

## Mathematics/Statistics

The following matrix indicates those courses deemed transferable among institutions listed across the top of the matrix. The numbers on the matrix represent the number of semester hours associated with the course at each institution and which institutions have agreed to transfer the commonly numbered course in each row.

A list of the academic discipline liaisons contacts for each institution are listed at the bottom of this document.

### Competency List for Math Majors Prior to MATH 165

The North Dakota Common Course Numbering Mathematics Discipline Group, made up of math faculty from both public and private institutions, has composed the following list of competencies for students planning to major in math. Prospective math majors should pay close attention to the following competencies and should be proficient with the following mathematical concepts when entering the junior (3rd) year of college:

Relations and functions

Equations and inequalities

Complex numbers

Polynomials

Systems of equations

Matrices and determinants

Sequences and summations

Systems of linear equations and inequalities

Elementary probability and descriptive statistics

Angle measure

Trigonometric and inverse trigonometric functions

Trigonometric identities and equations

Polar coordinates

Polynomial, rational, exponential, logarithmic, and trigonometric functions

[illegible]

|               |     |         |                                       |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |   |
|---------------|-----|---------|---------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|
| MATH          | 208 | ND:MATH | Discrete Mathematics                  | 3 |   | 3 |   |   | 3 |   |   | 3 | 3 |   |   | 4 |   |  |   |
| MATH          | 210 | ND:MATH | Elementary Statistics                 | 3 | 4 |   | 3 |   | 4 | 3 |   |   | 3 | 3 | 3 | 4 | 4 |  | 3 |
| MATH          | 227 |         | Applied Linear Algebra                | 3 |   |   |   |   |   |   |   |   |   |   |   | 3 |   |  |   |
| MATH          | 265 | ND:MATH | Calculus III                          | 4 |   |   | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |   | 4 |  | 4 |
| MATH          | 266 | ND:MATH | Intro to Differential Equations       | 3 |   | 3 | 3 |   | 3 | 3 | 3 | 3 | 3 | 3 | 3 |   |   |  | 3 |
| MATH/<br>EDUC | 277 |         | Mathematics for Elementary Teachers I | 4 | 3 | 3 | 3 | 4 | 3 | 4 |   | 3 | 4 | 4 |   | 3 |   |  | 3 |
| MATH          | 278 |         | Math for Elementary Teachers II       | 3 | 2 | 3 |   |   |   |   |   |   |   |   |   | 3 |   |  |   |

## Academic Skills Courses

Credits for courses listed on the matrix below do not count towards any degree, nor do these courses transfer. While ASC courses are developmental in nature and are intended to help students become more efficient and effective learners, many of these courses serve as prerequisites to enroll in other college level courses.

Institutions are listed across the top of the matrix. The numbers on the matrix represent the number of semester hours associated with the course at each institution. Again, these courses are not transferable; however, they may be used to fulfill prerequisites to enroll in other college level courses.

### ASC 091 Algebra Prep I

This course begins with the development of the fundamental skills required for the successful completion of studies in college level mathematics courses. Topics include operations with whole numbers and fractions, orders of operation, simplification and evaluation of expressions, and evaluations of one and two step linear equations. Study skills will be incorporated throughout the course. Credit earned does not count towards any degree, nor does it transfer. Placement is according to placement scores or on a voluntary basis.

### ASC 092 Algebra Prep II

This course continues the development of the fundamental skills required for the successful completion of studies in college level mathematics courses. Topics include the solutions of linear equations and inequalities, formula manipulation, Cartesian geometry and the graphing of linear equations and inequalities throughout the course. Credit earned does not count toward any degree, nor does it transfer. Prerequisites: Placement by appropriate test score or completion of ASC 091 with a grade of "C" or better.

### **ASC 093 Algebra Prep III**

This course continues the development of the fundamental skills required for the successful completion of studies in college level mathematics courses. Topics include exponents and radicals, algebraic manipulation involving polynomial and rational forms, and unit analysis. Study skills will be incorporated throughout the course. Credit earned does not count towards any degree, nor does it transfer. Prerequisites: Placement by appropriate test score or completion of ASC 092 with a grade of "C" or better.

### **MATH 102/102L Inter-Algebra/Lab – developmental course**

**(Effective Fall 2014: All developmental courses are numbered less than 100. See also ASC 093)**

Properties of the real number system, factoring, linear and quadratic equations polynomial and rational expressions, inequalities, systems of equations, exponents, radicals, functional notation, rational equations and absolute value.

Upon completion of the course the learner will be able to:

1. Students will demonstrate an understanding of the real number system as evidenced by classroom activities and objective tests
2. Students will be able to work with polynomials as evidenced by classroom activities and objective tests
3. Students will be able to factor standard expressions as evidenced by classroom activities and objective tests
4. Students will be able to work with rational expressions as evidenced by classroom activities and objective tests
5. Students will be successful in working with exponents and radicals as evidenced by classroom activities and objective tests
6. Students will be able to solve linear and quadratic equations as evidenced by classroom activities and objective tests
7. Students will create and solve systems of linear equations as evidenced by classroom activities and objective tests
8. Students will demonstrate skill in working with functional notation as evidenced by classroom activities and objective tests
9. Students will be able to solve rational equations and inequalities as evidenced by classroom activities and objective tests
10. Students will create and solve absolute value equations and inequalities as evidenced by classroom activities and objective tests

### **MATH 103 College Algebra**

Relations and functions, equations and inequalities, complex numbers; polynomial, rational, exponential, and logarithmic functions and systems of equations.

Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will demonstrate an understanding of relations and functions as evidenced by classroom activities and objective tests
2. Students will be able to work with equations and inequalities as evidenced by classroom activities and objective tests
3. Students will be able to work with complex numbers as evidenced by classroom activities and objective tests
4. Students will be able to work with rational and polynomial expressions as evidenced by classroom activities and objective tests
5. Students will be successful in working with exponential and logarithmic functions as evidenced by classroom activities and objective tests
6. Students will be able to solve systems of linear equations as evidenced by classroom activities and objective tests
7. Students will create and use matrices to solve systems of equations as evidenced by classroom activities and objective tests

### **MATH 104 Finite Math**

This course addresses areas that have application in the economic, behavioral, social, and life sciences. Topics include linear modeling, systems of linear equations and inequalities; matrix operations; linear programming; mathematics of finance; combinatorics, probability, and expected value; and descriptive statistics. Appropriate use of mathematical technology will be integrated throughout the course. Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Upon completion of the course the successful learner will interpret mathematical models and solutions to make informed decisions by

1. creating linear models to make predictions.
2. solving systems of linear equations algebraically, graphically, and through matrix operations.
3. solving systems of linear inequalities as they relate to mathematical models.
4. using linear programming to solve optimization problems.
5. solving financial application problems related to personal and consumer economics.
6. computing basic combinatorics to count items in a set.
7. computing the probability of an event.
8. computing expected value for long-term analysis.
9. computing descriptive statistics to summarize the characteristics of a data set.
10. creating statistical graphs to visualize data in an organized manner.

### **MATH 105 Trigonometry**

Angle measure, trigonometric and inverse trigonometric functions, trigonometric identities and equations, parametric and polar coordinates, and general applications. Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will be able to work with angular measure in degrees and radians as evidenced by classroom activities and objective tests
2. Students will be able to work with trigonometric and inverse trigonometric functions as evidenced by classroom activities and objective tests
3. Students will be able to use trigonometric identities as evidenced by classroom activities and objective tests
4. Students will be able to solve trigonometric equations as evidenced by classroom activities and objective tests
5. Students will demonstrate an understanding of how to solve real world problems using trigonometry as evidenced by classroom activities and objective tests
6. Students will be able to graph equations and polar coordinates.

### **MATH 107 Precalculus**

Equations and inequalities, polynomial, rational, exponential, logarithmic, trigonometric, and inverse trigonometric functions; trigonometric identities and equations and applications. Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will demonstrate an understanding of relations and functions as evidenced by classroom activities and objective tests
2. Students will be able to work with equations and inequalities as evidenced by classroom activities and objective tests
3. Students will be able to work with complex numbers as evidenced by classroom activities and objective tests
4. Students will be able to work with rational and polynomial expressions as evidenced by classroom activities and objective tests
5. Students will be successful in working with exponential and logarithmic functions as evidenced by classroom activities and objective tests
6. Students will be able to solve systems of linear equations as evidenced by classroom activities and objective tests
7. Students will be able to work with angular measure in degrees and radians as evidenced by classroom activities and objective tests

8. Students will be able to work with trigonometric and inverse trigonometric functions as evidenced by classroom activities and objective tests
9. Students will be able to use trigonometric identities as evidenced by classroom activities and objective tests
10. Students will be able to solve trigonometric equations as evidenced by classroom activities and objective tests
11. Students will demonstrate an understanding of how to solve real world problems using trigonometry as evidenced by classroom activities and objective tests

### **MATH 110 Mathematics in Society**

This course covers a broad range of mathematics that a person would encounter in their daily life. Topics include: statistical interpretation, data visualization, probability, growth models, finance, politics and voting, logic and sets, and the intersection of mathematics and the arts. Throughout, appropriate use of mathematical technology will be emphasized. Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Students shall be able to:

1. Interpret statistical data and graphs, including the implications of margin of error.
2. Articulate the difference between absolute and relative change.
3. Explain the fundamental concepts of probability.
4. Compute and interpret simple probabilities.
5. Compare and contrast different growth models.
6. Apply appropriate methods to make decisions about personal financial scenarios such as budgeting, investments, debt, and retirement planning.
7. Compute bracketed taxes.
8. Compare and contrast voting and apportionment methods.
9. Demonstrate knowledge and application of the principles of logic.
10. Solve problems using Venn diagrams and sets.

### **MATH 129 Basic Linear Algebra**

Present systems of linear equations, row operations, echelon form, matrix operations, inverses, and determinants, vector spaces, homogeneous systems, linear dependence, rank, and dimension.

### **MATH 132 Technical Algebra I**

A basic algebra course for students enrolled in technology programs. Topics include properties of real numbers, algebraic expressions, solving equations, polynomials, factoring, formula manipulations and problem solving.

### **MATH 137 Applied Algebra**

An intermediate algebra course for students enrolled in technology programs. Topics include properties of real numbers, algebraic expressions, factoring, formula manipulation, graphing, linear equations, quadratic equations, solving systems of equations, simultaneous equations, exponents, radicals, and logarithmic equations.

### **MATH 146 Applied Calculus I**

Limits, derivatives, integrals, exponential, logarithmic; and applications. Prerequisite: MATH 103 or MATH 104 or MATH 107 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will be able to work with limits as evidenced by classroom activities and objective tests

2. Students will be able to work with derivative functions as evidenced by classroom activities and objective tests
3. Students will be able to work with exponential and logarithmic functions as evidenced by classroom activities and objective tests
4. Students will be able to work with integrals and their applications as evidenced by classroom activities and objective tests
5. Students will demonstrate an understanding of how to solve real world problems using fundamental calculus concepts as evidenced by classroom activities and objective tests

### **MATH 147 Applied Calculus II**

Definite integrals, trigonometric functions, introduction to differential equations, infinite sequence and series, probability, and applications. Prerequisite: MATH 146.

Upon completion of the course the learner will be able to:

1. Students will be able to work with basic trigonometric functions and their derivatives as evidenced by classroom activities and objective tests
2. Students will be able to work with definite integrals and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with basic differential equations and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with infinite sequence and series as evidenced by classroom activities and objective tests
5. Students will be able to work with elementary probability and its applications as evidenced by classroom activities and objective tests
6. Students will demonstrate an understanding of how to solve real world problems using fundamental calculus concepts as evidenced by classroom activities and objective tests

### **MATH 165 Calculus I**

Limits, continuity, differentiation, Mean Value Theorem, integration, Fundamental Theorem of Calculus, and applications. Prerequisite: MATH 103 and MATH 105 or MATH 107 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will be able to work with functions, their derivatives, and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with definite integrals and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with the notion of limits and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with continuity as evidenced by classroom activities and objective tests
5. Students will be able to work with the Mean Value Theorem and its applications as evidenced by classroom activities and objective tests
6. Students will demonstrate an understanding of how to solve problems using Fundamental Theorem of Calculus as evidenced by classroom activities and objective tests

### **MATH 166 Calculus II**

Applications and techniques of integration, polar equations, parametric equations, sequences and series, power series and applications. Prerequisite: MATH 165.

Upon completion of the course the learner will be able to:

1. Students will be able to work with techniques of integration and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with polar equations and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with parametric equations as evidenced by classroom activities and objective tests
4. Students will be able to work with sequences and series and their applications as evidenced by classroom activities and objective tests
5. Students will demonstrate an understanding of how to work with power series as evidenced by classroom activities and objective tests

6. Students will demonstrate an understanding of how to solve real world problems using fundamental calculus concepts as evidenced by classroom activities and objective tests

### **MATH 208 Discrete Mathematics**

Sets, relations and functions, combinatorics, logic, Boolean Algebra, difference equations, introduction to graph theory and automata. Prerequisite: MATH 103 or MATH 104 or MATH 107 or MATH 146 or MATH 165 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will be able to work with sets, relations and functions, and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with combinatorics and its applications as evidenced by classroom activities and objective tests
3. Students will be able to work with logic and its applications as evidenced by classroom activities and objective tests
4. Students will be able to work with Boolean Algebra as evidenced by classroom activities and objective tests
5. Students will be able to work with difference equations and their applications as evidenced by classroom activities and objective tests
6. Students will demonstrate an understanding of how to solve problems using graph theory as evidenced by classroom activities and objective tests

### **MATH 210 Elementary Statistics**

An introduction to statistical methods of gathering, presenting, and analyzing data. Topics include probability and probability distributions, confidence intervals, hypothesis testing, and linear regression and correlation. Prerequisite: ASC 93 or MATH 98 or qualifying placement score.

Upon completion of the course the learner will be able to:

1. Students will be able to use statistical methods of gathering, presenting, and analyzing data as evidenced by classroom activities and objective tests
2. Students will be able to work with probability and probability distributions and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with confidence intervals and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with hypothesis testing as evidenced by classroom activities and objective tests
5. Students will be able to work with linear regression and correlation and its applications as evidenced by classroom activities and objective tests

### **MATH 227 Applied Linear Algebra**

Systems of linear equations and inequalities, vectors and matrices, mapping, linear programming, and numerical applications. Prerequisite: Individual institution discretion.

Upon completion of the course the learner will be able to:

1. Students will be able to work with systems of linear equations, and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with systems of linear inequalities and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with vectors and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with matrices and their applications as evidenced by classroom activities and objective tests
5. Students will be able to work with mappings and their applications as evidenced by classroom activities and objective tests
6. Students will demonstrate an understanding of how to use linear programming as evidenced by classroom activities and objective tests

### **MATH 265 Calculus III**

Multivariate and vector calculus including partial derivatives, multiple integration and its applications, line and surface integrals, Green's Theorem and Stoke's Theorem. Prerequisite: MATH 166.

Upon completion of the course the learner will be able to:

1. Students will be able to work with Multivariate and vector calculus including partial derivatives, and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with multiple integration and its applications as evidenced by classroom activities and objective tests
3. Students will be able to work with line and surface integrals and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with Green's Theorem as evidenced by classroom activities and objective tests
5. Students will be able to work with Stoke's Theorem and its applications as evidenced by classroom activities and objective tests

### **MATH 266 Intro to Differential Equations**

Solution of elementary differential equations by elementary techniques, Laplace transforms, systems of equations, matrix methods, numerical techniques, and applications. Prerequisite: Individual institution discretion.

Upon completion of the course the learner will be able to:

1. Students will be able to work with and solve elementary differential equations, and their applications as evidenced by classroom activities and objective tests
2. Students will be able to work with systems of equations and their applications as evidenced by classroom activities and objective tests
3. Students will be able to work with Laplace transforms and its applications as evidenced by classroom activities and objective tests
4. Students will be able to work with matrix methods and their applications as evidenced by classroom activities and objective tests
5. Students will be able to work with numerical techniques and their applications as evidenced by classroom activities and objective tests

### **MATH 277 Mathematics for Elementary Teachers I**

A mathematics content course for prospective elementary school teachers. Topics include problem solving, numeration systems, real numbers, and elementary number theory. Calculators, computers, and manipulatives are used in the course. Prerequisite: Individual institution discretion.

Upon completion of the course the learner will be able to:

1. Students will understand the content of elementary school mathematics as evidenced by classroom activities and objective tests
2. Students will be able to work with problem solving and its applications as evidenced by classroom activities and objective tests
3. Students will be able to work with numeration systems and their applications as evidenced by classroom activities and objective tests
4. Students will be able to work with real numbers as evidenced by classroom activities and objective tests
5. Students will be able to work with elementary number theory as evidenced by classroom activities and objective tests
6. The application of calculators and manipulatives will be stressed in the course, and their use is expected in the course

### **MATH 278 Math for Elementary Teachers II**