COLLIN COLLEGE EXPANDED GENERIC COURSE SYLLABUS

COURSE INFORMATION

Course Number: MATH 1351
Course Title: Mathematics for Teachers II
Credit Hours: 3
Lecture Hours: 3
Lab Hours: 0

Prerequisite
MATH 1314, or MATH 1350; or equivalent.

Course Description
This course is intended to build or reinforce a foundation in fundamental mathematics concepts and skills. It includes the concepts of geometry, measurement, probability, and statistics with an emphasis on problem solving and critical thinking. This course is designed specifically for students who seek middle grade (4 through 8) teacher certification.

Textbook/Supplies
Onsite and Online Courses: A Problem Solving Approach to Mathematics for Elementary School Teachers, 14th edition. 2025, Pearson, by Billstein, Boschmans, Libeskind, Lott, Beaudrie.

Supplies: Scientific or graphing calculator (optional). The use of a calculator is up to the discretion of the instructor.

STUDENT LEARNING OUTCOMES (SLO)

Upon completion of this course the students should be able to do the following:

1. Apply fundamental terms of geometry such as points, lines, and planes to describe two- and three-dimensional figures. (Communication Skills)
2. Make and test conjectures about figures and geometric relationships. (Critical Thinking)
3. Use a variety of methods to identify and justify congruency and similarity of geometric objects. (Critical Thinking, Communication Skills)
4. Perform geometric transformations. (Empirical/ Quantitative Skills)
5. Demonstrate fundamental probability techniques and apply those techniques to solve problems. (Critical Thinking)
6. Explain the use of data collection and statistics as tools to reach reasonable conclusions. (Communication Skills)
7. Recognize, examine, and utilize the basic principles of describing and presenting data. (Empirical/Quantitative Skills)

8. Perform measurement processes and explain the concept of a unit of measurement. (Empirical/Quantitative Skills, Communication Skills)
9. Develop and use formulas for the perimeter, area, and volume for a variety of figures. (Critical Thinking, Empirical/Quantitative Skills)

REQUIRED CORE OBJECTIVES FOR MATHEMATICS

As per the Texas Higher Education Coordinating Board, mathematics students must develop and demonstrate the following three required core objectives:

- Critical Thinking Skills - creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
- Communication Skills - effective development, interpretation and expression of ideas through written, oral and visual communication.
- Empirical and Quantitative Skills - manipulation and analysis of numerical data or observable facts resulting in informed conclusions.

METHOD OF EVALUATION

Course requirements

Attending class**,** completing homework assignments, completing core assessments, and completing required exams.

Course format

Lecture and guided practice.

A minimum of three proctored exams, three core assessments, and a proctored comprehensive final exam are required. The final exam must be comprehensive (i.e., include questions from all chapters covered) and must count at least as much as any regular exam. Online homework is required and must count for a minimum of 5% of the total course grade. Core assessments will be provided by the course coordinator. Graded core assessments will count for 5%–10% of the overall course grade. The specific weight of each evaluation component will be detailed in the individual instructor's syllabus. Credit for all out-of-class coursework—including homework assignments, service-learning projects, and other assessments and learning activities—may not exceed 25% of the total course grade. At least 75% of a student's grade must consist of proctored exams. No student may retake any of these exams.

Core Assessment Statement

Core assessments consist of problems or tasks that measure student achievement of state required core objectives – Critical Thinking Skills, Communication Skills, and Empirical and Quantitative Skills. These assessments are designed to be meaningful and require students to extend and apply course concepts. Students should be able to clearly see how these assessments reflect both the skills they are developing and the outcomes of the course.

COURSE POLICIES

College-wide policies are pre-loaded into the Concourse Syllabi and are not duplicated in the Expanded Generic Syllabi for each course.

Instructor specific policies should be added to the Concourse Syllabus.

COURSE CONTENT

Proofs and derivations will be assigned at the discretion of the instructor. The student will be responsible for knowing all definitions and statements of theorems for each section outlined in the following modules.

Module 1: Probability, Data Analysis, and Statistics

The student will be able to:

1. Compute experimental and theoretical probabilities. SLO 5
2. Determine the probability of mutually exclusive events, non-mutually exclusive events, and complementary events. SLO 5
3. Use a tree diagram to determine outcomes and probabilities of multistage experiments. SLO 5
4. Define independent events & find the probability of two independent events occurring. SLO 5
5. Model games that involve probability. SLO 5
6. Use area models to determine probabilities geometrically. SLO 5
7. Use simulations to compute probability. SLO 5
8. Compute odds in favor and odds against (optional)
9. Compute conditional probabilities. SLO 5
10. Compute expected value and determine if a game is fair. SLO 5
11. Compute the number of permutations or combinations of objects. SLO 5
12. Use permutations and combinations in probability. SLO 5
13. Represent and interpret categorical and numerical data using statistical graphs: pictographs, dot plots, stem-and-leaf plots, histograms, bar graphs, circle graphs, line graphs, and scatterplots. SLO 7
14. Compute and interpret measures of central tendency: mean, median, mode. SLO 6
15. Compute and interpret measures of the spread of data: range, interquartile range, variance, standard deviation, (mean absolute deviation is optional). SLO 6
16. Calculate quartiles and the interquartile range (IQR). SLO 6
17. Determine if any outliers exist for given data. SLO 6
18. Construct box plots. SLO 7
19. Interpret and apply the graphs of normal distributions and the percentages that represent approximations of the total percent of area under the curve. SLO 7
20. Interpret percentiles. SLO 6
21. Explore abuses and misleading uses of statistics. SLO 6 & 7

Module 2: Introductory Geometry

The student will be able to:

1. Define and recognize: collinear points, line segment, ray, coplanar points, coplanar lines, skew lines, intersecting lines, concurrent lines, parallel lines, perpendicular lines, half-planes, line perpendicular to a plane, transversal. SLO 1
2. Classify angles as acute, right, obtuse, or straight. SLO 1
3. Use a protractor to measure an angle. SLO 2
4. Define and illustrate a circle, its center, radius, diameter, an arc of a circle, and a semicircle. SLO 1
5. Define and recognize a curve as: simple, nonsimple, closed, nonclosed, convex, concave. SLO 1
6. Define and recognize polygons, interior angle of a polygon, exterior angle of a convex polygon, diagonal of a polygon, regular polygon. SLO 1
7. Define and write the notation for congruent segments and congruent angles. SLO 1
8. Classify triangles a right, acute, obtuse, scalene, isosceles, equilateral. SLO 1
9. Classify quadrilaterals as trapezoid, kite, isosceles trapezoid, parallelogram, rectangle, rhombus, square. SLO 1
10. Illustrate the hierarchy among polygons. SLO 2
11. Define and recognize angles such as adjacent, complementary, supplementary, vertical, interior, exterior, alternate interior, alternate exterior, and corresponding. SLO 1
12. Determine the sum of the measures of the exterior angles of a convex polygon. SLO 2
13. Determine the sum of the measures of the interior angles of a convex polygon. SLO 2
14. Determine the measure of a single interior angle of any convex polygon. SLO 2
15. Define simple closed surfaces in three-dimensions. SLO 1
16. Recognize and illustrate prisms and pyramids. SLO 1
17. Recognize and name the five regular polyhedra. SLO 1
18. Recognize and illustrate cylinders and cones. SLO 1
19. Define the relationship between the number of faces, the number of edges, and the number of vertices of any polyhedron. SLO 2
20. Determine polyhedra formed from a net. SLO 1
21. Define and illustrate a sphere. SLO 1
22. Define and illustrate terms relating to the Cartesian coordinate system: origin, x-axis, y-axis, x-coordinate, y-coordinate, graph. SLO 1
23. Graph linear equations. Graph vertical and horizontal lines. SLO 1
24. Find the equation of a line in slope-intercept form. SLO 1
25. Find the x-intercept, y-intercept, and slope of a line. SLO 1
26. Solve a system of linear equations using the substitution method and the elimination method. SLO 1

Module 3: Congruence, Similarity, and Constructions

The student will be able to:

1. Define and recognize similar and congruent objects. SLO 3
2. Determine if two triangles are congruent by SSS, SAS, ASA, AAS, HL. SLO 3
3. Define and illustrate the altitude of a triangle. SLO 2
4. Define and illustrate an isosceles triangle and its properties. SLO 2
5. Define the properties of different types of quadrilaterals. SLO 2
6. Calculate the scale factor for similar figures. SLO 3
7. Determine if two triangles are similar by AA. SLO 3
8. Define and construct a midsegment. SLO 2
9. Find indirect measurements using similar triangles. SLO 3
10. Use triangles to determine the slope of a line. SLO 2
11. Construct congruent segments and congruent angles. SLO 3
12. Construct parallel lines, angle bisectors, perpendicular bisectors, and perpendicular lines. SLO 2

Module 4: Measurement

The student will be able to:

1. Use dimensional analysis to convert from one unit of measure to another in the English system. SLO 8
2. Convert units of length in the English and metric systems. SLO 8
3. Calculate the perimeter of a polygon. SLO 9
4. Calculate the circumference of a circle. SLO 9
5. Given the radius of a circle, calculate the length of an arc whose central angle is known. SLO 9
6. Determine the greatest possible error of a measurement. SLO 8
7. Define and use the distance properties and the Triangle Inequality. SLO 9
8. Calculate areas of polygons on a geoboard or dot paper. SLO 9
9. Convert units of area in the English and in the metric systems. SLO 8
10. Derive and use formulas for the area of a rectangle, parallelogram, triangle, kite, trapezoid, regular polygon, circle, and sector of a circle. SLO 9
11. Use the Pythagorean Theorem to determine the sides of a right triangle. SLO 9
12. Determine if a triangle is a right triangle by using the converse of the Pythagorean Theorem. SLO 9
13. Use the Distance Formula to find the distance between two points. SLO 9
14. Derive and use formulas for the surface area of a right prism, a right circular cylinder, a right regular pyramid, a right circular cone. SLO 9
15. Use the formula for the surface area of a sphere. SLO 9
16. Convert English and metric measures of volume. SLO 9
17. Derive and use formulas for the volume of a right prism, right circular cylinder, right pyramid, right circular cone. SLO 9
18. Use the formula for the volume of a sphere. SLO 9
19. Discover the relationships among metric units of volume, capacity, and mass. SLO 8
20. Convert units of temperature between the Celsius and Fahrenheit scales. SLO 8

Module 5: Motion, Geometry, and Tessellations

The student will be able to:

1. Determine whether a geometric figure has line symmetry, rotational symmetry, or point symmetry. SLO 4
2. Describe figures according to their symmetries. SLO 4
3. Construct the image of a geometric figure under a translation. SLO 4
4. Construct the image of a geometric figure under a rotation. SLO 4
5. Construct the image of a geometric figure under a reflection. SLO 4
6. Construct the image of a geometric figure under a glide reflection. SLO 4
7. Construct an image similar to a geometric figure under a size transformation (dilation). SLO 4
8. Define and identify tessellations of the plane. SLO 4
9. Determine which regular polygons tessellate the plane. SLO 4