

**NORTH BRANFORD PUBLIC SCHOOLS**  
**Essential Curriculum**  
**Mathematics**

***Grades 9-12***

**Applied Mathematics I**

Upon completion of Applied Mathematics I, students will be able to:

- Round decimals
- Use the number line to graph and compare integers.
- Reduce and convert fractions, decimals and percents.
- Write numbers in scientific notation.
- Perform operations on integers and decimals.
- Solve real world problems involving integers, decimals and percents.
- Check reasonableness of answers in applications.
- Solve percent problems including percent of increase and decrease.
- Define proportion and ratio.
- Solve real-world applications of ratio and proportion.
- Appropriate basic metric unit (i.e. meter, liter, gram) and customary unit for length, volume and mass.
- Measure quantities using the metric and customary systems using appropriate measuring tools.
- Compare the metric system with U.S. Customary system.
- Convert measurements between systems and within systems.
- Define basic geometric terms.
- Identify various geometric shapes.
- Determine area, perimeter, circumference, and volume of above shapes.
- Define and apply mean, median and mode to data.
- Make predictions based on theoretical and experimental probability.
- Graph on a number line and in a Cartesian coordinate system.
- Solve one-step and two-step equations
- Determine square roots and perfect squares.
- Construct and analyze bar graphs, line graphs, histograms and stem and leaf plots.

## Applied Mathematics II

Upon completion of Applied Mathematics II, students will be able to:

- Define and determine absolute value.
- Write numbers as powers of 10.
- Convert numbers to and from scientific notation
- Write ratios in equivalent forms.
- Compare ratios.
- Solve proportions.
- Convert percents, fractions, and decimals into equivalent forms.
- Solve equations involving percents, fractions, decimals and integers.
- Solve real-world applications involving percents, fractions, decimals and integers.
- Appropriate basic metric unit (i.e. meter, liter, gram) and customary unit for length, volume and mass.
- Measure quantities using the metric and U.S customary system using appropriate measuring tools.
- Compare the metric system with the U.S. customary system.
- Appropriate basic metric unit (meter, liter, gram) for length, volume and mass.
- Define basic geometric terms.
- Define and classify polygons.
- Construct a scale drawing using similar triangles.
- Determine the area and perimeter polygons.
- Determine area and circumference of a circle.
- Identify symmetry and perform transformations on figures.
- Define and apply mean, median, and mode for a set of data.
- Make predictions based on theoretical and experimental probability.
- Determine a pattern in a sequence and express it algebraically.
- Apply the order of operations to numerical expressions.
- Determine square roots.
- Solve one-step and two-step linear equations and inequalities.
- Solve real-world problems using open sentences.
- Determine, graph and analyze linear functions and systems.
- Identify and graph quadratic functions.

## Algebra I

Upon completion of Algebra I, students will be able to:

- Simplify a numerical or variable expression using the order of operations.
- Determine the mean, median, mode, and range of a given set of data.
- Construct graphs (bar, line, scatter plot, and circle) from a given set of data and draw conclusions from those graphs.

- Construct and approximate a trend line from a scatter plot.
- Predict and describe patterns produced by iterations.
- Write an equation based upon real-world applications.
- Solve absolute value equations and inequalities.
- Solve word problems in one and two variables.
- Represent equations, inequalities, and functions graphically.
- Analyze graphs of equations, inequalities, and functions.
- Identify, analyze, and solve linear systems.
- Add, subtract, multiply, divide, and factor polynomials.
- Compare and analyze experimental and theoretical probabilities and make predictions based on these probabilities.

## **Geometry**

Upon completion of geometry, students will be able to:

- Solve similar figures (lengths, areas, and volumes) using correct proportions.
- Apply properties and theorems of congruent figures to draw conclusions and write proofs.
- Use logic and deductive reasoning to draw conclusions and solve problems.
- Apply properties and theorems of angles and lines to solve problems and write proofs.
- Apply area and perimeter formulas to two-dimensional figures.
- Apply area and volume formulas to three-dimensional figures.
- Measure angles and construct two-dimensional figures using a compass and a protractor.
- Solve problems using the Pythagorean Theorem and Special Triangle formulas.
- Define probability in terms of successful outcomes vs. total outcomes.
- Use probability ratios to solve "real-world" problems involving length, area, and volume.
- Use geometric tools to create/manipulate figures into translations, rotations and reflections.
- State and apply distance and midpoint formulas
- Place geometric figures on the coordinate axes and solve related problems

## **Algebra II**

Upon completion of Algebra II, students will be able to:

- Model and solve problems using direct, inverse, combined and joint variation.
- Simplify and analyze algebraic expressions (polynomial, rational, complex fractions).
- Model and solve problems with matrices and systems of equations.
- Solve and graph absolute value and linear equations and inequalities.
- Determine, analyze, and solve geometric and arithmetic sequences and series.

- Solve quadratic equations using completing the square, factoring, and the quadratic formula.
- Use tables, graphs, and algebraic operations to solve linear and quadratic problems.
- Define and perform operations with complex numbers.
- Simplify and perform operations with rational exponents and logarithms.
- Solve radical equations.
- State domain and range of functions and perform algebraic operations on functions.
- Use linear and quadratic functions to model real world situations.
- Use the composition and inverse of functions to model and solve problems.

## **Precalculus**

Upon completion of Precalculus, students will be able to:

- Transform quadratic, cubic, absolute value, exponential, and logarithmic functions and describe the results algebraically and geometrically.
- Use functions (polynomial, power, rational, exponential, logarithmic, logistic, piecewise-defined, and greatest integer) to model and solve problems.
- Interpret the constants, coefficients, and degree of polynomials.
- Use the regression capabilities of the graphing calculator to model real world situations.
- Use the composition and inverse of functions to model and solve problems.
- Use recursively-defined functions to model and solve problems.
- Solve linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric equations and inequalities.
- Model and solve real world situations using linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric equations and inequalities.
- Define the six trigonometric functions using the unit circle and right triangle proportions.
- Model and solve periodic problems using graphs, unit circle, right triangle proportions, calculator, Law of Sines, and Law of Cosines.
- Perform transformations of trigonometric functions with respect to period, amplitude, and vertical and horizontal shifts.
- Solve radian measure problems.
- Develop and prove trigonometric identities.

## **Calculus A and Honors**

Upon completion of Calculus, students will be able to:

- State and apply the properties of limits
- Use algebra to calculate one-sided and two-sided limits.

- Define and apply the Sandwich Theorem and the Intermediate Value Theorem.
- Describe asymptotic behavior in terms of limits involving infinity.
- Understand continuity in terms of limits.
- Explore and interpret the concept of the derivative graphically, numerically, and analytically.
- Find the derivatives of basic functions, including power, exponential, logarithmic, and trigonometric functions.
- Use the rules for the derivative of sums, differences, products, and quotients of functions.
- Solve using the chain rule and implicit differentiation.
- Determine tangent and normal lines to a curve at a given point.
- Explore and apply the Mean Value Theorem.
- Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
- Model and solve optimization and related rates problems.
- Analyze functions by determining extreme values, inflection points, and concavity.

## **Statistics**

Upon completion of Statistics, students will be able to:

- Select appropriate sampling techniques (random, systematic, stratified, or cluster) to collect data.
- Distinguish between sampling error and nonsampling error.
- Construct frequency tables, histograms, and boxplots.
- Compute mean, median, mode, and mid-range, standard deviation, z-score and percentiles, and 5-number summary.
- Compare data using graphs.
- Construct a probability distribution for a random variable.
- Determine expected value, binomial, and normal probabilities.
- Solve real-world problems involving theoretical probabilities.
- State the conclusions and rules of the central limit theorem.
- Estimate a population mean using normal and t-distribution.
- Define the components of a formal hypothesis test.
- Define type i and type ii errors.
- Apply the classical method to test a claim concerning a population.
- Test claims about two populations.
- Define the correlation coefficient for a linear relationship.
- Construct a scatterplot of two variables to estimate a regression line.
- Use StatDisk software to obtain measures and analyze data.

## **AP Calculus AB**

Upon completion of AP Calculus, students will be able to:

- State and apply the properties of limits
- Use algebra to calculate one-sided and two-sided limits.
- Define and apply the Sandwich Theorem and the Intermediate Value Theorem.
- Describe asymptotic behavior in terms of limits involving infinity.
- Understand continuity in terms of limits.
- Explore and interpret the concept of the derivative graphically, numerically, and analytically.
- Find the derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse functions.
- Use the rules for the derivative of sums, differences, products, and quotients of functions.
- Solve using the chain rule and implicit differentiation.
- Determine tangent and normal lines to a curve at a given point.
- Explore and apply the Mean Value Theorem.
- Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
- Model and solve optimization and related rates problems.
- Analyze functions by determining extreme values, inflection points, and concavity.
- Interpret the definite integral by Riemann sums and Trapezoidal Rule.
- Find antiderivatives from the derivatives and by substitution.
- Apply the Fundamental Theorem of Calculus to solve definite integrals.
- Solve differential equations using separation of variables.
- Find the average value of a function.
- Find areas between curves.
- Find volumes of rotations.
- Interpret differential equations by slope fields.