



## SOUTHERN LEHIGH SCHOOL DISTRICT

5775 Main Street  
Center Valley, PA 18034

### Scope and Sequence for **Precalculus**

#### Standards for Mathematical Practice:

**MP1** Make sense of problems and persevere in solving them.  
**MP2** Reason abstractly and quantitatively.  
**MP3** Construct viable arguments and critique the reasoning of others.  
**MP4** Model with mathematics.

**MP5** Use appropriate tools strategically.  
**MP6** Attend to precision.  
**MP7** Look for and make use of structure.  
**MP8** Look for and express regularity in repeated reasoning.

#### N.CN – Number and Quantity – The Complex Number System

##### CCSSM

##### **Perform arithmetic operations with complex numbers.**

**N.CN.3** (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

##### **Represent complex numbers and their operations on the complex plane.**

**N.CN.4** (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.

##### PA Core Standards for Mathematics

##### **CC.2.1.HS.F.2**

Apply properties of rational and irrational numbers to solve real world or mathematical problems.

##### **CC.2.1.HS.F.6**

Extend the knowledge of arithmetic operations and apply to complex numbers.

##### **CC.2.1.HS.F.7**

Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.

## N.VM – Number and Quantity – Vector & Matrix Quantities

CCSSM	PA Core Standards for Mathematics
<p><b>Perform operations on matrices and use matrices in applications</b></p> <p><b>N.VM.6</b> (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.</p> <p><b>N.VM.7</b> (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.</p> <p><b>N.VM.8</b> (+) Add, subtract, and multiply matrices of appropriate dimensions.</p> <p><b>N.VM.9</b> (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.</p> <p><b>N.VM.10</b> (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.</p> <p><b>N.VM.12</b> (+) Work with <math>2 \times 2</math> matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area.</p>	Intentionally left blank.

## A.REI – Algebra – Reasoning with Equations & Inequalities

CCSSM	PA Core Standards for Mathematics
<p><b>Solve systems of equations.</b></p> <p><b>A.REI.9</b> (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension <math>3 \times 3</math> or greater).</p>	Intentionally left blank.

## F.IF – Functions – Interpreting Functions

CCSSM	PA Core Standards for Mathematics
<p><b>Analyze functions using different representations.</b></p> <p><b>F.IF.7</b> Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p><b>d</b> (+) Graph rational functions, identify zeros and asymptotes when suitable factorizations are available, and showing end behavior.</p>	<p><b>CC.2.2.HS.D.6</b></p> <p>Extend the knowledge of rational functions to rewrite in equivalent forms.</p>

## F.BF – Functions – Building Functions

CCSSM	PA Core Standards for Mathematics
<p><b>Build a function that models a relationship between two quantities.</b></p> <p><b>F.BF.1</b> Write a function that describes a relationship between two quantities.</p> <p><b>c.</b> (+) Compose functions. <i>For example, if <math>T(y)</math> is the temperature in the atmosphere as a function of height, and <math>h(t)</math> is the height of a weather balloon as a function of time, then <math>T(h(t))</math> is the temperature at the location of the weather balloon as a function of time.</i></p>	<p><b>CC.2.2.HS.C.3</b></p> <p>Write functions or sequences that model relationships between two quantities.</p>
<p><b>Build a new functions from existing functions.</b></p> <p><b>F.BF.3</b> Identify the effect on the graph of replacing <math>f(x)</math> by <math>f(x) + k</math>, <math>k f(x)</math>, <math>f(kx)</math>, and <math>f(x + k)</math> for specific values of <math>k</math> (both positive and negative); find the value of <math>k</math> given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. <i>Include recognizing even and odd functions from their graphs and algebraic expressions for them.</i></p> <p><b>F.BF.4</b> Find inverse functions.</p> <p><b>b.</b> (+) Verify by composition that one function is the inverse of another.</p> <p><b>c.</b> (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.</p> <p><b>d.</b> (+) Produce an invertible function from a non-invertible function by restricting the domain.</p> <p><b>F.BF.4</b> (+) Produce an invertible function from a non-invertible function by restricting the domain.</p>	<p><b>CC.2.2.HS.C.4</b></p> <p>Write functions or sequences that model relationships between two quantities.</p>

## F.TF – Functions – Trigonometric Functions

CCSSM	PA Core Standards for Mathematics
<p><b>Extend the domain of trigonometric functions using the unit circle.</b></p> <p><b>F.TF.3</b> (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for <math>\pi/3</math>, <math>\pi/4</math> and <math>\pi/6</math>, and use the unit circle to express the values of sine, cosine, and tangent for <math>x</math>, <math>\pi + x</math>, and <math>2\pi - x</math> in terms of their values for <math>x</math>, where <math>x</math> is any real number.</p> <p><b>F.TF.4</b> (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.</p>	<p><b>CC.2.2.HS.C.7</b> Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.</p> <p><b>CC.2.2.HS.C.9</b> Prove the Pythagorean identity and use it to calculate trigonometric ratios.</p> <p><b>CC.2.3.HS.A.7</b> Apply trigonometric ratios to solve problems involving right triangles</p>
<p><b>Model periodic phenomena with trigonometric functions.</b></p> <p><b>F.TF.6</b> (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.</p> <p><b>F.TF.7</b> (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.</p>	<p><b>CC.2.2.HS.C.8</b> Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.</p>
<p><b>Prove and apply trigonometric identities.</b></p> <p><b>F.TF.9</b> (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.</p>	<p>Intentionally left blank.</p>

## G.GPE – Geometry – Expressing Geometric Properties with Equations

CCSSM	PA Core Standards for Mathematics
<p><b>Translate between the geometric description and the equation for a conic section.</b></p> <p><b>G.GPE.3</b> (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.</p>	<p><b>CC.2.3.HS.A.10</b> Translate between the geometric description and the equation for a conic section.</p>