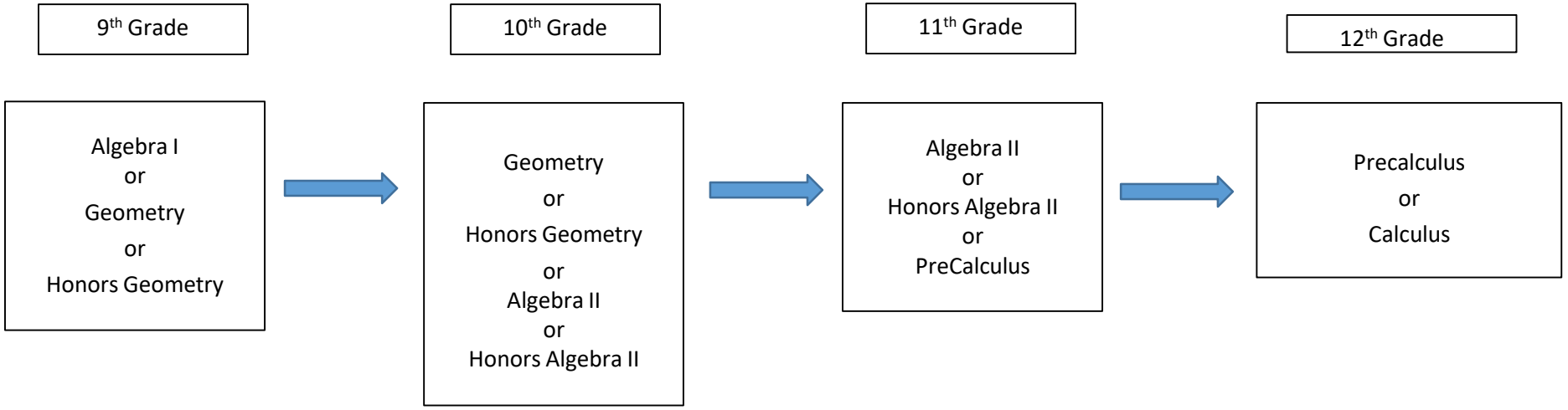
First State Military Academy Mathematics Flow Chart 2018 – 2019

A math course MUST be taken during senior year.



Curriculum Framework for

School: First State Military Academy **Course: Algebra 2**

Course Description: Algebra II continues the study of quadratic functions and introduces students to polynomial functions, logarithmic functions and trigonometric functions. Advanced features of the graphing calculator are incorporated into the course work. Real world problem solving and applications of algebra in various fields such as engineering and the sciences are a focal point of instruction. Content is aligned to the Delaware Core Standards and the new SAT.

Big Idea: To provide all cadets the knowledge, skills, and attributes, to thrive in post-secondary education, work, and civic life.			
Standards Alignment	**Unit Concepts/Big Ideas**	**Driving Questions/Learning Targets**	**Assessments**
Unit One: Expressions, Linear Equations, and Absolute Value **Timeline: 4 weeks**			
CCSS.Math.Content.ASSE.1a - Interpret parts of an expression, such as terms, factors, and coefficients. **CCSS.Math.Content.ASSE.1b** - Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.	**Concepts:** Variables Algebraic Expressions Order of Operations Formula Real Numbers Rational Numbers Irrational Numbers Integers Whole Numbers Natural Numbers Open Sentence Equation	**Driving Questions:** - How are symbols useful in mathematics? - What mathematical symbols do you know? **Learning Targets:** - Use the order of operations to evaluate expressions - Use formulas - Classify real numbers - Use the properties of real numbers to evaluate	**Summative:** - Party Project or Trip Project - Wall Activity for Absolute Value - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS. Math.Content.ASSE.2 - Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. **CCSS.Math.Content.A-CED.1** - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions.	Solution Absolute Value Empty Set Extraneous Solution **Big Ideas:** - Use the real properties of real numbers to evaluate expressions and formulas - Classify real numbers - Use the properties of equality to solve equations - Solve absolute value equations	expressions - Translate verbal expressions into algebraic expressions and equations, and vice versa - Solve equations using the Properties of Equality - Evaluate expressions involving absolute values - Solve absolute value equations	
Unit Two: Compound and Absolute Value Inequalities **Timeline: 4 weeks**			
CCSS.Math.Content.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions. **CCSS.Math.Content.A-CED.3.** - Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	**Concepts:** Compound Inequality Intersection Infinity **Big Ideas:** - Solve inequalities, compound inequalities, and absolute value inequalities - Graph inequalities, compound inequalities, and absolute value inequalities	**Driving Questions:** - How are symbols useful in mathematics? - What mathematical symbols do you know? **Learning Targets:** - To solve one-step inequalities - To solve multi-step inequalities - To solve compound inequalities - To solve absolute value inequalities	**Summative:** - Size Project or Prom Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

Unit Three: Linear Relations and Functions
Timeline: 5 weeks

CCSS.Math.Content.F-IF.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

CCSS.Math.Content.F-IF.5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function

CCSS.Math.Content.F-IF.9. - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger Maximum

Concepts:
One-to-one Functions
Onto Function
Discrete Relation
Continuous Relation
Vertical Line Test
Independent Variable
Dependent Variable
Function Notation
Linear Relations
Linear Equation
Linear Function
Standard Form
Y-intercept
X-intercept
Rate of Change
Slope
Slope-intercept Form
Point-slope Form
Parallel
Perpendicular
Scatter Plot
Positive Correlation
Negative Correlation
Line of Fit
Prediction Equation
Regression Line
Correlation Coefficient

Big Ideas:
- Identify the mathematical domains and ranges of functions and determine reasonable domain and range

Driving Questions:
- How can mathematical ideas be represented?

Learning Targets:
- Analyze relations and functions
- Use equations of relations and functions
- Use discrete and continuous functions to solve real-world problems
- Identify linear relations and functions
- Write linear equations in standard form
- Find rate of change
- Determine the slope of a line
- Write an equation of a line given the slope and a point on the line
- Write an equation of a line parallel or perpendicular to a given line
- Use scatter plots and prediction equations
- Model data using lines of regression

Summative:
- Winter Decoration Project
- Quiz

Formative:
- Workshop Practice
- Classwork/Homework Assignments
- Warm-Ups

CCSS.Math.Content.F-IF.6 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **CCSS.Math.Content.ASSE.1b** - Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P. **CCSS.Math.Content.A-CED.2** - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	values for continuous and discrete situations - Identify and sketch graphs of linear functions - Collect and organize data, make and interpret scatter plots, fit the graph of a function to the data, interpret the results and proceed to model, predict and make decisions and critical judgements		
Unit Four: Quadratics and Complex Numbers **Timeline: 9 weeks**			
CCSS.Math.Content.ASSE.1a - Interpret parts of an expression, such as terms, factors, and coefficients. **CCSS.Math.Content.F-IF.9. -** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For	**Concepts:** Quadratic function Quadratic Linear Constant Terms Parabola Axis of Symmetry Vertex Maximum Value Minimum Value Quadratic Equations	**Driving Questions:** - Why do we use different methods to solve math problems? **Learning Targets:** - Solve quadratic equations by using the Quadratic Formula - Use the discriminant to determine the number and type of roots of a quadratic	**Summative:** - Throwing a ball Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger Maximum **CCSS.Math.Content.A-CED.2** - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **CCSS.Math.Content.F-IF.4** - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.	Standard Form Root Zero Factored Form Foil Imaginary unit Pure imaginary unit Complex Number Complex Conjugates **Big Ideas:** - Determine reasonable domain and range values of quadratic functions - Analyze situations involving quadratic functions and formulate quadratic equations and inequalities to solve problems - Solve quadratic equations and inequalities using graphs, tables, and algebraic methods, including the Quadratic Formula - Use complex numbers to describe the solutions of quadratic equations - Determine a quadratic function from its zeros - Identify and sketch graphs of parent functions, including quadratic functions	equation - Use a graphing calculator to investigate changes to parabolas - Write a quadratic function in the form $y = a(x - h)^2 + k$ - Transform graphs of quadratic functions of the form $y = a(x - h)^2 + k$ - Investigate the rate of change of a quadratic function by examining first- and second-order differences	
Unit Five:Polynomials and Analyzing Graphs **Timeline: 6 weeks**			

CCSS.Math.Content.A-CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions **CCSS.Math.Content.A-APR.4** - Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x2 + y2)2 = (x2 – y2)2 + (2xy)2 can be used to generate Pythagorean triples **CCSS.Math.Content.A-APR.2** - Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). **CCSS.Math.Content.F-IF.7** - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. **CCSS.Math.Content.A-APR.3** - Identify zeros of polynomials	**Concepts:** Prime Polynomials Quadratic Form Identity Polynomial Identity Synthetic Substitution Depressed Polynomial **Big Ideas:** - Use tools including factoring and properties of exponents to simplify expressions and to transform and solve equations - Identify the mathematical domains and ranges of functions - Determine the reasonable domain and range values for continuous situations	**Driving Questions:** - Why is math used to model real-world situations? **Learning Targets:** - Factor Polynomials - Solve polynomial equations by factoring - Prove polynomial identities - Evaluate functions by using synthetic substitution - Determine whether a binomial is a factor of a polynomial by using synthetic substitution - Determine the number and type of roots for a polynomial equation - Find the zeros of a polynomial function - Use a graphing calculator to analyze polynomial functions - Identify possible rational zeros of a polynomial function - Find all of the rational zeros of a polynomial function	**Summative:** - Roller Coaster Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **CCSS.Math.Content.N-CN.9** - (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. **CCSS.Math.Content.A-REI.11 -** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★			
Unit Six: Inverses and Radical Functions and Relations **Timeline: 4 weeks**			
CCSS.Math.Content.F-IF.9 - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one	**Concepts:** Composition of Functions Inverse Relation Inverse Function Square Root Function Radical Function Square Root Inequality	**Driving Questions:** - How can you choose a model to represent a set of data? **Learning Targets:** - Find the sum, difference, product, and quotient of	**Summative:** - Driving in Style Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework

quadratic function and an algebraic expression for another, say which has the larger maximum **CCSS.Math.Content.F-BF.1** - Write a function that describes a relationship between two quantities.★ b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. **CCSS.Math.Content.F-IF.4** - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **CCSS.Math.Content.F-BF.4 -** Find inverse functions. a. Solve an equation of the form f(x) = c for	Nth root Radical sign Index Radicand Principal Root Rationalizing the Denominator Like radical expressions Conjugate Radical Equation Extraneous solution Radical Inequality **Big Ideas:** - Relate representations of square root functions - Connect inverses of square root functions with quadratic functions - Determine solutions of square root equations and inequalities using graphs, tables, and algebraic methods - Determine the reasonable domain and range values of square root functions, and interpret and determine the reasonableness of solutions to square root equations and inequalities - Use the parent function to investigate, describe, and predict the effects of parameter changes on graphs of square root functions and describe limitations on the domains and ranges	functions - Find the composition of functions - Find the inverse of a function or relation - Determine whether two functions or relations are inverses - Compare a functions and its inverse using a graphing calculator - Graph and analyze square root functions - Graph square root inequalities - Simplify radicals - Use a calculator to approximate radicals - Use a graphing calculator to graph nth root functions - Simplify radical expressions - Add, subtract, multiply, and divide radical expressions - Write expressions with rational exponents in radical form and vice versa. - Simplify expressions in exponential or radical form - Solve equations containing radicals - Solve inequalities containing radicals - Use a graphing calculator to solve radical equations and inequalities	Assignments - Warm-Ups

a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x 1. **CCSS.Math.Content.F-IF.7 -** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ b. Graph square root, cube root, and piecewisedefined functions, including step functions and absolute value functions. **CCSS.Math.Content.F-BF.3 -** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **CCSS.Math.Content.A-SSE.2. -** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of			

squares that can be factored as (x2 – y2)(x2 + y2). **CCSS.Math.Content.A-REI.2. -** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **CCSS.Math.Content.A-REI.11 -** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★			
Unit Seven: Exponential and Logarithmic Functions and Relations **Timeline: 5 weeks**			
CCSS.Math.Content.F-IF.7. - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ e. Graph exponential and	**Concepts:** Exponential Function Exponential Growth Asymptote Growth Factor Exponential Decay Decay Factor Exponential Equation Compound Interest	**Driving Questions:** - How can you make good decisions? - What factors can affect good decision making? **Learning Targets:** - Graph exponential growth functions	**Summative:** - Population Puzzle Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **CCSS.Math.Content.F-IF.8. -** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay. **CCSS.Math.Content.A-REI.11. -** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★	Exponential Inequality Logarithm Logarithmic Function Logarithmic Equation Logarithmic Inequality Common Logarithm Change of Base Formula Natural Base, *e* Natural Base Exponential Function Natural Logarithm Rate of Continuous Growth Rate of Continuous Decay Logistic Growth Model **Big Ideas:** - Analyze a situation modeled by an exponential function, formulate an equation or inequality, and solve the problem - Develop the definition of logarithms by exploring and describing the relationships between exponential functions and their inverses - Use parent functions to investigate, describe and predict the effects of parameter changes on the graphs of exponential and logarithmic functions, describe limitations on the domains and ranges, and examine asymptotic behavior - Determine solutions of exponential and logarithmic	- Graph exponential decay functions - Use a graphing calculator to solve exponential equations by graphing or by using the table feature - Solve exponential equations - Solve exponential inequalities - Evaluate logarithmic expressions - Graph logarithmic functions - Use a graphing calculator to find an equation of best fit for exponential and logarithmic functions - Solve logarithmic equations - Solve logarithmic inequalities - Simplify and evaluate expressions using the properties of logarithms - Solve logarithmic equations using the properties of logarithms - Solve exponential equations and inequalities using common logarithms - Evaluate logarithmic expressions using the Change of Base Formula - Use a graphing calculator to solve exponential and logarithmic equations and inequalities - Evaluate expressions involving the natural base and natural logarithm - Solve exponential equations and inequalities using natural	

CCSS.Math.Content.A-CED.1. - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions. **CCSS.Math.Content.F-LE..4. -** For exponential models, express as a logarithm the solution to abct =d where a, c, and d are numbers and the base b is 2,10,or e; evaluate the logarithm using technology**.** **CCSS.Math.Content.F-IF.7. -** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **CCSS.Math.Content.F-BF.3. -** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an	equations using graphs, tables, and algebraic methods - Interpret and determine the reasonableness of solutions to exponential and logarithmic equations and inequalities	logarithms - Use a spreadsheet to display the growth of an investment over time - Use logarithms to solve problems involving exponential growth and decay - Use logarithms to solve problems involving logistic growth	

explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **CCSS.Math.Content.A-SSE.2. -** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). **CCSS.Math.Content.A-CED.1. -** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions.			
Unit Eight: Rational Functions and Relations **Timeline: 4 weeks**			
CCSS.Math.Content.A-APR.7. - (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	**Concepts:** Rational expression Complex fraction Reciprocal function Hyperbola Asymptote Rational function Point discontinuity Direct variation Constant of variation	**Driving Questions:** - Why are graphs useful? **Learning Targets:** - Simplify rational expressions - Simplify complex fractions - Determine the LCM of polynomials - Add and subtract rational expressions	**Summative:** - Financial Literacy Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.Math.Content.A-CED.2. - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **CCSS.Math.Content.F-BF.3. -** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **CCSS.Math.Content.F-IF.9. -** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic exp **CCSS.Math.Content.A-REI.2. -** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise	Rational equations Rational inequalities Weighted average **Big Ideas:** - Determine properties of reciprocal functions and graph their transformations - Use quotients of polynomials to describe the graphs of rational functions, describe limitations on the domains and ranges, and examine asymptotic behavior - Determine the reasonable domain and range values of rational functions and determine the reasonableness of solutions to rational equations and inequalities - Analyze a situation modeled by a rational function, formulate an equation composed of a linear or quadratic function, and solve the problem - Use functions to model and make predictions in problem situations involving direct and inverse variation	- Determine properties of reciprocal functions - Graph transformations of reciprocal functions - Graph rational functions with vertical and horizontal asymptotes - Graph rational functions with oblique asymptotes and point discontinuity - Use a graphing calculator to explore the graphs of rational functions - Recognize and solve direct and joint variation problems - Recognize and solve inverse and combined variation problems - Solve rational equations - Solve rational inequalities - Use a graphing calculator to solve rational equations by graphing or by using the table feature	

CCSS.Math.Content.A-CED.1. - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and exponential functions. **CCSS.Math.Content.A-REI.11. -** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★			
Unit Nine: **Timeline:**			
CCSS.Math.Content.	**Concepts:** **Big Ideas:** -	**Driving Questions:** - **Learning Targets:** -	**Summative:** - - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

Algebra 2

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Expectations:

1. Use proper salutations.
2. Wear your uniform properly
3. Come prepared with a notebook, writing utensil, your computer, and homework if necessary.
4. Contribute during class discussion.
5. Stay on task while working in partners or groups.

Materials Needed Everyday:

Spiral Notebook
Writing Utensil
Computer

Topics to be covered:

Unit 1: Equations and Inequalities
Unit 2: Linear Relations and Functions
Unit 3: Systems of Equations and Inequalities
Unit 4: Quadratic Functions and Relations
Unit 5: Polynomials
Unit 6: Inverses and Radical Functions
Unit 7: Exponential and Logarithmic Functions
Unit 8: Rational Functions
Unit 9: Conic Sections

Assignment Headings

When you turn in work electronically, I need you to put a heading on your assignments so that it is easier to keep track of the assignments along with the members of your group.

Last name: Assignment Title
Collier: Order of Operations HW

Group Work
Last name: Group members: Assignment Title
Collier: Cook, Garton, Irwin: Order of Operation Project

Make-up Work:

Every student has the ability to check his or her assignments from home as long as Wi-Fi is available. Make-up work will be taken care of on an individual basis, but students that aren't in school will be expected to contact their groups to make sure that they are contributing as much as possible to help the group run smoothly to finish the projects. Absent students need to check the Agenda to see if there are any daily assignments that need to be accomplished before they come back to school. Assignments will only be accepted up to 5 school days late unless a plan has been created with the teacher.

Late Work

A student has the ability to turn in work up until 5 days after the due date for the assignment. This is for when a student needs to finish an assignment that might not be quite done at the time it is supposed to be turned in. The student will lose points off of his or her grade each day that the assignment is late. The assignment will not be accepted on the 6th day for a grade. The assignment will automatically turn to a 0.

Grading System:

The assignments will be graded on a scale so that Content and Knowledge are worth 50%, Written Communication is 15%, Oral Communication is 15%, Agency is 10%, and Collaboration is 10%.

100 – 93	A
92 – 85	B
84 – 77	C
76 – 70	D
69 – below	F

We are looking forward to an exciting year where everyone is learning and growing together.

Sincerely,

Mrs. Collier

Curriculum Framework for:

School: First State Military Academy **Course: Algebra I**

Course Description:

This course applies critical thinking skills needed to solve real world problems. It covers patterns and sequences, all types of linear equations and inequalities in one variable, systems of equations, quadratic functions, and an introduction to exponential functions. Coordinate geometry will be integrated into the investigation of these functions. Students learn how to use a graphing calculator in order to stay current with modern technological trends. Content is aligned to the Delaware Core Standards and the new SAT.

Big Idea: To provide all cadets the knowledge, skills, and attributes, to thrive in post-secondary education, work, and civic life.

Standards Alignment	Unit Concepts/Big Ideas	Driving Questions/Learning Targets	Assessments
Unit One: Expressions, Equations, and Functions **Timeline: 14 Days**			
CCSS.A.SSE.1a - Interpret parts of an expression, such as terms, factors, and coefficients. **CCSS.A.SSE.2 -** Use the structure of an expression to identify ways to rewrite it. **CCSS.A.SSE.1b -** Interpret complicated expressions by viewing one or more of their parts as a single entity. **CCSS.A.CED.1 -** Create equations and inequalities in one variable and use them to solve problems.	**Concepts:** Algebraic Expressions Variable Term Power Exponent Base Evaluate Order of Operations Equivalent Expressions Reciprocal Like Terms Simplest Form Distributive Property Coefficient Equation	**Driving Questions:** - How can mathematical ideas be represented? **Learning Targets:** - To write verbal expressions for algebraic expressions - To write algebraic expressions for verbal expressions - To evaluate numerical expressions by using the order of operations - To evaluate algebraic expressions by using the order of operations - To use the distributive property to evaluate and simplify expressions - To solve equations with one and	**Summative:** - Car Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.A.REI.3 - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **CCSS.A.REI.10 -** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **CCSS.F.IF.1 -** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. **CCSS.F.IF.2 -** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	Solving Solution Coordinate Plane X- and y-axes Origin Ordered Pair X- and y-coordinates Relation Domain Range Independent Variable Dependent Variable Function Vertical Line Test Function Notation **Big Ideas:** - Represent relationships among quantities using tables, graphs, verbal descriptions, and inequalities - Use symbols to represent unknowns and variables - Find specific function values and solve equations in problem situations - Describe independent and dependent quantities in functional relationships - Identify mathematical domains and ranges and determine reasonable domain and range values for given situations - Connect equation notation with function notation	two variables - To represent and interpret graphs of relations - To determine whether a relation is a function - To identify function values	
Unit Two: Linear Equations **Timeline: 20 Days**			
CCSS.A.CED.1 - Create equations and inequalities in one variable and use them to solve problems.	**Concepts:** Formula Solve an Equation Equivalent Equations	**Driving Questions:** - Why is it helpful to represent the same mathematical idea in different ways?	**Summative:** - Central Park Desmos - Pepsi Points Problem - Bottomless Coffee

CCSS.A.REI.1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method **CCSS.A.REI.3 -** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Multi-Step Equations Addition Property of Equality Subtraction Property of Equality Multiplication Property of Equality Division Property of Equality Consecutive Integers **Big Ideas:** - Describe functional relationships for given problem situations and write equations to answer questions arising from the situations - Represent relationships among quantities using diagrams, verbal descriptions, and equations - Find specific function values, and transform and solve equations in problem situations - Use the Properties to simplify expressions	**Learning Targets:** - To translate sentences into equations - To translate equations into sentences - To solve equations by using addition, subtraction, multiplication, and division - To solve equations involving more than one operation - To solve equations involving consecutive integers - To solve equations with the variable on each side - To solve equations involving grouping symbols	- Quiz **Formative:** - Penny Balance Problem - Basketball Overboard Problem - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Three: Linear Functions **Timeline: 12 days**			
CCSS.F.IF.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.* **CCSS.F.IF.7a -** Graph linear and quadratic functions and show intercepts, maxima, and minima.	**Concepts:** Linear Equation Standard Form Constant X-intercept Y-intercept Linear function Rate of change Slope Direct variation **Big Ideas:** - Create, use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions. - Interpret the meaning of intercepts in situations using data, symbolic	**Driving Questions:** - Why are graphs useful? **Learning Targets:** - To identify linear equations, intercepts, and zeros. - To graph and write linear equations. - To use rate of change to solve problems.	**Summative:** - Roller Coaster Project - Quiz **Formative:** - Function Research - Leo the Rabbit - Foundations of Functions Worksheet - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.A.REI.10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **CCSS.F.IF.6 -** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* **CCSS.F.LE.1a -** Distinguish between situations that can be modeled with linear functions and with exponential functions.	representations, or graphs - Determine the intercepts of the graphs of linear functions and zeros of linear functions from graphs, tables, and algebraic representations - Look for patterns and represent generalizations algebraically - Develop the concept of slope as rate of change and determine the slope from graphs, tables, and algebraic representations - Interpret the meaning of slope in situations using data, symbolic representation		
Unit Four: Equations of Linear Functions **Timeline: 16 Days**			
CCSS.F.IF.7a - Graph linear and quadratic functions and show intercepts, maxima, and minima. **CCSS.S.ID.7 -** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **CCSS.F.BF.1 -** Write a function that describes a relationship between two quantities **CCSS.F.LE.2 -** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **CCSS.F.IF.2 -** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**Concepts:** Slope-intercept form Constant function Constraint Linear extrapolation Point-slope form Parallel lines Perpendicular lines Inverse relation Inverse function **Big Ideas:** - Write equations of lines given specific characteristics - Interpret and predict the effects of changing the slope and y-intercept in applied situations - Interpret and make decisions, predictions, and critical judgments from functional relationships - Solve an equation of the form f(x)	**Driving Questions:** - Why is math used to model real-world situations? **Learning Targets:** - To write and graph linear equations in various forms. - To find inverse linear functions.	**Summative:** - Lost in Space Project - Quiz **Formative:** - Investigating T-shirt offers - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.A.CED.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **CCSS.F.BF.4a -** Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.	= c for a simple function *f* that has an inverse and write an expression for the inverse.		
Unit Five: Linear Inequalities **Timeline: 12 Days**			
CCSS.A.CED.1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **CCSS.A.REI.3 -** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **CCSS.A.REI.12 -** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	**Concepts:** Set-Builder Notation Compound Inequality Intersection Union Boundary Half-Plane Closed Half-Plane Open **Big Ideas:** - Formulate linear inequalities to solve problems - Investigate methods for solving linear inequalities using the Properties of Inequality - Solve linear inequalities - Interpret and determine the reasonableness of solutions to linear inequalities	**Driving Questions:** - How are symbols useful in mathematics? - What mathematical symbols do you know? **Learning Targets:** - To solve one-step and multi-step inequalities - To solve compound inequalities and inequalities involving absolute value. - To graph inequalities in two variables.	**Summative:** - Equations and inequalities project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Six: Systems of Linear Equations and Inequalities **Timeline: 12 Days**			
CCSS.A.CED.2 - Create equations in two or more variables to represent relationships between quantities;	**Concepts:** Systems of equations Consistent	**Driving Questions:** - How can you find the solution to a math problem?	**Summative:** - Netflix, Redbox, or Apple TV - Star Wars vs. Avengers

graph equations on coordinate axes with labels and scales. **CCSS.A.REI.6 -** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. **CCSS.A.REI.5** - Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions	Independent Dependent Inconsistent Substitution Elimination **Big Ideas:** - Analyze situations and formulate systems of linear equations in two unknowns to solve problems. - Solve systems of linear equations using graphs and algebraic methods - Interpret and determine the reasonableness of solutions to systems of linear equations.	- How can you use system of equations to solve real-world problems? **Learning Targets:** - To solve systems of linear equations by graphing, substitution, and elimination.	- Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Seven: Exponents and Exponential Functions **Timeline: 14 Days**			
CCSS.A.SSE.2 - Use the structure of an expression to identify ways to rewrite it. *For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2)*. **CCSS.F.IF.8b -** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **CCSS.N.RN.1 -** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5*. **CCSS.N.RN.2 -** Rewrite expressions involving radicals and rational	**Concepts:** Monomial Constant Zero Exponents Negative Exponent Order of Magnitude Rational Exponent Cube Root *n*th Root Exponential Equation Scientific Notation Exponential Function Exponential Growth Function Exponential Decay Function Compound Interest Geometric Sequence Common Ratio Recursive Formula **Big Ideas:** - Simplify polynomial expressions and apply the laws of exponents in problem-solving situations	**Driving Questions:** - How can you make good decisions? - What factors can affect good decision making? **Learning Targets:** - To simplify and perform operations on expressions involving exponents. - To extend the properties of integer exponents to rational exponents. - To use scientific notation. - To graph and use exponential functions	**Summative:** - Exponential Functions Project: Math with a Message. - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

exponents using the properties of exponents. **CCSS.F.IF.7e -** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **CCSS.F.LE.2 -** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **CCSS.REI.11 -** Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* **CCSS.F.BF.2 -** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.* **CCSS.F.IF.3 -** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1*.	- Graph and analyze exponential functions - Analyze data and represent situations involving exponential growth and decay using tables, graphs, or algebraic methods - Relate geometric sequences to exponential functions, and write recursive formulas to represent sequences		
Unit Eight: Quadratic Expressions and Equations **Timeline: 18 Days**			
CCSS.A.SSE.1a - Interpret parts of	**Concepts:**	**Driving Questions:**	**Summative:**

an expression, such as terms, factors, and coefficients. **CCSS.A.APR.1 -** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. **CCSS.A.SSE.2 -** Use the structure of an expression to identify ways to rewrite it. *For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2)***.** **CCSS.A.SSE.3a -** Factor a quadratic expression to reveal the zeros of the function it defines. **CCSS.A.REI.4b -** Solve quadratic equations by inspection (e.g., for *x*2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as *a* ± *bi* for real numbers *a* and *b*. **CCSS.A.REI.1 -** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	Factoring Factoring by grouping Zero Product Property Quadratic Equation Prime Polynomial Difference of Two Squares Perfect Square Trinomial **Big Ideas:** - Add, subtract, and multiply polynomials - Factor as necessary in problem situations - Solve quadratic equations using concrete models, tables, graphs, and algebraic methods	- When could a nonlinear function be used to model a real-world situation? **Learning Targets:** - To add, subtract, and multiply polynomials - To factor trinomials - To factor differences of squares - To graph quadratic functions - To solve quadratic equations	- "How To" Quadratics Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Nine: Quadratic Functions and Equations **Timeline: 18 Days**			
CCSS.F.IF.4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing	**Concepts:** Quadratic Function Standard form Parabola Axis of Symmetry	**Driving Questions:** - Why do we use different methods to solve math problems? **Learning Targets:**	**Summative:** - Quadratic functions project - Parabola Selfie - Quiz

key features given a verbal description of the relationship. **CCSS.F.IF.7a -** Graph linear and quadratic functions and show intercepts, maxima, and minima. **CCSS.A.REI.4b -** Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. **CCSS.A.SSE.3b -** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **CCSS.A.REI.4 -** Solve quadratic equations in one variable. **CCSS.F.IF.8a -** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **CCSS.F.IF.6 -** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **CCSS.F.LE.1 -**Distinguish between situations that can be modeled with linear functions and with exponential functions.	Vertex Minimum Maximum Double root Transformation Translation Dilation Reflection Vertex Form Completing the square Quadratic Formula **Big Ideas:** - To identify and sketch the general forms of quadratic parent functions - Analyze graphs of quadratic functions and draw conclusions - Make connections among the solutions of quadratic equations, the zeros of their related functions, and the horizontal intercepts of the graph of the function - Solve quadratic equations using concrete models, tables, graphs, and algebraic methods - Analyze functions with successive differences and ratios - Identify and graph special functions	- To solve quadratic equations by graphing, completing the square, and using the Quadratic Formula - To analyze functions with successive differences and ratios - To identify and graph special functions	**Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Ten: Radical Functions and Geometry **Timeline: 16 Days**			
CCSS.F.BF.4a - Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. **CCSS.F.IF.4 -** For a function that	**Concepts:** Square Root Function Radical Function Redicand Radical Expression	**Driving Questions:** - How can you choose a model to represent a real-world situation? **Learning Targets**	**Summative:** - Radical Functions - Modeling the Speed of Tsunamis - Quiz

models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. **CCSS.F.IF.7b -** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases **CCSS.A.REI.4a -** Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)2 = q$ that has the same solutions. Derive the quadratic formula from this form. **CCSS.N.NR.2 -** Rewrite expressions involving radicals and rational exponents using the properties of exponents. **CCSS.A.CED.2 -** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Rationalizing the denominator Conjugate Closed *n*th Root Index Radical Equations Extraneous Solutions Hypotenuse Legs Converse Pythagorean Triple Distance Formula Midpoint Trigonometry Trigonometric Ratio Sine Cosine Tangent Solving the Triangle Inverse sine Inverse Cosine Inverse Tangent **Big Ideas:** - Add, subtract, multiply, and simplify radical expressions - Solve radical equations - Use Pythagorean Theorem and and trigonometric ratios to solve problems.	- To graph and transform radical functions. - To simplify, add, subtract, and multiply, radical expressions. - To solve radical equations. - To use the Pythagorean Theorem. - To find trigonometric ratios.	**Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Eleven: Rational Functions and Equations **Timeline: 14 Days**			
CCSS.A.CED.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **CCSS.A.REI.11 -** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and y	**Concepts:** Inverse Variation Product Rule Rational Function Excluded Value Asymptote Rational Expression Least Common Multiple	**Driving Questions:** - How can simplifying mathematical expressions be useful? **Learning Targets** - To identify and graph inverse variations - To identify extended values of rational functions	**Summative:** - Rational Functions Project - Crime Scene Investigation - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments

= $g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*	Least Common Denominator Mixed Expression Complex Fraction Rational Equation Extraneous Solution Work and Rate Problems **Big Ideas:** - Analyze data and represent situation involving inverse variation using tables, graphs, or algebraic methods - Graph and analyze rational functions - Identify excluded values from rational expressions and simplify rational expressions - Multiply and divide rational expressions and use dimensional analysis - Divide a polynomial by a monomial or binomial - Add and subtract rational expressions with like and unlike denominators - Solve rational equations and eliminate extraneous roots	- To multiply, divide, and add rational expressions - To divide polynomials - To solve rational equations	- Warm-Ups
Unit Twelve: Statistics and Probability **Timeline: 14 Days**			
CCSS.S.ID.2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. **CCSS.S.ID.3** - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	**Concepts:** Population Sample Simple random sample Systematic sample Self-selected sample Convenience sample Stratified sample Bias Survey Observational study Experiment	**Driving Questions:** - How are statistics and probability used in the real world? **Learning Targets** - To design surveys and evaluate results - To use permutations and combinations - To design and use simulations	**Summative:** - Independent Study - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.S.ID.5 - Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	Statistical inference Statistic Parameter Mean absolute deviation (MAD) Standard deviation Variance Distribution Negatively skewed distribution Symmetric distribution Positively skewed distribution Linear transformation Theoretical probability Experimental probability Relative frequency Simulation Probability model Permutation Factorial Combination Compound event Joint probability Independent events Dependent events Mutually exclusive events Random variable Discrete random variable Probability distribution Probability graph Expected value **Big Ideas:** - Identify various sampling techniques and recognize a biased sample - Count outcomes using the Fundamental Counting Principle - Use combinations and permutations to determine probabilities - Find the probability of two independent events or dependent events, and find the probability of two mutually exclusive or inclusive events		

	- Use random variables to compute probability, and use probability distributions to solve real-world problems - Use probability simulations to model real-world situations		

Algebra 1

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Expectations:

1. Use proper salutations.
2. Wear your uniform properly
3. Come prepared with a notebook, writing utensil, your computer, and homework if necessary.
4. Contribute during class discussion.
5. Stay on task while working in partners or groups.

Materials Needed Everyday:

Spiral Notebook
Writing Utensil
Computer

Topics to be covered:

Unit 1: Functions, Equations, and Expressions
Unit 2: Linear Equations
Unit 3: Linear Functions
Unit 4: Equations of Linear Functions
Unit 5: Linear Inequalities
Unit 6: Systems of Linear Equations and Inequalities
Unit 7: Exponents and Exponential Functions
Unit 8: Quadratic Expressions and Equations
Unit 9: Quadratic Functions and Equations

Make-up Work:

Every student has the ability to check his or her assignments from home as long as Wi-Fi is available. Make-up work will be taken care of on an individual basis, but students that aren't in school will be expected to contact their groups to make sure that they are contributing as much as possible to help the group run smoothly to finish the projects. Absent students need to check the Agenda to see if there are any daily assignments that need to be accomplished before they come back to school. Assignments will only be accepted up to 5 school days late unless a plan has been created with the teacher.

Late Work
A student has the ability to turn in work up until 5 days after the due date for the assignment. This is for when a student needs to finish an assignment that might not be quite done at the time it is supposed to be turned in. The student will lose 7% of his or her grade each day that the assignment is late. The assignment will not be accepted on the 6th day for a grade. The assignment will automatically turn to a 0.

Grading System:
The assignments will be graded on a scale so that Content and Knowledge are worth 50%, Written Communication is 15%, Oral Communication is 15%, Agency is 10%, and Collaboration is 10%.

100 – 93	A
92 – 85	B
84 – 77	C
76 – 70	D
69 – below	F

We are looking forward to an exciting year where everyone is learning and growing together.

Sincerely,

Ms. Garton

Curriculum Framework for

School: First State Military Academy **Course: Calculus**

Course Description: This course includes the in-depth study of functions, analysis of graphs, limits, continuity, derivatives at a point and of functions, second derivatives and applications and computation of derivatives: interpretations and properties of definite integrals, applications of integrals, including volumes of solids of revolution, disks, and washer, and the approximations to definite integrals. All topics are covered algebraically, geometrically, and analytically.

Big Idea: To provide all cadets the knowledge, skills, and attributes, to thrive in post-secondary education, work, and civic life.			
Standards Alignment	**Unit Concepts/Big Ideas**	**Driving Questions/Learning Targets**	**Assessments**
Unit One: Prerequisites for Calculus **Timeline: 2 weeks**			
CCSS.MATH.CONTENT.HSA.CED.A.1 CCSS.MATH.CONTENT.HSA.CED.A.2 CCSS.MATH.CONTENT.HSA.CED.A.4 CCSS.MATH.CONTENT.HSA.REI.A.10 CCSS.MATH.CONTENT.HSA.CE	**Concepts:** Increments Slope of a Line Parallel and Perpendicular Lines Equations of Lines Functions Domains and Ranges Viewing and Interpreting Graphs Even Functions and Odd Functions-Symmetry Functions Defined in Pieces The Absolute Value Function Composite Functions	**Driving Questions:** - How are linear equations used extensively in business and economic applications? - How are functions and graphs used to form the basis for understanding mathematics? - How do exponential functions model growth patterns? - How do parametric equations create graphs of relations and functions? - How are logarithmic functions	**Summative:** - Isotope Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

D.A.11 CCSS.MATH.CONTENT.HSF.IF.A.1 CCSS.MATH.CONTENT.HSF.IF.A.2 CCSS.MATH.CONTENT.HSF.IF.A.5 CCSS.MATH.CONTENT.HSF.IF.A.7a CCSS.MATH.CONTENT.HSF.IF.A.7b CCSS.MATH.CONTENT.HSF.IF.A.7e CCSS.MATH.CONTENT.HSF.IF.A.8b CCSS.MATH.CONTENT.HSF.BF.A.1b CCSS.MATH.CONTENT.HSF.BF.A.1c CCSS.MATH.CONTENT.HSF.BF.A.3 CCSS.MATH.CONTENT.HSF.BF.A.4 CCSS.MATH.CONTENT.HSF.BF.A.5	Exponential Growth Exponential Decay The Number *e* Relations Circles Ellipses Lines and Other Curves One-to-One Functions Inverses Finding Inverses Logarithmic Functions Properties of Logarithms Radian Measure Graphs of Trigonometric Functions Periodicity Even and Odd Trigonometric Functions Transformations of Trigonometric Graphs Inverse Trigonometric Functions **Big Ideas:** - Review the most important topics necessary to start learning Calculus - Introduce a graphing utility as an investigative tool to support analytic work - Solve problems with numerical and graphical methods - Functions and parametric equations are major tools to describe real world situations - Learn the different functions and the behaviors they can describe - Trigonometric functions	used in real-life applications? - How do trigonometric functions model periodic behavior? **Learning Targets:** - Use increments to calculate slopes - Write an equation and sketch a graph of a line given specific information - Identify the relationships between parallel lines, perpendicular lines, and slopes - Use linear regression equations to solve problems - Identify the domain and range of a function using its graph or equation - Recognize even functions and odd functions using equations and graphs - Interpret and find formulas for piecewise defined functions - Write and evaluate compositions of two functions - Determine the domain, range, and graph of an exponential function - Solve problems involving exponential growth and decay - Use exponential regression equations to solve problems - Graph curves that are described, using parametric equations - Find parameterizations of circles, ellipses, line segments,	

CCSS.MATH.CONTENT.HSF.LE.A.1 CCSS.MATH.CONTENT.HSF.LE.A.3 CCSS.MATH.CONTENT.HSF.LE.A.4 CCSS.MATH.CONTENT.HSF.LE.A.5 CCSS.MATH.CONTENT.HSF.TF.A.1 CCSS.MATH.CONTENT.HSF.TF.A.2 CCSS.MATH.CONTENT.HSF.TF.A.4 CCSS.MATH.CONTENT.HSF.TF.A.5 CCSS.MATH.CONTENT.HSF.TF.A.6 CCSS.MATH.CONTENT.HSF.TF.A.7 CCSS.MATH.CONTENT.HSS.ID.B.6 CCSS.MATH.CONTENT.HSS.ID.B.7 CCSS.MATH.CONTENT.HSS.ID.B.8	describe cyclic and repetitive activity - Exponential, logarithmic, and logistic functions describe growth and decay - Polynomial functions can approximate these and most other functions	and other curves - Identify a one-to-one function - Determine the algebraic representation and the graphical representation of a function and its inverse - Use parametric equations to graph inverse functions - Convert between radians and degrees, and find arc length - Identify the periodicity and even-odd properties of the trigonometric functions - Find values of trigonometric functions - Generate graphs for trigonometric functions and explore various transformations - Use the inverse trigonometric functions to solve problems	

Unit Two: Limits and Continuity **Timeline: 4 weeks**			
CCSS.MATH.CONTENT.HSA.SSE.A.1 CCSS.MATH.CONTENT.HSA.SSE.B.3 CCSS.MATH.CONTENT.HSA.APR.C.4 CCSS.MATH.CONTENT.HSA.APR.D.6 CCSS.MATH.CONTENT.HSA.CED.A.4 CCSS.MATH.CONTENT.HSF.IF.B.6 CCSS.MATH.CONTENT.HSF.IF.C.7	**Concepts:** Average and Instantaneous Speed Definition of Limit Properties of Limits One-sided Limits Two-sided Limits Sandwich Theorem Finite Limits as $x \to \pm\infty$ Infinite Limits as $x \to a$ End Behavior Models Continuity as a Point Continuous Functions Algebraic Combinations Composites Intermediate Value Theorem for Continuous Functions Average Rates of Change Tangent to a Curve Slope of a Curve Normal to a Curve **Big Ideas:** - To understand the concept of limit - To define and calculate limits of function values - Use substitution, graphical investigation, numerical approximation, algebra, or some combination to solve limits - Use limits to test for continuity	**Driving Questions:** - How can limits be used to describe continuity, the derivative, and the integral? - How can limits be used to describe the behavior of functions for numbers in absolute value? - How do continuous functions describe how a body moves through space? - How does a tangent line describe points of motion? **Learning Targets:** - Calculate average and instantaneous speeds - Define and calculate limits for function values and apply the properties of limits - Use the Sandwich Theorem to find certain limits indirectly - Find and verify end behavior models for various functions - Calculate limits as $x \to \pm\infty$ and to identify vertical and horizontal asymptotes - Identify the intervals upon which a given functions is continuous and understand the meaning of continuous function - Remove removable discontinuities by extending or	**Summative:** - Insect Population Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

		modifying a function - Apply the Intermediate Value Theorem and the properties of algebraic combination and composites of continuous functions - Apply directly the definition of the slope of a curve in order to calculate slopes - Find the equations of the tangent line and normal line to a curve at a given point - Find the average rate of change of a function	
Unit Three: Derivatives **Timeline: 4 weeks**			
	Concepts: Derivative Notation Relationships between the Graphs of f and f' Graphing the Derivative from Data One-sided Derivatives How $f'(a)$ Might Fail to Exist Differentiability Implies Local Linearity Numerical Derivatives on a Calculator Differentiability Implies Continuity Intermediate Value Theorem for Derivatives Positive Integer Powers, Multiples, Sums, and	**Driving Questions:** - How can we use the derivative to model the instantaneous change? - How can we create a graph when you know the tangent lines at multiple points? - How do you use the rules for differentiation to analyze functions quickly? - How do derivatives give different rates at which things change? - How can sine and cosine graphs describe periodic change? **Learning Targets:**	**Summative:** - Medicine Dosage Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

	Differences Products and Quotients Negative Integer Powers of x Second and Higher Order Derivatives Instantaneous Rates of Change Motion Along a Line Sensitivity to Change Derivatives in Economics Derivative of the Sine Function Derivative of the Cosine Function Simple Harmonic Motion Jerk Derivatives of the Other Basic Trigonometric Functions **Big Ideas:** - **Calculate the instantaneous rate of change at any point** - **Study the rates of change of functions** - **Find out what a derivative is** - **Learn how derivatives work**	- Calculate slopes and derivatives using the definition of the derivative - Graph f from the graph of f', graph f' from the graph of f, and graph the derivative of a function given numerically with data - Find where a function is not differentiable and distinguish between corners, cusps, discontinuities, and vertical tangents. - Approximate derivatives numerically and graphically - Use the rules of differentiation to calculate derivatives, including second and higher order derivatives - Use the derivative to calculate the instantaneous rate of change - Use derivatives to analyze straight line motion and solve other problems involving rates of change - Use the rules of differentiating the six basic trigonometric functions	
Unit Four: More Derivatives **Timeline: 4 weeks**			
	Concepts:	**Driving Questions:**	**Summative:**

	Chain Rule Implicit Differentiation Inverse Function Inverse Cofunction Identities Logarithmic Differentiation Normal to the Surface Orthogonal Curves Orthogonal Families Power Chain Rule Power Rule for Arbitrary Real Powers Power Rule for Rational Powers of x **Big Ideas:** - Exploring the Chain Rule - Use the Chain Rule - Create a derivative for a composite function - Create derivatives of trigonometric functions and their inverses - Calculate derivatives of exponential and logarithmic functions - Use implicit differentiation to find derivatives - Use the Power Rule to find derivatives -	- How does the Chain Rule help you differentiate functions? - How does implicit differentiation allow us to find derivatives of functions? - How do graphs of functions and inverses relate to their derivatives? - How do exponential rates model growth rates in the real world? **Learning Targets:** - Differentiate composite functions using the Chain Rule - Find slopes of parameterized curves - Find derivatives using implicit differentiation - Find derivatives using the Power Rule for Rational Powers of x - Calculate derivatives of functions involving the inverse trigonometric functions - Calculate derivatives of exponential and logarithmic functions	- Professor Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups
Unit Five:Applications of Derivatives **Timeline: 6 weeks**			
	Concepts:	**Driving Questions:**	**Summative:**

	Absolute change Absolute maximum value Absolute minimum value Antiderivative Antidifferentiation Arithmetic mean Average cost Center of Linear Approximation Concave down Concave up Concavity Test Critical point Decreasing function Differential Differential estimate of change Differential of a function Extrema Extreme Value Theorem First Derivative Test Geometric mean Global maximum value Global minimum value Increasing function Linear approximation Linearization Local linearity Local maximum value Local minimum value Logistic or life cycle curve Logistic regression Marginal analysis Marginal cost and revenue Mean Value Theorem Monotonic function Newton's method Optimization Percentage change Point of inflection	- How do you find optimization? - How does the Mean Value Theorem connect average and instantaneous rates of change? - How do you use differential calculus to analyze functions? - How does optimization explain real world applications? - How can we use approximation techniques to explain practical applications? - How can we use related rate problems to explain mechanics? **Learning Targets:** - Determine the local and global extreme values of a function - Apply the Mean Value Theorem and find the intervals on which a function is increasing or decreasing - Use the First and Second Derivative Tests to determine the local extreme values of a function - Determine the concavity of a function and locate the points of inflection by analyzing the second derivative - Graph f using information about f' - Solve application problems involving finding minimum or maximum values of functions - Find linearizations and use	- Gas Mileage Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

	Profit Quadratic approximation Related rates Relative change Relative extrema Rolle's Theorem Second Derivative Test Standard linear approximation Stationary point **Big Ideas:** - Drawing conclusions from derivatives about extreme values and the general shape - See how tangent lines capture the shape of a curve near a point of tangency - Deducing rates of change we cannot measure from rates of change we already know - Finding functions from the first derivative and a point - Use the Mean Value Theorem to recover functions from derivatives	Newton's method to approximate the zeros of a function - Estimate the change in a function using differentials - Solve related rate problems	
Unit Six: The Definite Integral **Timeline: 6 weeks**			
	Concepts: Area under a curve Average value Bounded function Cardiac output Characteristic function of the	**Driving Questions:** - How do you estimate with finite sums? - What happens to a limit when the numbers are infinitely small or infinitely large?	**Summative:** - Lottery Project - Quiz **Formative:** - Workshop Practice

	rationals Definite integral Differential calculus Dummy variable Error bounds Fundamental Theorem of Calculus Integrable function Integral calculus Integral Evaluation Theorem Integral of f from a to b Integral sign Integrand Lower bound Lower limit of integration LRAM Mean value Mean Value Theorem for Definite Integrals MRAM Net area NINT Norm of a partition Partition RAM Regular partition Riemann sum Riemann sum for f on the $[a, b]$ RRAM Sigma notation Simpson's Rule Subinterval Total area Trapezoidal Rule Upper bound Upper limit of integration Variable of integration	- How can we connect derivatives and definite integrals? - How can we use trapezoids to create numerical approximations? **Learning Targets:** - Approximate the area under the graph of a nonnegative continuous function by using rectangle approximation methods - Interpret the area under a graph as a net accumulation of a rate of change - Express the area under a curve as a definite integral and as a limit of Riemann sums - Compute the area under a curve using a numerical integration procedure - Apply rules for definite integrals and find the average value of a function over a closed interval - Apply the Fundamental Theorem of Calculus - Understand the relationship between the derivative and definite integral as expressed in both parts of the Fundamental Theorem of Calculus - Approximate the definite integral by using the trapezoidal Rule and by using	- Classwork/Homework Assignments - Warm-Ups

	Big Ideas: - Calculate instantaneous rates of change - Investigate slopes of tangent lines - Investigate areas under curves - Prove how slopes of tangents and areas under curves are connected	Simpson's Rule. - Estimate the error in using the Trapezoidal and Simpson's Rules	
Unit Seven: Differential Equations and Mathematical Modeling **Timeline: 4 weeks**			
CCSS.MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. CCSS.MATH.CONTENT.HSG.MG.A.3 Apply geometric methods to solve	**Concepts:** Antidifferentiation by parts Antidifferentiation by substitution Arbitrary constant of integration Carbon-14 dating Carrying capacity Compounded continuously Constant of integration Continuous interest rate Decay constant Differential equation Direction field Euler's Method Evaluate an integral Exact differential equation General solution to a differential equation Growth constant First-order differential equation First-order linear differential equation Graphical solution of a differential equation Half-life	**Driving Questions:** - How can we model problems of motion using derivatives? - How can we find the antiderivative of f? - How does the Product Rule relate derivatives? - How does the differential equation $\frac{dy}{dx} = ky$ give insight into exponential growth and decay? - How do real world populations grow logistically over extended periods of time? **Learning Targets:** - Construct antiderivatives using the Fundamental Theorem of Calculus - Solve initial value problems in the form $\frac{dy}{dx} = f(x),\ y_o = f(x_o).$ - Construct slope fields using technology and interpret slope	**Summative:** - Population Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*	Heaviside method Indefinite integral Initial condition Initial value problem Integral sign Integrand Integration by parts Law of Exponential Change Leibniz notation for integrals Logistic differential equation Logistic growth model Logistic growth model Logistic regression Newton's Law of Cooling Numerical method Numerical solution of a differential equation Order of a differential equation Partial fraction decomposition Particular solution Proper rational function Properties of indefinite integrals Radioactive Radioactive decay Resistance proportional to velocity Second-order differential equation Separable differential equations Separation of variables Slope field Solution of a differential equation Substitution in definite integrals Tabular integration Variable of integration **Big Ideas:** - Predicting future positions from the present position and	fields as visualizations of different equations - Use Euler's Method for graphing a solution to an initial value problem - Compute indefinite and definite integrals by the method of substitution - Use integration by parts to evaluate indefinite and definite integrals - Use tabular integration or the method of solving for the unknown integral i order to evaluate integrals that require repeated use of integration by parts - Use integration by parts to integrate inverse trigonometric and logarithmic functions - Solve problems involving exponential growth and decay in a variety of applications - Solve problems involving exponential or logistic population growth	

	known velocity - Deduce what we need to know about a function from one of its known values and rate of change - Examine the analytic, graphical, and numerical techniques on which we create predictions		
Unit Eight: Applications of Definite Integrals **Timeline: 6 weeks**			
CCSS.MATH.CONTENT.HSG.GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*. CCSS.MATH.CONTENT.HSG.GMD.A.2 (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. CCSS.MATH.CONTENT.HSG.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**Concepts:** Arc length Area between curves Cavalieri's theorems Center of mass Constant-force formula Cylindrical shells Displacement Fluid pressure Foot-pound Force constant Gaussian curve Hooke's Law Inflation rate Joule Length of a curve Mean Moment Net change Newton Normal curve Normal pdf Probability density function Smooth curve	**Driving Questions:** - How can we use an integral to calculate net change and total accumulation? - How can we calculate the area in between curves? - How can we calculate the volume of a three dimensional solid? - How can we use definite integrals to calculate the length of a smooth curve? **Learning Targets:** - Solve problems in which a rate is integrated to find the net change over time in a variety of applications - Use integration to calculate areas of regions in a plane - Use integration by slices or shells to calculate volumes of solids	**Summative:** - Pottery Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.MATH.CONTENT.HSG.GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	Smooth function Solid of revolution Standard deviation Surface area Total distance traveled Universal gravitational constant Volume by cylindrical shells Volume by slicing Volume of a solid Weight-density work **Big Ideas:** - Finding the limits of Riemann sums - Calculate the regular pieces using known formulas - Evaluate definite integrals with antiderivatives - Fit the proper integrable function to the situation at hand - Use programs like NINT to help fit antiderivatives to certain situations - Break down the irregular whole into regular parts and set up a function to be integrated	- Use integration to calculate surface areas of solids of a revolution - Use integration to calculate lengths of curves in a plane - Adapt their knowledge of integral calculus to model problems involving rates of change in a variety of applications	

Calculus

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Expectations:

1. Use proper salutations.
2. Wear your uniform properly
3. Come prepared with a notebook, writing utensil, your computer, and homework if necessary.
4. Contribute during class discussion.
5. Stay on task while working in partners or groups.

Materials Needed Everyday:

Spiral Notebook
Writing Utensil
Computer

Topics to be covered:

Unit 1: Prerequisites for Calculus
Unit 2: Limits and Continuity
Unit 3: Derivatives
Unit 4: More Derivatives
Unit 5: Applications of Derivatives
Unit 6: The Definite Integral
Unit 7: Differential Equations and Mathematical Modeling
Unit 8: Applications of Definite Integrals
Unit 9: Sequences, L'Hopital's Rule, and Improper Integrals

Assignment Headings

When you turn in work electronically, I need you to put a heading on your assignments so that it is easier to keep track of the assignments along with the members of your group.

Last name: Assignment Title
Collier: Order of Operations HW

Group Work
Last name: Group members: Assignment Title
Collier: Cook, Garton, Irwin: Order of Operation Project

Make-up Work:

Every student has the ability to check his or her assignments from home as long as wifi is available. Make-up work will be taken care of on an individual basis, but students that aren't in school will be expected to contact their groups to make sure that they are contributing as much as possible to help the group run smoothly to finish the projects. Absent students need to check the Agenda to see if there are any daily assignments that need to be accomplished before they come back to school. Assignments will only be accepted up to 5 school days late unless a plan has been created with the teacher.

Late Work

A student has the ability to turn in work up until 5 days after the due date for the assignment. This is for when a student needs to finish an assignment that might not be quite done at the time it is supposed to be turned in. The student will lose points off of his or her grade each day that the assignment is late. The assignment will not be accepted on the 6th day for a grade. The assignment will automatically turn to a 0.

Grading System:

The assignments will be graded on a scale so that Content and Knowledge are worth 50%, Written Communication is 15%, Oral Communication is 15%, Agency is 10%, and Collaboration is 10%.

100 – 93	A
92 – 85	B
84 – 77	C
76 – 70	D
69 – below	F

We are looking forward to an exciting year where everyone is learning and growing together.

Sincerely,

Mrs. Collier

Collaboration Team Checklist High School

The Team Collaboration Checklist is intended to serve as a useful reminder on the important aspects of team dynamics. It is not a rubric for grading purposes, but rather a reminder for student and adult teams about the key conditions for good collaboration. Teams might regularly refer to the collaboration checklist throughout a project, revisit it in moments when their progress is stuck, or us it to reflect on successes and challenges.

We intend these to be two separate docs that serve different purposes. While the Collaboration rubric would feature regularly in project design, facilitation, and assessment, the checklist is more of a supplemental tool to be used as needed to boost team performance. Given the differences between individual and group behaviors it is best to think of these two resources as complimenting each other rather than being aligned to one another.

New Tech Network Team Collaboration Checklist

Behavior	Description
Equal Participation	Each member is equally engaged in the work of team, as represented by the role each member plays in accomplishing the task and how well each voice is heard during discussion. Established roles allow for equal participation.
Project Management	The team has collaboratively developed a context-specific plan for task completion that is regularly updated to reflect needed adjustments throughout the timeline.
Making Decisions	The team uses a transparent process, or set of processes, for making decisions that impact the entire group.
Physical Disposition	The team members exhibit physical cues that suggest active listening, engagement, and an openness to new ideas. In addition, team meetings are physically organized in ways that best support collaborative and cooperative work.
Creating/Using Norms	The team has established and is using a set of norms that guide the behavior of the team. The team regularly revisits the norms to assess their effectiveness and to determine whether they are an accurate reflection of the team's behavior.
Intellectual Discourse	The team regularly engages in constructive intellectual discourse aimed at deepening the team's understanding of key ideas and individual perspectives related to the task at hand.
Passionate Ownership	The team exhibits shared and passionate ownership over the successful completion of the task. All group members are made to feel valuable, that their contributions are meaningful, and their accomplishments are celebrated.
Conflict Resolution	The team anticipates that conflict may happen, and has a plan for addressing it directly. Group members engage constructively and reference both the plan and their norms when conflict occurs.

Collaboration Rubric High School

Overview

In designing our collaboration rubric, we drew a distinction between individual and group behaviors. While both are important for successful collaboration, distinguishing between the two provides useful guidance for how to support and assess student progress.

The Individual Collaboration Rubric focuses on specific aspects of individual collaboration. The indicators are designed to be simple and accessible to students using the Peer Evaluation Tool as well as instructive to guide group conversations. The number of dimensions (rows) for this rubric makes it unlikely a teacher would use it in its entirety. A teacher might opt to focus on particular rows by project or a school might focus on particular indicators in particular grade levels. Schools may also find opportunities to bring additional collaboration and project management skills to extend this outcome as their students grow as collaborators and we encourage you to do so.

Individual Collaboration – High School

Collaboration involves behaviors under the control of individual group members including effort they put into group tasks, their manner of interacting with others on group, and the quantity and quality of contributions they make to group discussions.

	Emerging	ED	Developing	DP	Proficient	PA	Advanced
Contribution and Development of Ideas	Ideas lack **supporting** reasoning **Limited acknowledgement** of others' thinking		Shares ideas, and **explains** the reasons behind them **Acknowledges** others' thinking		Provides ideas or arguments with **convincing** reasons **Builds on** the thinking of others		Acknowledges the **strengths and limitations** of their ideas Builds on the thinking of others and **checks back for agreement**
Equal Participation	Shares ideas **without listening** or listens **without sharing** ideas		**Allows for** equal participation by both sharing ideas and listening to the ideas of others		**Encourages** equal participation by **asking** clarifying or probing questions, **paraphrasing** ideas, and **synthesizing** group thinking		In addition to proficient, **actively invites** others to participate equitably, promoting divergent and creative perspectives
Group Norms	Follows group norms and processes but **only with modeling and/or reminders**		**Understands and follows** group created norms and processes		Understands and follows group created norms and processes and **helps others do the same**		In addition to proficient**, initiates** the use of norms and group processes in each meeting
Respectful Tone and Style	**At times**, words and tone indicate respectful intent, but not consistently		Words and tone indicate **respectful intent,** but **might not be sensitive** to others		Words and tone indicate **respect and sensitivity** to others		In addition to proficient, provides **gentle feedback about others' words and tone** to foster an environment of respect
Positive Body Language/ Active Listening	**Sporadically** faces speaker, or engages without distraction **some of the time**		**Faces speaker** and is **free of distractions** when others are speaking		When others are speaking, both body language and verbal responses **indicate engagement**		When others are speaking, body language and verbal responses indicate **positive, energetic** engagement
Roles	Knows role, and fulfills it only **some of the time**		**Accepts** role and shows understanding **by fulfilling it**		Knows the roles of **self and others**, and uses the roles to **maximize** group effectiveness		**In addition to proficient**, uses group roles as opportunities to **use strengths or address areas of weakness**
Work Ethic	Completes **only some** assigned tasks Comes to meetings **without evidence** of preparation		Completes **all assigned tasks by deadline** Comes to meetings partially **prepared**		Completes all assigned tasks by deadline; **work is quality, and advances the project** Comes to meetings **fully prepared**		**Models** consistently high standards for timeliness, quality, and ownership of work Preparation for meetings **surpasses** expectations
Team Support	Either **doesn't help**, or occasionally helps, but **must be asked**		Predictably helps **when asked** by others, but only then		**Always** helps when asked, and **sometimes** offers help to others		**Actively checks in** to understand how others are progressing and how they can be of help

Curriculum Framework for

School: First State Military Academy **Course: Geometry**

Course Description:

Students discover, explore and make conjectures about geometric concepts and relationships including parallelism, congruence, similarity, area, volume, trigonometry and coordinate geometry. Emphasis is placed on discovery of patterns, real life problem solving using technology, mathematical connections to other disciplines, critical thinking, reasoning, and communicating mathematics. Algebra skills are reviewed and strengthened throughout the course through the application of geometric concepts. Content is aligned to the Delaware Core Standards and the new SAT.

Big Idea: To provide all cadets the knowledge, skills, and attributes, to thrive in post-secondary education, work, and civic life.

Standards Alignment	Unit Concepts/Big Ideas	Driving Questions/Learning Targets	Assessments
Unit One: Basics of Geometry **Timeline: About 5 weeks**			
CCSS.Math.Content.HSG-MG.A.1 - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	**Concepts:** Points Lines Planes Rays Line Segments	**Driving Questions:** - Why do we measure? - Why are geometric figures and terms used to represent and describe real-world situations? How are geometric figures and	**Summative:** - FSMA Blueprint Project - Quiz **Formative:** - Workshop Practice

CCSS.Math.Content.HSG-GPE.B.7 - Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. **CCSS.Math.Content.HSG-GPE.B.4** - Use coordinates to prove simple geometric theorems algebraically. **CCSS.Math.Content.HSG-CO.A.1** - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Midpoint Formula Distance Formula Perimeter Circumference Area Measuring Angles Complementary Angles Supplementary Angles Adjacent Angles Vertical Angles Linear Pair **Big Ideas:** - Create an awareness of the structure of a math system, connecting definitions, postulates, reasoning, and theorems - Use construction to explore attributes of geometric figures and to make conjectures about geometric relationships - Use 1D and 2D coordinate systems to represent points, lines, rays, line segments, and figures - Find areas of regular polygons, circles, and composite figures	terms used on maps/blueprints? **Learning Targets:** - To identify special angle pairs and use their relationships to find angle measures - To find and compare lengths of segments - To find the midpoint of a segment - To find the distance between two points in the coordinate plane - To find the perimeter of circumference of basic shapes - To find the area of basic shapes - To find and compare the measure of angles - To identify special angle pairs and use their relationships to find angle measures	- Classwork/Homework Assignments - Warm-Ups
Unit Two: Parallel and Perpendicular Lines **Timeline: About 3 weeks**			
CCSS.Math.Content.HSG-MG.A.3 - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or	**Concepts:** Parallel Lines Skew Lines Parallel Planes Transversal	**Driving Questions:** - Why do we have undefined terms such as point and line? - How can we use undefined terms?	**Summative:** - Photography Project - Quiz **Formative:**

minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSG-GPE.B.5** - Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). **CCSS.Math.Content.HSG-CO.D.12** - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. **CCSS.Math.Content.HSG-CO.C.9** - Prove theorems about lines and angles. **CCSS.Math.Content.HSG-CO.A.1** - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of	Interior Angles Exterior Angles Corresponding Angles Alternate Interior Angles Alternate Exterior Angles Same-Side Interior Angles Congruency Perpendicular Lines Slope **Big Ideas:** - Make conjectures about lines and determine the validity of those conjectures - Make conjectures about angles and determine the validity of those conjectures - Use slopes to investigate geometric relationships, including parallel and perpendicular lines	- Why do architects, carpenters, and engineers use parallel and perpendicular lines to design buildings, furniture, and machines? **Learning Targets:** - To identify relationships between figures in space - To identify angles formed by two lines and a transversal - To use properties of parallel lines to find angle measures - To relate parallel and perpendicular lines	- Workshop Practice - Classwork/Homework Assignments - Warm-Ups

point, line, distance along a line, and distance around a circular arc.			
Unit Three: Polygons and Quadrilaterals **Timeline: About 6 weeks**			
CCSS.Math.Content.HSG-MG.A.3 - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSG-MG.A.1** - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). **CCSS.Math.Content.HSG-GPE.B.4** - Use coordinates to prove simple geometric theorems algebraically. **CCSS.Math.Content.HSG-CO.C.11** - Prove theorems about parallelograms.	**Concepts:** Polygon Triangle Quadrilateral Pentagon Hexagon *n*-gon Parallelogram Square Rectangle Rhombus Trapezoid Kite **Big Ideas:** - Use patterns to make generalizations about geometric properties, including properties of polygons - Formulate and test conjectures about the properties and attributes of polygons - Use formulas involving length, slope and midpoint to determine the type of quadrilateral - Formulate and test conjectures about the properties and attributes of polygons	**Driving Questions:** - Why do we name figures? - How much do we need to know before we can start making assumptions? **Learning Targets:** - To find and use the sum of the measures of the interior angles of a polygon - To find and use the sum of the exterior angles of a polygon - To recognize and apply properties of the sides and angles of parallelograms - To recognize and apply properties of the diagonals of parallelograms - To determine whether a quadrilateral is a parallelogram - To define and classify special types of parallelograms - To use properties of diagonals of rhombuses and rectangles - To verify and use properties of trapezoids and kites	**Summative:** - Quadrilateral Detective Problem Set - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

Unit Four: Congruent Triangles
Timeline: About 4 weeks

CCSS.Math.Content.HSG-SRT.B.5 - Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

CCSS.Math.Content.HSG-CO.D.12 - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

CCSS.Math.Content.HSG-GPE.B.4 - Use coordinates to prove simple geometric theorems algebraically.

CCSS.Math.Content.HSG-CO.C.10 - Prove theorems about triangles.

CCSS.Math.Content.HSG-CO.B.8 - Explain how the criteria for triangle congruence (ASA, SAS,

Concepts:
Acute Triangle
Equiangular Triangle
Obtuse Triangle
Right Triangle
Scalene Triangle
Isosceles Triangle
Equilateral Triangle
Congruent
Congruent Polygons
Corresponding Parts
Congruent Triangles
Congruency Statement
Side-Side-Side Congruence
Side-Angle-Side Congruence
Angle-Side-Angle Congruence
Included Side
Angle-Angle-Side Congruence
Hypotenuse-Leg Congruence
Hypotenuse

Big Ideas:
- Use patterns to make generalizations about geometric properties
- Use logical reasoning to prove statements are true

Driving Questions:
- How can you compare two objects?
- How can you tell if two objects are congruent?
- How can you tell if two triangles are congruent?
- What is the importance of manufacturing an item the same way every time it is made?

Learning Targets:
- To identify and classify triangles by and and side measures
- To apply the Triangle Angle-Sum Theorem and the Exterior Angle Theorem
- Name and use corresponding parts of congruent polygons
- Prove triangles congruent using the definition of congruence
- Use the SSS and SAS Postulates to test for triangle congruence
- To prove two triangles congruent using the ASA Congruence Postulate and the AAS, and HL Congruence Theorems

Summative:
- Joanna's Cafe Project
- Quiz

Formative:
- Workshop Practice
- Classwork/Homework Assignments
- Warm-Ups

and SSS) follow from the definition of congruence in terms of rigid motions. **CCSS.Math.Content.HSG-CO.B.7** - Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.			
Unit Five: Relationships Within Triangles **Timeline: About 3 weeks**			
CCSS.Math.Content.HSG-SRT.B.5 - Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **CCSS.Math.Content.HSG-CO.D.12** - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	**Concepts:** Triangle Midsegment Perpendicular Bisector Angle Bisector Bisectors in Triangles Medians Altitudes Inequalities in One Triangle Inequalities in Two Triangles **Big Ideas:** - Use slope and equations of lines to investigate geometric relationships, including special segments of triangles - Analyze geometric relationships in order to verify conjectures	**Driving Questions:** - What makes a triangle a triangle? - How are the sides and angles of a triangle related? **Learning Targets:** - To use midsegments of triangles in the coordinate plane - To use the Triangle Midsegment Theorem to find Distances - To use properties of perpendicular bisectors and angle bisectors - To identify properties of perpendicular bisectors and angle bisectors - To identify properties of medians and altitudes in	**Summative:** - Card Design Project (want to change this project next year) - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

CCSS.Math.Content.HSG-CO.C.9 - Prove theorems about lines and angles. **CCSS.Math.Content.HSG-CO.C.10** - Prove theorems about triangles. **CCSS.Math.Content.HSG-C.A.3 -** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.		triangles - To recognize and apply properties of inequalities to the relationships between the angles and sides of a triangle - To apply inequalities in two triangles	
Unit Six: Right Triangles and Trigonometry **Timeline: About 5 weeks**			
CCSS.Math.Content.HSG-SRT.D.10 - (+) Prove the Laws of Sines and Cosines and use them to solve problems. **CCSS.Math.Content.HSG-SRT.C.8** - Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. **CCSS.Math.Content.HSG-SRT.C.7** - Explain and use the relationship between the sine and cosine of complementary angles. **CCSS.Math.Content.HSG-SRT.C.6** - Understand that by similarity, side ratios in right	**Concepts:** The Pythagorean Theorem 45°-45°-90° Triangles 30°-60°-90° Triangles Trigonometry Ratio Sine Cosine Tangent Angles of Elevation Angles of Depression The Law of Sines The Law of Cosines **Big Ideas:** - Justify conjectures about geometric figures - Extend and use the Pythagorean Theorem	**Driving Questions:** - Why do we use mathematics to model real-world situations? - Where can mathematics be found in video game programming? **Learning Targets:** - To use the Pythagorean Theorem and its converse - To use the properties of 45°-45°-90° and 30°-60°-90° triangles - To use sine, cosine, and tangent ratios to determine side lengths and angle measures in right triangles - To solve problems involving angles of elevation and	**Summative:** - Video Game Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. **CCSS.Math.Content.HSG-MG.A.3** - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSG-CO.C.10** - Prove theorems about triangles.	- Identify and apply patterns from right triangles to solve meaningful problems, including special right triangles (45°-45°-90° and 30°-60°-90°) and triangles with sides that are Pythagorean triples - Develop, apply, and justify triangle similarity relationships, such as trigonometric ratios using a variety of methods	depression - To use angles of elevation and depression to find the distance between two objects - To use the Law of Sines to solve triangles - To use the Law of Cosines to solve triangles	
Unit Seven: Proportions and Similarity **Timeline: About 5 weeks**			
CCSS.Math.Content.HSG-MG.A.3 - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSG-SRT.A.2** - Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for	**Concepts:** Ratio Proportion Cross Product Similar Polygons Scale Factor Similar Triangles Triangle Similarity Angle-Angle Similarity Side-Side-Side Similarity Side-Angle-Side Similarity Right Triangle Similarity Proportions in Triangles **Big Ideas:** - Use ratios to solve problems	**Driving Questions:** - How can two objects be similar? - How does similarity in mathematics compare to similarity in everyday life? **Learning Targets:** - To write ratios - To write and solve proportions - To use proportions to identify similar polygons - To solve problems using the properties of similar polygons - To identify similar triangles using the AA Similarity	**Summative:** - Mini Golf Madness Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. **CCSS.Math.Content.HSG-SRT.B.4** - Prove theorems about triangles. **CCSS.Math.Content.HSG-SRT.B.5** - Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	involving similar figures - Create and test conjectures about the properties and attributes of polygons and their corresponding parts based on explorations and concrete models	Postulate and the SSS and SAS Similarity Theorems - To use similar triangles to solve problems - To find and use relationships in similar right triangles - To recognize and use proportional relationships of corresponding angle bisectors, altitudes, and medians of similar triangles - To use the Triangle Bisector Theorem	
Unit Eight: Transformations **Timeline: About 5 weeks**			
CCSS.Math.Content.HSG-CO.A.4 - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **CCSS.Math.Content.HSG-CO.A.5** - Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. **CCSS.Math.Content.HSG-GMD.B.4** - Identify the shapes of	**Concepts:** Reflection Translation Rotation Center of Rotation Angle of Rotation Transformation Glide Reflection Symmetry Line of Symmetry Axis of Symmetry Rotational Symmetry Dilation **Big Ideas:** - Use congruence transformations to make conjectures and justify properties of geometric figures	**Driving Questions:** - Where can transformations be found? - Why is symmetry desirable? **Learning Targets:** - To draw reflections - To draw reflections in the coordinate plane - To draw translations - To draw translations in the coordinate plane - To draw rotations - To draw rotations in the coordinate plane - To draw glide reflections and other compositions of isometries in the coordinate plane	**Summative:** - MC Escher Art Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. **CCSS.Math.Content.HSG-CO.A.2** - Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). **CCSS.Math.Content.HSG-CO.A.3** - Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. **CCSS.Math.Content.HSG-SRT.A.1a** - A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. **CCSS.Math.Content.HSG-SRT.A.1b** - The dilation of a line segment is longer or shorter in the ratio given by the scale factor.		- To draw compositions of reflections in parallel and intersecting lines - To identify line and rotational symmetries in 2D figures - To identify plane and axis symmetries in 3D figures - To draw dilations - To draw dilations in the coordinate plane	

Unit Nine: Surface Area and Volume
Timeline: About 4 weeks

CCSS.Math.Content.HSG-GMD.B.4 - Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. **CCSS.Math.Content.HSG-GMD.A.3** - Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. **CCSS.Math.Content.HSG-GMD.A.1** - Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. **CCSS.Math.Content.HSG-MG.A.3** - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSG-MG.A.1** - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a	**Concepts:** Cross Section Lateral Faces Lateral Edges Altitude Height Base Edges Lateral Area Composite Solid Regular Pyramid Slant Height Right Cone Oblique Cone Prism Cylinder Basic Area Formulas Sphere **Big Ideas:** - Find surface areas and volumes of prisms, pyramids, spheres, cones, cylinders, and composites of these figures - Describe the effect on area and volume when one or more dimensions of a figure are changed	**Driving Questions:** - How are 2D and 3D figures related? **Learning Targets:** - To find the surface area of a prism and a cylinder - To find the surface area of a pyramid and a cone - To find the volume of a prism and a cylinder - To find the volume of a pyramid and a cone - To find the surface area and and the volume of a sphere	**Summative:** - Marketing Mania (Product Packaging) Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

cylinder). **CCSS.Math.Content.HSG-MG.A.2** - Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).			
Unit Ten: Probability **Timeline: About 3 weeks**			
CCSS.Math.Content.HSS-CP.9 - (+) Use permutations and combinations to compute probabilities of compound events and solve problems. **CCSS.Math.Content.HSS-MD.7** - (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). **CCSS.Math.Content.HSG-MG.3** - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **CCSS.Math.Content.HSS-MD.6** - (+) Use probabilities to make	**Concepts:** Event Experiment Sample Space Tree Diagram Two-Stage Experiment Multistage Experiment Fundamental Counting Principle Intersection Complement Permutation Factorial Circular Permutation Combination Geometric Probability Compound Event Independent Events Dependent Events Mutually Exclusive Conditional Probability Two-Way Frequency Table Marginal Frequencies Joint Frequencies Relative Frequency	**Driving Questions:** - How can probability be used to predict the likelihood of different outcomes of the games that we play? **Learning Targets:** - To use lists, tables, and tree diagrams to represent sample spaces - To use the Fundamental Counting Principle to count outcomes - To describe events as subsets of sample spaces by using intersections and unions - To find probabilities of complements - To use permutations with probability - To use combinations with probability - To find probabilities by using lengths - To find probabilities by using	**Summative:** - Create a Game Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

fair decisions (e.g., drawing by lots, using a random number generator). **CCSS.Math.Content.HSS-CP.2** - Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. **CCSS.Math.Content.HSS-CP.3** - Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **CCSS.Math.Content.HSS-CP.4** - Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.	**Big Ideas:** - Understand sample spaces and design simulations - Compute probabilities for independent, dependent, mutually exclusive, not mutually exclusive, and conditional events - Calculate geometric probabilities	area - To apply the multiplication rule to situations involving independent events - To apply the multiplication rule to situations involving dependent events - To apply the addition rule to situations involving mutually exclusive events - To apply the addition rule to situations involving events that are not mutually exclusive - To find the probability of events given the occurrence of other events - To explain conditional probability and independence of everyday events - To decide whether events are independent by using two-way frequency tables - To approximate conditional probabilities by using two-way frequency tables -	

CCSS.Math.Content.HSS-CP.6 - Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. **CCSS.Math.Content.HSS-CP.1** - Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). **CCSS.Math.Content.HSS-CP.7** - Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.			

NTN Agency Rubric, High School

Develop Growth Mindset: *I can grow my intelligence and skills through effort, practice, and challenge. The brain grows bigger with use, like a muscle.*

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Use Effort and Practice to Grow	• Does not connect effort or practice to getting better at a skill, improved work quality, or performance		• Superficially connects effort and practice to getting better at a skill, improved work quality, or performance		• Understands how effort and practice relate to getting better at skills, improved work quality, or performance		• Understands that effort and practice improve skills, work quality, and performance and that the process takes patience and time
Seek Challenge	• Rarely takes on academic challenges and risks to pursue learning • Struggles to identify the personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• With encouragement, sometimes takes on academic challenges and risks to pursue learning • Superficially describes personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• Seeks academic challenges and takes risks to pursue learning • Analyzes personal barriers (mindset, beliefs, circumstances) that inhibit taking risks		• Strategically and independently seeks academic challenges and takes risks to pursue learning • Analyzes and overcomes personal barriers (mindset, beliefs, circumstances) that could inhibit taking risks
Grow from Setbacks	• Identifies challenges, failures, or setbacks, but does not describe reactions to them (e.g. giving up or trying harder)		• Identifies challenges, failures, or setbacks and describes reactions to them (e.g. giving up or trying harder)		• Identifies challenges, failures, or setbacks and reflects on how reactions to them (e.g. giving up or trying harder) affect process, product, or learning		• Reflects on personal or academic growth from challenges, failures, or setbacks as well as why and how reactions (e.g. giving up or trying harder) affect the process, product, and learning
Build Confidence	• Struggles to identify academic strengths, previous successes, or endurance gained from personal struggle to build confidence in academic success for a new task, project, or class		• Identifies an academic strength, previous success, or endurance gained through personal struggle, but does not use these skills to build confidence in success for a new task, project, or class		• Builds confidence in success (on a new task, project, or class) by knowing and using academic strengths, previous success, or endurance gained through personal struggle		• Consistently confident that success is possible (on a new task, project, or class) by knowing and using academic strengths, previous successes, or endurance gained through personal struggle

Find Personal Relevance	• Rarely, and with significant support, finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• With support, sometimes finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• Often finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices		• Independently seeks and finds personal relevance in the work by connecting it to interests or goals, reflecting on progress towards mastery, or identifying autonomous choices

Take Ownership Over One's Learning: *I can learn how to learn and monitor progress to be successful on tasks, school, and life.*

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED
Meet Benchmarks	• Completes few benchmarks and class assignments and may resist or struggle to use resources and supports (e.g. study groups, teacher support, workshops, tutorials)		• Completes some benchmarks and class assignments; and, only when forced to, or at the last minute, uses resources and supports (e.g. study groups, teacher support, workshops, tutorials)		• Usually completes polished benchmarks and class assignments by using resources and supports when necessary (e.g. study groups, teacher support, workshops, tutorials)		• Achieves personal best work on almost all benchmarks and class assignments by setting goals, monitoring progress, and using resources and supports (e.g. study groups, teacher support, workshops, tutorials)
Seek Feedback	• Rejects feedback and/or does not revise work		• Sometimes shows evidence of accepting feedback to revise work, but at times may resist when it's difficult		• Consistently shows evidence of accepting and using feedback to revise work to high quality		• Consistently shows evidence of actively seeking, identifying, and using feedback to revise work to high quality
Tackle and Monitor Learning	• For a task or project, superficially identifies what is known, what needs to be learned, and how hard it will be		• For a task or project, identifies what is known, what needs to be learned, and how hard it will be; but may not use a strategy to tackle the task or does not monitor how well the strategy is working		• For a task or project identifies what is known, what needs to be learned, and how hard it will be; uses a strategy and steps to tackle the task; and monitors how well the approach and effort are working		• For a task or project, identifies what is known, what needs to be learned, and how hard it will be; selects an appropriate strategy and takes steps to tackle the task; and monitors and adjusts based on how well the approach and effort are working
Actively Participate	• Stays focused for part of the activity/discussion, team meeting, or independent time but often cannot resist distraction or does not notice when or why a loss of focus happens		• Mostly stays focused on the activity/discussion, team meeting, or independent time and knows when and why disengagement or distraction happens		• Actively participates in the activity/discussion, team meeting, or independent time and has strategies for staying focused and resisting most distraction		• Actively participates and takes initiative on the activity/discussion, team meeting, or independent time and has personal strategies for staying focused

Build Relationships	• Does not build relationships with trusted adults or peers to get back on track as needed or to enhance learning		• Does not initiate building relationships, but has a few trusted adults or peers to get back on track as needed or to enhance learning		• Builds and uses relationships with trusted adults and peers to get back on track as needed and to enhance learning		• Actively builds trusting relationships with adults and peers to pursue goals, enhance learning, and get back on track as needed
Impact Self & Community	• Identifies the ups and downs of the classroom and home community		• Has limited understanding of individual role in the ups and downs of the classroom and home community		• Analyzes individual role in the ups and downs of the classroom and home community		• Monitors and adjusts individual role to positively influence the ups and downs of the classroom and home community

Oral Communication Rubric, High School

Overview

Interpersonal Communication Section - Focuses on the listening and speaking skills exhibited by individual students in a wide variety of informal conversations (e.g. student and teacher, student and student and expert). While there is some unavoidable overlap with the Collaboration Rubric, the Collaboration rubric emphasizes how teammates should talk to one another while collaborating.

Presentation Section - Focuses on the elements of a strong presentation. This section of the rubric could be used in its entirety to describe a complete presentation - though it's often good to focus on a few dimensions (rows), or indicators (bullets). Useful for providing a group grade on a presentation.

Delivery Section - Focuses on the individual aspects of a presentation and can be used to provide individualized grades for a student in a presentation, even in the case of a group presentation.

Interpersonal Communication

The ability to communicate knowledge and thinking through effective informal, pair, and small group conversations.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Listening and Comprehension	After listening, shows recall of **some key details but limited understanding of main points**		After listening, shows recall of **some key details and main points**		After listening, can **synthesize** main points and **reference** key details		After listening, can synthesize main points, reference key details, and **evaluate the strength** or value of the ideas
Clear Presentation of Ideas	Communicates ideas in **an unclear way**; ideas are **difficult to follow**		Communicates ideas **clearly most of the time**, **occasionally** ideas are difficult to follow		Communicates ideas **clearly**		Communicates ideas clearly, **adjusting as needed to enhance clarity for audience**
Asking Questions	Asks questions that **repeat stated details or main points**		Ask questions that **help clarify a topic or a line of reasoning**		Asks **thoughtful** questions that **develop** or **challenge** a topic or line of reasoning		Asks thoughtful questions that develop or challenge a line of reasoning and **explore connections to a larger theme or idea**

PRESENTATION

The ability to communicate knowledge and thinking orally.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Clarity	Central message is **unclear or unstated** **Does not include** alternate perspectives when appropriate		Central message **can be deduced but may not be explicit** **Includes** alternate perspectives when appropriate		Presents a **clear** central message **Addresses alternative** or opposing perspectives when appropriate		Presents a central message that is clear and **original** Addresses alternative or opposing perspectives i**n a way that sharpens** one's own perspective
Evidence	Draws on facts, experience, or research in a **minimal** way Demonstrates **limited** understanding of the topic		Draws on facts, experience, and/or research **inconsistently** Demonstrates an **incomplete or uneven** understanding of the topic		**Draws on** facts, experiences and research to **support a central message** Demonstrates an **understanding** of the topic		Facts, experience and research are **synthesized** to support a central message emonstrate an **in-depth** understanding of the topic
Organization	·A lack of organization and/or transitions **makes it difficult to follow** the presenter's ideas and line of reasoning		**Inconsistencies** in organization and limited use of transitions **detract from** audience understanding of line of reasoning		**Organization** and transitions **reveal** the line of reasoning		Organization and transitions **supports** the line of reasoning
Use of Digital Media / Visual displays	Digital media or visual displays are **confusing, extraneous, or distracting**		Digital media or visual displays are **informative and relevant**		Digital media or visual displays are informative and **support audience engagement and understanding**		Digital media or visual displays are **polished**, informative, and support audience engagement and understanding

DELIVERY

The ability to communicate knowledge and thinking orally.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
Language Use	Uses language and style that is **unsuited** to the purpose, audience, and task **Stumbles** over words, interfering with audience understanding		Uses language and style that is **at times** unsuited to the purpose, audience, and task Speaking is fluid **with minor lapses of awkward or incorrect language use that detracts from audience understanding**		Uses **appropriate** language and style that is **suited** to the purpose, audience, and task Speaking is fluid and **easy to follow**		Uses **sophisticated** and **varied** language that is suited to the purpose, audience, and task Speaking is **consistently** fluid and easy to follow
Presentation Skills	Makes **minimal** use of presentation skills: lacks control of body posture; does not make eye contact; voice is unclear and/or inaudible; and pace of presentation is too slow or too rushed Presenter's energy and affect are **unsuitable** for the audience and purpose of the presentation		Demonstrates a **command of some** aspects of presentation skills, including control of body posture and gestures, language fluency, eye contact, clear and audible voice, and appropriate pacing Presenter's energy, and/or affect are **usually appropriate** for the audience and purpose of the presentation, **with minor lapses**		Demonstrates a **command** of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing Presenter's energy and affect are **appropriate** for the audience and **support engagement**		Demonstrates **consistent command** of presentation skills, including control of body posture and gestures, eye contact, clear and audible voice, and appropriate pacing **in a way that keeps the audience engaged** Presenter **maintains a presence and a captivating energy** that is appropriate to the audience and purpose of the presentation
Interaction with Audience	Provides a **vague** response to questions Demonstrates a **minimal command** of the facts or understanding of the topic		Provides an **indirect** or **partial** response to questions; Demonstrates a **partial** command of the facts or understanding of the topic		Provides a **direct** and **complete** response to questions Demonstrates an **adequate** command of the facts and understanding of the topic		Provides a **precise** and **persuasive** response to questions Demonstrates an **in-depth** understanding of the facts and topic

Curriculum Framework for

School: First State Military Academy **Course: Precalculus**

Course Description:

This course provides algebraic and graphical explorations of polynomial, rational, exponential, logarithmic, and inverse functions with real life applications. In addition, trigonometric functions are studied as circular functions with applications to triangle problems. Topics include trigonometric identities, inverse trigonometric functions and oblique triangle trigonometry. Limits and sequences and series will be introduced if time permits. Extensive use of the graphing calculator will assist the student in a balanced approach to solving problems.

Big Idea: To provide all cadets the knowledge, skills, and attributes, to thrive in post-secondary education, work, and civic life.

Standards Alignment	Unit Concepts/Big Ideas	Driving Questions/Learning Targets	Assessments
Unit One: Functions from a Calculus Perspective **Timeline: About 4 weeks**			
CCSS.Math.Content.F.BF.1 - Build a function that models a relationship between two quantities c. (+) compose functions **CCSS.Math.Content.F.BF.4.b -**	**Concepts:** Set-builder notation Interval notation Implied domain Placewise-defined function Relevant domain Zeros	**Driving Questions:** - How are functions used throughout the business world? - How are functions used to analyze costs, predict sales, calculate profit, forecast future	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework

(+) Verify by composition that one function is the inverse of another. **CCSS.Math.Content.F.BF.4.c -** (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. **CCSS.Math.Content.F.BF.4.d -** (+) Produce an invertible from a non-invertible function by restricting the domain	Roots Line symmetry Point symmetry Event function Odd function Continuous Limit Discontinuous Infinite Jump Point Removable Nonremovale Discontinuities End behavior Increasing Decreasing Constant Maximum Minimum Extrema Average rate of change Secant line Transformation Translation Reflection Dilation Parent square root Quadratic cubic Reciprocal absolue value step Greatest integer functions Composition Inverse relation Inverse function One-to-one **Big Ideas:** - Identify functions and	costs and revenue, estimate depreciation, and determine the proper labor force? **Learning Targets:** - To describe subsets of real numbers - To identify and evaluate functions and state their domains - To use graphs of functions to estimate function values - To identify even and odd functions - To use limits to determine the continuity of a function - To use limits to describe the end behavior of functions - To find intervals on which functions are increasing, constant, or decreasing - To identify, graph, and describe parent functions - To identify and graph transformations of functions - To perform operations with functions - To find compositions of functions - To use the horizontal line test to determine whether a function has an inverse function - To find inverse functions algebraically and graphically	Assignments - Warm-Ups

	determine their domains, ranges, y-intercepts, and zeros - Evaluate the continuity, end behavior, limits, and extrema of a function - Calculate rate of change of nonlinear functions - Identify parent functions and transformations - Perform operations with functions, identify composite functions, and calculate inverse functions		
Unit Two: Power, Polynomial, and Rational Functions **Timeline: About 3 weeks**			
CCSS.Math.Content.F.IF.7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.	**Concepts:** Power function Monomial function Radical function Extraneous solutions Polynomial function Leading coefficient Leading-term test Turning point Quadratic form Repeated zero Multiplicity Synthetic division Depressed polynomial Synthetic substitution Rational Zero Theorem Descartes' Rule of Signs Fundamental Theorem of Algebra Linear Factorization Theorem Complex conjugates	**Driving Questions:** - How are polynomial functions used when designing and building new structures? - How do architects use functions to determine the weight and strength of the materials, analyze the costs, estimate deterioration of materials, and determine the proper labor force? **Learning Targets:** - To graph and analyze power functions - To graph and analyze radical functions and solve radical equations - To graph polynomial functions - To model real-world data with	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

	Rational function Asymptote Vertical asymptote Horizontal asymptote Oblique asymptote Holes Polynomial inequality Sign chart Rational inequality **Big Ideas:** - Graph and analyze power, radical, polynomial, and rational functions - Divide polynomials using long division and synthetic division - Use the Remainder and Factor Theorems - Find all zeros of polynomial functions - Solve radical and rational equations - Solve polynomial and rational inequalities	polynomial functions - To divide polynomials using long division and synthetic division - To use the Remainder and Factor Theorems - To find real zeros of polynomial functions - To find complex zeros and polynomial functions - To analyze and graph rational functions - To solve rational equations - To solve polynomial inequalities - To solve rational inequalities	
Unit Three: Exponential and Logarithmic Functions **Timeline: About 4 weeks**			
CCSS.Math.Content.F.BF.5 - (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents	**Concepts:** Algebraic function Transcendental function Exponential function Natural base Continuous compound interest Logarithmic function with base b Logarithm Common logarithm	**Driving Questions:** - How are exponential functions used to model the growth and decline of populations of endangered species? **Learning Targets:** - To evaluate, analyze, and graph exponential functions	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

	Natural logarithm Logistic growth function Linearize **Big Ideas:** - Identify the mathematical domains, ranges, and end behaviors of exponential and logarithmic functions - Use the properties of exponents and logarithms to solve exponential and logarithmic equations - Collect and organize data, make and interpret scatter plots, fit the graph of a function to the data, and interpret the results - Use function models to predict and make decisions and critical judgements - Use nonlinear regression	- To solve problems involving exponential growth and decay - To evaluate expressions involving logarithms - To sketch and analyze graphs of logarithmic functions - To apply properties of logarithms - To apply the Change of Base Formula - To apply the One-to-One Property of Exponential Functions to solve equations - Apply the One-to-One Property of Logarithmic Functions to solve equations - To model data using exponential, logarithmic, and logistic functions - To Linearize and analyze date	
Unit Four: Trigonometric Functions **Timeline: About 3 weeks**			
CCSS.Math.Content.F.TF.3 - (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for □/3, □/4, and □/6, and use the unit circle to express the values of sine, cosine, and tangent for □ - x, □ + x, and 2□ - x in terms of their values for x, where x is any real number	**Concepts:** Trigonometric functions Reciprocal function Inverse trigonometric function Angles of elevation and depression Vertex Initial side Terminal side Standard position Radian	**Driving Questions:** - How is trigonometry used in satellite navigation? - How are the techniques used in satellite navigation also used when navigating cars, planes, ships, and spacecraft? **Learning Targets:** - To find values of trigonometric functions for acute angles of	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Unit circle coffee filter activity - Classwork/Homework Assignments - Warm-Ups

CCSS.Math.Content.F.TF.4 - (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **CCSS.Math.Content.F.TF.6 -** (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed **CCSS.Math.Content.F.TF.7 -** (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. ★ **CCSS.Math.Content.F.BF.1 -** Build a function that models a relationship between two quantities c. (+) compose functions **CCSS.Math.Content.F.BF.4.b -** (+) Verify by composition that one function is the inverse of another. **CCSS.Math.Content.F.BF.4.c -** (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.	Coterminal angles Linear speed Angular speed Sector Quadrantal angle Reference angle Unit circle Circular function Periodic function Period Sinusoid Amplitude Frequency Phase shift Vertical shift Midline Sin^{-1} function Cos^{-1} function Tan^{-1} function Oblique triangles Law of Sines Ambiguous case Law of Cosines Heron's Formula **Big Ideas:** - Solve right triangles using trigonometric and inverse trigonmoetric functions - Convert between degrees and radians - Solve real-world problems using trigonometric functions - Graph trigonometric functions and their inverses - Solve oblique triangles and find their area using various laws and formulas	right triangles - To solve right triangles - To convert degree measures of angles to radian measures and vice versa - Use angle measures to solve real-world problems - To find values of trigonometric functions for any angle - To find values of trigonometric functions using the unit circle - To graph transformations of the sine and cosine functions - To use sinusoidal functions to solve problems - To graph tangent and reciprocal trigonometric functions - To graph damped trigonometric functions - To evaluate and graph inverse trigonometric functions - To find compositions of trigonometric functions - To solve oblique triangles by using the Law of Sines or Law of Cosines - To find areas of oblique triangles	

CCSS.Math.Content.F.BF.4.d - (+) Produce an invertible from a non-invertible function by restricting the domain			
Unit Five: Trigonometric Identities and Equations **Timeline: About 4 weeks**			
CCSS.Math.Content.F.TF.9 - (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	**Concepts:** Identity Trigonometric identity Cofunction Odd-even identities Verify an identity Reduction identity **Big Ideas:** - Identify and use trigonometric identities to find trigonometric values - Use trigonometric identities to simplify and rewrite trigonometric expressions - Verify trigonometric identities - Solve trigonometric equations - Use sum and difference identities to evaluate trigonometric functions - Use double-angle, power-reducing, half-angle, and product-to-sum identities to evaluate trigonometric expressions and solve trigonometric equations	**Driving Questions:** - What makes a triangle a triangle? - How are the sides and angles of a triangle related? **Learning Targets:** - To identify and use basic trigonometric identities to find trigonometric values - To use basic trigonometric identities to simplify and rewrite trigonometric expressions - To verify trigonometric identities - To determine whether equations are identities - To solve trigonometric equations using algebraic techniques - To solve trigonometric equations using basic identities - To use sum and distance identities to evaluate trigonometric functions - To use sum and difference identities to solve trigonometric	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

		equations - To use double-angle, power-reducing, half-angle and product-to-sum identities to evaluate trigonometric expressions and solve trigonometric equations	
Unit Six: Systems of Equations and Matrices **Timeline: About 3 weeks**			
CCSS.Math.Content.N.VM.6 - (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network **CCSS.Math.Content.N.VM.7** - (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled **CCSS.Math.Content.N.VM.8** - (+) Add, subtract, and multiply matrices of appropriate dimensions **CCSS.Math.Content.N.VM.9** - (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties **CCSS.Math.Content.N.VM.10** -	**Concepts:** Multivariable linear system, Row-echelon form Gaussian elimination Augmented matrix Coefficient matrix Reduced row-echelon form Gauss-Jordan elimination Identity matrix Inverse matrix Inverse Invertible Singular matrix Determinant Square system Cramer's Rule Partial fraction Partial fraction decomposition Optimization Linear programming Objective function Constraints Feasible solutions Multiple optimal solutions Unbounded	**Driving Questions:** - Why has linear programming become a standard tool for many businesses, like farming? - What are constraints farmers must take into account to maximize profits? **Learning Targets:** - To solve systems of linear equations using matrices and Gaussian elimination - To solve systems of linear equations using matrices and Gauss-Jordan elimination - To multiply matrices - To find determinants and inverses of 2x2 and 3x3 matrices - To solve systems of linear equations using inverse matrices - To solve systems of linear equations using Cramer's Rule - To write partial fraction	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

(+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse **CCSS.Math.Content.A.REI.8** - (+) Represent a system of linear equations as a single matrix equation in a vector variable **CCSS.Math.Content.A.REI.9 -** (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices for dimension 3x3 or greater).	**Big Ideas:** - Solve systems of linear equations using matrices and Gaussian or Gauss-Jordan elimination - Multiply matrices - Find determinants and inverses of 2x2 and 3x3 matrices - Solve systems of linear equations using inverse matrices and Cramer's Rule - Write partial fraction decompositions of rational expressions with linear and irreducible quadratic factors - Use linear programming to solve applications - Recognize situations in which there are no solutions or more than one solutions of a linear programming application	decompositions of rational expressions with linear factors in the denominator - Write partial fraction decompositions of rational expressions with prime quadratic factors in the denominator - To use linear programming to solve applications - To recognize situations in which there are multiple points at which a function is optimized	
Unit Seven: Conic Sections and Parametric Equations **Timeline: About 5 weeks**			
CCSS.Math.Content.G.GPE.3 - (+) Derive the equations of the ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. **CCSS.Math.Content.G.GMD.2 -** (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a	**Concepts:** Conic section Degenerate conic Locus Parabola Focus Directrix Axis of symmetry Vertex Latus rectum Ellipse	**Driving Questions:** - When a ball is hit or thrown, like a baseball, why can the bath of the ball be represented and traced by parametric equations? **Learning Targets:** - To analyze and graph equations of parabolas - To write equations of	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

sphere and other solid figures	Foci Major axis Center Minor axis Vertices Co-vertices Eccentricity Hyperbola Transverse axis Conjugate axis Parametric equation Parameter Orientation Parametric curve **Big Ideas:** - Analyze, write, and graph equations of parabolas, ellipses, circles, and hyperbolas - Use equations to identify types of conic sections - Use rotation of axes to write equations of rotated conic sections - Graph rotated conic sections - Graph parametric equations - Solve problems related to the motion of projectiles	parabolas - To analyze and graph equations of ellipses and circles - To use equations to identify ellipses and circles - Analyze and graph equations of hyperbolas - To use equations to identify types of conic sections - To find rotation of axes to write equations of rotated conic sections - To graph rotated conic sections - To graph parametric equations - To solve problems related to the motion of projectiles	
Unit Eight: Vectors **Timeline: About 3 weeks**			
CCSS.Math.Content.N.VM.1 - (+) Recognize vector quantities as having both magnitude and	**Concepts:** Vector Initial point	**Driving Questions:** - How are vectors used to model changes in direction due to	**Summative:** - Project - Quiz

direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). **CCSS.Math.Content.N.VM.2** - (+) Find the components of a vector by subtracting the coordinated of an initial point from the coordinates of a terminal point **CCSS.Math.Content.N.VM.3** - (+) Solve problems involving velocity and other quantities that can be represented by vectors **CCSS.Math.Content.N.VM.4.a** - Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitude **CCSS.Math.Content.N.VM.4.b** - Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum **CCSS.Math.Content.N.VM.4.c** - Understand vector subtraction v - w as v + (-w), where -w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. REpresent vector subtraction	Terminal point Standard position Direction Magnitude Quadrant bearing True bearing Parallel vectors Opposite vectors Resultant Zero vector Components Component form Unit vector Linear combination Dot product Orthogonal Vector projection Work 3D coordinate system Z-axis Octant Ordered triple Cross product Torque Triple scalar product **Big Ideas:** - Represent and operate with vectors both geometrically and algebraically - Resolve vectors into their rectangular components - Write a vector as the linear combination of unit vectors - Find the dot product of two vectors and use the dot product to find the angle between them	water and air currents? **Learning Targets:** - To represent and operate with vectors geometrically - To solve vector problems and resolve vectors into their rectangular components - To represent and operate with vectors in the coordinate plane - To write vector as a linear combination of unit vectors - To find the dot product of two vectors and use the dot product to find the angle between them - To find the projection of one vector onto another - To plot points and vectors in the 3D coordinate system - To express algebraically and operate with vectors in space - To find dot products of and angles between vectors in space - To find cross products of vectors in space and use cross products to find area and volume	**Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise. **CCSS.Math.Content.N.VM.5.a** - Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g. as $c(v_x, v_y) = (cv_x, cv_y)$ **CCSS.Math.Content.N.VM.5.b** - Compute the magnitude of a scalar multiple cv using $\|\|cv\|\| = \|c\|v$. Compute the direction of cv knowing that when $\|c\|v \neq 0$, the direction of cv is either along v (for $c > 0$) or against v (for $c < 0$)	- Find the projection of one vector onto another - Graph and operate with vectors in space - Find the dot and cross product of and angles between vectors in space - Find areas of parallelograms and volumes of parallelepipeds in space		
Unit Nine: Polar Coordinates and Complex Numbers **Timeline: About 3 weeks**			
CCSS.Math.Content.N.CN.3 - (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers **CCSS.Math.Content.N.CN.4** - Represent complex numbers and their operations on the complex plane. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary	**Concepts:** Polar coordinate system Polar axis Polar coordinate Polar equation Polar graph Limaçon Cardioid Rose Lemniscate Spiral of Archimedes Complex plane Real axis	**Driving Questions:** - How can polar equations be used to model sound patterns to help determine state arrangement, speaker and microphone placement, and volume and recording levels? - How can they also be used with lightning and camera angles when concerts are filmed? **Learning Targets:**	**Summative:** - Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

numbers), and explain why the rectangular and polar forms of a given complex number represent the same number **CCSS.Math.Content.N.CN.5** - (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation **CCSS.Math.Content.N.CN.6** - (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers and its points	Imaginary axis Argand plane Absolute value of a complex number Polar form Trigonometric form Modulus Argument pth roots of unity **Big Ideas:** - Graph points with polar coordinates - Graph polar equations - Identify and graph classic polar curves - Convert between polar and rectangular coordinates - Convert between polar and rectangular equations - Identify polar equations of conics - Write and graph the polar equation of a conic given its eccentricity and the equation of its directrix - Convert complex numbers from rectangular to polar form and vice versa - Find products, quotients, and roots of complex numbers in polar form	- To graph points with polar coordinates - To graph simple polar equations - To graph polar equations - To identify and graph classical curves - To convert between polar and rectangular coordinates - To convert between polar and rectangular equations - To identify polar equations of conics - To write and graph the polar equation of a conic given its eccentricity and the equation of its directrix - To convert complex numbers from rectangular to polar form and vice versa - To find products quotients, powers, and roots of complex numbers in polar form	
Unit Ten: Sequences and Series **Timeline: About 4 weeks**			
	Concepts:	**Driving Questions:**	**Summative:**

	Sequence Term Finite sequence Infinite sequence Recursive sequence Explicit sequence Fibonacci sequence Converge Diverge Series Finite series nth partial sum Infinite series Sigma notation Arithmetic sequence Common difference Arithmetic means First difference Second difference Arithmetic series Geometric sequence Common ratio Geometric means Geometric series Principle of mathematical induction Anchor step Inductive hypothesis Inductive step Extended principle of mathematical induction Binomial coefficients Pascal's triangle Binomial Theorem Power series Exponential series Euler's Formula	- How are sequences and series used to predict patterns? **Learning Targets:** - To investigate several different types of sequences - To use sigma notation to represent and calculate sums of series - To find nth terms and arithmetic means of arithmetic sequences - To find sums of n terms of arithmetic series - To find nth terms of geometric means of geometric sequences - To find sums of n terms of geometric series and the sums of infinite geometric series - To use mathematical induction to prove summation formulas and properties of divisibility involving a positive integer n - To extend mathematical induction - To use Pascal's Triangle to write binomial expansions - To use the Binomial Theorem to write and find the coefficients of specified terms in binomial expansions - To use a power series to represent a rational function - To use power series representation to approximate value of transcendental functions	- Project - Quiz **Formative:** - Workshop Practice - Classwork/Homework Assignments - Warm-Ups

	Big Ideas: - Use sigma notation to represent and calculate sums of series - Find nth terms of arithmetic sequences and arithmetic series - Find nth terms of geometric sequences and geometric series. Find sums of infinite geometric series. - Use mathematical induction to prove summation formulas and properties of divisibility involving a positive integer n - Use Pascal's Triangle or the Binomial Theorem to write binomial expansions - Use a power series to represent a rational function - Use power series representations to approximate values of transcendental functions		

COURSE OVERVIEW:
The Introduction to Applied Math course will prepare students to enter the work force or to attend college with an understanding of the mathematics in the real world. The course will help students develop quantitative literacy as a habit of mind and an approach to problems that employs and enhances both statistics and mathematics. The main goal of the course is for students to see that mathematics is a powerful tool for living,as they develop confidence with mathematics, habits of inquiry and logical thinking, and the ability to use mathematics to make decisions in everyday life. Topics address the math used to run our country's households, businesses, and governments, such as the mathematics of consumption, inflation, depreciation, borrowing, saving, and taxation, as well as the mathematics of logic, likelihood, statistics, and sports.

EXPECTED OUTCOMES
Students are expected to perform at a proficient level on a variety of tasks and assessments addressing the Common Core Standards for Mathematical Practice and selected high school Common Core State Standards for Math. Levels of proficiency are defined near the end of this course outline under Performance Criteria.

Common Core State Standards for Mathematical Practice (SMP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

INSTRUCTIONAL METHOD AND/OR STRATEGIES:
A variety of instructional strategies will be utilized to accommodate all learning styles. Universal Design for Learning strategies and guidelines will be utilized to provide choices to address the learning needs of students with disabilities, English Language Learners and students of low or high abilities in each lesson and unit.

PERFORMANCE CRITERIA:
Students will be assessed on knowledge and content as well as agency, oral communication, and written communication. The New Tech Network High School rubrics will be utilized. The students will self-assess using the rubrics as well as the teacher.

Common Core Mathematical Standards

Reasoning with Equations & Inequalities

Reason quantitatively and use units to solve problems.

CCSS.MATH.CONTENT.HSN.Q.A.1
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.MATH.CONTENT.HSN.Q.A.2
Define appropriate quantities for the purpose of descriptive modeling.

CCSS.MATH.CONTENT.HSN.Q.A.3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Linear, Quadratic, & Exponential Model

Construct and compare linear, quadratic, and exponential models and solve problems.

CCSS.MATH.CONTENT.HSF.LE.A.1
Distinguish between situations that can be modeled with linear functions and with exponential functions.

CCSS.MATH.CONTENT.HSF.LE.A.1.B
Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

CCSS.MATH.CONTENT.HSF.LE.A.1.BC
Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

CCSS.MATH.CONTENT.HSF.LE.A.3
Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Statistics and Probability

Interpreting Categorical and Quantitative Data

CCSS.MATH.CONTENT.HSS.ID.A
Summarize, represent, and interpret data on a single count or measurement variable.

CCSS.MATH.CONTENT.HSS-ID.A.2
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

CCSS.MATH.CONTENT.HSS-ID.A.3
Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme date points (outliers).

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

CCSS.MATH.CONTENT.HSS.IC.B.3
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

CCSS.MATH.CONTENT.HSS.IC.B.6
Evaluate reports based on data.

Conditional Probability and the Rules of Probability

CCSS.MATH.CONTENT.HSS-CP.A
Understand independence and conditional probability and use them to interpret data.

CCSS.MATH.CONTENT.HSS-CP.A.5

Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

Using Probability to Make Decisions

CCSS.MATH.CONTENT.HSS-MD.A

Calculate expected values and use them to solve problems.

CCSS.MATH.CONTENT.HSS-MD.B

Use probability to evaluate outcomes of decisions.

CCSS.MATH.CONTENT.HSS-MD.7

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

COURSE CONTENT AND SUGGESTED TIME ALLOTMENT:

Content sequencing, activities, and time allocations are only suggestions and may be adjusted to suit school site curriculum plans, available materials, and student needs.

Unit 1: The Mathematics of Calculation

Duration: 16 days

Description:

Students use computational skills to make sense of and solve problems in real-world contexts. First, students use the order of operations to evaluate expressions including formulas. Next, they use technology to solve problems, analyzing the results in terms of the context to determine if solutions are reasonable. Then, students solve a variety of real-world problems involving percent. Finally, they use units as a way to understand problems and to guide the solution of multi-step problems.

Standards Addressed:

Common Core Standards for Mathematical Practice 1-8

CCSS.MATH.CONTENT.HSN.Q.A.1

CCSS.MATH.CONTENT.HSN.Q.A.2

CCSS.MATH.CONTENT.HSN.Q.A.3

Unit 2: The Mathematics of Consumption

Duration: 15 days

Description:
In this unit, students study the mathematics involved in making purchases and budgeting. Students will analyze and compare unit prices in making purchases. They will find markup and discounts, including finding final prices after multiple discounts. Students will find sales tax, excise tax, and value-added tax on items. Finally, students will learn how to create, balance and analyze a monthly budget, write checks and balance a checkbook.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

Unit 3: The Mathematics of Logic and the Media

Duration: 17 days

Description:
In this unit, students study the mathematics involved in logic and the media. Students use set and set diagrams to describe unions, intersections and complements of sets. Students will study statements and negations, deductive an inductive reasoning, and recognize fallacies in logic.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS.MATH.CONTENT.HSS.IC.B.3
CCSS.MATH.CONTENT.HSS.IC.B.6

Unit 4: The Mathematics of Inflation and Depreciation

Duration: 16 days

Description:
In this unit, students study the mathematics involved in inflation and depreciation. Students will study exponential growth and decay, inflation and the consumer price index, and depreciation.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS.MATH.CONTENT.HSF.LE.A.1
CCSS.MATH.CONTENT.HSF.LE.A.1.B
CCSS.MATH.CONTENT.HSF.LE.A.1.C
CCSS.MATH.CONTENT.HSF.LE.A.3

Unit 5: The Mathematics of Taxation

Duration: 15 days

Description:
In this unit, students study the mathematics involved in taxation. Students will study flat tax and political philosophy, graduated income tax, property tax, social security and payroll taxes.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

Unit 6: The Mathematics of Borrowing and Saving

Duration: 16 days

Description:
In this unit, students study the mathematics involved in borrowing and saving. Students will be introduced to lending, including promissory notes and loans. They will create an amortization table and analyze the cost of buying on credit. Students will compare rates and terms for home mortgages, and compare the costs of buying and renting. Finally, students will analyze savings and retirement plans.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

Unit 7: The Mathematics of Patterns and Nature

Duration: 15 days

Description:
In this unit, students study the mathematics involved in patterns and nature. Students will recognize and describe linear, exponential, quadratic, and other patterns in nature, art, and science.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS.MATH.CONTENT.HSF.LE.A.1
CCSS.MATH.CONTENT.HSF.LE.A.1.B
CCSS.MATH.CONTENT.HSF.LE.A.1.C
CCSS.MATH.CONTENT.HSF.LE.A.3

Unit 8: The Mathematics of Likelihood

Duration: 15 days

Description:
In this unit, students study the mathematics of likelihood. Students will use probability to describe the likelihood of an event, analyze likelihood of a risk, and describe actuarial data. They will find theoretical and experimental probability, and find expected values for events.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS.MATH.CONTENT.HSS-CP.A
CCSS.MATH.CONTENT.HSS-MD.A
CCSS.MATH.CONTENT.HSS-MD.B

Unit 9: The Mathematics of Description

Duration: 15 days

Description:
In this unit, students study the mathematics of description. Students will read, interpret and create stacked area graphs and radar graphs. Students will use mean, median and mode to describe average value of a data set, and understand the effect of outliers on averages. They will read and understand box-and-whisker plots and histograms. Students will use standard deviation to describe dispersion of a data set, and compare different types of distributions. Finally, students will study various sampling methods.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS.MATH.CONTENT.HSS.ID.A
CCSS.MATH.CONTENT.HSS.ID.A.2
CCSS.MATH.CONTENT.HSS.ID.A.3

Unit 10: The Mathematics of Fitness and Sports

Duration: 16 days

Description:
In this unit, students study the mathematics involved in fitness and sports. Students will study various statistics related to a person's fitness and health, and also statistics used in a variety of sports activities.

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

Universal Design for Learning Guidelines

I. Provide Multiple Means of **Representation**

1: Provide options for perception

1.1 Offer ways of customizing the display of information

1.2 Offer alternatives for auditory information

1.3 Offer alternatives for visual information

2: Provide options for language, mathematical expressions, and symbols

2.1 Clarify vocabulary and symbols

2.2 Clarify syntax and structure

2.3 Support decoding of text, mathematical notation, and symbols

2.4 Promote understanding across languages

2.5 Illustrate through multiple media

3: Provide options for comprehension

3.1 Activate or supply background knowledge

3.2. Highlight patterns, critical features, big ideas, and relationships

3.3 Guide information processing, visualization, and manipulation

3.4 Maximize transfer and generalization

Resourceful, knowledgeable learners

II. Provide Multiple Means of **Action and Expression**

4: Provide options for physical action

4.1 Vary the methods for response and navigation

4.2 Optimize access to tools and assistive technologies

5: Provide options for expression and communication

5.1 Use multiple media for communication

5.2 Use multiple tools for construction and composition

5.3 Build fluencies with graduated levels of support for practice and performance

6: Provide options for executive functions

6.1 Guide appropriate goal-setting

6.2 Support planning and strategy development

6.3 Facilitate managing information and resources

6.4 Enhance capacity for monitoring progress

Strategic, goal-directed learners

III. Provide Multiple Means of **Engagement**

7: Provide options for recruiting interest

7.1 Optimize individual choice and autonomy

7.2 Optimize relevance, value, and authenticity

7.3 Minimize threats and distractions

8: Provide options for sustaining effort and persistence

8.1 Heighten salience of goals and objectives

8.2 Vary demands and resources to optimize challenge

8.3 Foster collaboration and community

8.4 Increase mastery-oriented feedback

9: Provide options for self-regulation

9.1 Promote expectations and beliefs that optimize motivation

9.2 Facilitate personal coping skills and strategies

9.3 Develop self-assessment and reflection

Purposeful, motivated learners

CAST

APA Citation: CAST (2011). *Universal design for learning guidelines version 2.0.* Wakefield, MA: Author.

NTN Written Communication Rubric, Grade 10

The ability to effectively communicate knowledge and thinking through writing by organizing and structuring ideas and using discipline appropriate language and conventions.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT	P/A	ADVANCED 12 Grade Proficient
DEVELOPMENT *What is the evidence that the student can develop ideas?*	• **Does not explain** background or context of topic/issue • Controlling idea* is **unclear** or **not evident** throughout the writing • Ideas and evidence are **underdeveloped**		• Provides a **cursory or partial explanation** of background and context of topic/issue • Controlling idea* is **present** but **unevenly addressed** throughout the writing • Ideas and evidence are **somewhat developed**		• **Addresses** appropriate background and context of topic/issue • Controlling idea* is **presented clearly** throughout the writing • Ideas and evidence are **developed**		• **Explains appropriate** background and context of topic/issue • Controlling idea* is **consistently maintained** throughout the writing • Ideas and evidence are **developed**
ORGANIZATION *What is the evidence that the student can organize and structure ideas for effective communication?*	• Ideas and evidence are **disorganized,** making relationships **unclear** • **No** transitions are used, or are used **ineffectively** • Conclusion, when appropriate, is **absent** or **restates** the introduction or prompt		• Ideas and evidence are **loosely sequenced or** organization may be **formulaic** • Transitions **connect ideas** with **some** lapses; may be **repetitive** or **formulaic** • Conclusion, when appropriate, **follows from** the controlling idea		• Ideas and evidence are **sequenced** to **show relationships** • Transitions **connect ideas** • Conclusion, when appropriate, follows from **and supports** the controlling idea		• Ideas and evidence are **logically sequenced** to show **clear** relationships • Transitions are **varied** and connect ideas, **showing clear relationships** • Conclusion, when appropriate, is l**ogical** and **raises important implications**
LANGUAGE AND CONVENTIONS *What is the evidence that the student can use language skillfully to communicate ideas?*	• Language, style, and tone are **inappropriate** to the purpose, task, and audience. • **Uses** norms and conventions of writing that are **inappropriate** to the discipline/genre** • Has an **accumulation** of errors in grammar, usage, and mechanics that **distract or interfere** with meaning • Textual citation is **missing or incorrect,** when appropriate		• Language, style, and tone are mostly **appropriate** to the purpose, task, and audience with **minor** lapses • **Attempts to follow** the norms and conventions of writing in the discipline/genre** with **major** errors • Has some **minor errors** in grammar, usage, and mechanics that **partially** distract or interfere with meaning • Cites textual evidence with **partially or using an incorrect format**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience with **minor** lapses • Attempts to follow the norms and conventions of writing in the discipline/genre** with **some** errors • Is **generally free** of **distracting** errors in grammar, usage, and mechanics • Cites textual evidence with **some minor errors**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience • **Follows** the norms and conventions of writing in the discipline/genre with **minor** errors** • Is **free** of distracting errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate

***Controlling idea may refer to a thesis, argument, topic, or main idea, depending on the type of writing**
****E.g. accurate use of scientific/technical terms, quantitative data, and visual representations in science; use of multiple representations in math**

NTN Written Communication Rubric, Grade 12

The ability to effectively communicate knowledge and thinking through writing by organizing and structuring ideas and using discipline appropriate language and conventions.

	EMERGING	E/D	DEVELOPING	D/P	PROFICIENT College Ready	P/A	ADVANCED College Level
DEVELOPMENT *What is the evidence that the student can develop ideas?*	• **Does not explain** background or context of topic/issue • Controlling idea* is **unclear** or **not evident** throughout the writing • Ideas and evidence are **underdeveloped**		• Provides a **cursory or partial explanation** of background and context of topic/issue • Controlling idea* is **evident** but **unevenly addressed** throughout the writing • Ideas and evidence are **somewhat developed**		• **Explains appropriate** background and context of topic/issue • Controlling idea* is **consistently maintained** throughout the writing • Ideas and evidence are **developed**		• **Thoroughly** explains appropriate background and context of topic/issue • Controlling idea* is **clearly and consistently communicated** throughout the writing • Ideas and evidence are **thoroughly developed and elaborated**
ORGANIZATION *What is the evidence that the student can organize and structure ideas for effective communication?*	• Ideas and evidence are **disorganized** or **loosely** sequenced; relationships are **unclear** • **No** transitions are used, or are used **ineffectively** • Conclusion, when appropriate, is **absent** or **restates** the introduction or prompt		• Ideas and evidence are **somewhat organized** but **not always logically sequenced to show relationships** • Transitions **connect ideas** with **minor** lapses, or may be **repetitive** or **formulaic** • Conclusion, when appropriate, **follows from** the controlling idea		• Ideas and evidence are **logically sequenced** to show **clear** relationships • Transitions are **varied** and connect ideas, **showing clear relationships** • Conclusion, when appropriate, follows from **and supports** the controlling idea		• Ideas are logically sequenced to present a **coherent whole** • Transitions are varied and **clearly orient** the reader in the **development and reasoning of the controlling idea** • Conclusion, when appropriate, is l**ogical** and **raises important implications**
LANGUAGE AND CONVENTIONS *What is the evidence that the student can use language skillfully to communicate ideas?*	• Language, style, and tone are **inappropriate** to the purpose, task, and audience • **Attempts** to follow the norms and conventions of writing in the discipline/genre with **major**, consistent errors • Has an **accumulation** of errors in grammar, usage, and mechanics that **distract or interfere** with meaning • Textual citation is **missing or incorrect,** when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience with **minor** lapses • **Follows** the norms and conventions of writing in the discipline/genre with **consistent** errors • Has some **minor errors** in grammar, usage, and mechanics that **partially** distract or interfere with meaning • Cites textual evidence with **some minor errors**, when appropriate		• Language, style, and tone are **appropriate** to the purpose, task, and audience • **Follows** the norms and conventions of writing in the discipline/genre** with **minor** errors • Is **generally free** of **distracting** errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate		• Language, style, and tone are **tailored** to the purpose, task, and audience • **Consistently follows** the norms and conventions of writing in the discipline/genre • Is **free** of distracting errors in grammar, usage, and mechanics • Cites textual evidence **consistently and accurately**, when appropriate

***Controlling idea may refer to a thesis, argument, topic, or main idea, depending on the type of writing**
****E.g. accurate use of scientific/technical terms, quantitative data, and visual representations in science; use of multiple representations in math**