

MATHEMATICS DEPARTMENT

MATH DEPARTMENT COURSES	GRADE(S)	CREDIT	PREREQUISITE	RAI COURSE ¹
Math Essentials	9-10	2	Recommendation	
<u>Algebraic Principles</u>	9-10	2	Recommendation	
<u>Algebra I</u>	9-11	2	8th Grade Math or Algebraic Principles	X
<u>Geometry</u>	9-12	2	Algebra I	X
<u>Honors Geometry</u>	9-10	2	Algebra I, teacher recommendation	X
<u>Algebra II</u>	10-12	2	Geometry	X
<u>Honors Algebra II</u>	9-11	2	Geometry, teacher recommendation	X
<u>Math Analysis</u>	12	1	Algebra II, teacher recommendation	X
<u>MAT- 156: College Statistics</u>	11-12	1	Algebra II, ACT Math score of 22 or Aleks Test score of 30	X
<u>Pre-Calculus</u>	10-12	2	Algebra II, C or higher in Algebra II	X
* <u>Calculus</u>	11-12	2	Pre-Calculus, B or higher in Pre-Calculus	X
* <u>Math 210 & 216 Calculus: College Calculus</u>	12	2.66	Calculus	X

1. Designates classes that fulfill the requirement for the *Regent's Admission Index Core Classes*. Go to the "New Standards for Automatic Admission to Iowa's Public Universities," in this handbook, to www2.state.ia.us/regents/RAI/ or to your counselor for additional information about the RAI.

2. Six math credits are required for graduation. *Designates the class is offered as a potential dual-credit course

All NSHS Mathematics Courses engage students in the Iowa Core Mathematical Practices Standards

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.

ALGEBRAIC PRINCIPLES

GRADES 9-10

2 Credits/Year

Prerequisite: *RECOMMENDATION OF TEACHER*

Algebraic Principles is especially designed for the student who has insufficient mastery of basic math skills, and will encounter difficulty in comprehending algebra due to the pace required to complete the course of study. Algebraic Principles is designed to provide an additional period of transition from arithmetic to algebraic concepts. Students who select this class should take this course with the intent of going into Algebra 1 the following year. **(This course does NOT meet RAI requirements)**

Benchmarks: The student will

- utilize operations with integers, decimals, and fractions.
- translate verbal into algebraic expressions and equations.
- use concepts on the Coordinate Plane.
- write and solve linear equations.
- use proportions and percentages to solve problems.
- apply rules with exponential and scientific notation.
- find squares and square roots.
- apply the Pythagorean Theorem and its converse.
- solve problems from a variety of geometric concepts, such as angles, triangles, quadrilaterals, and circles.

ALGEBRA I

GRADES 9-11

2 Credits/Year

Prerequisite: *SUCCESSFUL COMPLETION OF 8TH GRADE MATH OR EQUIVALENT.*

Algebra I builds the groundwork for future study in higher mathematics. This course will help students to organize a logical step-by-step thought process to solve everyday problems and communicate effectively using mathematics. *(fulfills RAI Core Course Requirement)*

Benchmarks: The student will

- simplify and evaluate algebraic expressions (commutative, associative, distributive, collecting like terms, order of operation, etc.).
- translate word problems into equations.
- solve equations of the first degree (one step and multi-step) and story problems.
- use a coordinate plane to develop the concepts of slopes, intercepts, and the graph of a linear equation.
- apply laws of exponents to simplify expressions.
- solve linear equations and inequalities.
- solve a system of two linear equations by graphing, the substitution method, or the multiplication-addition (elimination) method.
- factor and solve polynomial equations using various techniques.
- add, subtract, multiply, and divide expressions composed of monomials and polynomials.
- graph inequalities, systems of inequalities.
- simplify and perform operations with radicals.
- solve quadratic equations by factoring, completing the square and quadratic formula and use the solutions to help graph parabolas.
- explore statistics and distribution of data

GEOMETRY

GRADES 9-12

2 Credits/Year

Prerequisite: *SUCCESSFUL COMPLETION OF ALGEBRA I*

Geometry is an integrated course in plane, solid, and coordinate geometry. It uses two and three-dimensional geometric shapes (points, lines, planes, triangles, polygons, circles, and solids) and examines their properties, measurements, and mutual relations in space. This course emphasizes problem-solving skills as opportunities to use inductive and deductive reasoning to construct two column proofs. A strong understanding of basic Algebra concepts is needed to be successful in this class.

(fulfills RAI Core Course Requirement)

Benchmarks: The students will

- draw conclusions from postulates, definitions and theorems to apply properties of segments and angles.
- draw conclusions from parallel lines and their related pairs of angles.
- prove triangles congruent and similar.
- use proportional segment lengths to solve problems.
- apply the Pythagorean Theorem.
- use the ratios of trigonometry to find missing parts of a right triangle.
- explore properties of circles.
- surface area and volume of solid figures.
- apply basic transformations to various geometric figures.
- explore statistics and probability applications

HONORS GEOMETRY

GRADES 9-10

2 Credits/Year

Prerequisite: *SUCCESSFUL COMPLETION OF ALGEBRA 1, TEACHER RECOMMENDATION*

Geometry is an integrated course in plane, solid, and coordinate geometry. It uses two and three-dimensional geometric shapes (points, lines, planes, triangles, polygons, circles, and solids) and examines their properties, measurements, and mutual relations in space. This course emphasizes problem-solving skills as opportunities to use inductive and deductive reasoning to construct two column proofs. A strong understanding of basic Algebra concepts is needed to be successful in this class.

(fulfills RAI Core Course Requirement)

Benchmarks: The students will

- draw conclusions from postulates, definitions and theorems to apply properties of segments and angles.
- draw conclusions from parallel lines and their related pairs of angles.
- prove triangles congruent and similar.
- use proportional segment lengths to solve problems.
- apply the Pythagorean Theorem.
- use the ratios of trigonometry to find missing parts of a right triangle.
- use Law of Sines and Law of Cosines to find missing parts of triangles
- explore properties of circles.
- surface area and volume of solid figures.
- apply basic transformations to various geometric figures.
- explore statistics and probability applications

ALGEBRA 2
GRADES 9-12
2 Credits/Year

Prerequisite: *SUCCESSFUL COMPLETION OF ALGEBRA 1.*

Algebra 2 is a continuation and extension of the groundwork that was established in Algebra 1. The course explores working with variables and making connections between their graphic representations, values in a table, written equations and verbal descriptions. Students will explore quadratic, polynomial, exponential, and logarithmic functions. *(fulfills RAI Core Course Requirement)*

Benchmarks: The student will

- graph systems of inequalities and piecewise functions.
- use linear programming and systems of equations to solve real life problems.
- simplify radicals and expressions involving radicals.
- simplify expressions that involve complex numbers.
- solve quadratic equations by factoring, completing the square and quadratic formula and use the solutions to help graph parabolas.
- understand the relationship between zeros and factors of polynomials and their graphs.
- use operations of polynomials to solve problems.
- extend applications of quadratics.
- add, subtract, multiply rational expressions and solve rational equations.
- identify and apply the basic properties of logarithms and exponents.
- explore function composition and inverses
- explore statistics and probability applications

Honors Algebra 2

GRADES 9-12

2 Credits/Year

Prerequisites: *SUCCESSFUL COMPLETION OF ALGEBRA I AND GEOMETRY. (with at least 90% in both courses or teacher recommendation)*

Benchmarks The student will cover more topics than regular Algebra 2 and most topics will be covered in greater depth. While differentiation does occur in the mathematics classroom, the Honors Algebra 2 environment would allow for coverage of additional material within a single school year. *The intention of the Honors Algebra 2 class is to prepare students that are planning on taking higher level math classes and going into a math related field (engineering, etc.) and the regular Algebra 2 class is for the entrance requirement of being accepted at a college. This course will increase math appreciation, develop problem solving and communication skills, and use technology as a tool to understand mathematics better. The regular course will cover the Common Core Standards for that level and the Common Core Plus*

Standards will be achieved earlier in the Honors class.: (fulfills RAI Core Course Requirement)

In addition to the Algebra 2 Benchmarks: *The student will...*

- Solving more in-depth equations of various degrees
- Analyzing, creating and graphing more in-depth functions
- Solving Systems (including 3 variable)
- Exploring Domain and Range of various functions
- Greater use of graphing technology
- Explore multiple applications of Algebra 2 topics and how they relate to real life and possible careers involving mathematics. 2nd Semester: Math Career Research Project

PRE-CALCULUS

GRADES 10-12

2 Credits/Year

Prerequisites: *SUCCESSFUL COMPLETION OF GEOMETRY AND ALGEBRA 2 (with a B or higher or teacher recommendation);*

This course bridges all previously studied areas of mathematics: algebra, geometry, and algebra 2. The use of a graphing calculator is integrated throughout the course. The main topic emphasis is the examination of polynomials and rational, trigonometric, exponential and logarithmic functions and beginning calculus concepts. While this is not a college class, more responsibilities and demands will be placed on the student than in previous math courses. *(fulfills RAI Core Course Requirement)*

Benchmarks: The student will

- analyze polynomial and rational functions.
- explore the concepts of domain and range.
- use inverse functions to relate exponentials and logarithms.
- work with the natural base e in both exponential and logarithmic functions.
- recognize 8 parent functions and their key features.
- solve exponential equations (compound interest, growth and decay).
- use the language and notation of trigonometry including the 16 point unit circle.
- solve triangles using right triangle trigonometry, the Law of Sines and Cosines.
- explore the characteristics of trigonometric and inverse trigonometric functions.
- prove simple trigonometric identities.
- use matrices to solve systems of equations.
- study applications of trig including vectors and the polar coordinate system.

Math Analysis

GRADE 12

1 Credit/ 1 Semester

Prerequisites: SUCCESSFUL COMPLETION OF ALGEBRA II

This course is designed for seniors that have completed North Scott's graduation requirements. This course prepares students for topics commonly taught in freshman year college courses. Topics include Coordinate Graphing, Probability, Logarithms, Matrices, 3D Geometry, Counting Theory, Transformations and Conic Sections. *(fulfills RAI Core Course Requirement)*

MAT-156 College Statistics

GRADES 11-12

1 Credit/ 1 Semester

Prerequisites: SUCCESSFUL COMPLETION OF ALGEBRA II. ALSO, AN ACT MATH SCORE OF 22 OR ALEKS MATH TEST SCORE OF 30. This course is designed for math students who desire to continue with math after successful completion of Algebra 2 and the prerequisite test score. This is an introductory statistics course for business, economics, mathematics, science, and social sciences students. The course deals with obtaining, presenting and organizing statistical data. Topics covered include: descriptive measures, probability, probability distributions, binomial distributions, normal distributions, sampling estimates, confidence intervals, hypothesis testing, chi-square test, and linear regression and correlation. A graphing calculator is required for this course. *(fulfills RAI Core Course Requirement)*

Course Goals:

- Use descriptive and inferential statistics and distinguish between them.
- Use elementary probability concepts to analyze situations which deal with laws of chance.
- Critically examine statistics presented in the media.
- Use the hypothesis testing process to draw conclusions based on samples.

CALCULUS

GRADES 11-12

2 Credits/Year

Prerequisite: *SUCCESSFUL COMPLETION OF PRE-CALCULUS (with at least a B or higher or teacher recommendation)*

This course is designed for successful math students who desire to continue their math career for any of the following reasons, prepare themselves for further college mathematics, meet college prerequisites for various majors, review for college math exams and/or increase their appreciation and knowledge of

mathematics. Graphing calculators will be extensively used throughout the study of Calculus. Taking the Advanced Placement Calculus AB Exam in May is an option for this course. The exam offers the opportunity to earn up to one semester of college credit at most colleges and universities, when a satisfactory score is earned on the AP exam. ***(fulfills RAI Core Course Requirement)***

Benchmarks: The student will

- evaluate limits at a point and at infinity.
- examine rates of change of the tangent line using limit definitions and rules of differentiation.
- determine continuity and differentiability of various functions including trigonometric, piecewise and polynomial functions.
- compute the derivatives of sums, differences, products and quotients of functions along with using the Chain Rule.
- describe particle and vertical motion, using knowledge of velocity and acceleration
- compute derivatives by implicit differentiation.
- solve related rate problems using derivatives.
- determine local and absolute maximum and minimum values of functions.
- determine concavity and points of inflection of functions.
- solve applied maximum and minimum optimization problems.
- have a working knowledge of the intermediate Value Theorem, Mean Value Theorem and The Fundamental Theorem of Calculus.
- find limits by rationalizing the numerator and using L'Hospital's Rule.
- evaluate an integral using a variety of techniques.
- find the area between two curves, the volumes of solids of revolution, and the average value of a function.
- solve certain differential equations, including those applicable to exponential growth or decay.
- work with and sketch slope fields for differential equations

MAT-210 Calculus I

GRADE 12

1 CREDIT/SEMESTER

Students in this course may earn college credit from Scott Community College in addition to the high school credit.

Prerequisite: AP Calculus

First of a series of 3 courses. The purpose of the sequence is to provide the student with a foundation in calculus and analytical geometry. Those students enrolled in the science, math, engineering and computer science and similar fields will gain proficiency. Topics include analytic geometry, differentiation and applications of the derivative, integration and its applications. A graphing calculator is required. ***(fulfills RAI Core Course Requirement)***

MAT-216 Calculus II

GRADE 12

1 CREDIT/SEMESTER

Students in this course may earn college credit from Scott Community College in addition to the high

school credit.

Prerequisite: MAT 210

A continuation of Calculus I, this is the second course in the series. Topics include differentiation and integration of trigonometric, logarithmic and exponential functions, methods of integration, improper integrals; polar coordinates and infinite series. A graphing calculator is required. ***(fulfills RAI Core Course Requirement)***