# Honors Mathematics

**Introduction and Definition of Honors Mathematics**

Honors Mathematics courses are intended to be more challenging than standard courses and provide multiple opportunities for students to take greater responsibility for their learning. Honors Mathematics courses should be distinguished by a difference in the quality of the work expected rather than merely by the quantity of the work required.

Honors Mathematics courses are designed for students who have demonstrated an advanced level of interest and achievement in mathematics. The rationale for honors courses is not to provide a means to attract students to enroll in classes for additional credit, but rather to offer challenging, higher level courses for students who aspire to an advanced level of learning. Furthermore, students and parents should be informed that Honors Mathematics courses are more demanding and have requirements beyond those of standard Mathematics courses.

Honors Mathematics courses will follow goals and objectives built upon the standard versions of the same courses from the Mathematics Standard Course of Study. Honors Mathematics courses should reflect a differentiation of curriculum, both in breadth and depth of study.

Honors Mathematics courses should provide opportunities for the following:

- Problem-seeking and problem-solving
- Participation in scholarly and creative processes
- Use of imagination
- Critical analysis and application
- Personalized learning experiences
- Learning to express/defend ideas
- Learning to accept constructive criticism
- Becoming a reflective thinker
- Becoming an initiator of learning

**Teachers of Honors Mathematics Courses**

Teachers of Honors Mathematics courses should possess the skills, knowledge, and dispositions to challenge and inspire thought processes of honors level students. In addition, these teachers should be able to implement diverse kinds of best teaching practices for high school learners. The capability of developing, implementing, and evaluating defensibly differentiated curriculum is a key characteristic of teachers who work with honors students. They should know and use a variety of teaching techniques. They should be proficient in the use of both indirect and direct modes of instruction. They should be confident in

their teaching roles as facilitator, model, and coach. Furthermore, they should be aware of current curriculum innovations and research in Mathematics in order to be able to develop and implement Honors Mathematics courses that are both challenging and rigorous.

**Curriculum Guide for Honors Mathematics Courses**

In order to offer Honors Mathematics courses, teachers and districts must develop a Curriculum Guide for each honors course. The Curriculum Guide for Honors Mathematics should clearly and concisely include, but is not limited to, the following elements:

- Course description
- Competency goals and objectives
- Issues particular to the course
- Expectations of performance
- Assignments
- Timetables and deadlines
- Pacing guide
- Assessments, including rubrics
- A system for grading
- Instructional materials, equipment, and technologies required

**Course Descriptions, Competency Goals and Objectives**

Honors Mathematics Course Descriptions and Competency Goals and Objectives are provided by NCDPI. These are the minimum content expectations for each Honors Mathematics course.

**Expectations of Performance**

Students in Honors Mathematics courses may have a different set of performance expectations than students in standard Mathematics courses. The Curriculum Guide provides a place where teachers can compare the expectations of students in standard courses to those in honors courses.

**Assignments**

Students in Honors Mathematics courses will have assignments that reflect the inherent rigor of honors level courses. Included should be long-term project- or problem-based assignments that offer students the opportunity to directly apply Mathematics at a more complex level.

**Timetables and Deadlines**

Timetables and deadlines for Honors Mathematics course projects and activities are helpful in course planning and communication with students. These should be provided to students in a timely fashion.

**Pacing Guides**

A pacing guide is a calendar showing the pace of instruction, with time allocated for teaching and applying each essential concept. The pacing guide is a useful tool for teachers to ensure that instructional time is carefully used. Pacing guides should be planned in advance with the flexibility to accurately depict time allocations for units and objectives being taught.

**Assessments**

Good instruction involves assessment by multiple and varied means. The ***Indicators*** provided for most Mathematics courses provide a beginning point. A wide variety of evaluation methods and forms of assessments should be used in Mathematics courses to measure what students know and what they know how to do. This is particularly important in honors courses. These assessments should include both cognitive and performance-based tasks. Where appropriate, rubrics should be developed and provided to students and evaluators.

The following types of assessments should be included:

- Student written response – extended free response, proofs, essays, research papers, scenarios, journals, questionnaires
- Performance tasks - labs, projects, extended problems, original designs, portfolios, lesson plans, self-evaluations
- Conversation assessments - interviews, annotated discussions, panel discussions, debates, focus groups
- Observation assessments - case studies, anecdotal records, observation reports

**A System for Grading**

Each Honors Mathematics honors course should have a clear, concise system for grading so that students will be accountable for course requirements and know in advance the relative weight of each component of their grades. The system for grading should be explained in the Curriculum Guide. The grading system, along with timetables and deadlines, assignments, and expectations for students, should be explained clearly in a course syllabus that is made available to students at the beginning of the course.

**Instructional Materials, Equipment, and Technologies**

In many Mathematics courses, being able to complete honors-level learning experiences and assignments may be dependent upon having the necessary resources with which to work. In such instances, having a list of essential instructional materials, equipment, and technologies helps administrators and teachers plan course offerings and make program decisions.

## Honors Algebra 2

Honors Algebra 2 continues students' study of advanced algebraic concepts including functions, polynomials, rational expressions, systems of functions and inequalities, and matrices. Students will be expected to describe and translate among graphic, algebraic, numeric, tabular, and verbal representations of relations and use those representations to solve problems. Emphasis will be placed on higher order thinking skills that impact practical and increasingly complex applications, modeling, and algebraic proof. Appropriate technology should be used regularly for instruction and assessment.

Prerequisites

- Operate with matrices to solve problems.
- Create linear models, for sets of data, to solve problems.
- Use linear functions and inequalities to model and solve problems.
- Use quadratic functions to model problems and solve by factoring and graphing.
- Use systems of linear equations or inequalities to model and solve problems.
- Graph and evaluate exponential functions to solve problems.

**Strands:** Number and Operations, Geometry, Data Analysis, Algebra

**COMPETENCY GOAL 1: The learner will perform operations with complex numbers, matrices, and polynomials.**

**Objectives**

1.01 Simplify and perform operations with rational exponents and logarithms (common and natural) to solve problems.
1.02 Define and compute with complex numbers.
1.03 Operate with algebraic expressions (polynomial, rational, complex fractions) to solve problems.
1.04 Operate with matrices to model and solve problems.
1.05 Model and solve problems using direct, inverse, combined and joint variation.

**COMPETENCY GOAL 2: The learner will use relations and functions to solve problems.**

**Objectives**

2.01 Use the composition and inverse of functions to model and solve problems; justify results.

2.02 Use quadratic functions and inequalities to model and solve problems; justify results.
- a) Solve using tables, graphs, and algebraic properties.
- b) Interpret the constants and coefficients in the context of the problem.

2.03 Use exponential functions to model and solve problems; justify results.
- a) Solve using tables, graphs, and algebraic properties.
- b) Interpret the constants, coefficients, and bases in the context of the problem.

2.04 Create, justify, and use best-fit mathematical models of linear, exponential, quadratic, and cubic functions to solve problems involving sets of data.
- a) Interpret the constants, coefficients, and bases in the context of the data.
- b) Check the model for goodness-of-fit and use the model, where appropriate, to draw conclusions or make predictions.

2.05 Use rational equations to model and solve problems; justify results.
- a) Solve using tables, graphs, and algebraic properties.
- b) Interpret the constants and coefficients in the context of the problem.
- c) Identify the asymptotes and intercepts graphically and algebraically.

2.06 Use polynomial equations (third degree and higher) to model and solve problems.
- a) Solve using tables and graphs.
- b) Interpret constants and coefficients in the context of the problem.

2.07 Use equations with radical expressions to model and solve problems; justify results.
- a) Solve using tables, graphs, and algebraic properties.
- b) Interpret the degree, constants, and coefficients in the context of the problem.

2.08 Use equations and inequalities with absolute value to model and solve problems; justify results.
- a) Solve using tables, graphs, and algebraic properties.
- b) Interpret the constants and coefficients in the context of the problem.

2.09 Identify, compare, and construct the conic sections to model and solve problems; justify results.

a) Precisely describe parabolas and circles algebraically according to definitions, characteristics, and constituent parts.

b) Interpret the constants and coefficients of parabolas and circles in the context of the problem.

c) Identify and distinguish among the conic sections using tables, graphs, and algebraic properties.

2.10 Use systems of two or more equations or inequalities to model and solve problems; justify results. Solve using tables, graphs, matrix operations, algebraic properties, and linear programming.