

1. Number and Operations Standard

1a. Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Expectations	<i>Precalculus with Trigonometry</i>
develop a deeper understanding of very large and very small numbers and of various representations of them;	Not typically covered in a precalculus course.
compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions;	Not typically covered in a precalculus course.
understand vectors and matrices as systems that have some of the properties of the real-number system;	Chapter 6: Triangle Trigonometry 6.6: Vector Addition 6.8: Chapter Review and Test Chapter 10: Three-Dimensional Vectors 10.1: Review of Two-Dimensional Vectors 10.2: Two-Dimensional Vector Practice 10.3: Vectors in Space 10.4: Scalar Products and Projections of Vectors 10.6: Vector Product of Two vectors 10.9: Chapter Review and Test Chapter 11: Matrix Transformations and Fractal Figures 11.2: Matrix Operations and Solutions of Linear Systems 11.7: Chapter Review and Test

1b. Understand meanings of operations and how they relate to one another

Expectations	<i>Precalculus with Trigonometry</i>
judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitude of quantities;	Not typically covered in a precalculus course.
develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices;	Chapter 6: Triangle Trigonometry 6.6: Vector Addition 6.8: Chapter Review and Test Chapter 10: Three-Dimensional Vectors 10.1: Review of Two-Dimensional Vectors 10.2: Two-Dimensional Vector Practice 10.3: Vectors in Space 10.4: Scalar Products and Projections of Vectors 10.6: Vector Product of Two vectors 10.9: Chapter Review and Test Chapter 11: Matrix Transformations and Fractal Figures 11.2: Matrix Operations and Solutions of Linear Systems 11.7: Chapter Review and Test
develop an understanding of permutations and combinations as counting techniques.	Chapter 9: Probability, and Functions of a Random Variable 9.3: Two Counting Principles 9.4: Probabilities of Various Permutations 9.5: Probabilities of Various Combinations 9.9: Chapter Review and Test

1c. Compare fluently and make reasonable estimates

Expectations	<i>Precalculus with Trigonometry</i>
develop fluency in operations with real numbers, vectors, and matrices using mental computation or paper-and-pencil calculations for simple cases and technology for more-complicated cases;	Chapter 6: Triangle Trigonometry All Sections Chapter 10: Three-Dimensional Vectors All Sections Chapter 11: Matrix Transformations and Fractal Figures All Sections
judge the reasonableness of numerical computation and their results.	All Sections of all Chapters

2. Algebra Standard

2a. Understand patterns, relations, and functions

Expectations	<i>Precalculus with Trigonometry</i>
<p>generalize patterns using explicitly defined and recursively defined functions;</p>	<p>Chapter 1: Functions and Mathematical Models 1.1: Functions: Algebraically, numerically, Graphically, and Verbally 1.2: Kinds of Functions 1.3: Dilation and Translation of Function Graphs 1.4: Composition Of Functions 1.6: Reflections, Absolute Values, and Other Transformations 1.8: Chapter Review and Test Chapter 7: Properties of Elementary Functions 7.1: Shapes of Function Graphs 7.2: Identifying Functions from Graphical Patterns 7.3: Identifying Functions from Numerical Patterns 7.7: Chapter Review and Test Chapter 14: Sequences and Series 14.1: Introduction to Sequences and Series 14.2: Arithmetic, Geometric, and Other Sequences 14.4: Chapter Review and Test</p>
<p>understand relations and functions and select, convert flexibly among, and use various representations of them;</p>	<p>Not typically covered in a precalculus course.</p>
<p>analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior;</p>	<p>Chapter 15: Polynomial and Rational Functions, Limits, and Derivatives 15.1: Review of Polynomial Functions 15.2: Graphs and Zeros of Polynomial Functions 15.4: Rational Functions: Discontinuities, Limits, and Partial Fractions 15.5: Instantaneous Rate of Change of a Function: The Derivative 15.6: Chapter Review and Test 15.7: Cumulative Review, Chapters 10-15</p>
<p>understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions;</p>	<p>Chapter 1: Functions and Mathematical Models 7.5: Dilation and Translation of Function Graphs 7.6: Composition of Functions 7.7: Inverse of Functions 7.8: Reflections, Absolute Values, and Other Transformations 1.8: Chapter Review and Test</p>

Expectations	<i>Precalculus with Trigonometry</i>
understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions;	Chapter 1: Functions and Mathematical Models 1.2: Kinds of Functions 1.8: Chapter Review and Test Chapter 3: Applications of Trigonometric and Circular Functions 3.1: Sinusoids: Amplitude, Period, and Cycles 3.2: General Sinusoidal Graphs 3.5: Circular Functions 3.8: Chapter Review and Test Chapter 7: Properties of Elementary Functions 7.1: Shapes of Function Graphs 7.5: Logarithmic Functions 7.7: Chapter Review and Test
interpret representations of functions of two variables.	Not typically covered in a precalculus course.

2b. Represent and analyze mathematical situations and structures using algebraic symbols

Expectations	<i>Precalculus with Trigonometry</i>
understand the equivalent forms of expressions, equations, inequalities, and relations;	<p>Chapter 4: Trigonometric Function Properties, Identities, and Parametric Functions</p> <p>4.2: Pythagorean, Reciprocal, and Quotient Properties</p> <p>4.3: Identities and Algebraic Transformation of Expressions</p> <p>4.5: Parametric Functions</p> <p>4.7: Chapter Review and Test</p> <p>Chapter 5: Properties of Combined Sinusoids</p> <p>5.1: Introduction to Combinations of Sinusoids</p> <p>5.2: Composite Argument and Linear Combination Properties</p> <p>5.3: Other Composite Argument Properties</p> <p>5.5: The Sum and Product Properties</p> <p>5.6: Double and Half Argument Properties</p> <p>5.7: Chapter Review and Test</p> <p>Chapter 7: Properties of Elementary Functions</p> <p>7.4: Logarithms: Definitions, Properties, and Equations</p> <p>7.7: Chapter Review and Test</p>
write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency-mentally or with paper and pencil in simple cases and using technology in all cases;	<p>Chapter 4: Trigonometric Function Properties, Identities, and Parametric Functions</p> <p>1.3: Identities and Algebraic Transformation of Expressions</p> <p>7.7: Arcsine, Arctangent, Arccosine, and Trigonometric Equations</p> <p>4.7: Chapter Review and Test</p> <p>Chapter 5: Properties of Combined Sinusoids</p> <p>5.2: Composite Argument and Linear Combination Properties</p> <p>5.3: Other Composite Argument Properties</p> <p>5.6: Double and Half Argument Properties</p> <p>5.7: Chapter Review and Test</p> <p>Chapter 7: Properties of Elementary Functions</p> <p>7.4: Logarithms: Definition, Properties, and Equations</p> <p>7.7: Chapter Review and Test</p> <p>Chapter 11: Matrix Transformations and Fractal Figures</p> <p>11.2: Matrix Operations and Solutions of Linear Systems</p> <p>11.7: Chapter Review and Test</p>
use symbolic algebra to represent and explain mathematical relationships;	<p>The mathematical relationships are represented and explained by using symbolic algebra throughout the book. Some examples follow.</p> <p>Chapter 1: Functions and Mathematical Models</p>

Expectations	<i>Precalculus with Trigonometry</i>
	<p>1.2: Kinds of Functions 1.3: Dilation and Translation of Function Graphs 1.4: Composition of Functions 7.7: Reflections, Absolute Values, and Other Transformation, Chapter 2: Periodic Functions and Right Triangle Problems 2.2: Measurement of Rotation 2.3: Sine and Cosine Functions 2.5: Inverse Trigonometric Functions Chapter 3: Applications of Trigonometric and Circular Functions 3.2: General Sinusoidal Graphs 3.3: Graphs of Tangent, Cotangent, Secant, and Cosecant Functions Chapter 4: Trigonometric Function Properties, Identities, and Parametric Functions 4.2: Pythagorean, Reciprocal, and Quotient Properties 4.3: Identities and Algebraic Translations of Expressions 4.4: Arcsine, Arctangent, Arccosine, and Trigonometric Equations 4.6: Inverse Trigonometric Relation Graphs.</p>
<p>use a variety of symbolic representations, including recursive and parametric equations, for functions and relations;</p>	<p>Throughout the text, functions and relations are represented in a variety of symbolic representations. Some examples follow. Chapter 4: Trigonometric Function Properties, Identities, and Parametric Functions 4.5: Parametric Functions. Chapter 7: Properties of Elementary Functions 7.2: Identifying Functions from Graphical Patterns 7.3: Identifying Functions from Numerical Patterns 7.5: Logarithmic Functions 7.6: Logistic Function for Restrained Growth Chapter 9: Probability, and Functions of a Random Variable 9.7: Functions of a Random Variable Chapter 10: 10.5: Planes in Space 10.8: Vector Equations of Lines in Space Chapter 12: Analytical Geometry of Conic Sections and Quadric Surfaces 12.2: Parametric and Cartesian Equations of the Conic Sections 12.5: Parametric and Cartesian Equations for Rotated Conics Chapter 13: Polar Coordinates, Complex Numbers, and Moving Objects 13.2: Polar Equations of Conics and Other Curves 13.4: Complex Numbers in Polar Form 13.5: Parametric Equations for Moving Objects. Chapter 14: Sequences and Series</p>

Expectations	<i>Precalculus with Trigonometry</i>
	14.2: Arithmetic, Geometric, and Other Sequences 14.3: Series and Partial Sums Chapter 15: Polynomial and Rational Functions, Limits, and Derivative 15.2: Graphs and Zeros of Polynomial Functions 15.3: Fitting Polynomial Functions to Data 15.4: Rational Functions: Discontinuities, Limits, and Partial Fractions 15.5: Instantaneous Rate of Change of a Function: The Derivative
judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.	Throughout the text, students are introduced to logical thinking and reasoning and applying this thinking to all mathematical concepts, symbolic manipulations they perform in solving problems, and to check for the reasonableness of the results obtained by paper and pencil calculations or the results obtained by technology. This methodology gives students the opportunity to be successful in mathematics.

2c. Use mathematical models to represent and understand quantitative relationships

Expectations	<i>Precalculus with Trigonometry</i>
<p>identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships;</p>	<p>Chapter 1: Functions and Mathematical Models 7.7: Functions: Algebraically, Numerically, Graphically, and Verbally 7.8: Kinds of Functions 7.9: Dilation and Translation of Function Graphs 7.10: Composition of Functions 7.11: Reflections, Absolute Values, and Other Transformations 1.8: Chapter Review and Test Chapter 2: Periodic Functions and Right Triangle Problems 2.1: Introduction to Periodic Functions 2.5: Inverse Trigonometric Functions and Triangle Problems 2.6: Chapter Review and Test Chapter 3: Applications of Trigonometric and Circular Functions 3.2: General Sinusoidal Graphs 3.5: Circular Functions 3.7: Sinusoidal Functions as Mathematical Models 3.8: Chapter Review and Test Chapter 5: Properties of Combined Sinusoids 5.4: Composition of Ordinates and Harmonic Analysis 5.7: Chapter Review and Test Chapter 7: Properties of Elementary Functions 7.2: Identifying Functions from Graphical Patterns 7.3: Identifying Functions from Numerical Patterns 7.4: Logarithmic Functions 7.7: Chapter Review and Test Chapter 11: Matrix Transformations and Fractal Figures 11.2: Matrix Operations and Solutions of Linear Systems 11.3: Rotation and Dilation Matrices 11.4: Translation with Rotation and Dilation Matrices 11.7: Chapter Review and Test Chapter 12: Analytical Geometry of Conic Sections and Quadric Surfaces 12.2: Parametric and Cartesian Equations of the Conic Sections 12.4: Analytical Geometry of the Conic Sections 12.7: Chapter Review and Test Chapter 13: Polar Coordinates, Complex Numbers, and Moving Objects 13.2: Polar Equations of Conic and Other Curves 13.4: Complex Numbers in Polar Form 13.6: Chapter Review and Test Chapter 15: Polynomial and Rational Functions, Limits, and Derivative</p>

Expectations	<i>Precalculus with Trigonometry</i>
	15.2: Graphs and Zeros of Polynomial Functions 15.3: Fitting Polynomial Functions to Data 15.4: Rational Functions: Discontinuities, Limits, and Partial Fractions 15.5: Instantaneous Rate of Change of a Function: The Derivative 15.6: Chapter Review and Test
use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts;	Chapter 11: Matrix Transformations and Fractal Figures 11.1: Introduction to Iterated Transformations 11.3: Rotation and Dilation Matrices 11.4: Translation with Rotation and Dilation 11.5: Strange Attractors for Several Iterated Transformations 11.7: Chapter Review and Test Chapter 14: Sequences and Series 14.2: Arithmetic, Geometric, and Other Sequences 14.4: Chapter Review and Test
draw reasonable conclusions about a situation being modeled.	Chapter 1: Functions and Mathematical Models 1.6: Functions: Algebraically, Numerically, Graphically, and Verbally 1.7: Chapter Review and Test Chapter 3: Applications of Trigonometric and Circular Functions 3.7: Sinusoidal Functions as Mathematical Models 3.8: Chapter Review and Test Chapter 7: Properties of Elementary Functions 7.6: Logistic Functions for Restrained Growth 7.7: Chapter Review and Test Chapter 8: Fitting Functions to Data 8.4: Residual Plots and Mathematical Models 8.5: Chapter Review and Test

2d. Analyze change in various contexts

Expectations	<i>Precalculus with Trigonometry</i>
approximate and interpret rates of change from graphical and numerical data.	Chapter 15: Polynomial and Rational Functions, Limits, and Derivative 15.5: Instantaneous Rate of Change of a Function: The Derivative 15.6: Review and Test

3. Geometry Standard

3a. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Expectations	<i>Precalculus with Trigonometry</i>
analyze properties and determine attributes of two- and three dimensional objects;	Not typically covered in a precalculus course.
explore relationships (including congruence and similarity) among classes of two- and three dimensional geometric objects, make and test conjectures about them, and solve problems involving them;	Not typically covered in a precalculus course.
establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others;	Not typically covered in a precalculus course.
use trigonometric relationships to determine lengths and angle measures.	Chapter 2: Periodic Functions and Right Triangle Problems 2.5: Inverse Trigonometric Functions and Triangle Problems 2.6: Chapter Review and Test Chapter 6: Triangle Trigonometry 6.1: Introduction to Oblique Triangles 6.2: Oblique Triangles: Law of Cosines 6.4: Oblique Triangles: Law of Sines 6.7: Real-World Triangle Problems 6.8: Chapter Review and Test 6.9: Cumulative Review, Chapters 1-6

3b. Specify locations and describe spatial relationships using coordinate geometry and other representational systems;

Expectations	<i>Precalculus with Trigonometry</i>
<p>use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations;</p>	<p>Chapter 1: Functions and Mathematical Models 1.1: Functions: Algebraically, Numerically, Graphically, and Verbally 1.2: Kinds of Functions 1.3: Dilation and Translation of Function Graphs 1.4: Composition of Functions 1.5: Reflections, Absolute Values, and Other Transformations 1.6: Chapter Review and Test</p> <p>Chapter 3: Applications of Trigonometric and Circular Functions 3.7: Sinusoidal Functions as Mathematical Models 3.8: Chapter Review and Test</p> <p>Chapter 4: Trigonometric Function Properties, Identities, and Parametric Functions 4.5: Parametric Functions 4.6: Chapter Review and Test</p> <p>Chapter 7: Properties of Elementary Functions 7.1: Shapes of Function Graphs 7.2: Identifying Functions from Graphical Patterns 7.3: Identifying Functions from Numerical Patterns 7.5: Logarithmic Functions 7.7: Chapter Review and Test</p> <p>Chapter 8: Fitting Functions to Data 8.1: Introduction to Regression for Linear Data 8.3: Regression for Nonlinear Data 8.5: Chapter Review and Test</p> <p>Chapter 10: Three-Dimensional Vectors 10.8: Vector Equations of Lines in Space 10.9: Chapter Review and Test</p> <p>Chapter 12: Analytical Geometry of Conic Sections and Quadric Surfaces 12.2: Parametric and Cartesian Equations of the Conic Sections 12.5: Parametric and Cartesian Equations for Rotated Conics 12.7: Chapter Review and Test</p> <p>Chapter 13: Polar Coordinates, Complex Numbers, and Moving Objects 13.2: Polar Equations of Conics and Other Curves 13.3: Intersections of Polar Curves 13.4: Complex Numbers in Polar Form 13.5: Parametric Equations for Moving Objects 13.6: Chapter Review and Test</p> <p>Chapter 15: Polynomial and Rational Functions, Limits, and Derivatives 15.2: Graphs and Zeros of Polynomial Functions 15.3: Fitting Polynomial Functions to Data</p>

Expectations	<i>Precalculus with Trigonometry</i>
	15.4: Rational Functions: Discontinuities, Limits, and Partial Fractions 15.5: Instantaneous Rate of Change of a Function: The Derivative 15.6: Chapter Review and Test 15.7: Cumulative review, Chapters 10-15
investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates.	Chapter 1: Functions and Mathematical Model 1.1: Kinds of Functions 1.2: Dilation and Translation of Function Graphs 1.3: Composition of Functions 1.6: Reflections, Absolute Values, and Other Transformations 1.1: Chapter Review and Test Chapter 7: Properties of Elementary Functions 7.1: Shapes of Function Graphs 7.2: Identifying Functions from Graphical Patterns 7.3: Identifying Functions from Numerical Patterns 7.5: Logarithmic Functions 7.7: Chapter Review and Test Chapter 8: Fitting Functions to Data 8.1: Introduction to Regression for Linear Data 8.3: Regression for Nonlinear Data 8.5: Chapter Review and Test Chapter 10: Three-Dimensional Vectors 10.8: Vector Equations of Lines in Space 10.9: Chapter Review and Test Chapter 12: Analytical Geometry of Conic Sections and Quadric Surfaces 12.2: Parametric and Cartesian Equations of the Conic Sections 12.5: Parametric and Cartesian Equations for Rotated Conics 12.7: Chapter Review and Test Chapter 15: Polynomial and Rational Functions, Limits, and Derivatives 15.2: Graphs and Zeros of Polynomial Functions 15.3: Fitting Polynomial Functions to Data 15.4: Rational Functions: Discontinuities, Limits, and Partial Fractions 15.5: Instantaneous Rate of Change of a Function: The Derivative 15.6: Chapter Review and Test 15.7: Cumulative review, Chapters 10-15

3c. Apply transformations and use symmetry to analyze mathematical situations

Expectations	<i>Precalculus with Trigonometry</i>
<p>understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices;</p>	<p>Chapter 1: Functions and Mathematical Models 1.3: Dilation and Translation of Function Graphs 1.1: Reflections, Absolute Values, and Other Transformations 1.6: Chapter Review and Test Chapter 11: Matrix Transformations and Fractal Figures 11.3: Rotation and Dilation Matrices 11.4: Translation with Rotation and Dilation Matrices 11.5: Strange Attractors for Several Iterated Transformations 11.6: Fractal Dimensions 11.7: Chapter Review and Test</p>
<p>use various representations to help understand the effects of simple transformations and their compositions.</p>	<p>Chapter 1: Functions and Mathematical Models 1.3: Dilation and Translation of Function Graphs 1.4: Composition of Functions 1.6: Reflections, Absolute Values, and Other Transformations 1.8: Chapter Review and Test Chapter 12: Analytical Geometry of Conic Sections and Quadric Surfaces 12.2: Parametric and Cartesian Equations of the Conic Sections 12.5: Parametric and Cartesian Equations for Rotated Conics 12.7: Chapter Review and Test</p>

3d. Use visualization, spatial reasoning, and geometric modeling to solve problems

Expectations	<i>Precalculus with Trigonometry</i>
draw and construct representations of two- and three-dimensional geometric objects using a variety of tools;	Not typically covered in a precalculus course.
visualize three-dimensional objects from different perspectives and analyze their cross sections;	Not typically covered in a precalculus course.
use vertex-edge graphs to model and solve problems;	Not typically covered in a precalculus course.
use geometric models to gain insight into, and answer questions in, other area of mathematics;	Not typically covered in a precalculus course.
use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture.	Not typically covered in a precalculus course.

4. Measurement Standard

4a. Understand measurable attributes of objects and the units, systems, and processes of measurement

Expectations	<i>Precalculus with Trigonometry</i>
make decisions about units and scales that are appropriate for problem situations involving measurement.	Chapter 2: Periodic Functions and Right Triangle 2.2: Measurement of Rotation 2.5: Inverse Trigonometric Functions and Triangle Problems 2.6: Chapter Review and Test Chapter 3: Application of Trigonometric and Circular Functions 3.4: Radian Measure of Angles 3.8: Chapter Review and Test Chapter 6: Triangle Trigonometry 6.2: Oblique Triangles: Law of Cosines 6.3: Area of Triangles 6.4: Oblique Triangle: Law of Sines 6.7: Real-World Triangle Problems 6.8: Chapter Review and Test Chapter 11: Matrix Transformations and Fractal Figures 11.6: Fractal Dimensions 11.7: Chapter Review and Test

4b. Apply appropriate techniques, tools, and formulas to determine measurements

Expectations	<i>Precalculus with Trigonometry</i>
analyze precision, accuracy, and approximate error in measurement situations;	Not typically covered in a precalculus course.
understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders;	Chapter 6: Triangle Trigonometry 6.3: Area of a Triangle 6.7: Real-World Triangle Problems 6.8: Chapter Review and Test Chapter 10: Three-Dimensional Vectors 10.6: Vector Product of Two Vectors 10.9: Chapter Review and Test
apply informal concepts of successive approximation, upper and lower bounds, and limit in measurement situations;	Not typically covered in a precalculus course.

Expectations	<i>Precalculus with Trigonometry</i>
use unit analysis to check measurement computations.	Chapter 3: Applications of Trigonometric and Circular Functions 3.4: Radian Measure of Angles 3.8: Chapter Review and Test

5. Data Analysis and Probability Standard

5a. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

Expectations	<i>Precalculus with Trigonometry</i>
understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each;	Not typically covered in a precalculus course.
know the characteristics of well-designed studies, including the role of randomization in surveys and experiments;	Not typically covered in a precalculus course.
understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable;	Not typically covered in a precalculus course.
understand histograms, parallel box plots, and scatterplots and use them to display data;	Not typically covered in a precalculus course.
compute basic statistics and understand the distinction between a statistic and a parameter.	Not typically covered in a precalculus course.

5b. Select and use appropriate statistical methods to analyze data

Expectations	<i>Precalculus with Trigonometry</i>
for univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics;	Not typically covered in a precalculus course.
for bivariate measurement data, be able to display scatterplot, describe the shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools;	Not typically covered in a precalculus course.
display and discuss bivariate data where at least one variable is categorical;	Not typically covered in a precalculus course.
recognize how linear transformations of univariate data affect shape, center, and spread;	Not typically covered in a precalculus course.
identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled.	Not typically covered in a precalculus course.

5c. Develop and evaluate inferences and predictions that are based on data

Expectations	<i>Precalculus with Trigonometry</i>
use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions;	Not typically covered in a precalculus course.
understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inferences;	Not typically covered in a precalculus course.
evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions;	Not typically covered in a precalculus course.
understand how basic statistical techniques are used to monitor process characteristics in the workplace.	Not typically covered in a precalculus course.

5d. Understand and apply basic concepts of probability

Expectations	<i>Precalculus with Trigonometry</i>
understand the concepts of sample spaces and distributions in simple cases;	Chapter 9: Probability, and Functions of Random Variable 9.1: Introduction to Probability 9.2: Words Associated with Probability 9.9: Chapter Review and Test 9.10: Cumulative Review, Chapters 7-9
use simulations to construct empirical probability distributions;	Not typically covered in a precalculus course.
compute and interpret the expected value of random variables in simple cases;	Chapter 9: Probability, and Functions of Random Variable 9.7: Functions of a Random Variable 9.8: Mathematical Expectation 9.9: Chapter review and Test 9.10: Cumulative Review, Chapters 7-9
understand the concepts of conditional probability and independent events;	Chapter 9: Probability, and Functions of Random Variable 9.3: Two Counting Principles 9.4: Probabilities of Various Permutations 9.5: Probabilities of Various Combinations 9.9: Chapter Review and Test
understand how to compute the probability of a compound event.	Chapter 9: Probability, and Functions of Random Variable 9.6: Properties of Probability 9.9: Chapter Review and Test

6. Problem Solving Standard

Expectations	<i>Precalculus with Trigonometry</i>
Build new mathematical knowledge through problem solving	In each chapter, students build new mathematical knowledge through problem solving, applications and modeling. Each new section in a chapter is depended on the knowledge and skills acquired in the previous section or sections. For example, the concepts learned in chapter 1 are needed in chapter 2, and the concepts of chapter 2 are needed in chapter 3 and so on.
Solve problems that arise in mathematical and in other contexts	Each chapter has many applications to real-world problems. These applications to real-world problems have connections to mathematics and other subjects, such as history, biology, physics or finances. The Concept Problems at the end of each chapter gives students a chance to apply their knowledge to new and challenging situations. For instance, (chapter 7, section 7.6) students find the best-fitting logistic function from a set of data on restrained population growth and then use the function to predict the population at various times and the times to reach various populations.
Apply and adapt a variety of appropriate strategies to solve problems	The text contains problems based on real-world situations throughout the text. Students use a variety of strategies to solve these problems and exercises. Students use algebra skills to solve problems utilizing geometric concepts throughout the text. Similarly, geometry ideas are used to algebra problems. Calculators are used throughout the text to develop and explore concepts as well as to solve problems. There are problem solving situations, where computer access is desirable for Dynamic geometry work with The Geometer's Sketchpad and for data handling with Fathom.
Monitor and reflect on the process of mathematical problem solving	Starting very early in the book, students are expected to keep a Precalculus Journal. Students write in their journal, after they have seen the topic in class and in homework assignments. The student journals are expected to contain students' understanding of the math concepts they have learned, their reflection on the process of mathematical thinking and problem solving strategies.

7. Reasoning and Proof Standard

Expectations	<i>Precalculus with Trigonometry</i>
Recognize reasoning and proof as fundamental aspects of mathematics	Throughout the text, students use inductive and deductive reasoning in learning new concepts and problem solving. One concept emphasized is that mathematics can be learned four ways: algebraically, graphically, numerically, and verbally. In presenting the material, students are expected to learn by doing, not by watching others. For example, in Chapter 2, “they are asked to transform an expression to another form, and sometimes they are asked to prove that a given equation is an identity. Students reinforce the proof style they learned in geometry, starting with “Proof”, to show where statement of the identity ends and proving begins and ending with a statement of what they have proved, including the abbreviation “Q.E.D”. “. The theorems (properties as these are called in the book), are used to solve problems and subsequently used to prove new properties. Another technique the book employs is, where ever possible, first to let the student discover a property by measurement on an accurately drawn graphs and then proven by algebraic method. See an example of this approach in Chapter 6: Triangle Trigonometry, the derivation of the law of cosines.
Develop and evaluate mathematical arguments and proofs	Students are introduced to the idea proof quite early in the text. Chapter 4: Trigonometric Functions Properties, and Parametric Function 4.3: Identities and Algebraic Transformation of Expressions. (Proving Identities) Appendix A: Kinds of Numbers, Axioms, and Other Properties. Properties of real numbers that can be proved from Axioms. Appendix B: Mathematical Induction
Select and use various types of reasoning and methods of proof	It is inherent throughout the text, students use inductive and deductive reasoning in learning new concepts and in solving problems. A major emphasis from the very beginning is that mathematics can be learned four ways: algebraically, graphically, numerically, and verbally. Students are expected to learn by doing, not by watching others. For example, in Chapter 2, they are asked to transform an expression to another form They are also asked to prove that a given equation is an identity. Students reinforce the proof style they learned in geometry, to show where statement of the identity ends and proving begins. The theorems are referred to as properties. These properties are used to solve problems and subsequently to prove new properties. Another technique the book employs is, where ever possible, first to let the student discover a property by measurement on an accurately drawn

Expectations	<i>Precalculus with Trigonometry</i>
	graphs and then prove by algebraic method. See an example of this approach in Chapter 6.

8. Communication Standard

Expectations	<i>Precalculus with Trigonometry</i>
Organize and consolidate their mathematical thinking through communication	From the beginning students are advised that they will gain mathematical knowledge in four ways: Graphically, Algebraically, Numerically, and Verbally. The students acquire mathematical concepts by practicing problem solving, applications and modeling. Students use language to communicate their thinking and reasoning, discuss their findings in one of more of the four ways mentioned. Starting in Chapter 1: 1.7 Precalculus, students start writing a journal. The students record in their journal what they have learned about precalculus mathematics and questions they have concerning concepts about which they are not quite clear. This practice of journal writing is continued in subsequent chapters.
Communicate their mathematical thinking coherently and clearly to peers, teachers, and others	The problem solving, investigations and explorations throughout the book give students the opportunity for class discussions and to communicate their understanding of relationships of math concepts to peers and teachers. Students start writing, Chapter 1: 1.7 Precalculus journal. They record in their journal what they have learned about precalculus mathematics and questions they have concerning concepts about which they are not quite clear. The journal writing is a very good way for students to communicate with their peer and teachers.
Analyze and evaluate the mathematical thinking and strategies of others	The class discussions, doing investigations and explorations in small groups, give students many opportunities to analyze and evaluate the mathematical thinking and strategies of others.
Use the language of mathematics to express mathematical ideas precisely	Students use the language of mathematics constantly to express mathematical ideas when they write solutions to problems, investigations and explorations, and proofs. Many of these activities require students to justify their results or proofs by using the language of mathematics.

9. Connections Standard

Expectations	<i>Precalculus with Trigonometry</i>
Recognize and use connections among mathematical ideas	This is a Precalculus book in which Algebra and Geometry are integrated throughout the text. For example, algebraic and geometry concepts of functions in chapter 1 are used in developing trigonometry in chapters 2-7. Algebraic and geometric ideas are used in chapters 8-15.
Understand how mathematical ideas interconnect and build on one another to produce a coherent whole	This is discussed in the Connection Standard: Recognize and use connections among mathematical ideas. See above. Also, many exercises in the text demonstrate that mathematical ideas are interconnected.
Recognize and apply mathematics in contexts outside of mathematics	This book is full of problems that apply mathematics in contexts outside of mathematics. A few examples follow: Airplane Engine Problems (p 385,390), Airplane Payload Problem (p 633), AM/FM Radio Project (p 205), Bacterial Culture Problem (p 26), Bank Interest Problem (p 336), Baseball Game Problem (p 400), Batting Average Problem (p 396), Braking Distance Problem (p 34), Carbon Dating Problem (p 304), Colorblindness Problem (p389), Comet Path Problem (p 528), Cost of Owning a Car Problem (p 34), Diving Board Problem (p 653), Earthquake Problems (p 45, 305), Ebola Outbreak Epidemic Problem (p 312), Football Plays Problem (p 385), Forensic Bullet Path Problem (p 449), Gear Tooth Problem (p 581), Geometric Series Mortgage Problem (p 606), Halley's Comet Problem (p 537), Indy 500 Problem (p406), Koch's Snowflake Problem (p 482), Loan Problem (p 614), Mars Orbit Problem (p 527), Medication Problem (p614), Mortgage Payment Problem (p 6, 596).

10. Representations Standard

Expectations	<i>Precalculus with Trigonometry</i>
Create and use representations to organize, record, and communicate mathematical ideas	Students investigate and explore mathematical relationships using concrete representations. They have the opportunity to learn mathematics four ways—algebraically, numerically, graphically, and verbally. The use of calculator allows students to do numerical calculations that would be very time consuming to do with just paper and pencil.
Select, apply, and translate among mathematical representations to solve problems	This has been discussed previously in the following standards: Problem Solving Standard, Reasoning and Proof Standard, Communication Standard, and Connections Standard.
Use representations to model and interpret physical, social, and mathematical phenomena	Students have learned many strategies in solving problems. They have many opportunities to apply these strategies to solve a wide variety of problems that model real-world situations. Many examples of this standard are given above in the Communication Standard—Recognize and apply mathematics in contexts outside of mathematics.