

EASTERN LEBANON COUNTY SCHOOL DISTRICT
STUDENT LEARNING MAP

Revised 1/17/14

Course/Subject: Precalculus
Unit 1: Prerequisites

Days: 15 – 20 days
Grade Level: 11

Key Learning

There are several concepts that are required in the study of algebra. From simplifying expressions to solving equations to graphing and interpreting data, all are necessary in the application of algebra to experiences and problems we face everyday in as well as outside the classroom.



Unit Essential Question



How are the concepts of algebra used to interpret and solve problems we face in our everyday lives?

Concept Real Numbers	Concept Exponents & Radicals	Concept Polynomials & Factoring
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question How are the properties of equality and the properties of the operations used in simplifying expressions and solving equations?	Lesson Essential Question How are the rules for simplifying exponential expressions and radical expressions related?	Lesson Essential Question How do you identify which factoring rule to use when trying to factor polynomials?
↓	↓	↓
Vocabulary Rational Irrational Real, Inequality Absolute value Infinity Trichotomy axiom Variable Coefficient, Constant Evaluate Term Expression Inclusive Factor, Divisor Prime, Composite Fundamental Theorem of Arithmetic	Vocabulary Exponential form Exponent Base Power Scientific notation Square root Cube root Principal root Radical symbol Index Radicand Perfect square Perfect cube Rationalizing Like radicals	Vocabulary Polynomial Degree Monomial Binomial Trinomial Standard form Sum Difference Product Quotient Irreducible over the Integers Factoring

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Concept Fractional Expressions	Concept Solving Equations	Concept Solving Inequalities
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question How is factoring polynomials used in simplifying rational expressions and complex fractions?	Lesson Essential Question How do you identify various equations so that you may use specific methods to solve them?	Lesson Essential Question What are the critical differences between solving inequalities and solving equations?
↓	↓	↓
Vocabulary Domain Equivalent Rational expression Compound Complex fractions	Vocabulary Solve Solution Identity Conditional equation Equivalent Extraneous Quadratic equation Square root principle Completing the square Quadratic formula	Vocabulary Satisfy Solution set Linear inequality Double inequality Critical numbers Test intervals

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Concept Graphical Representation of Data		
Standards:		
		
Lesson Essential Question How are graphical representations of data used to solve real world problems?		
		
<p style="text-align: center;">Vocabulary</p> <ul style="list-style-type: none"> Rectangular coordinate system Cartesian plane Origin Quadrants x-axis y-axis Ordered pair x-coordinate y-coordinate Distance formula Midpoint 		

Additional Information/Resources:

Precalculus Fourth Edition, Larson & Hostetter Copyright 1997

EASTERN LEBANON COUNTY SCHOOL DISTRICT
STUDENT LEARNING MAP

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Course/Subject: Precalculus
Unit 2: Functions & Their Graphs

Days: 15 – 20 days
Grade Level: 11

Key Learning

Data can be used to construct graphs that can be modeled by various equations so that future predictions and decisions can be made based on this data. Understanding the behavior and the general forms of the graphs of these equations is essential.



Unit Essential Question

How can the relationship between two variables be represented?

<u>Concept</u> Graphs & Graphing Utilities	<u>Concept</u> Lines in the Plane & Slope	<u>Concept</u> Functions
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
↓	↓	↓
<u>Lesson Essential Question</u> How can you use the concepts of symmetry to graph various equations and then use those graphs to solve problems?	<u>Lesson Essential Question</u> How are linear equations developed from given information and then used to solve problems?	<u>Lesson Essential Question</u> What is the importance of equations being functions and how do the domain and range of a function relate?
↓	↓	↓
<u>Vocabulary</u> Equation Solution Parabola Intercepts Symmetry Radius Center	<u>Vocabulary</u> Linear equation Slope-intercept form Ratio Rate of change Fixed cost Marginal cost Slope Point-slope form Parallel Perpendicular Linear interpolation Linear extrapolation	<u>Vocabulary</u> Function Domain Range Independent variable Dependent variable Function notation Value Implied domain

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Concept Analyzing Graphs of Functions	Concept Translations & Combinations	Concept Inverse Functions
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question How does describing the nature of graphs of functions explain situations in real life?	Lesson Essential Question How do numerical operations performed on functions affect the shape and movement of their graphs?	Lesson Essential Question How does the inverse function relate to the original function and what does it show?
↓	↓	↓
Vocabulary Vertical line test Increasing Decreasing Constant Greatest integer function Step function Even function Odd function	Vocabulary Vertical shift Horizontal shift Reflection Rigid transformation Nonrigid transformation Vertical stretch Vertical shrink Sum Difference Product Quotient Composition	Vocabulary Inverse function Horizontal line test



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Concept Mathematical Modeling		
Standards:		
↓		
Lesson Essential Question How is mathematical modeling used to answer question about future problems given current data?		
↓		
Vocabulary Direct variation Inverse variation Joint variation Constant of variation Proportional Sum of square differences Least squares regression line		

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Course/Subject: Precalculus
Unit 3: Polynomial & Rational
Functions

Days: 15 – 20 days
Grade Level: 11

Key Learning

Polynomial and Rational Functions can be formed from given data in various areas of science and economics as well as other real world situations. Understanding how these are formed and the information we can obtain from these functions can help us to better interpret the data and make decisions based on that data.



Unit Essential Question

How is information obtained regarding polynomial and rational functions and how does this information relate to their graphs?

<u>Concept</u> Quadratic Functions	<u>Concept</u> Polynomial Functions of Higher Degree	<u>Concept</u> Polynomial & Synthetic Division
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
↓	↓	↓
<u>Lesson Essential Question</u> How do you identify the critical elements of a quadratic function and how do they relate to its graph?	<u>Lesson Essential Question</u> How do you identify the critical elements of a polynomial function and how do they relate to the behavior of its graph?	<u>Lesson Essential Question</u> How is long division or synthetic division used in obtaining information about a polynomial function?
↓	↓	↓
<u>Vocabulary</u> Constant function Linear function Quadratic function Parabola Axis of symmetry Vertex Standard form	<u>Vocabulary</u> Continuous Leading coefficient test Zeros Repeated zero Intermediate value theorem	<u>Vocabulary</u> Long division Division algorithm Synthetic division Remainder theorem Factor theorem

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Concept Real Zeros of Polynomial Functions	Concept Complex Numbers	Concept The Fundamental Theorem of Algebra
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question How is Descartes' Rule of Signs and the Rational Zero Test used in obtaining information related to a polynomial function?	Lesson Essential Question What is a complex number and how does it relate to the roots of a polynomial?	Lesson Essential Question How does the degree of a polynomial function relate to its zeros – real or imaginary?
↓	↓	↓
Vocabulary Descartes' Rule of Signs Upper bound Lower bound	Vocabulary Imaginary number Complex number Complex conjugates	Vocabulary Fundamental Theorem of Algebra Conjugates Irreducible over the reals

Concept Rational Functions		
Standards:		
↓	↓	↓
Lesson Essential Question How do you find the critical elements of a rational function and use them to sketch its graph?		
↓	↓	↓
Vocabulary Vertical asymptote Horizontal asymptote Slant asymptote		

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Course/Subject: Precalculus
Unit 4: Exponential & Logarithmic
Functions

Days: 10 – 15 days
Grade Level: 11

Key Learning

Data is constantly being collected in the real world to analyze and solve problems. Sometimes this data best fits an exponential or logarithmic model. Understanding how these models are developed and manipulated algebraically gives us a mathematical process for analyzing and solving these problems.









Unit Essential Question

How are exponential and logarithmic functions developed from real world data and then used to solve problems?

<u>Concept</u> Exponential Functions & Their Graphs	<u>Concept</u> Logarithmic Functions & Their Graphs	<u>Concept</u> Properties of Logarithms
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
↓	↓	↓
<u>Lesson Essential Question</u> How do you identify the properties of exponential functions?	<u>Lesson Essential Question</u> How do you sketch graphs of exponential & logarithmic functions?	<u>Lesson Essential Question</u> How do you identify the properties of logarithmic functions?
↓	↓	↓
<u>Vocabulary</u> Algebraic function Exponential function Natural base Natural exponential funct. Continuous compounding	<u>Vocabulary</u> Logarithmic function Common logarithmic funct. Natural logarithmic funct.	<u>Vocabulary</u> Change-of-Base Formula

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<u>Concept</u> Exponential & Logarithmic Equations	<u>Concept</u> Exponential & Logarithmic Models	<u>Concept</u>
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
		
<u>Lesson Essential Question</u> How do you solve exponential & logarithmic equations?	<u>Lesson Essential Question</u> How do you apply exponential & logarithmic functions in real world situations?	<u>Lesson Essential Question</u>
		
<u>Vocabulary</u> Inverse properties	<u>Vocabulary</u> Exponential growth Exponential decay Carbon dating Gaussian model Normally distributed Bell-shaped curve Logistics curve Sigmoidal curve	<u>Vocabulary</u>

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Course/Subject: Precalculus
Unit 5: Trigonometry

Days: 15 – 20 days
Grade Level: 11

Key Learning

Understanding the concepts and graphs of trigonometric functions is needed to use them to solve problems. Applying concepts, graphs, and applications of the family of trigonometric functions are used to solve problems in various places in our society.



Unit Essential Question

What are the trigonometric functions and how can they be applied to solve problems?

<u>Concept</u> Radian & Degree Measure	<u>Concept</u> The Unit Circle	<u>Concept</u> Right Triangle Trigonometry
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
↓	↓	↓
<u>Lesson Essential Question</u> How is the radian measure of an angle and the degree measure of an angle related?	<u>Lesson Essential Question</u> How is the unit circle developed and what is its significance?	<u>Lesson Essential Question</u> How do you solve a right triangle and how are they used to solve problems?
↓	↓	↓
<u>Vocabulary</u> Trigonometry Angle Initial side Terminal side Vertex Standard position Positive angles Negative angles Coterminal angles Central angle Radian Acute Obtuse Complementary Supplementary Angular speed	<u>Vocabulary</u> Unit circle Periodic Period	<u>Vocabulary</u> Hypotenuse Opposite side Adjacent side

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Concept Trigonometric Functions of Any Angle	Concept Graphs of Sine & Cosine Functions	Concept Graphs of Other Trigonometric Functions
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question What is a reference angle and how is it used to find the trigonometric function of any angle?	Lesson Essential Question How do you determine the critical elements of a sine or cosine curve and how are these elements used to graph these functions?	Lesson Essential Question How do you determine the critical elements of a tangent, cotangent, secant, or cosecant curve and how are these elements used to graph these functions?
↓	↓	↓
Vocabulary Reference angle	Vocabulary Sine curve Cosine curve Amplitude Reflection Period Phase shift Vertical translation Horizontal translation	Vocabulary Tangent curve Cotangent curve Secant curve Cosecant curve Reciprocal function

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Concept Inverse Trigonometric Functions	Concept Applications & Models	Concept
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question What does it mean when you are finding the inverse of a trigonometric function and how is it used to solve problems?	Lesson Essential Question How is right triangle trigonometry used to solve problems?	Lesson Essential Question
↓	↓	↓
Vocabulary Inverse sine function Inverse cosine function Inverse tangent function Arcsin Arcos Arctan	Vocabulary Angle of elevation Angle of depression Amplitude modulation Frequency modulation	Vocabulary

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Course/Subject: Precalculus
Unit 6: Analytic Trigonometry &
Additional Topics in Trigonometry

Days: 10 – 15 days
Grade Level: 11

Key Learning

Fundamental identities can be used to evaluate trig functions, simplify trig expressions, develop additional trig identities, and solve trig equations.



Unit Essential Question

How can trigonometric identities be used to evaluate trigonometric functions, simplify trigonometric expressions, and solve trigonometric equations?

<u>Concept</u> Using Fundamental Identities	<u>Concept</u> Verifying Trigonometric Identities	<u>Concept</u> Solving Trigonometric Equations
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
↓	↓	↓
<u>Lesson Essential Question</u> How are fundamental identities used to simplify trigonometric expressions?	<u>Lesson Essential Question</u> How do you verify trigonometric identities algebraically and confirm it graphically?	<u>Lesson Essential Question</u> How do you solve a trigonometric equation algebraically and what does it mean graphically?
↓	↓	↓
<u>Vocabulary</u> Reciprocal Identities Quotient Identities Pythagorean Identities Cofunction Identities Even/Odd Functions	<u>Vocabulary</u> Verifying	<u>Vocabulary</u>

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Concept Trigonometric Formulas	Concept Law of Sines	Concept Law of Cosines
Standards:	Standards:	Standards:
↓	↓	↓
Lesson Essential Question How are trigonometric formulas used in evaluating trigonometric functions?	Lesson Essential Question How is the Law of Sines used in solving oblique triangles?	Lesson Essential Question How is the Law of Cosines used in solving oblique triangles?
↓	↓	↓
Vocabulary Sum & Difference Formula Reduction Formula Multiple Angle Formulas Power Reducing Formulas Half Angle Formulas Product to Sum Formulas	Vocabulary Oblique triangles Ambiguous case	Vocabulary Heron's Formula

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