Year	Development	Grade	Overview
2003	Peak Performance	Grades 9-12, Algebra II, Trigonometry, Pre-Calculus	Students will construct trigonometric models of the three biorhythmic cycles. Students will predict when the three cycles and the combinations will simultaneously peak. Students will use their models to verify or refute these predictions.
2001	Gravel Roads and Sinusoidal Patterns	Grades 11-12, Trigonometry, Pre-Calculus	The student will construct and analyze sinusoidal (trigonometric) functions from given tables of gravel road erosions data, and use the graphing capabilities of the TI-83 calculator to compare best fit model to the data. Students will encounter real-world data that can be modeled closely with a sinusoidal graph even though the regression capabilities of a graphing calculator will not produce the most accurate model.
2000	Making Waves	Grades 11-12, Trigonometry, Pre-Calculus	The students will construct and analyze equations of trigonometric functions from given tables of temperature data, observe patterns, and use regression analysis on the TI-83 calculator. They will explore phase shifts and changes in amplitude by analyzing the graphs of the normal daily maximum temperature average of U.S. cities from 1961-1990. Through the assessment they will make predictions using the regression equation.
1997	Hold That Note	Grades 9-12, Algebra 1, Algebra 2, Trigonometry, Physical Science, Physics	A vibrating tuning fork disturbs air molecules and creates compressions (regions of higher than normal pressure) and rarefactions (regions of lower than normal pressure). These pressure variations can be digitized with a microphone, transferred to a calculator, and displayed on its screen as a sinusoidal curve. The addition of two or more of these sinusoidal curves is referred to as superposition. The concept of superposition is tied to the amplification of sound. This activity is designed to study the properties of a sinusoidal curve created by superposition.
1997	Forecast -- Trig Waves	Grades 10-12, Trigonometry, Pre-Calculus	Students use the Internet to access average high/low temperatures for various cities. Students enter the monthly temperature data into a TI-82 or TI-83 calculator and produce a statistical plot of the data. They see that the best fit for the data is a cosine graph. Students determine the particular cosine equation that best fits the statistical data. Reversing the process, students interpret cosine graphs and match them to cities.
1996	Just a Matter of Time	Grades 10-12, Trigonometry, Pre-Calculus, Calculus	Students will perform an experiment to investigate how varying lengths of a pendulum transform a sinusoidal curve. They will also investigate the relationship between algebraic models, graphical representations, and physical phenomena.

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1996	Milling Mathematics Metal	Grades 9-12, Trigonometry, Pre-Calculus, Algebra II	This lesson will demonstrate a current technical trade application (computer numerical control and using machine shop formulas). Students will use the coordinate plane and trigonometric functions to mill a piece of metal. They will find the distance between points using trigonometry, reproduce an xy table, and use TI-82 graphing calculators and the CBL to sketch a similar form.
1996	Running Around in Circles...	Grades 9-12	This lesson introduces students to trigonometry on the circle. Using the Geometer's Sketchpad, students will be introduced to trigonometric functions and the connection to the geometry on the circle.
1996	Stringing Along with Radians	Grades 9-12	This activity is designed to reinforce student knowledge of the properties of the circle and to introduce them to the concept of radian measure and its connection to the study of trigonometry. The lesson is divided into four parts. The first part is a hands-on activity using string, chalk, and protractor. The second part of the activity is a follow-up using graphics technology to model the initial activity and introduce the term radian. The third part contains practice problems which involve discovery and hypothesis of ways to convert degree measures into radians and radian measures into degrees. The fourth part allows students to explore applications involving radian measures.
1995	Analysis of the Tidal Wave	Grades 9-12	The application of physics principles to the real world is made clear when the subject is an exciting experience for the students. In this lesson, conservation of energy and circular motion formulas are used to quantify the experience of riding a roller coaster. The ideas contained here are intended to be used in a culminating experience involving a field trip to the amusement park, but they can also be used with “canned” data supplied by the teacher. The analysis here is for the “Tidal Wave” coaster at Trimper’s Amusements in Ocean City, MD, but it can be modified easily for other rides in other parks.
1995	Applying Vectors Solutions to Navigation	Grades 11-12, Trigonometry	This lesson involves use of polar charts to draw vectors to solve a wing triangle and other resultants.
1995	Bungee Barbie	Grades 11-12, Trigonometry, Pre-Calculus, Physics	Students will perform an experiment involving harmonic motion. They will then investigate the interrelationships among the physical phenomenon, the graphic model, and the symbolic representation.

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1995	Forces on an Inclined Plane	Grades 10-12, Trigonometry, Functions, Physics	When an object is on an inclined plane, the force of gravity on the object is broken up into two component forces. One component force is perpendicular to the inclined plane and the other is parallel to it. In this activity, students will measure the parallel force at various angles of elevation and study the relationship that exists between the size of the parallel force and the angle of elevation.
1995	Generating the Sine Curve in the First Quadrant Using the CBL	Grades 10 - 11, Trigonometry	The sine function is a continuous curve defined for all values of its domain. The coordinates of all points on the curve y = sin θ are of the form (θ, y). These points can be found on the circumference of a unit circle in the (x, y) plane where θ is in radian measure and y is the ycoordinate of the point. The students will select values for θ and determine the corresponding y values through a distance relation.
1995	Good Days, Bad Days	Grades 11-12, Trigonometry, Pre-Calculus	Biorhythm theory asserts that we all have cyclic inner rhythms which begin at birth. These rhythms follow a sinusoidal pattern and we can determine “good” and “bad” days for certain activities by examining high and low points on a sine curve. Using trigonometric functions, each student will determine his/her own set of biorhythms.
1995	Heart Rates as a Sinusoidal Curve	Grades 11-12, Trigonometry, Pre-calculus	Sinusoidal functions can be used to represent repetitive behavior. In this lesson, students will record their heartbeats using a CBL and a heart monitor; based on this data, the students will plot these values using the TI-82. They will then estimate a “best fit” cosine curve. This equation can be matched with a TI-82 generated equation.
1995	Tweaking a Trigonometric Function: An Exploratory Lesson	Grades 11-12, Trigonometry, Trig-Analysis, Fucntions, Pre-Calculus	This lesson will demonstrate the various translations of y=AsinB(x+C)+D and y=AcosB(x+C)+D based upon changes in A, B, C, and D. The graphing calculator’s overlay graphs make it easy for students to detect, understand, and predict translations in periodic curves.