



This course requires a performance assessment and an objective exam. It covers 6 competencies and represents 4 competency units.

## Introduction

### Overview

Pre-Calculus covers the knowledge and skills necessary to apply trigonometry, complex numbers, systems of equations, vectors and matrices, sequence and series, and to use appropriate technology to model and solve real-life problems. Topics include:

- degrees;
- radians and arcs;
- reference angles and right triangle trigonometry;
- applying, graphing and transforming trigonometric functions and their inverses;
- solving trigonometric equations;
- using and proving trigonometric identities;
- geometric, rectangular, and polar approaches to complex numbers;
- DeMoivre's Theorem;
- systems of linear equations and matrix-vector equations
- systems of nonlinear equations;
- systems of inequalities; and
- arithmetic and geometric sequences and series.

College Algebra is a prerequisite for this course.

### Getting Started

Welcome to Pre-Calculus! To master the competencies for this course you will typically read the e-text or sometimes watch a video about a topic in precalculus. You will check your understanding by taking a diagnostic from the interactive "MathLab" portion of your e-text. When you do a diagnostic, you can practice what you got wrong by going to "Review Results." You can also do the homework exercises, which are the full pool of items that the diagnostic questions are drawn from. While you do homework or use "Review Results," you will be able to access the relevant readings from the online textbook, Blitzer's Algebra and Trigonometry, 5th edition. Most of the time, you will also be able to access learning aids such as worked examples or interactive step-by-step solutions of the problems you're doing.

You will demonstrate your competency by successfully completing a project about modelling the real world with sinusoidal functions and passing a comprehensive objective exam.

### Teaching Dispositions Statement

Please review the [WGU Statement of Teaching Dispositions](#).



## Competencies and Objectives

This course covers the following competencies:

- **Competency 2008.1.1: Trigonometry of Angles**

The graduate applies trigonometric ratios and triangle formulas to model and solve real-life problems.

- Identify characteristics of angles.
- Compute angular measurements in both radians and degrees.
- Use properties of arcs to model and solve real-life problems.
- Apply the law of sines or law of cosines to solve oblique triangles.
- Apply right triangle side ratios to evaluate the six trigonometric functions.
- Use right-triangle trigonometry to model and solve real-life problems.
- Use reference angles to find trigonometric values.

- **Competency 2008.1.2: Trigonometry of Real Numbers**

The graduate uses a unit circle to define trigonometric functions and applies these functions to model and solve real-life problems.

- Analyze the inverse sine or inverse cosine functions.
- Evaluate the compositions of trigonometric functions with inverse trigonometric functions.
- Apply trigonometric functions to model periodic phenomena.
- Apply a unit circle to find the values of trigonometric functions.
- Graph sine or cosine functions.
- Graph tangent, cotangent, secant, or cosecant functions.

- **Competency 2008.1.3: Analytic Trigonometry**

The graduate proves trigonometric identities and solves trigonometric equations.

- Use algebraic, quadratic, or inverse trigonometric function methods to solve trigonometric equations.
- Use trigonometric formulas to solve trigonometric problems.
- Apply the fundamental trigonometric identities in evaluating and simplifying trigonometric expressions.
- Verify trigonometric identities.

- **Competency 2008.1.4: Complex Numbers**

The graduate applies various representations of complex numbers to solve problems.

- Convert the rectangular form to the polar form of complex numbers.
- Conduct multiplication and division with complex numbers in polar form.
- Use DeMoivre's theorem to find powers and roots of complex numbers.
- Recognize the properties of complex numbers, including the relationship between complex, imaginary, and real numbers.
- Conduct addition, subtraction, multiplication, and division of complex numbers in rectangular form.

- **Competency 2008.1.5: Systems of Equations & Inequalities**

The graduate uses systems of equations, systems of inequalities, and matrices to model and solve real-life problems.



- Convert between systems of equations and their matrix representations.
- Solve systems of linear equations using matrix methods.
- Model real-world data using systems of equations.
- Solve systems of linear equations.
- Solve systems of nonlinear equations in two variables.
- Solve systems of inequalities graphically.
- **Competency 2008.1.6: Sequences**  
The graduate explores arithmetic and geometric sequences and uses them to model and solve real-life problems.
  - Use sequence, factorial, and summation notation to solve problems.
  - Determine partial sums or the nth term in arithmetic sequences.
  - Use arithmetic sequences to model and solve real-life problems.
  - Determine partial sums and nth terms in geometric sequences.
  - Use geometric sequences to model and solve real-life problems.

## Preparation and Self-Evaluation

### Seek Help When You Need It

Your course instructor is an important resource for you to take advantage of as you progress through your study of the course. Your course instructor will be able to help guide your learning, answer questions, and provide valuable information. Be sure to consult your course instructor frequently.

### Supplemental Activities

There may be times when you feel you need more information or practice than what has been provided in the course. In addition to consulting with your course instructor when you need help, you can access optional and supplemental activities by using the word "supplemental" in the Course Search box. These activities can be enriching, but they are not essential for becoming competent.

### Pacing Guide

The following is a suggested timeline to help you stay on track in this course:

#### Week 1:

- Preparation
- Self Evaluation of Precalculus
- Angles & Arcs
- Triangles
- Optional:
  - Law of Sines and Law of Cosines
  - Self-evaluation of Trig of Angles
- Trigonometric Functions

#### Week 2:



- Inverse/Composite/Harmonic Functions
- Performance Assessment
- Self-evaluation of Trig of Real Numbers

### **Week 3:**

- Trigonometric Identities
- Solving Trigonometric Equations
- Self-evaluation of Analytic Trig

### **Week 4:**

- Law of Sines and Law of Cosines
- Self-evaluation of Trig of Angles
- Rectangular form of Complex Numbers
- Polar Form of Complex Numbers
- Self-evaluation of Complex Numbers

### **Week 5:**

- Systems of Equations & Systems of Inequalities
- Matrices
- Self-evaluation of Systems of Equations and Inequalities
- Arithmetic Sequences
- Geometric Sequences
- Self-evaluation of Sequences

### **Week 6:**

- Competence in Precalculus Diagnostic
- Pre-assessment
- Objective Exam

## **Graphing Calculator**

If you don't already have one, acquire [an appropriate calculator for use on WGU exams](#).

## **Using the Interactive Textbook**

Read the sections indicated and use the interactive links in the textbook to supplement your learning. Take the Diagnostic for each section and try to succeed without using any notes or readings. There are also Diagnostics for each major topic of the course, which correspond with your coaching report on the pre-assessment and objective exam -- these are timed experiences and cover several sections and will give you even better training for the exam. When you've finished a Diagnostic, you can either Review Results for that Diagnostic (use 'show me an



example' and 'help me solve this' features) or follow the interactive textbook's Pearson Study Plan to work on learning objectives that you've missed (it works best after you've taken quite a few Diagnostics). When you retake a Diagnostic, it draws from a pool of problems, so you will get valuable experience doing multiple attempts. You should consider yourself competent when you are regularly scoring above 80% on all Diagnostics. If you want additional practice with the problems that generated the Diagnostics, you can work on the customized homework problems for each section of the book.

Pearson MyMathLab may contain interactive documents that require a CDF Player which can be downloaded [here](#).

### **Check Learning Resource Links**

- [Textbook](#) leads you to the textbook used in this course: Blitzer, R. (2014). *Algebra and trigonometry* (5th ed.). Boston: Pearson. Print ISBN: 978-0-321-83724-0. Use the left-hand margin to navigate to the Section you want to read. Use the ISBN listed if you would like to order a hard copy of this text.
- [Homework](#) goes into Pearson's MyMathLab and lists each section covered in the course, and each assignment includes every interactive item in the textbook that is relevant to your assessments.
- [Diagnostic](#) goes into another part of MyMathLab and lists quiz-like assignments, one for each section and larger ones covering multiple sections by subject.
- [Review Results](#) lets you practice what you got wrong on Diagnostics and includes links to interactive worked solutions, similar examples, and readings from the textbook.

*Note: Some of the interactive problems will require the Wolfram CDF Player to be downloaded. This is a common web tool used by math educators.*

### **Self-evaluation in Pre-Calculus**

After you've finished the "Preparation" activities listed earlier, you should take the [Competence in Precalculus Diagnostic](#). (Even if you don't know much of the material, take this Diagnostic because it will train your interactive textbook on what you already know and what you need to study). If you score above 70%, skip to Week 6 and fill in the gaps to prepare for the pre-assessment instead of going through the course linearly, and immediately start working on the performance assessment (the one project) to submit in TaskStream.

## **Trigonometry**

Trigonometry is the method for finding unknown elements and defining relations of the sides and angles of triangles.

### **Trigonometry**

Trigonometric functions are periodic, which means that they repeat their pattern after a certain amount of distance. Consequently, they require an understanding of radian and degree measure, right triangle geometry, and the unit circle. These topics are the foundation for a clear idea of how the trigonometric functions appear graphically, as well as the important characteristics of trigonometric functions. Trigonometric functions will also be shown to model real-world cycles such as tides, seasonal temperatures, and breathing. The study of



trigonometry also extends into the more abstract areas of using important facts, such as the sum and difference formulas, laws of sines and cosines, knowing and proving identities, solving equations, and understanding the relationships between the six trigonometric functions.

### **Angles and Arcs**

Complete:

- 5.1 (read the [textbook](#), take the [diagnostic](#), then [review results](#)).

### **Triangles**

Complete:

- 5.2 and 5.3 (read the textbook [section 5.2](#) and [section 5.3](#), take the [diagnostic](#), then [review results](#)).

Optional: Skip ahead and Complete:

- [7.1](#) and [7.2](#) and take the Competence in Trig of Angles [diagnostic](#).

### **Trigonometric Functions**

Complete:

- 5.4, 5.5, and 5.6 (read the textbook [section 5.4](#), [section 5.5](#), and [section 5.6](#); take the [diagnostic](#); then [review results](#)).

### **Inverse, Composite, and Harmonic Functions**

Complete

- 5.7 and 5.8 (read the textbook [section 5.7](#) and [section 5.8](#), take the [diagnostic](#), then [review results](#)).

### **Performance Assessment**

- Thoroughly review Example 9 in [section 5.5](#) (page 588).
- Complete and submit Task 1. If you do not pass, work with your Course Instructor.

### **Self-evaluation of Trig of Real Numbers**

Complete:

- [Competence in Trig of Real Numbers Diagnostic](#).
- [Review results](#) to focus on trouble spots.

### **Trigonometric Identities**

Complete:

- 6.1, 6.2, and 6.3 (read the [textbook](#), take the [diagnostic](#), then [review results](#)). In 6.3, don't study power-reducing formulas.



## Solving Trigonometric Equations

Complete:

- 6.5 (read the [textbook](#), take the [diagnostic](#), then [review results](#)).

On the objective exam, you will be given the sum, difference, double, and half-angle formulas.

### Self-evaluation of Analytic Trig

Complete:

- [Competence in Analytic Trig Diagnostic](#).
- Use [Review Results](#) to focus on trouble spots.

## Law of Sines and Law of Cosines

Complete:

- 7.1 and 7.2 (read the textbook [section 7.1](#) and [section 7.2](#), take the [diagnostic](#), then [review results](#)).

### Self-evaluation of Trig of Angles

Complete:

- [Competence in Trig of Angles Diagnostic](#).
- [Review results](#) to focus on trouble spots.

## Complex Numbers

Complex numbers are an extension of the real number system, and have many of the same properties as real numbers.

### Complex Numbers

Previous study of real number arithmetic operations included laws of commutativity, associativity, and distribution. You will review properties for real numbers and extend them to a study of the properties of complex numbers and operations with complex numbers. You will also learn about both rectangular and polar forms of complex numbers and the kinds of applications and computations that are best suited for each form. Complex numbers are used in many scientific fields, including engineering, electromagnetism, quantum physics, applied mathematics, and chaos theory.

### Rectangular Form of Complex Numbers

Complete:

- 1.4 (read the [textbook](#), take the [diagnostic](#), then [review results](#)).

### Polar Form of Complex Numbers

Complete:



- 7.3 and 7.5 (read textbook [section 7.3](#) and [section 7.5](#), take the [diagnostic](#), then [review results](#)).

### Self-evaluation of Complex Numbers

Complete:

- Competence in Complex Numbers Diagnostic.
- [Review results](#) to focus on trouble spots.

## Systems of Equations & Inequalities

You will learn to use systems of equations, systems of inequalities, and matrices to model and solve real-life problems which involve multiple variables with multiple relationships among them.

### Systems of Equations & Systems of Inequalities

Complete:

- 8.1, 8.2, 8.4, and 8.5 (read the textbook [section 8.1](#), [section 8.2](#), [section 8.4](#), and [section 8.5](#); take the [diagnostic](#); then [review results](#)).

### Matrices, Week 5

Complete:

- 9.1 and 9.2 (read the textbook [section 9.1](#) and [section 9.2](#), take the [diagnostic](#), then [review results](#)).

### Self-evaluation of Systems of Equations & Inequalities

Complete:

- [Competence in Systems of Equations & Inequalities](#) Diagnostic.
- [Review results](#) to focus on trouble spots.

## Sequences

You will explore arithmetic and geometric sequences and use them to model and solve real-life problems.

### Arithmetic Sequences

Complete:

- 11.1 and 11.2 (read the textbook [section 11.1](#) and [section 11.2](#), take the [diagnostic](#), then [review results](#)).

### Geometric Sequences

Complete:

- 11.3 (read the [textbook](#), take the [diagnostic](#), then [review results](#)).

### Self-evaluation of Sequences





Complete:

- [Competence in Sequences Diagnostic](#).
- [Review results](#) to focus on trouble spots.

## **Final Steps**

You have covered all the material evaluated on the objective exam for the course.

### **Exam Preparation**

- Take the [Competence in Precalculus diagnostic](#). [Review results](#) to focus on trouble spots.
- Take the pre-assessment. The coaching report will show you which activities you ought to re-examine. Each line of the report matches with one of the activity titles in this course.
- Take the objective exam. If you do not pass, meet with your course instructor.