2: Circular Functions of Special Angles	15. Quiz 7: Period of Circular Functions
		16. Phase Shift of Circular Functions
	6. Quiz 3: Graphs of Sin and Cos	17. Quiz 8: Phase Shift of Circular Functions
	7. Other Graphs	18. Special Project*
	8. Quiz 4: Other Graphs	19. Test
	9. Applications	20. Alternate Test*
	10. Parametric Equations	21. Glossary and Credits
	11. Quiz 5: Applications	

Unit 5: Identities and Functions of Multiple Angles		
Assignments		
Pre-calculus	1. Reciprocal Relations	12. Quiz 6: Additional Sum and Difference Formulas
	2. Quiz 1: Reciprocal Relations	13. Double- and Half-Angle Formulas
	3. Pythagorean Relations	14. Quiz 7: Double- and Half-Angle Formulas
	4. Quiz 2: Pythagorean Relations	15. Identities
	5. Quotient Relations	16. Quiz 8: Identities
	6. Quiz 3: Quotient Relations	17. Trigonometric Equations
	7. Trigonometric Identities	18. Quiz 9: Trigonometric Equations
	8. Quiz 4: Trigonometric Identities	19. Special Project*
	9. Cosine of the Sum of Two Angles	20. Test
	10. Quiz 5: Cosine of the Sum of Two Angles	21. Alternate Test*
	11. Additional Sum and Difference Formulas	22. Glossary and Credits

Unit 6: Semester Review and Exam		
Assignments		
Pre-calculus	1. Review	3. Alternate Exam—Form A*
	2. Exam	4. Alternate Exam—Form B*

Unit 7: Application of Trigonometric Functions	
Assignments	
Pre-calculus	1. Trigonometric Functions of Any Angle
	2. Quiz 1: Trigonometric Functions of Any Angle
	3. More Trigonometric Functions of Any Angle
	4. Quiz 2: Trigonometric Functions
	5. Applied Problems
	6. Law of Cosines
	7. Quiz 3: Law of Cosines
	8. Law of Sines
	9. Quiz 4: Law of Sines
	10. Vectors
	11. Operations with Vectors
	12. Applications of Vectors
	13. More Applications
	14. Quiz 5: More Applications
	15. Inclined Plane Application
	16. Navigation Application
	17. Quiz 6: Additional Application Problems
	18. Special Project*
	19. Test
	20. Alternate Test*
	21. Glossary and Credits

Unit 8: Inverse Trigonometric Functions and Polar Coordinates	
Assignments	
Pre-calculus	1. The Inverse Sine Function
	2. Quiz 1: The Inverse Sine Function
	3. The Inverse Cosine Function
	4. Quiz 2: The Inverse Cosine Function
	5. The Inverse Tangent Function
	6. Quiz 3: The Inverse Tangent Function
	7. Other Inverse Functions
	8. Quiz 4: Other Inverse Functions
	9. Graphs of Inverse Functions
	10. Quiz 5: Graphs of Inverse Functions
	11. Graphing Polar Coordinates
	12. Quiz 6: Graphing Polar Coordinates
	13. Converting Coordinates
	14. Quiz 7: Converting Coordinates
	15. Converting Cartesian Equations to Polar Equations
	16. Quiz 8: Converting Cartesian Equations to Polar Equations
	17. Converting Polar Equations to Cartesian Equations
	18. Quiz 9: Converting Polar Equations to Cartesian Equations
	19. Graphing Polar Equations
	20. Quiz 10: Graphing Polar Equations
	21. Project: De Moivre's Theorem
	22. Special Project*
	23. Test
	24. Alternate Test*
	25. Glossary and Credits

Unit 9: Quadratic Equations		
Assignments		
Pre-calculus	1. The Circle	
	2. The Circle Continued	
	3. Equation from Three Points	
	4. Equation from Three Points Applied	
	5. The Ellipse	
	6. The Ellipse: Standard Form	
	7. The Ellipse: General Form	
	8. The Ellipse Applied	
	9. Quiz 1: Quadratic Equations	
	10. The Parabola	
	11. The Parabola Continued	
	12. The Parabola: Standard Form	
		13. The Parabola Applied
		14. The Hyperbola
	15. Quiz 2: Quadratic Equations	
	16. Translation	
	17. Translation of Equations	
	18. Rotation	
	19. Rotation of Equations	
	20. Quiz 3: Quadratic Equations	
	21. Special Project*	
	22. Test	
	23. Alternate Test*	
	24. Glossary and Credits	

Unit 10: Counting Principles	
Assignments	
calculus Pre-	1. Definitions, Sample Spaces, and Probability
	2. Addition of Probabilities
	3. Multiplication of Probabilities
	4. Quiz 1: Probability
	5. Definitions
	6. Permutation of N Things: Different
	7. Permutation of N Things: Not All Different
	8. Circular Permutations
	9. Combinations
	10. Binomial Theorem
	11. Quiz 2: Probability
	12. Arithmetic and Geometric Sequences
	13. Summation
	14. Arithmetic and Geometric Series
	15. Quiz 3: Sequences and Series
	16. Proofs by Mathematical Induction
	17. Special Project
	18. Test
	19. Alternate Test
	20. Glossary and Credits

Unit 11: Calculus and Review	
Assignments	
calculus Pre-	1. Functional Notation
	2. Difference Quotient
	3. Limits
	4. Quiz 1: Limits
	5. Slope of a Curve
	6. Slope of a Line
	7. Angle Between Curves
	8. Quiz 2: Slopes and Curves
	9. Review: Relations and Functions
	10. Review: Trigonometric and Circular Functions
	11. Review: Identities, Multiple Angle Functions
	12. Review: Inverse Trig Functions; Polar Coordinates; Quadratics
	13. Review: Probability and Calculus
	14. Quiz 3: Reviews
	15. Special Project
	16. Test
	17. Alternate Test
	18. Glossary and Credits

Unit 12: Semester Review and Exam	
Assignments	
calculus Pre-	1. Review
	2. Exam
	3. Alternate Exam—Form A*
	4. Alternate Exam—Form B*

Unit 13: Final Exam	
Assignments	
calculus Pre-	1. Exam
	2. Alternate Exam—Form A*
	3. Alternate Exam—Form B*