

# Learning Outcomes for Mathematics and Statistics Classes

*Approved by the Department of Mathematics and Statistics on XXX*

*Up to date for the 2022-2023 Academic Year*

## Introduction

As a guide for our LOPER 4 General Studies classes, we provide comprehensive Learning Outcomes for our two developmental classes, MATH 90 and MATH 101. For other courses our Learning Outcomes are given in a briefer form.

We begin with the Learning Outcomes for our LOPER 4 General Studies classes, followed by our Learning Outcomes for our two Experiential Learning classes. After that, we list the Learning Outcomes for our MATH classes in numerical order, followed by our STAT classes also in numerical order.

## Learning Outcomes for LOPER 4 General Studies Mathematics and Statistics Classes

Our General Studies classes are **MATH 102** (College Algebra), **MATH 103** (Plane Trigonometry), **MATH 106** (Mathematics for Liberal Arts), **MATH 115** (Calculus I with Analytic Geometry), **MATH 120** (Finite Mathematics), **MATH 123** (Applied Calculus I), **MATH 230** (Math for Elementary Teachers I), **STAT 235** (Introduction to Statistics for Social Sciences), and **STAT 241** (Elementary Statistics). The learning outcomes for LOPER 4 classes are

- (1) Can describe problems using mathematical, statistical, or programming language.
- (2) Can solve problems using mathematical, statistical, or programming techniques.
- (3) Can construct logical arguments using mathematical, statistical, or programming concepts.
- (4) Can interpret and express numerical data or graphical information using mathematical, statistical, or programming concepts and methods.

## Learning Outcomes for Experiential Learning Mathematics and Statistics Classes

Our Experiential Learning classes are: **MATH 300** (Tutoring in Mathematics) and **MATH 390** (Research Experience in Mathematics). The learning outcomes for our Experiential Learning classes are

- (1) Student reflects critically on their research experience, describing the experience including reactions, observations, and thoughts on research problems in mathematics.
- (2) Student reflects critically on their research experience, articulating connections between experiential learning in mathematical research and their coursework in mathematics.
- (3) Student communicates mathematical concepts, ideas, methods, and results effectively in both oral and written form.
- (4) Student demonstrates dispositions appropriate to mathematics and possibly other related areas (e.g., physics, computer sciences, etc.).
- (5) Student demonstrates mastery of the practical use of mathematical skills in solving research problems.

## MATH 90, Elementary Algebra

The Learning Outcomes for MATH 90 are

### Unit 1

- (1) Evaluate algebraic expressions
- (2) Translate English phrases/sentences into algebraic expressions
- (3) Determine whether a number is a solution of an equation

- (4) Evaluate formulas
- (5) Convert between mixed numbers and improper fractions
- (6) Write the prime factorization of a composite number
- (7) Reduce or simplify fractions
- (8) Add, subtract, multiply and divide fractions
- (9) Solve problems involving fractions in algebra
- (10) Define the sets that make up the real numbers
- (11) Graph numbers on a number line
- (12) Express rational numbers as decimals
- (13) Classify numbers as belonging to one or more sets of the real numbers
- (14) Understand and use inequality symbols
- (15) Find the absolute value of a real number
- (16) Understand and use the vocabulary of algebraic expressions
- (17) Use the commutative, associate, and distributive properties
- (18) Simplify algebraic expressions
- (19) Understand and use the vocabulary of algebraic expressions
- (20) Add numbers with or without a number line
- (21) Add, subtract, multiply and divide real numbers
- (22) Use identity and inverse properties for addition and multiplication
- (23) Use the basic operations to simplify algebraic expressions
- (24) Solve applied problems using a series of basic operations
- (25) Evaluate/simplify exponential expressions
- (26) Use the order of operations agreement
- (27) Evaluate mathematical models

## **Unit 2**

- (1) Identify linear equations in one variable
- (2) Use the addition and multiplication properties of equality to solve equations
- (3) Solve linear equations
- (4) Solve linear equations involving fractions and decimals
- (5) Identify equations with no solution or infinitely many solutions
- (6) Solve applied problems using formulas
- (7) Solve a formula for a variable
- (8) Use the percent formula
- (9) Solve applied problems involving percent change
- (10) Translate English phrases into algebraic expressions
- (11) Solve algebraic word problems using linear equations
- (12) Solve problems using formulas for perimeter, the circumference of a circle, area, and volume
- (13) Solve problems involving the angles of a triangle
- (14) Solve problems involving complementary and supplementary angles

## **Unit 3**

- (1) Plot/find coordinates of points in the rectangular coordinate system
- (2) Determine whether an ordered pair is a solution of an equation
- (3) Find solutions of an equation in two variables
- (4) Use point plotting to graph linear equations
- (5) Use graphs of linear equations to solve problems
- (6) Use a graph to identify intercepts
- (7) Graph a linear equation in two variables using intercepts
- (8) Graph horizontal or vertical lines
- (9) Compute the slope of a line
- (10) Use slope to show that lines are parallel or perpendicular
- (11) Calculate rate of change in applied situations
- (12) Find the slope of a line and its y-intercept from its equation
- (13) Graph lines in slope-intercept form
- (14) Use slope and the y-intercept to graph  $Ax + By = C$
- (15) Use the slope and y-intercept to model data
- (16) Use the point-slope form to write equations of a line
- (17) Write linear equations that model data and make predictions

#### **Unit 4**

- (1) Understand the vocabulary used to describe polynomials
- (2) Add and subtract polynomials
- (3) Graph equations defined by polynomials of degree two
- (4) Use FOIL in polynomial multiplication
- (5) Find the square of a binomial sum or difference
- (6) Multiply polynomials
- (7) Add, subtract, and multiply polynomials in several variables
- (8) Evaluate polynomials in several variables
- (9) Divide monomials
- (10) Check polynomial division
- (11) Divide a polynomial by a monomial
- (12) Divide polynomials by binomials
- (13) Use the negative exponent rule
- (14) Simplify exponential expressions

#### **Unit 5**

- (1) Find the greatest common factor and factor it out of a polynomial
- (2) Factor by grouping
- (3) Factor trinomials of the form  $x^2 + bx + c$
- (4) Factor trinomials by trial and error
- (5) Factor trinomials by grouping
- (6) Factor the difference of two squares
- (7) Factor perfect square trinomials

- (8) Factor the sum or difference of two cubes
- (9) Use a general strategy to recognize the appropriate method of factoring a polynomial
- (10) Solve quadratic equations by factoring
- (11) Solve problems using quadratic equations

#### **Unit 6**

- (1) Find numbers for which a rational expression is undefined
- (2) Simplify rational expressions
- (3) Solve applied problems involving rational expressions
- (4) Multiply and divide rational expressions
- (5) Add and subtract rational expressions
- (6) Simplify complex rational expressions by dividing
- (7) Simplify complex rational expressions by multiplying by the LCD
- (8) Solve rational equations
- (9) Solve problems involving formulas with rational expressions

#### **Unit 7**

- (1) Solve quadratic equations using the square root property
- (2) Solve problems using the Pythagorean Theorem
- (3) Find the distance between two points
- (4) Complete the square of a binomial
- (5) Solve quadratic equations by completing the square
- (6) Solve quadratic equations using the quadratic formula
- (7) Solve problems using quadratic equations

#### **Learning Outcomes for MATH 101 (Intermediate Algebra)**

The Learning Outcomes for MATH 101 are

##### **Unit 1**

- (1) Determine whether a number is a solution to a linear equation
- (2) Solve linear equations using the properties of equality
- (3) Identify identities and contradictions
- (4) Use geometric formulas to find the perimeter of plane two-dimensional figures
- (5) Find the circumference of a circle
- (6) Use formulas to find the area and volume of various geometric figures
- (7) Solve equations for a specific variable
- (8) Solve application problems using formulas
- (9) Use problem solving techniques to solve percent, investment, uniform motion, and mixture problems.

##### **Unit 2**

- (1) Plot ordered pairs and determine the coordinates of a point
- (2) Read graphs and graph paired data
- (3) Find the midpoint of a line segment

- (4) Determine whether an ordered pair is a solution of an equation
- (5) Graph linear equations in two variables
- (6) Use linear models to solve applied problems
- (7) Calculate an average rate of change
- (8) Find the slope of a line using a graph or the slope formula
- (9) Use slope to solve application problems
- (10) Determine whether lines are parallel or perpendicular using slope
- (11) Use the slope-intercept and point-slope forms to write equations of lines
- (12) Identify functions and use function notation
- (13) Use the vertical line test to identify functions
- (14) Find the domain and range of functions
- (15) Graph linear functions
- (16) Find the domain and range of functions graphically
- (17) Graph nonlinear functions
- (18) Translate and reflect graphs of functions

### **Unit 3**

- (1) Read and interpret inequality symbols
- (2) Graph intervals and use interval and set-builder notation
- (3) Solve linear inequalities using properties of inequality
- (4) Use linear inequalities to solve problems
- (5) Find the intersection and union of two sets
- (6) Solve double linear inequalities
- (7) Solve compound inequalities containing the words and or
- (8) Graph linear inequalities in two variables
- (9) Solve applied problems involving linear inequalities in two variables
- (10) Solve systems of linear inequalities
- (11) Graph compound inequalities
- (12) Solve problems involving systems of linear inequalities

### **Unit 4**

- (1) Identify bases and exponents
- (2) Use the exponent rules to simplify expressions
- (3) Define and classify polynomials
- (4) Evaluate polynomial functions
- (5) Find function values and the domain and range of polynomial functions graphically
- (6) Add, subtract, and multiply polynomials
- (7) Find special products
- (8) Use multiplication to simplify expressions
- (9) Find the greatest common factor of a list of terms
- (10) Factor out the greatest common factor
- (11) Factor by grouping

- (12) Use factoring to solve formulas for a specific variable
- (13) Factor perfect square trinomials
- (14) Factor trinomials in the form  $x^2 + bx + c$  and  $ax^2 + bx + c$
- (15) Use substitution to factor trinomials
- (16) Use the grouping method to factor trinomials
- (17) Factor the difference of two squares
- (18) Factor the sum and difference of two cubes
- (19) Solve higher-degree polynomial equations by factoring
- (20) Use quadratic equations to solve problems

## **Unit 5**

- (1) Define rational expressions and functions
- (2) Evaluate rational functions
- (3) Find the domain of a rational function
- (4) Recognize the graphs of rational functions
- (5) Simplify rational expressions
- (6) Multiply and divide rational expressions
- (7) Perform mixed operations on rational expressions
- (8) Find the least common denominator of rational expressions
- (9) Add and subtract rational expressions
- (10) Simplify complex fractions using division
- (11) Simplify complex fractions using the LCD
- (12) Divide a polynomial by a monomial
- (13) Divide a polynomial by a polynomial
- (14) Divide polynomials with missing terms
- (15) Solve rational equations
- (16) Solve rational equations with extraneous solutions
- (17) Solve formulas for a specific variable
- (18) Solve shared-work and uniform-motion problems

## **Unit 6**

- (1) Find square, cube and  $n^{\text{th}}$  roots
- (2) Graph the square root and cube root functions
- (3) Evaluate radical functions
- (4) Convert between radicals and rational exponents
- (5) Use rules of exponents to simplify expressions
- (6) Simplify radical expressions by using prime factorization, and the product and quotient rule
- (7) Add and subtract radical expressions
- (8) Rationalize numerators and denominators of radical expressions
- (9) Multiply and divide radical expressions
- (10) Solve equations containing one and two radicals
- (11) Solve formulas containing radicals

(12) Use the Pythagorean Theorem to solve problems

## **Unit 7**

- (1) Use the square root property to solve quadratic equations
- (2) Solve quadratic equations by completing the square
- (3) Derive the quadratic formula
- (4) Solve quadratic equations using the quadratic formula
- (5) Use the quadratic formula to solve application problems
- (6) Use the discriminant to determine the number and type of solutions to quadratic equations
- (7) Solve application problems using quadratic equations
- (8) Find the vertex of a quadratic function using  $-b/2a$
- (9) Graph quadratic functions
- (10) Graph functions of the form  $f(x) = ax^2 + bx + c$  by completing the square
- (11) Determine the minimum and maximum values of quadratic functions
- (12) Solve quadratic equations graphically
- (13) Solve quadratic inequalities
- (14) Solve rational inequalities
- (15) Graph nonlinear inequalities in two variables

The online MATH 101 course is slightly different. The online course does additional work in Unit 1, and it eliminates Unit 3. The Learning Outcomes for the additional work in Unit 1 are

- (1) Write verbal and mathematical models
- (2) Use equations to construct tables of data
- (3) Define the set of natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers.
- (4) Graph real numbers
- (5) Order the real numbers
- (6) Find the additive inverse and the absolute value of real numbers
- (7) Add, subtract, multiply, and divide real numbers
- (8) Find powers and square roots of real numbers
- (9) Use the order of operations rule
- (10) Evaluate algebraic expressions
- (11) Identify terms, factors, and coefficients
- (12) Identify and use properties of real numbers
- (13) Simplify algebraic expressions using the properties of real numbers

## **MATH 104, Concepts in Mathematics and Statistics**

On completion of this course, students will be able to

- (1) Identify, write, and graph linear functions.
- (2) Write and graph quadratic functions.
- (3) Solve linear and quadratic equations and inequalities.
- (4) Solve two-variable systems of linear equations.

- (5) Determine probabilities for independent events.
- (6) Use the multiplication principle, permutations, and combinations.
- (7) Use measures of center including mean, median, and mode.
- (8) Use measures of variation including standard deviation, range, and variance.
- (9) Describe distributions and create box plots.

### **MATH 202, Calculus II with Analytic Geometry**

On completion of this course, students will be able to

- (1) use definite integrals to solve problems involving volume, arc length, surface area, work, and center of mass.
- (2) use integration by parts, trigonometric substitution, and partial fractions to evaluate definite and indefinite integrals.
- (3) apply the concepts of limits, convergence, and divergence to evaluate improper integrals.
- (4) determine convergence or divergence of sequences and series.
- (5) use Taylor and MacLaurin series to represent functions and integrate functions.
- (6) use parametrizations and polar coordinates to find areas and arc lengths.

### **MATH 250, Foundations of Math**

On completion of this course, students will

- (1) gain an understanding of naïve set theory.
- (2) gain an understanding of symbolic logic, quantifiers, and functions.
- (3) gain an understanding of direct proofs, proofs by contradiction, proofs by contrapositive, and proofs by induction.
- (4) gain the ability to read and understand mathematical proofs.
- (5) gain the problem solving skills that are needed to create a mathematical proof.

### **MATH 251, Inquiry and Proof in 9–12 Mathematics**

On completion of this course, students will be able to

- (1) Articulate and utilize mathematical practices essential for 9–12 mathematics.
- (2) Articulate the roles proof can play in secondary mathematics instruction.
- (3) Engage in mathematical inquiry using technological and mathematical tools.
- (4) Articulate mathematical arguments with precise mathematical language and symbols.
- (5) Communicate technical mathematical justifications in a manner appropriate for secondary students.
- (6) Determine how essential understanding of proof is embedded across mathematical content.

### **MATH 260, Calculus III**

On completion of this course, students will

- (1) be able to use vectors to solve geometric problems and basic engineering statics problems.
- (2) understand the concept of partial derivatives and limits of multi-variable functions.
- (3) understand the concept of a parameterized curve and understand the concept of curvature.



- (4) be able to use partial derivatives to solve multi-variable optimization problems.
- (5) understand the concept of a line integral and apply it to basic physics problems involving energy and work.
- (6) be able to set up and evaluate multiple integrals using Cartesian, polar, and spherical coordinates to find volumes, surface areas, centroids, and moments of inertia.
- (7) understand the concepts of the vector divergence, gradient, and curl in three-dimensional space.
- (8) understand the Green theorem and the Divergence theorem and be able to apply these theorems to problems involving surface and line integrals.

### **MATH 270, Methods in Middle and High School Mathematics Teaching I**

On completion of this course, students will be able to

- (1) Thoroughly describe what is meant by “doing”, “teaching”, and “learning” mathematics in their own words and with the support of mathematics educational research.
- (2) Explain and provide real-life examples of the eight research-based mathematics teaching practices.
- (3) Identify and begin creating opportunities for high-quality instruction that includes mathematical discourse, productive struggle, purposeful questioning, and the connecting of multiple representations.
- (4) Articulate the essential mathematical concepts of 6–12 mathematics curriculum in regard to number, algebra/functions, statistics/probability, and geometry/measurement.
- (5) Explain the organization and benefits of the NCTM Standards, the Common Core State Standards, Nebraska State Standards,
- (6) Explain the history and current trends in mathematics education.
- (7) Define NCTM and NATM, explain membership benefits associated with each organization, and articulate the importance of professional affiliations.
- (8) Build upon foundational understanding of mathematics education and research-based mathematics teaching.
- (9) Be reflective of own learning and realize how his/her own understanding influences student learning.

### **MATH 271, Field Experience in Middle and High School Mathematics I**

On completion of this course, students will be able to

- (1) Identify research-based mathematics teaching practices that are included in the classroom, as well as how they could be incorporated.
- (2) Engage 6–12 students in developmentally appropriate mathematical activities.
- (3) Work with a diverse range of students individually, in small groups, and in large class settings.
- (4) Plan, facilitate, and reflect upon mathematical tasks that promote reasoning and sense making.
- (5) Collect and analyze data to determine if 6–12 students have built new knowledge.
- (6) Meet expectations of all Teacher Education Dispositions, including
  - (a) Demonstrate effective oral communication skills
  - (b) Demonstrate effective written communication skills
  - (c) Demonstrate professionalism
  - (d) Demonstrate a positive and enthusiastic attitude
  - (e) Demonstrate preparedness in teaching and learning
  - (f) Exhibits an appreciation of and value for cultural and academic diversity
  - (g) Collaborates effectively with stakeholders
  - (h) Demonstrates self-regulated learner behaviors/takes initiative
  - (i) Exhibits the social and emotional intelligence to promote personal and educational goals/stability

**MATH 280, Linear Algebra****MATH 305, Differential Equations**

On completion of this class, students will

- (1) Know the basic methods for solving first order differential equations (ODEs).
- (2) Be able to set up and solve applied problems involving first order ODEs.
- (3) Know the basic methods for solving second order ODEs.
- (4) Know the basic methods for solving systems of first order ODEs.
- (5) Be able to solve initial value problems for first and second order ODEs and for systems of ODEs.

**MATH 310, College Geometry**

On completion of this course, students will be able to

- (1) understand the basic definitions, axioms, and important theorems in neutral geometry.
- (2) compare Euclidean geometry, hyperbolic geometry, and elliptical geometry.
- (3) use the axiomatic or transformational approach to prove theorems in neutral/Euclidean geometry.
- (4) use interactive geometry software for constructions in plane geometry, and explain geometric concepts and results in concrete models.

**MATH 330, Math for Elementary Teachers II**

On completion of this course, students will be able to

- (1) Explain and perform operations with fractions and decimals.
- (2) Apply understanding of ratios, percentages, and proportions to real-life situations.
- (3) Identify, categorize, compare and contrast various shapes and solids.
- (4) Determine the area, surface area, and volume of two and three-dimensional objects.
- (5) Approach mathematics problems using a variety of methods.
- (6) Explain mathematical concepts to students at their level of understanding.

**MATH 350, Abstract Algebra****MATH 365, Complex Analysis**

Upon completion of this course, students will

- (1) be able to represent complex numbers algebraically and geometrically.
- (2) be able to use the definition of the limit to prove that a function has a limit.
- (3) be able to find derivatives of complex valued functions from the limit definition.
- (4) understand the connection between the complex exponential and the trigonometric functions and be able to prove trigonometric identities using these connections.
- (5) be able to use the Cauchy-Riemann equations to determine if a function is analytic.
- (6) be able to represent functions using Laurent and power series and be able to find function residues, poles, and pole order.
- (7) be able to evaluate contour integrals using residues.
- (8) understand the Cauchy integral formula and its consequences, including the fundamental theorem of algebra.

**MATH 399, Internship****MATH 400, History of Mathematics**

On completion of this course, students will

- (1) understand the progression of mathematics through history.
- (2) understand the history of a variety of mathematical topics.
- (3) gain an understanding of several mathematicians through history.

**MATH 404, Theory of Numbers**

On completion of this course, students will be able to

- (1) explain the concepts of divisibility, prime number, and congruence.
- (2) calculate the greatest common divisor using the Euclidean algorithm and the prime factorization.
- (3) solve linear congruence and quadratic congruence equations.
- (4) understand Wilson's Theorem and Fermat's Little Theorem.
- (5) compute Euler's torsion function and other important multiplicative functions.
- (6) use primitive roots and index arithmetic to solve higher-order congruence equations.
- (7) solve linear Diophantine equations and find primitive Pythagorean triples.
- (8) understand how rational numbers are related to repeating decimals and continued fractions.

**MATH 413, Discrete Mathematics**

On completion of MATH 413, students will

- (1) gain an understanding of counting principles and how to apply them.
- (2) gain an understanding of discrete structures and how to use and analyze them, including induction, recursion, and probabilistic methods.

**MATH 420, Numerical Analysis**

On completion of this course, students will

- (1) understand IEEE arithmetic and know the rules for accurate computation.
- (2) be able to determine the time complexity of algorithms.
- (3) understand the concepts of linear and quadratic convergence and use these concepts to analyze the efficiency of an algorithm.
- (4) develop an understanding of the algorithms for solving linear and nonlinear equations, interpolation, quadrature, and solution of differential equations.
- (5) be able to use a programming language and graphical tools to solve problems numerically.

**MATH 430, Middle School Mathematics**

Upon completion of this course, students will be able to

- (1) Conceptualize the real number system, including rational and irrational numbers.
- (2) Explain algebraic procedures (i.e. solving equations/inequalities, laws of exponents).
- (3) Simplify exponential and radical expressions.
- (4) Apply transformation properties of congruent and similar figures.

- (5) Identify and interpret graphs and functions.
- (6) Compare and contrast different types of functions.
- (7) Apply the Pythagorean Theorem to variety of situations.
- (8) Use the coordinate plane to solve problems and display mathematics.
- (9) Calculate, display, and interpret statistical measures.
- (10) Perform probability simulations and interpret results.
- (11) Approach mathematical problems using a variety of methods.
- (12) Use various teaching models and techniques of curriculum delivery including effective questioning, cooperative learning, inquiry, and constructivist learning.
- (13) Explain mathematical concepts to students at their level of understanding.
- (14) Be reflective of own learning and realize how his/her own understanding influences student learning.

#### **MATH 445, Actuarial Science Seminar**

#### **MATH 460, Advanced Calculus I**

On completion of this class, students will

- (1) be able to prove basic propositions that involve the fundamentals of point set topology, including the concepts of open sets, closed sets, boundary points, and limit points.
- (2) be able to prove basic propositions that involve the concept of the infimum and supremum.
- (3) demonstrate competence with basic properties of sequences including determining convergence and proving results involving the sum, difference, product, and quotient of sequences.
- (4) be able to use the definitions of continuity, uniform continuity, the limit, and the derivative to prove basic propositions involving these concepts as well as be able to prove facts about specific functions.
- (5) demonstrate the ability to use the Mean Value Theorem to prove theorems.
- (6) be able to define and evaluate the lower, upper, and general Riemann sums.
- (7) demonstrate a solid understanding of the fundamental theorem of calculus.

#### **MATH 465, Advanced Study in 9 - 12 Mathematics**

On completion of this course, students will be able to

- (1) Connect higher level content knowledge to essential content in secondary mathematics.
- (2) Explain the impact of higher-level mathematical content knowledge on their teaching of high school students.
- (3) Articulate and utilize mathematical practices essential for 9 - 12 mathematics.
- (4) Describe essential understandings for 9 - 12 students in number theory, algebra/functions, statistics, probability, and calculus.
- (5) Demonstrate the interconnectedness of mathematics among mathematical ideas.
- (6) Utilize technological tools to explore essential mathematical content in number/quantity, algebra, statistics/probability, and calculus.

## **MATH 470, Methods in Middle and High School Mathematics Teaching II**

On completion of this course, students will be able to

- (1) Develop effective unit and lessons that support district, state and national standards and are developmentally appropriate.
- (2) Incorporate various forms of communication and connections (including within the subject area, to other disciplines and to real life) into lessons.
- (3) Diagnose and assess student performance in a variety of ways, including formative, summative, open ended, and performance assessments.
- (4) Address student diversity and various learning needs in lessons and units.
- (5) Use teaching methods and techniques of curriculum delivery including effective questioning, cooperative learning, inquiry, technology, and problem solving.
- (6) Incorporate various classroom organization and management techniques when teaching students.
- (7) Develop mathematical experiences for students, which will lead to positive dispositions toward math.
- (8) Explain the organization and benefits of the NCTM Standards, the Common Core State Standards, Nebraska State Standards, and current trends in mathematics education.
- (9) Define NCTM and NATM, and explain membership benefits associated with each organization, and articulate the importance of professional affiliations.
- (10) Be reflective of own learning and realize how his/her own understanding influences student learning.

## **MATH 471, Field Experience in Middle and High School Mathematics II**

On completion of this course, students will

- (1) Utilize research-based mathematics teaching practices in the classroom.
- (2) Engage 6–12 students in developmentally appropriate mathematics lessons.
- (3) Incorporate technology and tools into the 6–12 class in order to enhance mathematical understanding.
- (4) Work with a diverse range of students individually, in small groups, and in large class settings.
- (5) Plan, facilitate, and reflect upon mathematics lessons that promote reasoning and sense making.
- (6) Collect and analyze data to determine if 6–12 students have built new knowledge.
- (7) Collaborate with colleagues, other school professionals, families, and stakeholders.
- (8) Continue to develop as a reflective practitioner.
- (9) Meet expectations of all Teacher Education Dispositions, including:
  - (a) Demonstrate effective oral communication skills
  - (b) Demonstrate effective written communication skills
  - (c) Demonstrate professionalism
  - (d) Demonstrate a positive and enthusiastic attitude
  - (e) Demonstrate preparedness in teaching and learning
  - (f) Exhibits an appreciation of and value for cultural and academic diversity
  - (g) Collaborates effectively with stakeholders
  - (h) Demonstrates self-regulated learner behaviors/takes initiative
  - (i) Exhibits the social and emotional intelligence to promote personal and educational goals/stability

## **MATH 490, Special Topics in Mathematics**

The learning outcomes for MATH 490 vary by the course content.

**MATH 495, Independent Study in Mathematics**

The learning outcomes for MATH 495 vary by the course content.

**MATH 496, Mathematics Seminar**

The learning outcomes for MATH 496 vary by the course content.

**STAT 345, Applied Statistics I**

The class STAT 345 has not been offered in over five years. The department does not have a current syllabus for this course. Should we offer this course, we will need to revise the course description and create a syllabus. Accordingly, we have no Learning Outcomes for this class.

**STAT 399, Internship****STAT 441, Probability and Statistics****STAT 442, Mathematical Statistics**

The class STAT 442 has not been offered in over five years. The department does not have current syllabus for this course. Should we offer this course, we will need to revise the course description and create a syllabus. Accordingly, we have no Learning Outcomes for this class.

**STAT 495, Independent Study in Statistics**

The learning outcomes for STAT 495 vary by the course content.