

## Course Syllabus

**Course Name:** Math for College Liberal Arts

**Description:** Mathematics for College Liberal Arts gives you the opportunity to explore a range of mathematical concepts and fields, all while connecting ideas to their application in our world. Major topics in this course include linear and exponential functions, geometry in the real world, analysis of data and probability, and the use of functions as models. Logic and theory as they apply to the practical use of mathematical concepts are introduced, giving you an understanding of how the principles of higher-level math connect to everyday life.

In Mathematics for College Liberal Arts, instructional time will emphasize five areas:

1. analyzing and applying linear and exponential functions within a real-world context
2. utilizing geometric concepts to solve real-world problems
3. extending understanding of probability theory
4. representing and interpreting univariate and bivariate data
5. developing an understanding of logic and set theory

**Pre-Requisites:** Algebra 1 required, Geometry recommended

**Credits:** 1

**Estimated Completion Time:** 2 Segments / 32–36 weeks



## Major Topics and Concepts:

### Segment One

- Solve and graph mathematical problems that are modeled with linear functions.
- Interpret key features and determine constraints of linear functions in a real-world context.
- Classify exponential functions as representing growth or decay, given a mathematical or real-world context.
- Write exponential functions from a mathematical context given as a graph, a written description, or a table.
- Graph an exponential function, given a table, equation, or written description.
- Determine the constant percent rate of change using the properties of exponents, given an exponential function.
- Write and graph exponential functions, given a real-world context.
- Interpret key features of exponential functions in a real-world context.
- Compare key features of linear and nonlinear functions, each represented algebraically, graphically, in tables, or written descriptions.
- Determine whether a linear, quadratic, or exponential function best models a given real-world situation.
- Compare simple, compound, and continuously compounded interest over time.
- Solve real-world problems involving simple, compound, and continuously compounded interest.
- Explore the relationship between linear growth and simple interest.
- Explore the relationship between exponential growth and compound interest.
- Explore the relationship between exponential growth and continuously compounded interest.
- Solve mathematical problems involving congruence in two-dimensional figures.
- Solve mathematical problems involving similarity in two-dimensional figures.
- Solve real-world problems involving congruence or similarity in two-dimensional figures.
- Determine symmetries of reflection, symmetries of rotation, and symmetries of translation of a geometric figure.
- Solve mathematical problems involving right triangles using trigonometric ratios.
- Solve mathematical problems involving right triangles using the Pythagorean Theorem.
- Solve real-world problems involving right triangles using trigonometric ratios and the Pythagorean Theorem.
- Solve mathematical problems involving the area of two-dimensional figures.
- Solve mathematical problems involving the surface area of three-dimensional figures limited to cylinders, pyramids, prisms, cones, and spheres.
- Solve real-world problems involving the area or surface area of figures.
- Solve mathematical problems involving the volume of three-dimensional figures limited to cylinders, pyramids, prisms, cones, and spheres.
- Solve real-world problems involving the volume of three-dimensional figures.
- Apply previous knowledge of scale drawings and scale factors to determine properties of figures.
- Determine how dilations affect the area of two-dimensional figures.
- Determine how dilations affect the surface area or volume of three-dimensional figures.

### Segment Two

- Determine if given data is numerical or categorical.
- Determine if given data is univariate or bivariate.
- Determine an appropriate visual model to represent a given data set, depending on the type of data given.
- Interpret data given as a visual model and determine quantities from the display.
- Calculate and compare the appropriate measures of center and measures of variability of two data sets based on the effect of outliers.
- Interpret notable features of the shape of the data distributions for given sets of data.
- Fit a linear function to bivariate numerical data and interpret the slope and y-intercept of the model.
- Solve real-world problems using linear models in the context of a given set of data.
- Fit an exponential function to bivariate numerical data and interpret the percent rate of change.
- Solve real-world problems using exponential models in the context of a given set of data.
- Determine the power set of a given set.
- Determine if one set is a subset of another set.
- Determine if two sets are equivalent.

- Apply Venn diagrams to make arguments about sets.
- Describe unions, intersections, or complements as subsets of a sample space using characteristics of the outcomes.
- Determine the complement of a set, the union of two sets, and the intersection of two sets.
- Determine the independence of events by calculating the product of their probabilities.
- Create two-way tables to organize data and determine relative, joint, and marginal frequencies.
- Interpret the joint and marginal relative frequencies as empirical probabilities.
- Apply probabilities to determine whether characteristics in the population are approximately independent.
- Calculate the conditional probability of two events and interpret the result in terms of its context.
- Interpret the independence of two events using conditional probability.
- Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
- Apply the addition rule for probability and interpret the results in terms of the model and its context.
- Apply the general multiplication rule for probability and interpret the result in terms of the context.
- Apply the addition and multiplication rules for counting to solve mathematical and real-world problems, including problems involving probability.
- Perform the set operations, including the difference and product of two sets.
- Prove set relations including DeMorgan's laws.
- Translate propositional statements into logical arguments using propositional variables and logical connectives.
- Determine truth values of simple and compound statements using truth tables.
- Identify and accurately interpret conditional, biconditional, and quantified statements.
- Find the converse, inverse, and contrapositive of a statement.
- Represent logic operations, such as AND, OR, NOT, NOR, and XOR, using logical symbolism to solve problems.
- Determine whether two propositions are logically equivalent.
- Construct logical arguments using laws of detachment, syllogism, tautology, contradiction, and Euler diagrams.
- Judge the validity of arguments and give counterexamples to disprove statements.
- Given a mathematical situation, calculate the appropriate permutation.
- Given a mathematical situation, calculate the appropriate combination.
- Given a real-world situation, calculate a permutation or combination for the scenario.

#### Course Assessment and Participation Requirements:

To achieve success, students are expected to submit work in each course weekly. Students can learn at their own pace; however, "any pace" still means that students must make progress in the course every week. To measure learning, students complete self-checks, practice lessons, multiple choice questions, projects, Discussion-Based Assessments, and discussions. Students are expected to maintain regular contact with teachers; the minimum requirement is monthly. When teachers, students, and parent or guardians work together, students are successful.