9th Grade Algebra I Learning Targets

1. Create and solve equations.

a) I can solve one-step equations.
b) I can solve multi-step equations.
c) I can solve multi-step equations which involve combing like terms.
d) I can solve multi-step equations using the distributive property.
e) I can translate verbal expressions.
f) I can use equations to model and solve real world problem situations.
g) I can solve a formula for a specified variable.
h) I can solve absolute value equations.
i) I can evaluate expressions with and without grouping symbols.

2. Apply concepts related to functions.

a) I can label and identify parts of the coordinate plane (including quadrants).
b) I can identify the domain and range of a relation.
c) I can determine if a relation is a function.
d) I evaluate a function using functional notation. [e.g., f(x)]
e) I can write a function rule from a table.
f) I can sketch a graph to represent a verbal description.
g) I can use functions to model real world problem situations.
h) I can identify the appropriate domain for a given situation.

3. Create, graph, and interpret linear equations.

a) I can verify the graph of a line is the set of all its solutions plotted in the coordinate plane.
b) I can graph a line given a table of values.
c) I can identify linear equations.
d) I can identify key features of graphs and tables. (e.g., x-and y-intercepts, end behavior, increasing/decreasing, and slope).
e) I can find the x- and y-intercepts of a given equation.
f) I can graph a linear equation using the x- and y-intercepts.
g) I can graph a linear equation using slope-intercept form (including from standard form).
h) I can graph vertical and horizontal lines.
i) I can create a linear equation given a graph.
j) I can translate between different representations of relations. (e.g., graphs, equations, tables, verbal descriptions, and ordered pairs)
k) I can calculate and interpret the average rate of change when given two points.
l) I can determine the equation of a line in point-slope form given two points.
m) I can determine the equation of a line in slope-intercept form given two points.
n) I can determine the equation of a line in standard form given two points.
o) I can write the equation of horizontal and vertical lines.
p) I can solve a system of equations by graphing with and without technology.
q) I can solve a system of equations by substitution.
r) I can solve a system of equations by elimination.
s) I can represent and solve a real world situation with a system of equations.

4. Create, graph and interpret inequalities in one and two variables.

a) I can graph linear inequalities in one variable.
b) I can solve one-step linear inequalities in one variable.
c) I can solve multi-step linear inequalities in one variable.
d) I can create inequalities and use them to solve real world situations.
e) I can solve and graph compound inequalities in one variable.
f) I can graph a linear inequality in two variables (including from standard form).
g) I can create linear inequalities to solve real world situations.
h) I can represent constraints by inequalities and interpret solutions as appropriate and or
i) non-appropriate options.
j) I can graph systems of linear inequalities.
k) I can represent and solve real world situations with systems of equations.

5. Construct and compare linear and exponential models and solve problems.

a) I can identify and interpret parts of an exponential function (e.g. starting amount, growth or decay, rate of change).
b) I can create and solve real world situations with exponential functions.
c) I can interpret the key features of graphs and tables representing exponentials functions
d) (e.g., end behavior, increasing/decreasing, domain/range).
e) I can graph exponential functions.
f) I can distinguish between situations that can be modeled with linear functions and with exponential functions.
g) I can observe and compare the growth patterns of linear and exponential functions.
h) I can identify arithmetic sequences and patterns in a set of data.
i) I can identify geometric sequences and patterns in a set of data.

6. Apply arithmetic operations to polynomials and radicals.

a) I can classify polynomials by the number of terms and the degree.
b) I can interpret parts of an expression such as terms, factors, and coefficients.
c) I can multiply monomials.
d) I can divide monomials.
e) I can apply the properties of exponents (including zero and negative exponents) to evaluate and simplify expressions.
f) I can add and subtract polynomials.
g) I can multiply polynomials.
h) I can evaluate and simplify radicals.
i) I can add and subtract radicals.
j) I can multiply radicals with and without variables.
k) I can multiply radicals using the distributive property.
l) I can simplify a fraction by rationalizing the denominator, including an irrational monomial denominator.

7. Create, graph, and solve quadratic equations.

a) I can factor using the greatest common factor method.
b) I can factor using the grouping method.
c) I can factor trinomials in standard form.
d) I can factor using the difference of squares method.
e) I can factor perfect square trinomials.

f) I can solve quadratic equations in standard form by factoring.
g) I can solve quadratic equations not in standard form by factoring.
h) I can solve quadratic equations using the quadratic formula.
i) I can solve quadratic equations by taking the square roots.
j) I can solve quadratic equations by completing the square.
k) I can determine and apply the most appropriate method to use to solve a quadratic equation.
l) I can identify key features of quadratics graphs and tables. (e.g., x-and y-intercepts, end behavior, increasing/decreasing, relative max/min, domain/range and axis of symmetry).
m) I can find the x- and y-intercepts of a given quadratic equation.
n) I can graph a quadratic equation from standard form.
o) I can relate factors, solutions (roots), x-intercepts, and zeros of related quadratic functions.
p) I can determine a quadratic equation when given its graph or roots.
q) I can use quadratic functions to represent and solve real world problem situations.

8. Apply arithmetic operations to rational expressions.
a) I can evaluate and simplify rational expressions.
b) I can identify excluded values for the domain of rational expressions.
c) I can multiply rational expressions.
d) I can divide rational expressions.
e) I can add and subtract rational expressions with like denominators.
f) I can add and subtract rational expressions with unlike denominators.

9. Explore and analyze graphs of nonlinear equations.
a) I can graph a quadratic equation from vertex form.
b) I can complete the square in a quadratic expression to reveal the max or min.
c) I can graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
d) I can investigate transformations of linear, exponential, quadratic, and absolute value
e) functions (e.g. horizontal/vertical shifts and the width of the graph).
f) I can solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
g) I can interpret and rewrite expressions involving radicals and rational exponents using the properties of exponents.
h) I can define and explain basic properties of rational numbers (e.g. why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational).

10. Compare various methods of data recording to make inferences, predictions, and to estimate probabilities.
a) I can interpret data from line, bar, and circle graphs, histograms, scatterplots, box-and-whisker plots, stem-and-leaf plots, and frequency tables to draw inferences and make predictions.
b) I can represent data using dot plots, histograms, and box plots.
c) I can represent data on a scatterplot and interpret the line of best fit.
d) I can identify the most efficient way to display data.
e) I can identify the effect on mean, median, mode, and range when a set of data is changed.

f) I can analyze and interpret the shape of the data distribution to compare the center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
g) I can summarize, represent, and interpret data on two categorical variables.
h) I can find the probability of a simple event and compound events.
i) I can distinguish between dependent and independent events.

Algebra II with Trigonometry

1. Graph and analyze linear functions.

a) I can solve linear systems by using the following methods:
Ø Graphing
Ø Substitution
Ø Elimination
Ø Matrices
b) I can solve a system with three variables by substitution and elimination.
c) I can solve systems of linear inequalities.
d) I can solve real-world applications involving linear systems.
e) I can formulate the inverse of a function or a relation.
f) I can evaluate composition of functions.
g) I can determine the domain and range of linear functions.

2. Graph and analyze absolute value equations and inequalities.

a) I can solve absolute value equations and inequalities.
b) I can produce a graph of absolute value equations and inequalities.
c) I can evaluate composition of functions.

3. Graph and analyze quadratic functions.

a) I can produce a graph of quadratic functions.
b) I can solve quadratic equations by the following methods:
Ø Graphing
Ø Factoring
Ø Quadratic Formula
Ø Square Roots
c) I can perform order of operations using complex numbers.
d) I can formulate the inverse of a function.
e) I can evaluate composition of functions.
f) I can determine the domain and range of quadratic functions.
g) I can model real world situations that involve quadratic functions.

4. Graph and analyze polynomial functions.

a) I can add, subtract, multiply, and divide (using long and synthetic division).
b) I can identify a polynomial by its degree and predict its end behavior.
c) I can recall and relate the Quadratic Formula, Descartes Rule of Signs, and the Rational Root Theorem when graphing polynomial functions.

d) I can predict the approximate and exact roots of polynomial functions using Quadratic Formula, Descartes Rule of Signs, and the Rational Root Theorem.
e) I can recognize the appropriate method for solving quadratic functions and then apply the method.
Ø Factor
Ø Square roots
Ø Quadratic Formula
f) I can construct a polynomial equation given a graph or exact roots.
g) I can produce a graph of polynomial functions.

5. Graph and analyze radical functions.
a) I can produce a graph of radical functions.
b) I can solve radical equations.
c) I can formulate the inverse of a function.
d) I can evaluate composition of functions.
e) I can determine the domain and range of radical functions.

6. Graph and analyze exponential and logarithmic functions.
a) I can produce a graph of exponential and logarithmic functions.
b) I can solve equations using rational exponents.
c) I can evaluate logarithms.
d) I can solve exponential and logarithmic equations.
e) I can formulate the inverse of a function.
f) I can determine the domain and range of exponential and logarithmic functions.

7. Graph and analyze rational functions.
a) I can produce a graph of rational functions. This includes horizontal and vertical asymptotes, and holes.
b) I can solve rational equations.
c) I can perform the following operations with rational functions:
Ø Simplify
Ø Add / Subtract
Ø Multiply / Divide
d) I can formulate the inverse of a function.
e) I can evaluate composition of functions.
f) I can determine the domain and range of rational functions.

8. Graph and analyze trigonometric functions.
a) I can draw, understand, and apply the unit circle to all 6 trigonometric functions.
b) I can recognize and draw basic graphs of trigonometric functions.
c) I can recognize trigonometric identities, including reciprocal identities.
d) I can solve basic trigonometric equations.
e) I can solve general triangles using Law of Sines and Law of Cosines.

9. Graph basic conic sections.
a) I can generate an equation of a circle in standard form by completing the square.

b) I can recognize the equation of the basic conic sections: parabola, circle, ellipse, and hyperbola.
c) I can produce a graph of the following conic sections that originate at the origin:
Ø Parabolas
Ø Circles
Ø Ellipses
Ø Hyperbolas

10. Use different forms of representation to compare characteristics of data.
a) I can evaluate the appropriateness of the design of an experimental study.
b) I can describe how sample statistics reflect values of population parameters.

11. Formulate an equation of linear regression from a set of data.
a) I can examine data to determine if a linear, quadratic, or exponential relationship exists and to predict outcomes.

12. Calculate probabilities of events using the laws of probability.
a) I can use permutations and combinations to calculate probabilities.
b) I can calculate conditional probabilities.
c) I can calculate probabilities of mutually exclusive events, independent events, and dependent events.

** Special note: Each time students are asked to ANALYZE a family of functions, this includes identifying the function and graph, identifying the domain and range, identifying translations, finding the x and y-intercepts, and determining the maximum and minimum points.

Algebra II without Trigonometry Learning Targets
Patterns, Functions, and Algebra

1. Graph and analyze linear functions.
a) I can solve linear systems by using the following methods:
Ø Graphing
Ø Substitution
Ø Elimination
Ø Matrices
b) I can solve a system with three variables by substitution and elimination.
c) I can solve systems of linear inequalities.
d) I can solve real-world applications involving linear systems.
e) I can formulate the inverse of a function or a relation.
f) I can evaluate composition of functions.

2. Graph and analyze absolute value equations and inequalities.
a) I can solve absolute value equations and inequalities.
b) I can produce a graph of absolute value equations and inequalities.

c) I can evaluate composition of functions.

3. Graph and analyze quadratic functions.

a) I can produce a graph of quadratic functions.
b) I can solve quadratic equations by the following methods:
Ø Graphing
Ø Factoring
Ø Quadratic Formula
Ø Square Roots
c) I can perform order of operations using complex numbers.
d) I can formulate the inverse of a function.
e) I can evaluate composition of functions.

4. Graph and analyze polynomial functions.

a) I can add, subtract, multiply, and divide (using long and synthetic division).
b) I can identify a polynomial by its degree and predict its end behavior.
c) I can recall and relate the Quadratic Formula and the Rational Root Theorem when graphing polynomial functions.
d) I can predict the approximate and exact roots of polynomial functions using Quadratic Formula and the Rational Root Theorem.
e) I can recognize the appropriate method for solving quadratic functions and then apply the method.
Ø Factor
Ø Square roots
Ø Quadratic Formula
f) I can construct a polynomial equation given a graph or exact roots.
g) I can formulate the inverse of a function.
h) I can evaluate composition of functions.
i) I can produce a graph of polynomial functions.

5. Graph and analyze radical functions.

a) I can produce a graph of radical functions.
b) I can solve radical equations.
c) I can formulate the inverse of a function.
d) I can evaluate composition of functions.

6. Graph and analyze exponential and logarithmic functions.

a) I can produce a graph of exponential and logarithmic functions.
b) I can solve equations using rational exponents.
c) I can evaluate logarithms.
d) I can solve exponential and logarithmic equations.
e) I can formulate the inverse of a function.

7. Graph and analyze rational functions.

a) I can produce a graph of rational functions. This includes horizontal and vertical asymptotes, and holes.

b) I can solve rational equations.
c) I can perform the following operations with rational functions:
Ø Simplify
Ø Add / Subtract
Ø Multiply / Divide
d) I can formulate the inverse of a function.
e) I can evaluate composition of functions.
f) I can determine the domain and range of rational functions.

8. Graph basic conic sections.
a) I can generate an equation of a circle in standard form by completing the square.
b) I can recognize the equation of the basic conic sections: parabola, circle, ellipse, and hyperbola.
c) I can produce a graph of the following conic sections that originate at the origin:
Ø Parabolas
Ø Circles
Ø Ellipses
Ø Hyperbolas

9. Use different forms of representation to compare characteristics of data.
a) I can evaluate the appropriateness of the design of an experimental study.
b) I can describe how sample statistics reflect values of population parameters.
10. Formulate an equation of linear regression from a set of data.
a) I can examine data to determine if a linear, quadratic, or exponential relationship exists and to predict outcomes.
11. Calculate probabilities of events using the laws of probability.
a) I can use permutations and combinations to calculate probabilities.
b) I can calculate conditional probabilities.
c) I can calculate probabilities of mutually exclusive events, independent events, and dependent events.

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Algebraic Connections Learning Targets

1. Write linear equations and proportions to solve application word problems.
a) I can solve multi-step equations and inequalities. This includes combining like terms, using the distributive property, and solving double-sided equations.
b) I can set up proportions to solve direct and inverse variation problems.
c) I can translate word problems into equations and solve.

2. Graph and write equations of lines to represent a given set of conditions.

a) I can determine the slope of a line from its graph or from two given points.
b) I can graph lines from slope-intercept form and write equations of lines in slope-intercept form.
c) I can graph lines from point-slope form and write equations of lines in point-slope form.
d) I can write equations of parallel and perpendicular lines.
e) I can write and graph linear equations to solve application problems, including line of best fit.
f) I can represent a set of data by estimating the equation of a line of best fit from a table of values or a scatterplot.
g) I can make predictions based upon tables or graphs from societal contexts.

3. Solve application word problems by writing and solving systems of linear equations or inequalities.

a) I can solve a system of linear equations by graphing.
b) I can solve a system of linear equations by substitution or elimination.
c) I can write and solve systems of equations to model applications.
d) I can solve multi-step inequalities.
e) I can produce a graph of single inequalities and systems of inequalities.
f) I can determine maximum and minimum values using linear programming techniques.
g) I can solve linear programming application problems.

4. Factor binomials, trinomials, and other polynomials.

a) I can identify if there is a greatest common factor (GCF) in any polynomial.
b) I can factor the difference of two squares.
c) I can factor perfect square trinomials.
d) I can factor trinomials in the form.
e) I can factor trinomials in the form.
f) I can factor polynomials using the grouping method.
g) I can factor completely. (There may be multiple factoring opportunities in one problem.)

5. Solve and graph quadratic equations.

a) I can produce a graph of a quadratic equation and determine its domain and range.
b) I can determine the vertex, maximum and minimum point, x and y-intercepts using factoring or the quadratic formula.
c) I can use the extreme values of a given quadratic function to solve applied problems. (ex: maximizing profit)
d) I can approximate rates of change of nonlinear relationships from graphical and numerical data.

6. Apply properties of exponents and graph exponential equations.

a) I can apply properties of exponents, including negatives.
b) I can produce a graph of exponential equations.
c) I can write and use exponential functions to solve application problems, including exponential growth and decay.

7. Apply properties of square root expressions.

a) I can simplify square root expressions with variables.

b) I can multiply, divide, add and subtract square root expressions including rationalizing denominators.

8. Apply algebraic and graphing techniques to make financial and economic decisions.

a) I can calculate simple and compound interest to analyze and determine best options for investments and loans.

b) I can compare and contrast credit purchases such as credit card costs and mortgage loans.

9. Apply properties of right triangles to solve for sides and angles in application word problems.

a) I can calculate the values of the trigonometric ratios.

b) I can apply trig ratios to solve for missing sides and angles of right triangles.

c) I can apply the Pythagorean Theorem to solve for missing sides of right triangles.

10. Use ratios, geometric formulas, symmetry, and measurements to solve applied problems.

a) I can analyze the aesthetics of real-life situations using line symmetry, rotational symmetry, or the golden ratio.

b) I can use ratios of perimeters, areas, and volumes of similar figures to solve applied problems.

c) I can critique the appropriateness of measurements in terms of precision, accuracy, and approximate error.

11. Estimate probabilities.

a) I can estimate probabilities given a frequency distribution.

b) I can make decisions on the basis of given probabilities.

Analytical Mathematics

1. Solve and graph linear and quadratic equations.

a) I can solve, graph, and write linear equations in all forms.

b) I can solve, graph, and write linear inequalities.

c) I can solve, graph, and analyze absolute values equations and inequalities.

d) I can solve, graph, and analyze quadratic functions.

2. Use complex numbers in polynomial identities and equations.

a) I can find vertex, x-intercepts, y-intercepts and graph a quadratic function.

b) I can form a polynomial in standard form whose zeros and degree are given.

c) I can use the Fundamental Theorem of Algebra to find all real and complex roots of a polynomial functions and graph a polynomial in factored form.

d) I can write the partial fraction decomposition of a rational expression.

e) I can form a cubic function of best fit and use the function to predict new values.

3. Utilize financial formulas to understand economic procedures in the banking and consumer industry.

a) I can calculate simple and compound interest on given principal.
b) I can solve exponential equations to determine amounts of loan and interest.
c) I can determine the best source of investing based on presented factors.
d) I can compare and contrast offers dealing with borrowing and investing and make an informed decision regarding which is most cost efficient.

4. Extend the domain of trigonometric functions using the unit circle and apply trigonometry to general triangles.

a) I can approximate solutions of trigonometric equations using the Unit Circle, tables, or graphs.
b) I can use law of sines and law of cosines to solve triangles.
c) I can use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
d) I can discuss the topics: why we have complex numbers, how they were created, how are they used and how Euler's and deMoivre's formulas link complex numbers and trigonometry.
e) I can incorporate the use of trigonometry in the process of finding locations.

5. Represent and model with vector quantities.

a) I can use geometric vectors to construct sums and differences.
b) I can find a position vector given an initial point and a terminal point.
c) I can calculate quantities of vectors (including sum, difference, dot product, magnitude and the combination of any of the previous).
d) I can find the angle between two vectors.
e) I can calculate the cross product of two vectors.
f) I can solve problems involving velocity and other quantities that can be represented by vectors, including navigation.

6. Perform operations on matrices and use matrices in applications.

a) I can solve systems of linear equations using augmented matrices and reduced row echelon form.
b) I can utilize matrices to solve problems manually or with technological tools (graphing calculator).
c) I can perform matrix addition, subtraction, scalar multiplication, and matrix multiplication.
d) I can solve matrix applications problems such as input-output, code theory, and routing.
e) I can create a system of equations that represents a problem in my life that can be solved using matrices.

7. Apply linear programming procedures to solve application problems.

a) I can solve systems of linear and quadratic equations using various methods, including graphing, elimination, and substitution.
b) I can solve linear programming application problems by graphing and finding the maximum or minimum values.

c) I can create a comprehensive portfolio regarding my understanding of linear programming and its application in my world.

8. Use probability to evaluate outcomes of decisions.

a) I can calculate probability of an event given outcomes and sample space.
b) I can use diagrams (tree and Venn) to describe relationships on sets.
c) I can calculate probabilities using the addition rule.
d) I can calculate conditional probability using the multiplication rule.
e) I can calculate factorials, permutations, and combinations.

9. Apply logic to statements to determine equivalence.

a) I can use logic symbols to create truth tables.
b) I can show logical equivalence through truth tables.
c) I can produce the output signal of a digital logic circuit given the input.
d) I can find the Boolean expression that corresponds to a digital logic circuit.
e) I can produce an input/output table of a digital logic circuit.
f) I can create a game and game analysis with description of the probabilities and expected values.

10. Understand limits of functions.

a) I can calculate the limit of a function.
b) I can write the terms of a sequence and write the n^{th} term of a sequence from given terms.
c) I can find the sum of a sequence from k to n.
d) I can connect an event in history with the characteristics of a function and the function's limit.

Geometry Learning Targets

1. Apply theorems to solve problems involving segments and angles.

a) I can describe the undefined terms of points and lines.
b) I can define and identify line segments.
c) I can identify collinear and coplanar points.
d) I can describe and calculate the distance along a line using the Segment Addition Postulate.
e) I can describe and calculate the distance along a line using the Midpoint Theorem.
f) I can describe and calculate the distance along a line using the Segment Congruence Theorem.
g) I can prove vertical angles are congruent.
h) I can define and identify angles.
i) I can identify and solve problems involving adjacent, complementary, supplementary, and vertical angles.
j) I can apply the Angle Addition Postulate.
k) I can solve word problems involving angles.
l) I can solve problems involving angle bisectors.

m) I can define and identify parallel, skew, and intersecting lines.
n) I can define and identify alternate interior, alternate exterior, corresponding, and consecutive angles.
o) I can solve problems using alternate interior, alternate exterior, corresponding, and consecutive angles.
p) I can read and write different types and formats of proofs including two-column, flowchart, paragraph, and indirect proofs.
q) I can identify and write conditional and biconditional statements along with the converse, inverse, and contrapositive of a conditional statement and use these statements to form conclusions.
r) I can use inductive reasoning to make conjectures and deductive reasoning to arrive at valid conclusions.

2. Translate simple geometric theorems to the coordinate plane.

a) I can write, graph, and interpret linear equations.
b) I can distinguish between parallel and perpendicular lines by analyzing their slopes.
c) I can find the equation of a line parallel or perpendicular to a given line that passes through a given point.
d) I can apply the distance formula to solve problems.
e) I can apply the midpoint formula to solve problems.

3. Apply properties relating to triangles.

a) I can classify triangles by its sides and angles.
b) I can prove the measure of interior angles of a triangle sum to 180.
c) I can apply the Angle Sum Theorem to find interior and exterior angles of a triangles.
d) I can prove base angles of isosceles triangles are congruent.
e) I can solve mathematical and real-world problems using the Isosceles Triangle Theorem and its converse.
f) I can verify the Triangle Midsegment Theorem.
g) I can evaluate the sides of a triangle given a line parallel to the base.
h) I can determine that a line is parallel to a side of a triangle given that the endpoints of the line divide the intersecting side proportionally.
i) I can distinguish whether or not three segments create a triangle.
j) I can determine the order of triangles' sides and angles.
k) I can analyze the properties of angle bisectors and their incenter.
l) I can analyze the properties of medians and their centroid.
m) I can analyze the properties of altitudes and their orthocenter.
n) I can analyze the properties of perpendicular bisectors and their circumcenter.
o) I can justify the congruence of two triangles using rigid motions.
p) I can prove two triangles are congruent by verifying all six pairs of corresponding parts are congruent.
q) I can verify that two triangles are congruent using the angle-side-angle, side-angle-side, side-side-side, angle-angle-side, and hypotenuse-leg triangle congruence.
r) I can prove that two triangles are congruent using the angle-side-angle, side-angle-side, side-side-side, angle-angle-side, and hypotenuse-leg triangle congruence.
s) I can use the principle that corresponding parts of congruent triangles are congruent to solve problems.

t) I can read and write different type of formats of proofs including two-column, flowchart, paragraph, and indirect proofs.

4. Examine similarity relationships in geometric shapes.

a) I can define and identify similar figures.
b) I can recognize the symbol for similarity and write a similarity statement.
c) I can state the scale factor of two similar figures and use it to solve mathematical and real-world problems.
d) I can apply relationships between perimeters and areas of similar figures in terms of scale factor, to solve mathematical and real-world problems.
e) I can prove similarity of two figures from given information using proportions.
f) I can use the properties of similar figures to solve for sides and angles.
g) I can create figures using the coordinate plane and distinguish the relationship properties.
h) I can prove two triangles are similar using angle-angle, side-angle-side, and side-side-side similarity.

5. Experiment with transformations in the coordinate plane.

a) I can create, using physical representations, transformations in the plane (e.g. transparencies, patty paper, paper models, geometry software,).
b) I can specify a sequence of transformations that will carry a given figure onto another.
c) I can identify isometric transformations and non-isometric transformations.
d) I can create and identify rules of reflections, translations, dilations, and rotations.
e) I can reflect a figure across the x-axis, y-axis, and y=x line by graphing.
f) I can map transformations on the coordinate plane.
g) I can dilate a figure on the coordinate plane by graphing.
h) I can rotate an image 90^{o}, 180^{o}, and 270^{o} on the coordinate plane.
i) I can describe the rotations and reflections that carry rectangles, parallelograms, trapezoids, or regular polygons onto itself.
j) I can transform a figure multiple times (composition).
k) I can define rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

6. Investigate relationships unique to right triangles.

a) I can write a similarity statement of the three triangles formed when the altitude to the hypotenuse of a right triangle is drawn.
b) I can determine the geometric mean between two numbers.
c) I can solve problems involving relationships formed when the altitude to the hypotenuse of a right triangle is drawn (Geometric Mean).
d) I can prove the Pythagorean Theorem using triangle similarity.
e) I can apply the Pythagorean Theorem to triangles to solve mathematical and real world problems.
f) I can apply the converse of the Pythagorean Theorem to solve mathematical and real world problems.
g) I can identify and use Pythagorean triples in right triangles to find lengths of the unknown sides.
h) I can apply properties of a 45-45-90 triangle to determine lengths of sides of right triangles.
i) I can apply properties of a 30-60-90 triangle to determine lengths of sides of right triangles.

j) I can identify and solve missing side lengths and angles of a right triangle using basic trigonometric ratios and their inverses, respectively.
k) I can explain and use the relationship between the sine and cosine of complementary angles.
l) I can solve real world problems using angles of elevation and depression.
m) I can derive and use the formula A=1/2absin(C) for finding the area of a triangle.
n) I can prove the Law of Sines.
o) I can understand and apply the Law of Sines to solve for missing angles and sides of right triangles and non-right triangle (i.e. surveying problems, resultant forces).
p) I can prove the Law of Cosines.
q) I can understand and apply the Law of Cosines to solve for missing angles and sides of right triangles and non-right triangles (i.e. surveying problems, resultant forces).

7. Verify relationships among polygons.

a) I can identify and classify quadrilaterals, including parallelograms, rectangles, rhombi, squares, kites, trapezoids, and isosceles trapezoids, using their properties.
b) I can prove opposite sides and angles of a parallelogram are congruent.
c) I can prove the diagonals of a parallelogram bisect each other.
d) I can solve problems using properties of parallelograms and systems of equations
e) I can prove that rectangles are parallelograms with congruent diagonals.
f) I can solve problems using the properties and geometric theorems of parallelograms.
g) I can solve problems using the properties and geometric theorems of kites and trapezoids.
h) I can use properties of parallelograms in a proof using the coordinate plane.
i) I can graph quadrilaterals on the coordinate plane and use their properties to solve problems algebraically.
j) I can use coordinates to compute perimeters of polygons using the distance formula.
k) I can use coordinates to compute areas of triangles and rectangles.
l) I can determine areas and perimeters of regular polygons, including inscribed or circumscribed polygons, given the coordinates of vertices or other characteristics.
m) I can identify and classify convex and concave, regular and irregular polygons.
n) I can apply the Angle Sum Theorem for polygons to find interior and exterior angle measures given the number of sides, to find the number of sides given angle measures, and to solve real world problems.
o) I can solve for area of basic figures including parallelograms, rhombi, triangles, and circles.
p) I can solve real world problems using perimeter and area formulas of polygons.
q) I can determine area of composite figures.
r) I can determine areas and perimeters of regular polygons using special right triangles and trigonometry.
s) I can determine areas and perimeters of inscribed and circumscribed polygons using special right triangles and trigonometry.
t) I can use area to solve problems involving geometric probability.

8. Analyze properties of geometric solids.

a) I can identify and classify prisms, pyramids, cylinders, cones, spheres, and hemispheres and use their properties to solve problems.
b) I can provide an explanation for the formulas of lateral area, surface area, and volume of solids.

c) I can calculate the lateral area, surface area, and volume of prisms, pyramids, cylinders, cones, spheres, and hemispheres.
d) I can solve real world problems using properties of prisms, pyramids, cylinders, cones, spheres, and hemispheres.
e) I can draw and describe cross sections of prisms, pyramids, cylinders, and cones.
f) I can use cross sections of prisms, pyramids, cylinders, and cones to solve volume problems.
g) I can apply similarity ratios for lengths, areas, and volume of similar solids to solve mathematical and real world problems.

9. Determine arc measure, arc length, and equations of circles.

a) I can identify and define circles and line segments associated with circles.
b) I can identify and describe relationships among chords, secants, and tangents.
c) I can calculate the length of segments formed by the intersection of chords, secants, and tangents.
d) I can identify and describe the relationship between central, inscribed, and circumscribed angles.
e) I can identify that inscribed angles with rays that intersect the endpoints of the diameter are right angles.
f) I can determine the measure of central and inscribed angles and their intercepted arcs.
g) I can find segment lengths, angle measures, and intercepted arc measures formed by chords, secants, and tangents intersecting inside, outside, and on circles.
h) I can identify that the radius of a circle is perpendicular to a tangent line.
i) I can prove properties of angles for a quadrilateral inscribed in a circle.
j) I can derive the formula for arc length and area of a sector.
k) I can find arc lengths using circumferences of circles from given information.
l) I can find the area of a sector using the area of a circle formula and given information.
m) I can derive the equation of a circle using the Pythagorean Theorem, given the center and radius.
n) I can identify the center and radius when given the standard form of a circle.
o) I can complete the square to find the center and radius of a circle given an equation of a circle not in standard form.

10. Construct geometric figures.

a) I can construct a copy of a segment.
b) I can construct a copy of an angle.
c) I can construct a segment bisector.
d) I can construct an angle bisector and angle trisector.
e) I can construct perpendicular lines.
f) I can construct the perpendicular bisector of a line segment.
g) I can construct a line parallel to a given line through a point not on the line.
h) I can construct an equilateral triangle inscribed in a circle.
i) I can construct a square inscribed in a circle.
j) I can construct a regular hexagon inscribed in a circle.
k) I can construct the inscribed circle of a triangle.
l) I can construct the circumscribed circle of a triangle.
m) I can construct a tangent line from a point outside a given circle to the circle.
n) I can locate, describe, and draw a locus in a plane or space.

11. Using Probability to Make Decision

a) I can use probability to evaluate outcomes of decisions applying counting rules.

b) I can use probabilities to make fair decisions (e.g. drawing by lots, using a random number generator).

c) I can analyze decisions and strategies using probability concepts (e.g. product testing, medical testing, pulling a hockey goalie at the end of a game).

Pre-AP ALGEBRA II w/ TRIG.
MATH TEAM LEARNING TARGETS
Patterns, Functions, and Algebra

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1. Graph and analyze linear functions.

a) I can solve linear systems by using the following methods: graphing, substitution, elimination, and matrices.

b) I can solve a system with three variables by substitution and elimination.

c) I can solve systems of linear inequalities.

d) I can solve real-world applications involving linear systems.

e) I can formulate the inverse of a function or a relation.

f) I can evaluate composition of functions.

g) I can determine the domain and range of linear functions.

2. Solve, Simplify, Graph and Analyze Equations and Inequalities.

a) I can simplify complex expressions using order of operations.

b) I understand the definition of an open and closed set.

c) I can solve multivariable equations for each individual variable.

d) I can graph inequalities, combined inequalities, inequalities with "and" & "or."

e) I can solve and graph equations and inequalities.

f) I understand the definition of absolute value (and the piecewise definition).

g) I can solve and graph absolute value equations and inequalities.

h) I can solve combined inequalities with absolute value.

i) I can create equations in order to evaluate real world problems involving equations and inequalities.

3. Graph and analyze absolute value equations and inequalities.

a) I can solve absolute value equations and inequalities.

b) I can produce a graph of absolute value equations and inequalities.

c) I can evaluate composition of functions.

4. Graph and analyze quadratic functions.

a) I can produce a graph of quadratic functions.

b) I can solve quadratic equations by the following methods: graphing, factoring, quadratic formula, and square roots

c) I can perform order of operations using complex numbers.

d) I can formulate the inverse of a function.

e) I can evaluate composition of functions.

f) I can determine the domain and range of quadratic functions.

g) I can model real world situations that involve quadratic functions
h) I can solve quadratic equations by completing the square.
i) I can construct the graph a quadratic function.
j) I can create a quadratic function from two roots/x-intercepts and another point.
k) I can create equations to evaluate real world problems involving quadratic situations.

5. Graph and analyze polynomial functions.

a) I can add, subtract, multiply, and divide (using long and synthetic division).
b) I can identify a polynomial by its degree and predict its end behavior.
c) I can recall and relate the quadratic formula, Descartes rule of signs, and the rational root theorem when graphing polynomial functions.
d) I can predict the approximate and rational roots of polynomial functions using the quadratic formula, Descartes rule of signs, and the rational root theorem.
e) I can recognize the appropriate method for solving quadratic functions and then solve by factoring, square roots, or the quadratic formula
f) I can construct a polynomial equation given a graph or exact roots.
g) I can produce a graph of polynomial functions.
h) I can find the roots/factors of a polynomial equation/function using synthetic & long division once I determine its possible rational roots.
i) I can factor a difference of two squares and a difference of two cubes.
j) I can factor, to some degree, a difference of any two powers.
k) I can factor certain four-term polynomials by grouping and as a difference of two squares
l) I understand and can apply the concepts of direct, inverse, and joint variation when problem solving.
m) I can find the slant or oblique asymptote of a Rational function using synthetic division.
n) I can use Descartes' rule of signs to evaluate the nature of the roots.

6. Graph and analyze radical functions and imaginary numbers.

a) I can produce a graph of radical functions.
b) I can solve radical equations.
c) I can formulate the inverse of a function.
d) I can evaluate composition of functions.
e) I can determine the domain and range of radical functions.
f) I can determine if roots are extraneous or not given the domain.
g) I can simplify infinite radical and fractional expressions.
h) I understand how to rationalize denominators with binomial radical expressions including those that are partial difference of cube factorizations.
i) I can solve radical equations, including equations with more than one radical expression.
j) I can add, subtract, multiply, and divide imaginary numbers in $a+bi$ form.
k) I can simplify infinite radical expressions using substitution.
l) I understand z notation, and can calculate.

7. Graph and analyze exponential and logarithmic functions.

a) I can produce a graph of exponential and logarithmic functions.
b) I can solve equations using rational exponents.
c) I can evaluate logarithms.
d) I can solve exponential and logarithmic equations.
e) I can formulate the inverse of a logarithmic and exponential equations and I understand their connection.

f) I can determine the domain and range of logarithmic & exponential functions.
g) I can simplify all manner of logarithmic and exponential equations.
h) I can solve all manner of logarithmic and exponential equations.
i) I can simplify/solve composite logarithmic equations.
j) I can apply the process of exponentiation to solve logarithmic equations.
k) I understand the natural logarithm function & the exponential function of base *e,* and I understand the value of and how it is relevant with these functions.

8. Graph and analyze rational functions.

a) I can produce a graph of rational functions. This includes horizontal and vertical asymptotes, and holes.
b) I can simplify complex rational expressions.
c) I can solve rational equations.
d) I can simplify, add/subtract, and multiply/divide rational functions:
e) I can formulate the inverse of a function.
f) I can evaluate composition of functions
g) I can determine the domain and range of rational functions.
h) I can rewrite simple rational expressions using partial fraction decomposition.
i) I can simplify infinite rational expressions.
j) I can, when asked to analyze a function, identify the function and graph, identify the domain and range, identify any translations, find the *x* and *y*-intercepts, and determine the absolute max and min.

Geometry and Measurement

9. Graph and analyze trigonometric functions.

a) I can graph all six trigonometric graphs and list domain, range, max, min, symmetry and period of each function.
b) I can graph translated trigonometric graphs in the form for all six trig functions, which includes graphing trig functions with vertical shift changes, horizontal/phase shift changes, reflections over the *x*-axis and *y*-axis, changes in the length of the period, changes in the amplitude
c) I can list the amplitude, period, phase shift and vertical shift of a given equation or graph.
d) I can find an equation that models a given graph and explain the significance of the amplitude, period, phase shift, and vertical shift.
e) I can recognize trigonometric identities, including reciprocal identities, Pythagorean identities, cofunction identities, even/odd identities, sum & difference identities, double angle identities, half angle identities.
f) I can solve basic trigonometric equations.
g) I can solve more complex trigonometric equations by factoring and substitution.
h) I can prove/verify random identities given the aforementioned identities as fact.
i) I can demonstrate an understanding of the proper methods of proving an identity and the proper form necessary.
j) I can determine missing sides and angles of all triangles using the laws of sines & cosines
k) I understand and can distinguish the properties of the ambiguous case of SSA from others and can solve the triangles accordingly.
l) I can compute the area of any triangle using the area formulas for triangles.
m) I can evaluate real world problems and then use the laws of sines & cosines to solve them.

10. Graph basic conic sections.

a) I can generate an equation of a circle in standard form by completing the square.
b) I can recognize the equation of the 4 basic conic sections: parabola, circle, ellipse, and hyperbola.
c) I can graph the conic sections (circles, parabolas, ellipses, and hyperbolas) originating at any place on the coordinate plane.
d) I can determine the equation of a conic section given the graph.
e) I understand the concept of a degenerate conic and can identify a degenerate conic from its equation and from the slice taken of a double napped cone.
f) I can determine whether the conic is a circle, parabola, ellipse, hyperbola, or a degenerate conic from an equation in standard or expanded form.
g) I can convert an equation into its conic form from form by completing the square.
h) I can derive & use the distance & midpoint formulas to calculate the distance & midpoint between two points.
i) I can graph a parabola, hyperbola, ellipse, circle, and degenerate conics from second degree equations.
j) I can determine & label various characteristics of a conic such as vertex or vertices, center, axis of symmetry, focus, directrix, focus or foci, major & minor axes, transverse & conjugate axes, latus rectum or latera recta, & asymptotes of a hyperbola.
k) I can determine other characteristics such as area of the interior of an ellipse & a circle, the eccentricity of each type of conic, the sum of focal radii of an ellipse, the difference of focal radii of a hyperbola, the max & min of a parabola, and even the directrices of ellipses and hyperbolas.
l) I can determine the equation of various conics given some of their characteristics.
m) I can create equations in order to evaluate real world problems that involve the application of conic sections.
n) I can determine the equation of a circle given three points on the circle algebraically using geometric principles and also using standard form with a system of equations or matrices.

11. Examine & Evaluate Matrices

a) I understand the difference between a matrix and a determinant.
b) I can use a matrix to represent a system of equations.
c) I can add, subtract, & multiply matrices.
d) I can evaluate any "n x n" determinant using expansion by minors & cofactors.
e) I can evaluate 2x2 and 3x3 determinants using the "diagonal" method.
f) I can find the inverse of 2x2 and 3x3 matrices.
g) I can solve equations involving matrices and determinants.
h) I can evaluate certain higher order determinants using patterns and tricks.
i) I can solve linear & planar systems using Cramer's Rule.

12. Analyze and Evaluate Sequences & Series and the Binomial Theorem.

a) I understand the nature of a sequence and can see examples of a sequence in real life.
b) I can demonstrate a complete understanding of arithmetic sequences and their linear properties.
c) I can determine the equation of an arithmetic sequence from the sequence.
d) I can determine various terms in the sequence from the equation of a sequence.

PreAP Geometry Math Team Learning Targets

1. Apply and expand on known algebraic concepts to investigate geometric figures on the coordinate plane and in coordinate space.

a) I can calculate the slope and intercepts of a line given its equation.
b) I can apply the Distance Formula and Midpoint Formula to find the length of a segment and its midpoint.
c) I can determine the centroid of a triangle given the coordinates of its vertices.
d) I can write an equation of a line given certain information about the line.
e) I can write an equation of a circle in standard form, completing the square if necessary.
f) I can write an equation of a circle given the coordinates of three points on the circle.
g) I can determine the slopes of parallel and perpendicular lines.
h) I can find the distance from a point to a line given the coordinates of the point and the equation of the line.
i) I can find the area of any polygon on the coordinate plane.
j) I can graph points and lines in a plane.
k) I can write an equation of a plane.
l) I can graph points in space.
m) I can write the equation of a sphere, completing the square if necessary.
n) I can find the distance from a point to a plane given the coordinates of the point and the equation of the plane.

2. Apply and expand on known algebraic concepts to solve Geometry Math Team problems.

a) I can solve problems without relying on a calculator.
b) I can simplify square roots and other radicals.
c) I can use mathematical reasoning to solve problems quickly and efficiently.

3. Discover patterns in geometric figures.

a) I can develop formulas and algorithms by analyzing data and properties of geometric figures.
b) I can find the number of paths on a rectangular grid to get from one point to another.
c) I can calculate polygonal numbers.
d) I can examine networks and their traceability.
e) I can memorize formulas to solve problems and find measurements.

4. Characterize basic geometric figures.

a) I can identify, name, and sketch points, lines, angles, and planes.
b) I can use the following terms correctly to name or classify parts of a figure: equidistant, collinear, coplanar, congruent, and concurrent.

5. Apply properties of angles and distinguish relationships between angles.

a) I can classify angles as acute, right, obtuse, or straight.
b) I can determine the measures of segments and angles using the Segment Addition Postulate and the Angle Addition Postulate.
c) I can explain relationships between pairs of angles including vertical angles, adjacent angles, complementary angles, and supplementary angles.
d) I can convert angle measures from degrees to radians and radians to degrees.
e) I can calculate the angle or the arc measures formed by the hands of a clock at a given time.

6. Apply properties of parallel lines and planes.

a) I can distinguish between parallel lines and skew lines.

b) I can locate special angle pairs formed by two lines and a transversal line.

c) I can incorporate congruent and supplementary pairs of angles formed by parallel lines and a transversal to find additional angles in a figure.

d) I can sketch additional parallel lines in a figure to help determine missing angle measures.

7. Examine and analyze properties of polygons.

a) I can classify polygons by the number of sides, convex or concave, and regular or not regular.

b) I can calculate the sum of the interior angles and sum of the exterior angles of a convex polygon.

c) I can solve for the measure of one interior angle or one exterior angle of a regular polygon.

d) I can determine the number of diagonals in a convex polygon.

e) I can calculate the lengths of diagonals in regular hexagons and octagons given only a side measure.

f) I can determine angle measures that are formed by segments in a regular polygon by sketching a circumscribed circle.

8. Describe and use properties of triangles.

a) I can classify triangles according to their sides and angles.

b) I can prove that triangles are congruent using the five tests for triangle congruency.

c) I can identify altitudes, medians, angle bisectors, and perpendicular bisectors in a triangle.

d) I can name and identify the points of concurrency for each special segment of a triangle – orthocenter, centroid, incenter, and circumcenter.

e) I can relate a median and its centroid to find segment lengths in a triangle.

f) I can use the Theorem of Ceva to find measures of segments in a triangle.

g) I can calculate the height of an equilateral triangle given a random interior point and three perpendiculars.

h) I can compute the measure of the radii of inscribed and circumscribed circles about a triangle.

9. Discover and apply properties of right triangles.

a) I can calculate segment measures in a right triangle by using the Pythagorean Theorem.

b) I can classify any triangle as acute, right, or obtuse given its three sides and using the Pythagorean Theorem.

c) I can recall Pythagorean triples of numbers to find the lengths of segments in right triangles.

d) I can relate the concept of geometric mean to find the measures of segments in a right triangle with an altitude drawn to the hypotenuse.

e) I can find segment lengths in 45-45-90 and 30-60-90 triangles by using the patterns for those triangles.

f) I can use trigonometric ratios to find missing side lengths or angle measures in a right triangle.

g) I can find exact values of certain trigonometric ratios using special right triangles.

10. Describe and use properties of quadrilaterals.

a) I can use the properties of parallelograms, rectangles, rhombi, squares, trapezoids, and kites to find segment lengths and angle measures.

b) I can use given information to determine what type of quadrilateral is in a problem.
c) I can use properties of cyclic quadrilaterals to find segment lengths and angle measures.
d) I can find the measure of a missing segment in problems when given a random point in the interior of a rectangle.
e) I can find the length of the median of a trapezoid.
f) I can determine what type of quadrilateral is formed when the midpoints of the sides of a given quadrilateral are connected.
g) I can use Ptolemy's Theorem to find the length of a diagonal in a cyclic quadrilateral and an isosceles trapezoid.

11. Solve problems and work with similar polygons and similar solids.

a) I can determine whether or not two polygons are similar or not.
b) I can prove triangles similar using the three tests for similar triangles.
c) I can determine the scale factor of two similar polygons or similar solids.
d) I can find segments lengths, angle measures, and perimeters of two similar polygons.
e) I can calculate the measures of segments, perimeters and circumferences of bases, surface areas and volumes of similar solids
f) I can solve for missing measures in the "flagpole" math team problem.

12. Describe and use properties of circles.

a) I can name and identify the parts of circles – center, radius, diameter, chord, tangent, secant, sector, and arc.
b) I can determine angle measures using the arcs of a circle.
c) I can find missing segment lengths given special segments of circles.
d) I can calculate the measure of a common tangent of two circles.
e) I can find the circumference of a circle and the length of an arc (portion of the circumference)

13. Analyze and calculate areas of plane figures.

a) I can find the area of the following plane figures: triangles, parallelograms, rhombi, rectangles, squares, trapezoids, sectors, circles, regular polygons
b) I can recall and apply known formulas to calculate areas.
c) I can calculate the area of an equilateral triangle, regular hexagon, and a regular octagon given one of its side measures by using properties of each figure and special right triangles.
d) I can use the scale factor of similar figures to calculate areas.
e) I can use Heron's Formula to find the area of any triangle given its side lengths.

14. Describe solids and calculate their measurements.

a) I can calculate the lateral surface area, total surface area, and volume of right prisms, right circular cylinders, regular pyramids, and right circular cones.
b) I can calculate the surface area and volume of spheres.
c) I can find the length of a space diagonal and a face diagonal of a right prism.
d) I can name and classify the five Platonic Solids.
e) I can use Euler's Formula for polyhedra.
f) I can determine the volume of a tetrahedron given only an edge length.
g) I can find the surface area and volume of frusta formed by planes intersecting pyramids and cones.
h) I can use the scale factor of similar solids to calculate surface areas and volumes.

15. Identify and demonstrate geometric transformations.

a) I can recognize which transformations are isometries.

b) I can sketch a figure that has been reflected, translated, or rotated.
c) I can determine the coordinates of a point on the coordinate plane that has been reflected, translated, or rotated.
d) I can sketch a figure that is a dilation of a given figure.
e) I can determine the coordinates of a point on the coordinate plane that has been part of dilation.

16. Analyze sets of data from geometric contexts to determine relationships.

a) I can use a linear function and its graph to express relationships among given data.
b) I can determine the probability of selecting a random point in a figure using length and area.
c) I can construct a circle graph (pie chart) to represent data.

17. Organize and develop geometric proofs.

a) I can write a two-column proof or an indirect proof to prove statements about a figure.
b) I can prove geometric theorems.
c) I can use known postulates and theorems to make statements about a figure or justify statements about a figure.

18. Discuss loci (plural of locus).

a) I can describe a locus of points that satisfies a list of given conditions.
b) I can define certain geometric terms as a locus of points.

19. Recognize and use if-then statements.

a) I can write conditional statements in if-then form and identify the hypothesis and conclusion.
b) I can write the converse, inverse, contrapositive, and negation of a conditional statement.
c) I can identify logically equivalent statements.

Pre-Calculus Learning Targets

1. Graph and analyze the six trigonometric functions.

a) I can determine all six trigonometric values for any angle around the unit circle.
b) I can construct a graph all six trigonometric graphs and list domain, range, symmetry and period.
c) I can produce translated trigonometric graphs in the form for all six trig functions, including the following:

- Vertical shift changes
- Horizontal/phase shift changes
- Reflections
- Changes in the length of the period
- Changes in the amplitude

d) I can describe the amplitude, period, phase shift and vertical shift of a given equation or graph.
e) I can model real world situations that involve trigonometric functions.
f) I can develop a trigonometric equation that models a given set of data.
g) I can determine exact angles and values of trigonometric functions given various information.
h) I can solve simple trigonometric equations using the unit circle.

i) I can simplify inverse trigonometric expressions (arcsin, arccos, arctan) with unit circle values.
j) I can determine the domain and range of inverse trigonometric functions.
k) I can verify / prove trigonometric identities.
l) I can assimilate knowledge of all trigonometric identities in problem solving.
m) Pythagorean Identities
n) Co-function Identities
o) Even/Odd Identities
p) Reciprocal Identities
q) Quotient Identities
r) Sum and difference Identities
s) Double and half angle identities

2. **Formulate and model vectors.**

a) I can recognize the characteristics of a vector and write them in different forms.
b) I can produce a graph of a vector given its components.
c) I can formulate a vector in the following ways:
Ø given its graph
Ø given its magnitude and its direction angle
Ø given initial and terminal point
d) I can add and subtract vectors graphically and algebraically.
e) I can multiply scalar numbers and vectors.
f) I can determine the magnitude of a vector.
g) I can determine whether two vectors are parallel or orthogonal.
h) I can model real world situations with vectors.
i) I can graph a complex number in the real-imaginary plane.

3. **Formulate and model parametric equations.**

a) I can formulate the parametric equations of a projectile.
b) I can produce the horizontal and vertical locations of a projectile in space algebraically as well as with a graphing calculator.
c) I can model real world projectile motion problems with parametric equations.

4. Analyze polar coordinates, equations, and graphs.

a) I can convert a rectangular coordinate into a polar coordinate.
b) I can convert a polar coordinate into a rectangular coordinate.
c) I can graph polar coordinates on a polar coordinate plane.
d) I can convert rectangular equations in x and y into polar equations in .
e) I can convert polar equations in into rectangular equations in x and y.
f) I can produce graphs of various types of polar graphs.
g) I can formulate the equations of polar graphs.

Analyze and produce graphs of conic sections.

a) I can determine the type of conic from an equation in standard or expanded form.
b) I can transfer an equation into its conic form from standard form by completing the square.
c) I can produce a graph of a parabola, hyperbola, ellipse, circle, and degenerate conics from second degree equations.
d) I can formulate the equation of a conic from its graph.

e) I can determine and label various characteristics of a conic such as vertex, center, axis of symmetry, focus, directrix, foci, major and minor axes, transverse and conjugate axes, asymptotes of a hyperbola.
f) I can generate the equation of various conics given some of their characteristics.
g) I can model real world problems that involve conic sections.

. Graph and analyze basic functions.

a) I can recognize and graph the 9 basic functions given an equation of each function.
Ø Linear, quadratic, cubic, absolute value, square root, exponential, greatest integer, rational (,)
b) I can determine the equation of each of the 9 basic functions given the graph of the function.
c) I can determine domain, range, symmetry, even/odd, and points of discontinuity of basic functions.
d) I can produce graph and give equations of all of the basic functions translated.
Ø Shifted right/left
Ø Shifted up/down
Ø Flipped over x-axis
Ø Flipped over y-axis
Ø Stretched or compressed vertically
Ø Stretched or compressed horizontally
e) I can, given the graph, formulate the equation of each of the 9 basic functions translation.
Ø Shifted right/left
Ø Shifted up/down
Ø Flipped over x-axis
Ø Flipped over y-axis
Ø Stretched or compressed vertically
Ø Stretched or compressed horizontally
f) I can, if given the graph of a function, recognize the following:
Ø Domain in interval notation
Ø Range in interval notation
Ø Symmetry y-axis, origin, or neither and even, odd, or neither
Ø Local maximum (points)
Ø Local Minimum (points)
Ø Intervals of increasing, decreasing, and constant (interval notation using x values)
Ø Intervals where $f(x) > 0$ or $f(x) < 0$
g) I can evaluate the domain of a function given an equation.
Ø Look for negative numbers under square root
Ø Look for values that make the denominator zero
Ø Look for the logarithm of positive numbers
h) I can analyze and determine given values of piecewise functions given the equation.
i) I can produce the equation of a piecewise function given the graph (equation and domain).
j) I can create and apply piecewise functions to word problems of real life situations.
k) I can produce a graph of a piecewise function given an equation.

7. Graph and analyze polynomial functions.

a) I can determine the characteristics of a graph of a polynomial function and be able to explain why a graph is not a polynomial.

Ø the number of real roots and the number of imaginary roots
Ø the end behavior
Ø the domain and range of a polynomial given its graph.
b) I can determine the number of roots of a polynomial given its equation.
c) I can, if given a graph of a polynomial and an extra point, produce the equation of the polynomial.
d) I can, if given a table of data with the roots given, produce the equation of the polynomial and use the y-intercept to find the leading coefficient.
e) I can, if given the equation of a polynomial, determine characteristics of the graph of the equation:
Ø the possible number of roots
Ø the maximum and minimums
Ø the direction graph is going left and right
Ø the maximum number of imaginary roots that could exist
f) I can use a graphing calculator to analyze various characteristics of the graph of the equation:
Ø Use the calculate zero feature to determine the zeros.
Ø Use the calculate zero feature, indirectly, to determine intervals where the .
Ø Use the calculate max / min feature to determine the maximum and minimum values.
Ø Use the max/min feature to determine intervals of increasing and decreasing.
g) I can, with a graphing calculator, determine an appropriate window for representing the graph of a polynomial.
h) I can model real world situations that involve polynomials.
i) Revenue, ball trajectory, box problem, population, etc.

8. Graph and analyze rational functions.

a) I can communicate the differences between a rational function and a polynomial function.
b) I can, from the equation of a rational function, determine the following:
Ø coordinates of the hole (if exist)
Ø equation of the vertical asymptote
Ø equation of the horizontal/oblique asymptote
Ø the x-intercepts and y-intercepts
c) I can, if given the graph of a rational function, examine the following:
Ø left / right nature of a vertical asymptote
Ø behavior of the graph that has an oblique asymptote
Ø existence of a horizontal asymptote
Ø the x-intercepts and y-intercepts
Ø existence of a hole
d) I can construct a graph of a rational function with given characteristics and accurately sketch the rational function without the use of a graphing calculator.
e) I can develop the equation of a rational function given the graph of a rational function.

9. Graph and analyze exponential and logarithmic functions.

a) I can calculate an inverse function.
b) I can determine the following characteristics of composite function given two functions.
Ø values
Ø existence of inverses of each other
Ø domain

c) I can produce the graph of an inverse function given the graph of the function.
d) I can graph and translate exponential and logarithmic functions and list the following characteristics:
Ø intercepts
Ø asymptotes
Ø domain and range
e) I can apply exponential laws to simplify expressions.
f) I can solve exponential equations.
g) I can apply logarithmic laws to simplify logarithmic expressions.
h) I can solve logarithmic equations.
i) I can model real world problems involving exponential and logarithmic equations.
Ø uninhibited growth or decay
Ø half-life
Ø compounding interest
j) I understand the value of **.**

10. Compute and analyze limits.

a) I can define a limit.
b) I can determine the limit of a function algebraically and graphically as x approaches a certain value.
c) I can determine the limit of a function algebraically and graphically as x approaches .
d) I can apply the definition of continuity to determine continuity at a certain x-value.

11. Compute and analyze derivatives.

a) I can communicate the definition of a derivative both in terms of limits and in my own words.
b) I can calculate the derivative using the definition of a derivative (in terms of limits).
c) I can determine the derivative of a function using the power, product, quotient, chain rules, base *e* exponential function, a natural logarithmic function and trigonometric functions.
d) I can determine if a function is differentiable at a certain point.

Pre-AP Precalculus Math Team Learning Targets
NUMBER AND OPERATIONS

1. Analyzing Vectors.

a) I can recognize the characteristics of a vector.
b) I can graph a vector given its components and determine its components given its graph.
c) I can determine a vector from two points.
d) I can determine a vector given its magnitude & its direction angle.
e) I can add vectors graphically.
f) I can recognize and write vectors in different forms (unit vector form, component form, trig form).
g) I can add and subtract vectors algebraically.
h) I can multiply scalar numbers and vectors.
i) I can determine the magnitude of a vector.
j) I can determine the direction angle of a two-dimensional vector.
k) I can calculate a dot product and I understand the derivation of the dot product.
l) I can use the dot product to determine perpendicularity.

m) I can use the dot product to help determine the angle between two vectors & as well as the angle between two planes.
n) I can use the dot product to determine the equation of a plane.
o) I can calculate a cross product and I understand its relevance to torque.
p) I can use the cross product to determine area of a parallelogram.
q) I can determine whether two vectors are parallel or perpendicular, and if they are neither I can determine the angle between them.
r) I can determine a unit vector in the same direction as a given vector.
s) I can calculate a triple scalar product.
t) I can use the triple scalar product to calculate the volume of a parallelepiped.
u) I can demonstrate an understanding of the equation of a plane and how it is derived using the dot product.
v) I can create an equation of a plane given three points.
w) I can determine the intercepts of a plane and the xy, yz, & xz traces given the equation of a plane.
x) I can evaluate and solve real world vector problems involving wind & current.
y) I can communicate the definitions of perpendicular, normal, & orthogonal.
z) I can calculate the distance between a plane (or line) and a point not on the plane (or line) using a formula derived from vector attributes.

2. Understand the Concept of "*e*".

a) I can define *e* using the limit form of and understand its usefulness in continuous compounding, exponential functions, and the natural logarithm function.

PATTERNS, FUNCTIONS, & ALGEBRA

3. Solving equations & inequalities.

a) I can derive & use the distance & midpoint formulas to calculate the distance & midpoint between two points.
b) I can determine the x-intercepts & y-intercepts from equations algebraically & using a graphing calculator.
c) I can solve quadratic equations, special cubic equations, and certain four-term polynomials by factoring.
d) I can solve quadratic equations using the quadratic formula.
e) I can derive the quadratic formula by completing the square of a quadratic equation.
f) I understand the concept of the discriminant and know how to determine the nature of the roots.
g) I can solve equations involving one, two, three, or four radical expressions.
h) I can demonstrate an understanding of the concept of absolute value from its "piecewise" definition.
i) I can solve equations with absolute value.
j) I can solve inequalities with absolute value.
k) I can solve combined inequalities.
l) I can solve rational equations.
m) I can solve rational inequalities.

4. Construct Graphs and Analyze Basic Functions.

a) I can graph/sketch the 19 basic functions given an equation of each function.

b) I can determine the equation of each of the 19 basic functions given the graph of the function.
c) I can determine domain, range, symmetry, even/odd, and points of discontinuity of basic functions as well as the domain of more complex rational functions & radical functions.
d) I can determine the x-intercepts/roots/zeros/real solutions of translated basic functions if they exist.
e) I can graph and construct equations of all of the 19 basic functions including when the graph includes horizontal/phase shifts to the right or left, vertical shifts up or down, reflections over *x*-axis, reflections over *y*-axis, and vertical stretches or compressions.
f) I can, given the graph, construct an equation of each of the 19 basic functions when it has been horizontally / phase shifted to the right or left, vertically shifted up or down, reflected over *x*-axis, reflected over *y*-axis, or stretched or compressed vertically.
g) I can, when given the graph of a function, determine its domain (including writing domain in interval notation) and range (including writing range in interval notation).
h) I can, when given the graph of a function, determine its symmetry: *y*-axis, origin, or neither and how symmetry relates to it being even or odd.
i) I can, when given the graph of a function, determine its local maximum, local minimum, absolute maximum and absolute minimum.
j) I can, when given the graph of a function, determine intervals where the function is increasing, decreasing, & constant (interval notation).
k) I can, when given the graph of a function, determine intervals where $f(x) > 0$ or $f(x) < 0$.
l) I can determine the domain of a function given an equation by acknowledging where a
m) function's domain is not defined over the real numbers by looking for negative numbers under square root, looking for values that make the denominator zero, looking for the logarithm of positive numbers, and by looking for asymptotes of the trig functions .
n) I can analyze piecewise functions given the equation.
o) I can construct an equation of a piecewise function given the graph (equation and domain).
p) I can determine given values of piecewise functions.
q) I can create and apply piece-wise functions in order to evaluate real world problems.
r) I can evaluate a function at different *x*-values & will demonstrate the ability to evaluate the difference quotient used in the definition of a derivative.
s) I can use the max/min feature on my calculator to determine intervals where the function is increasing, decreasing, and constant.

5. Construct Graphs, Analyze, and Evaluate Polynomial functions.

a) I can discuss the characteristics of polynomial functions and be able to explain why a graph is not a polynomial.
b) I can determine the number of real roots based on the number of times a polynomial crosses or bounces off the x-axis
c) I can determine the number of imaginary roots based on non-uniform "wiggles" in the graph.
d) I understand that piercing the *x*-axis results in an odd number of roots and that touching but not piercing the *x*-axis results in an even number of roots.
e) I can determine the domain and range of a polynomial given its graph.
f) I can determine the number of roots of a polynomial given its equation.
g) I can determine the direction a graph is going as it moves to the left and the right based on the degree of the polynomial & the lead coefficient's positivity/negativity.

h) I can, if given a graph of a polynomial with integral roots and an extra point, construct the equation of the polynomial.
i) I can, if given a table of data with the roots given, construct the equation of the polynomial and use the *y*-intercept to find the leading coefficient.
j) I can, if given the equation of a polynomial, discuss the possible number of roots, the maxima and minima, the direction graph is going as it moves toward the left and right, and discuss the maximum number of imaginary roots that could exist.
k) I can, with a graphing calculator, determine the zeros.
l) I can, with a graphing calculator, determine the absolute or relative maxima and minima.
m) I can, with a graphing calculator, determine the intervals where the graph is increasing and decreasing.
n) I can, with a graphing calculator, determine an appropriate window for representing the graph of a polynomial.
o) I can, if given a problem that involves a polynomial, determine the max, min, intersections and roots:
p) I can solve a polynomial equation algebraically.
q) I can determine the possible rational roots.
r) I can use Descartes' rule of signs to evaluate the nature of the roots.
s) I can use synthetic division and long division to check for roots and to "shrink" the degree of the polynomial.
t) I can use the quadratic formula to determine the last 2 roots.
u) I can demonstrate an understanding of the remainder theorem and its applications with
v) both finding remainders and with evaluating functions and can decide when it is appropriate with each situation.
w) I can use polynomials to represent and solve various real world scenarios.

6. Construct Graphs, Analyze, and Evaluate Rational Functions.

a) I can communicate the differences between a rational function and a polynomial function.
b) I can, from the equation of a rational function, determine the slant / oblique asymptote.
c) I can determine the left / right behavior of the graph by examining the slant / oblique asymptote.
d) I can determine if a hole exists and then find the coordinates of the hole.
e) I can determine if vertical asymptotes exist and then find the equation of each asymptote.
f) I can communicate the nature of a vertical asymptote, how a graph reacts as it approaches the Vertical Asymptote, and how it differs from a hole.
g) I can, if a graph does not have a slant or oblique asymptote, determine if the graph has a horizontal asymptote based on the degree of the numerator and the denominator.
h) I can, if the graph does not have horizontal asymptote, find the slant or oblique asymptote by performing synthetic or long division.
i) I can calculate the *x*-intercepts & *y*-intercepts of a rational function, given the equation.
j) I can discuss specific characteristics of rational functions
k) I can determine if a function "bounces" at root if the factor in numerator creating the root is squared (or even powered).
l) I can determine if a function moves in the same direction around an asymptote if the factor in the denominator creating the asymptote is squared (or even powered).
m) I can draw the characteristics mentioned above on a coordinate plane and accurately sketch the rational function without the use of a graphing calculator.

n) I can determine the equation of a rational function given the graph of a rational function.

7. Construct Graphs, Analyze, and Evaluate Conic Sections.

a) I can determine the type of conic from an equation in standard or expanded form.
b) I can convert an equation into its conic form from form by completing the square.
c) I can graph a parabola, hyperbola, ellipse, circle, and degenerate conics from second degree equations.
d) I can determine the equation of a conic from its graph.
e) I can determine & label various characteristics of a conic such as vertex, center, axis of symmetry, focus, directrix, foci, major & minor axes, transverse & conjugate axes, latus rectum, latera recta, & asymptotes of a hyperbola.
f) I can determine other characteristics such as area of the interior of an ellipse & a circle, the eccentricity of each type of conic, the sum of focal radii of an ellipse, the difference of focal radii of a hyperbola, the directrices of an ellipse & a hyperbola, max & min of a parabola.
g) I can determine the equation of various conics given some of their characteristics.
h) I can create equations in order to evaluate real world that involve the application of conic sections.
i) I can use the "discriminant" to determine what kind of conic results from second degree equations with an "xy" term.
j) I can determine the axis of rotation of conics with an "xy" term.
k) I can algebraically determine the equation of a circle or a parabola given three points on the graph using algebraic and geometric principles.

8. Analyze and Evaluate Sequences & Series.

a) I can demonstrate an understanding of the nature of a sequence and can see examples of a sequence in real life.
b) I can demonstrate a complete understanding of arithmetic sequences and their linear properties.
c) I can determine the equation of an arithmetic sequence from the sequence.
d) I can determine various terms in the sequence from the equation of a sequence.
e) I can determine the common difference of an arithmetic sequence.
f) I can determine the equation of an arithmetic sequence from two non-consecutive terms of an arithmetic sequence.
g) I can calculate the arithmetic mean & the arithmetic means from two terms in an arithmetic sequence.
h) I can solve real world problems that have the properties of arithmetic sequences.
i) I can derive a formula for calculating the sum of an arithmetic series.
j) I can find the sum of an arithmetic series.
k) I can demonstrate a complete understanding of geometric sequences and their exponential properties.
l) I can determine the equation of a geometric sequence from the sequence.
m) I can determine various terms in the sequence from the equation of a sequence.
n) I can determine the common ratio of a geometric sequence.
o) I can determine the equation of a geometric sequence from two non-consecutive terms of a geometric sequence.
p) I can calculate the geometric mean & the geometric means from two terms in a geometric sequence.
q) I can solve real world problems that have the properties of geometric sequences.

r) I can find the sum of a geometric series.
s) I can derive a formula for calculating the sum of a geometric series.
t) I can find the sum of an infinite geometric series.
u) I can write arithmetic & geometric series using Sigma Notation.
v) I can find the sum of a series from an expression written using Sigma Notation.
w) I can determine the exact fractional representation of a repeating decimal using a geometric sum formula.
x) I can derive simple formulas to simplify the process.
y) I can evaluate a variety of finite & infinite sums, neither arithmetic nor geometric, using variations on the proof of a geometric sum.
z) I can evaluate a variety of finite & infinite sums, neither arithmetic nor geometric using various algebraic tricks and patterns.
aa) I can demonstrate a complete understanding of quadratic sequences.
bb) I can determine if a sequence is quadratic from its terms.
cc) I can determine the formula for a quadratic sequence given the terms in the sequence.
dd) I can determine the n^{th} term in a quadratic sequence given the terms in the sequence.
ee) I can evaluate Pi notation, as well as Sigma Notation.
ff) I can evaluate Sigma notation problems involving polynomials up to the 5^{th} degree using the formulas for the sum of the first n terms, n squares, n cubes, n fourths, & n fifths.
gg) I can identify harmonic sequences and can determine additional terms in the sequence by examining characteristics of the sequence.
hh) I can solve distance, rate, & time problems involving harmonic sequences.
ii) I can demonstrate an understanding of recursive sequences and how to evaluate certain terms of a recursive sequences.

9. Analyze and Evaluate Binomials raised to powers using the Binomial Theorem.

a) I can find the sum of the coefficients of any row of Pascal's triangle without writing out the triangle.
b) I can find the sum of the coefficients & constants of the terms in a polynomial expansion without writing out the expansion.
c) I can find certain terms in a binomial expansion using the binomial theorem.
d) I can find certain terms of trinomial expansions using a variation of the binomial theorem.
e) I can expand a binomial using Pascal's triangle.

10. Analyze and Evaluate Parametric Equations with Projectile Motion.

a) I can recognize the parametric nature of projectile motion as well as the parabolic nature of a projectile in a gravity driven environment.
b) I can determine the parametric equations of a projectile.
c) I can determine the horizontal & vertical locations of a projectile in space algebraically as well as with a calculator.
d) I can determine the maximum height and maximum distance that a projectile can travel algebraically as well as with a calculator.
e) I can analyze real world projectile problems both algebraically and graphically using a calculator and present my results in written form.

11. Construct Graphs, Analyze, and Evaluate the Six Trigonometric Functions.

a) I can determine all six trigonometric values for any angle around the unit circle.
b) I can convert degree values to radian values, and vice-versa.
c) I can determine trigonometric values for "special" angles that are negative or over 2

d) I can determine arc length and sector area.
e) I can graph all six trigonometric graphs and list domain, range, max, min, symmetry and period.
f) I can graph translated trigonometric graphs in the form for all six trig functions, including the following vertical shift changes, horizontal/phase shift changes, reflections over the *x*-axis, changes in the length of the period, and changes in the amplitude.
g) I can list the amplitude, period, phase shift and vertical shift of a given equation or graph.
h) I can find an equation that models a given graph and explain the significance of the amplitude, period, phase shift, and vertical shift.
i) I can find a trigonometric equation that models a given set of data.
j) I can simplify trig expressions with a calculator.
k) I can determine exact angles and values of trig functions given various information.
l) I can understand the concept of a reference angle and can determine the reference angle of a given angle.
m) I can solve simple trig equations using the unit circle.
n) I can simplify inverse trig expressions (arcsin, arccos, arctan) with unit circle values.
o) I can determine the domain and range of inverse trigonometric functions.
p) I can solve complex trig equations
q) I can solve trig equations with multiple inverse trig expressions.
r) I can simplify composite trig expressions.
s) I can verify / prove complex trigonometric identities and show proper form in proof.
t) I can assimilate knowledge of all trig identities in problem solving and in verifying identities including identifying and using the Pythagorean identities, cofunction identities, even/odd identities, reciprocal identities, quotient identities, sum & difference identities, double & half angle identities, power-reducing formulas, sum to product formulas, product to sum formulas, and the triple angle identity for sine.

12. Analyze and Evaluate Triangles using Law of Sines & Law of Cosines.

a) I can use the laws of sines & cosines to solve for missing sides and angles of all triangles.
b) I can distinguish the properties of the ambiguous case of SSA from others and can solve the triangles accordingly.
c) I can use the area formulas for triangles to calculate the area of all triangles regardless of the given situation (SSA, AAS, SAS, SSS, ASA).
d) I can use law of sines & cosines to solve real world problems.

13. Understand the Complex Number System and its Subsets.

a) I can understand the difference between a real and an imaginary number.
b) I can identify numbers that are rational and irrational.
c) I can identify numbers that are elements of the subsets of integers, whole numbers, and natural numbers.
d) I can write a number in its proper complex number form.
e) I can graph a complex number in the real-imaginary plane.
f) I can determine the absolute value of any complex number and I understand the definition of absolute value of a complex number.
g) I can determine the direction angle of any complex number.
h) I can write a complex number in standard form or in trigonometric/polar form.
i) I can add, subtract, multiply, & divide complex numbers that are in standard form and in trigonometric form.

j) I can raise a complex number to a higher power using DeMoivre's Theorem, and I can find the n^{th} roots of a complex number.

14. Construct Graphs, Analyze and Evaluate Exponential & Logarithmic functions (with inverse & composite functions).

a) I can calculate an inverse function.
b) I can determine the composite function given two functions.
c) I can determine composite values given two functions and/or their composite functions.
d) I can determine if two functions are inverses of each other using composite functions.
e) I understand the real world existence of a composite function.
f) I can determine the domain of a composite function without looking at its graph.
g) I can comprehend the symmetric nature of a graph and its inverse.
h) I can sketch the graph of an inverse function given the graph of the function.
i) I know that the exponential function and the logarithmic function are, by nature, inverses of each other.
j) I can graph exponential and logarithmic functions, as well as, discuss intercepts, asymptotes and domain and range (this was introduced in the basic function section).
k) I can apply exponential laws to simplify expressions.
l) I can solve equations involving the laws of exponents.
m) I can apply logarithmic laws to simplify logarithmic expressions.
n) I can solve equations involving the laws of logarithms.
o) I can exponentiate to solve logarithmic equations.
p) I can use logarithms to solve exponential equations.
q) I can understand the natural logarithm function & the exponential function of base *e,* and I understand how the value of is relevant with these functions.
r) I can solve real world problems involving exponential & logarithmic equations such as uninhibited growth or decay, half-life, and compounding interest.
s) I can demonstrate understanding of various financial terms & expressions.
t) I can use the "finance" feature of my calculator to determine present value, future value, compounded interest, time, and monthly payments of annuities such as income growth annuities, and car/house payment annuities.
u) I can demonstrate the relationship between the growth equations and.
v) I can comprehend the nature of the exponential curve and its effect on the importance of investing early and often and the incredible nature of the time value of money.

15. Analyze and Evaluate Limits.

a) I can write the definition of a limit.
b) I can determine the limit of a function algebraically & graphically as x approaches a certain value.
c) I can determine the limit of a function algebraically & graphically as x approaches infinity.
d) I can determine the limit of a trigonometric function algebraically as x approaches a certain value (most notably 0).
e) I can comprehend the definition of continuity and can determine continuity or discontinuity at a certain x-value.

16. Analyze and Evaluate Derivatives.

a) I can write the definition of a derivative both in terms of limits and in my own words.
b) I can calculate the derivative using the definition of a derivative (in terms of limits).

c) I can determine the derivative of a function using the power, product, quotient, & chain rules.
d) I can determine the derivative of any exponential function and any logarithmic function.
e) I can determine if a function is differentiable at a certain point.
f) I can find the equation of a line tangent to a curve at a certain point.
g) I can calculate the derivative of trigonometric functions using the power, product, quotient, & chain rules.

17. Examine & Evaluate Matrices & the Binomial Theorem.

a) I understand the difference between a matrix and a determinant.
b) I can use a matrix to represent a system of equations.
c) I can add, subtract, & multiply matrices.
d) I can evaluate any "n x n" determinant using expansion by minors & cofactors.
e) I can evaluate 2x2 and 3x3 determinants using the "diagonal" method.
f) I can find the inverse of 2x2 and 3x3 matrices.
g) I can find the element in the *n*-row and *m*-column of the inverse of any size matrix.
h) I can solve equations involving matrices and determinants.
i) I can use elementary row operations to rewrite a matrix in reduced-row echelon form.
j) I can solve a system of equations when written in reduced-row echelon form and in row echelon form.
k) I can use my graphing calculator to solve a system of equations using the matrix function and the reduced-row echelon function.
l) I can evaluate certain higher order determinants using patterns and tricks.
m) I can solve linear & planar systems using Cramer's Rule.

18. Evaluate, Solve, and Apply Systems, Partial fractions, & Linear Programming.

a) I can solve linear, planar, and other multi-variable systems of equations using "linear combination" or "substitution."
b) I can rewrite a rational function with a polynomial denominator into the sum of fractions with lesser degree polynomials using partial fraction decomposition.
c) I can graph systems of inequalities.
d) I can understand the concept of linear programming and can apply this understanding to linear systems in order to evaluate and determine maximum profit and minimum cost.

GEOMETRY

19. Analyze Polar Coordinates, Equations, & Construct Graphs.

a) I can convert a rectangular coordinate into a polar coordinate.
b) I can convert a polar coordinates into a rectangular coordinate.
c) I can graph polar coordinates on a polar coordinate plane and complex numbers in the real-imaginary plane.
d) I can convert rectangular equations in x & y into polar equations in *r* and theta.
e) I can convert polar equations in into rectangular equations in x & y.
f) I can graph various types of polar graphs including certain limaçons with inner loops, cardioids, convex limaçons, rose curves, circles, & lemniscates on the polar coordinate plane.
g) I can determine the equations of the polar graphs mentioned above.
h) I can determine the maximum *r*-values of the aforementioned polar equations by understanding where sine & cosine are maximized.

DATA ANALYSIS AND PROBABILITY

20. Examine Data using Data Analysis, Regression & Statistics.

a) I can calculate regression equations from a set of data using a calculator.
b) I can recognize whether regressions are exponential, sinusoidal, linear, logarithmic, or quadratic in nature.
c) I can use a calculator to determine if a given equation is a best fit for a certain set of data.
d) I can infer from a given regression possible future/unknown outcomes.
e) I can demonstrate an understanding of the standard normal distribution curve (bell curve).
f) I can calculate the mean, median, mode, 1^{st} quartile, 3^{rd} quartile, range, variance, standard deviation, & outliers of a given set of data.
g) I can represent statistical information with a box & whisker plot.
h) I can show how mean & standard deviation are relevant with the standard normal distribution curve by labeling the standard normal distribution curve using the mean & standard deviation from a given set of data.
i) I can determine percentiles given information that is located at integral standard deviations from the mean on a bell curve.

21. Analyze and Evaluate Counting Principles and Probability.

a) I can use the fundamental counting principle to determine the number of times a sequence of events can occur.
b) I can compute the number of ways an event could occur using permutations and combinations.
c) I can evaluate real world problems involving counting principles and compute the number of ways they can occur involving situations with or without replacement, situations with cards, dice, coins, etc.
d) I can understand and can apply the definition of an event.
e) I can understand and can apply the definition of mutually exclusive and know when it is relevant.
f) I can understand and can apply various definitions of odds and probability.
g) I can comprehend the concept of dependent and independent events and how they are relevant with counting principles and probability.
h) I can formulate expressions in order to evaluate real world problems involving counting principles and probability.
i) I can determine the probability of an event occurring with or without replacement.
j) I can determine the probability when one event is mutually exclusive of another event occurring.
k) I can determine the probability of an event occurring when it is independent/dependent of another event.
l) I can analyze and solve complex probability problems involving multiple choices/options including a variety of math team level problems.

COMMUNICATION

22. Organize and communicate mathematical thinking coherently and clearly to peers, teachers, and others.

a) I can use the language of mathematics (vocabulary) to express mathematical ideas precisely, orally, or in written form for each of the aforementioned learning targets.

b) I can explain in a detailed, organized manner the thinking process that took place in order to find the solution to a given problem.
c) I can reflect on thinking processes and methods of solving problems to justify solutions.

CALCULUS

Limits

1. Interpret and analyze limits graphically and numerically.

a) I can determine the limit of a function from a graph.
b) I can determine the limit of a function using a numerical approach or a table of values.
c) I can recognize and explain why limits are undefined when given a graph.

2. Evaluate limits analytically.

a) I can calculate limits by: factoring, rationalizing the numerator, rewriting a function, using trigonometric properties and identities.

3. Evaluate one-sided limits, infinite limits, and limits at infinity.

a) I can solve limit approaching from the left or right side of an x-value.
b) I can solve limit problems where the limit is.
c) I can solve limit problems where x is approaching.

Differentiation

4. Determine the derivative of a function.

a) I can use the limit definition of a derivative to find the derivative of a function.
b) I can recall and apply derivative rules to find the derivative of a function in terms of x.
c) I can apply derivative rules to find the derivative of a function and evaluate it at a point.
d) I can utilize logarithmic differentiation to find the derivative of a function when possible.

5. Calculate higher-order derivatives.

a) I can differentiate a function multiple times to find a higher-order derivative.

6. Use implicit differentiation to determine the derivative of an equation.

a) I can utilize implicit differentiation to determine for an equation.
b) I can generate for an equation using both implicit differentiation and substitution.

Applications of Differentiation

7. Investigate graphs of functions using derivatives.

a) I can find the slope of a line tangent at a point on the graph of a function.
b) I can model the equation of a line tangent to a point on the graph of a function.
c) I can recognize where on a graph a function is nondifferentiable.
d) I can solve for the critical numbers of a function and determine if they are maxima or minima.
e) I can examine the derivative of a function to determine where the graph of the function is increasing, decreasing, or constant
f) I can use the second derivative to determine points of inflection and the concavity of a function.

8. Use differentiation to model real-life applications.

a) I can develop and model optimization problems and use differentiation to evaluate maxima and minima.

b) I can develop and model related rates problems and use differentiation to evaluate rates of change.
c) I can use differentiation to solve problems involving position, velocity, and acceleration.

Integration

9. Use integration rules to determine the antiderivative of a function.

a) I can recall and apply integration rules to find a general or the particular antiderivative of a function.
b) I can incorporate the process of u-substitution to determine the antiderivative of a function.
c) I can incorporate the process of integration by parts to determine the antiderivative of a function.

10. Use the Fundamental Theorem of Calculus.

a) I can demonstrate the Fundamental Theorem of Calculus by evaluating an integral over an interval.

Applications of Integration

11. Use integration to solve differential equations.

a) I can design and then evaluate a differential equation using integration.
b) I can develop and model problems involving exponential growth and decay.
c) I can interpret Newton's Law of Cooling and use integration to solve problems.

12. Use integration to find the area of a region.

a) I can determine the area of a region bounded by a curve and either axis.
b) I can determine the area of a region bounded by two curves.

13. Use integration to find the volumes of solids.

a) I can determine the volume of a solid of revolution by using the disk and washer method.
b) I can determine the volume of a solid of revolution by using the shell method.
c) I can find the volume of a solid by using the method of known cross sections.