

# Course Description:

## Precalculus with Trigonometry

### Credits Earned:

1 Precalculus with Trigonometry Credit  
½ Geometry Credit

### Curriculum:

David Shormann, Ph.D. (2017). *Shormann Precalculus with Trigonometry*. Digital Interactive Education, USA.

### Course Description:

Shormann Precalculus provides a comprehensive teaching of standard precalculus topics, with a special emphasis on advanced algebra and trigonometry topics found on the CLEP Precalculus Exam. Functions are a priority, with both standard and real-world applications of the following types: linear, quadratic, cubic, polynomial, rational, exponential, logarithmic, absolute value, trigonometric and piecewise-defined. Students learn to work with functions presented in graphic, symbolic, verbal and numeric form. Students learn to use technology such as spreadsheets and graphing calculators to solve problems. Calculus fundamentals are also presented and practiced, which improves student confidence and success in college-level Calculus I. Attached is a copy of the Table of Contents.

### Grades:

- Practice Sets: 30%
- Weekly Quizzes: 30%
- Quarterly Exams: 40%

### Grading Scale:

A – 90 -100  
B –80 – 89  
C – 70 – 79  
D – 60 – 69  
F – 59 or below  
I – Incomplete

# Shormann Precalculus with Trigonometry

## Table of Contents

**NOTE:** To build a firm foundation, Lessons 1-25 introduce fundamental rules and definitions covered in Shormann Precalculus, plus a review of Shormann Algebra 2 with Integrated Geometry.

Lesson 1      Number I: What is Mathematics? - A Brief History of Number - Number Sets and Set Notation -  
Special Number Types, Exponents

Lesson 2      Ratio I: Ratio, Proportion, and the Christian Adventure - Rational and Irrational Numbers -  
Simplifying Fractions - Logarithms (Ratio Numbers) - Ratio Word Problems

Lesson 3      Algebra I: Expanding - Factoring and Canceling - Exponents - Logarithms

Lesson 4      Algebra II: Linear Equations - Systems of Linear Equations - Rational Equations

### Week 1 Quiz

Lesson 5      Algebra III: Quadratic Equations - Absolute Value Equations - Radical Equations (Square Root) -  
Exponential Equations - Logarithmic Equations

Lesson 6      Geometry I: Geometry Fundamentals - Similar Triangles - Geometry in Art and Creation -  
Geometry in 3D Design

Lesson 7      Geometry II: Logic Fundamentals - Proof - Syllogisms - Truth Tables

Lesson 8      Geometry III: Coordinate Geometry - Circle Relationships - Circle Proofs - Non-Euclidean  
Geometry

### Week 2 Quiz

Lesson 9      Analytical Geometry I: Identifying Functions - Evaluating Functions - Operations with Functions -  
Domain and Range

Lesson 10     Analytical Geometry II: Linear Inequalities - Linear System Word Problems

Lesson 11     Analytical Geometry III: Nonlinear Systems - Nonlinear Inequalities - Nonlinear System Word Problems

Lesson 12     Analytical Geometry IV: Identifying Conic Sections - Conics and Nonlinear Systems - Nonlinear Systems of Inequalities

### **Week 3 Quiz**

Lesson 13     Analytical Geometry V: Piecewise Functions - Domain, Range, and Extrema from Graphs - Conic/Conic Systems

Lesson 14     Measurement I: Why Standards Matter - Unit Conversions - Rate Conversions and Other Conversions - Arc Lengths and Sectors

Lesson 15     Measurement II: Length, Area, and Volume Conversions - Perimeter, Area, Surface Area, and Volume - Special Volume Conversions

Lesson 16     Trigonometry I: Trigonometry Basics - Inverse Trig Functions - Graphing Trig Functions

### **Week 4 Quiz**

Lesson 17     Trigonometry II: Periodicity and Unit Circles - Rectangular to Polar Coordinates - Polar to Rectangular Coordinates - The Parallelogram Law and Resultant Vectors

Lesson 18     Trigonometry III: Basic Trig Identities - Pythagorean Theorem Applications - Other Right Triangle Applications

Lesson 19     Calculus I: To Understand Calculus, Just Believe - Limits

### **Week 5 Quiz**

Lesson 20     Calculus II: Calculus is About Rates of Change - Derivative Means Slope - Derivative of  $f(x) = x^2$

Lesson 21     Calculus III: More on Limits - Derivative Applications - The Integral

Lesson 22     Statistics I: The Normal Distribution - Measures of Central Tendency - Probability

## **Week 6 Quiz**

- Lesson 23      Statistics II: The Least Squares Algorithm for Linear Regressions - The Fundamental Counting Principle and Permutations - Combinations
- Lesson 24      Computer Math I: Pixels, Bits, and the Binary Numeral System - Matrices - Boolean Algebra
- Lesson 25      Computer Math II: Sequences - Series - Sums - Infinite Series

## **Week 7 Quiz**

**Exam 1, Week 8:**      Practice Test 1 & 2, Quarterly Exam 1

- Lesson 26      Sum and Difference Two Cubes; Polynomial Division: Sum and Difference of Two Cubes - Polynomial Division
- Lesson 27      Game Playing with Logarithm Laws; Taking the Logarithm of: Game Playing with Logarithm Laws - Taking the Logarithm of
- Lesson 28      Synthetic Division and the Remainder Theorem; Factor Theorem: Synthetic Division and the Remainder Theorem - Synthetic Division and the Factor Theorem
- Lesson 29      Nonstandard Absolute Value Equations; Finding Roots of Polynomial Equations - Nonstandard Absolute Value Equations - Finding Roots of Polynomial Equations

## **Week 9 Quiz**

- Lesson 30      Pascal's Triangle and the Binomial Theorem; Distinguishable Permutations: Pascal's Triangle and the Binomial Theorem - Distinguishable Permutations
- Lesson 31      Advanced Radical Equations
- Lesson 32      Polar Form of a Complex Number; More Rate Problems: Polar Form of a Complex Number - More Rate Problems
- Lesson 33      Factorable Trig Equations

### **Week 10 Quiz**

- Lesson 34      Composite Functions; Products of Complex Numbers: Composite Functions - Products of Complex Numbers
- Lesson 35      Inverse Functions; Inverse Logarithms: Inverse Functions - Inverse Logarithms
- Lesson 36      Modeling of Linear Functions
- Lesson 37      Even and Odd Functions

### **Week 11 Quiz**

- Lesson 38      Reciprocal Trig Equations; Advanced Trig Equations: Reciprocal Trig Equations - Advanced Trig Equations
- Lesson 39      New Domains, Ranges, and Intervals after Operations; Decomposing Functions: New Domains, Ranges and Intervals from Operations - Decomposing Functions
- Lesson 40      Operations with Numerical Representation of Functions
- Lesson 41      The  $t$ -Test; Factoring Polynomials with Imaginary Roots: The  $t$ -Test - Factoring Polynomials with Imaginary Roots

### **Week 12 Quiz**

- Lesson 42      Locus Definition of a Circle; Coordinate Geometry Proofs: The Locus Definition of a Circle - Coordinate Geometry Proofs
- Lesson 43      Operations with Graphical Representations of Functions
- Lesson 44      Abstract Rate Problems
- Lesson 45      Symbolic Transformations of Functions

### **Week 13 Quiz**

- Lesson 46      Graphical Transformations; Numeric Transformations: Graphical Transformations of Functions -

## Numerical Transformations of Functions

Lesson 47 Matrix Multiplication

Lesson 48 Nonstandard Representation of Linear Functions

Lesson 49 Locus definition of a Parabola

Lesson 50 Nonstandard and Other Representations of Absolute Value Functions

### Week 14 Quiz

**Exam 2, Week 15:** Practice Test 1 & 2, Quarterly Exam 2

Lesson 51 Resolving Fractions into Infinite Series

Lesson 52 Modeling of Absolute Value Functions

Lesson 53 Nonstandard and Other Representations of Quadratic Functions

Lesson 54 Resultant Vectors: Force Applications

### Week 16 Quiz

Lesson 55 Locus definition of an Ellipse

Lesson 56 Modeling of Quadratic Functions

Lesson 57 DeMoivre's Formula, Euler's Formula, and Complex Roots: De Moivre's Formula - Finding Complex Roots

Lesson 58 Infinity as a Limit; Special Limits: Infinity as a Limit - Some Special Limits (That are Also Derivatives)

### Week 17 Quiz

Lesson 59 Nonstandard and Other Representations of Square Root Functions

Lesson 60 Balancing Chemical Equations:

Lesson 61 Modeling of Square Root Functions

Lesson 62      Nonstandard and Other Representations of Degree 3+ Polynomial Functions, Part I

### **Week 18 Quiz**

Lesson 63      Nonstandard and Other Representations of Degree 3+ Polynomial Functions, Part II

Lesson 64      Nonstandard and Other Representations of Rational Functions

Lesson 65      Nonstandard and Other Representations of Exponential Functions

Lesson 66      Nonstandard and Other Representations of Logarithmic Functions

### **Week 19 Quiz**

Lesson 67      Modeling of Exponential and Logarithmic Functions

Lesson 68      Graphing Reciprocal and Inverse Trig Functions

Lesson 69      Transformations of Trig Functions:

### **Week 20 Quiz**

Lesson 70      Modeling of Degree 3+ Polynomials

Lesson 71      Derivatives of Polynomials; Trig Equations of  $n\theta$ : Derivatives of Polynomials -  
Trig Equations of  $n\theta$

Lesson 72      Transformations of Reciprocal Trig Functions

### **Week 21 Quiz**

Lesson 73      Symbolic Forms of Piecewise Functions from Graphs

Lesson 74      Locus Definition of a Hyperbola

Lesson 75      Comparing General Forms of Conic and Linear Equations

### **Week 22 Quiz**

**Exam 3, Week 23:**      Practice Test 1 & 2, Quarterly Exam 3

Lesson 76      Trig Problem Solving

- Lesson 77 Law of Sines
- Lesson 78 Nonstandard Solutions for Conics
- Lesson 79 Law of Cosines
- Lesson 80 More with Inverse Trig Functions

#### **Week 24 Quiz**

- Lesson 81 Sum and Difference Trig Identities
- Lesson 82 Double-Angle, Half-Angle, and Tangent Sum and Difference Trig Identities
- Lesson 83 Cramer's Rule; Gas Law Problems
- Lesson 84 More Trig Problem Solving; Angular Velocity: Trig Problem Solving - Angular Velocity

#### **Week 25 Quiz**

- Lesson 85 Partial Fractions; Recurrence Problems: Partial Fractions - Recurrence Problems
- Lesson 86 More Modeling of Trig Functions
- Lesson 87 Non-Periodic Functions: Damping Functions - The Sinusoidal Fibonacci Function
- Lesson 88 Integrals II: Sums of Rectangles

#### **Week 26 Quiz**

- Lesson 89 Interest Rate, Savings and Debt
- Lesson 90 Deriving formulas for infinite series
- Lesson 91 Derivatives of sums and differences
- Lesson 92 Integrals III: Definite Integrals

#### **Week 27 Quiz**

- Lesson 93 Integrals IV: Indefinite Integrals
- Lesson 94 Taking the 2nd Derivative



Lesson 95      The Product Rule for Derivatives

Lesson 96      The Quotient Rule for Derivatives

**Week 28 Quiz**

Lesson 97      The Chain Rule for Derivatives

Lesson 98      Using  $f'$  to Find Extrema

Lesson 99      Related rates

Lesson 100     Fundamental Theorem of Calculus

**Week 29 Quiz**

**Exam 4, Week 30:**    Practice Test 1 & 2, Quarterly Exam 4