

# ACT Mathematics

## Course Overview

The ACT Mathematics course was developed by aligning Plato Courseware with the topics that are assessed on the 2016 ACT Test. Each unit aligns to one or more topics within the test. This course focuses on the study of algebraic problem-solving skills and concepts related to geometry, probability, and statistics. In this course, you will find a variety of lessons and activities to improve your knowledge and skills in these areas.

## Course Goals

By the end of this course, you will be able to do the following:

- Use addition, subtraction, multiplication, and division to solve real-world problems.
- Use fractions to solve real-world problems.
- Add, subtract, multiply, and divide decimals using the standard algorithm.
- Order rational numbers in real-world situations.
- Describe absolute values and recognize the difference between absolute value and statements about order.
- Describe common factors and multiples.
- Describe the use of ratios, and understand ratios and rates as percentages.
- Compare properties of exponents and understand the use of scientific notation.
- Use square and cube roots.
- Review and interpret statistics and ways to measure data sets.
- Explain probability.
- Add, subtract, multiply, and divide binomials and monomials.
- Evaluate rational expressions and create and solve equations.
- Rewrite equations to solve for a single variable.
- Apply the rules for exponents when the exponents are rational numbers.
- Solve quadratic equations by factoring, and find the solution for the quadratic equations of the form  $x^2 + bx = 0$ .
- Simplify rational and polynomial expressions.
- Simplify rational expressions with exponents and radicals.
- Prove and use polynomial identities and the Binomial Theorem.
- Use the quadratic formula to find a solution set for a quadratic equation.

- Solve linear inequalities by using the addition, subtraction, multiplication, and division method.
- Graph the solution sets of associated inequalities.
- Solve a system of equations by adding or subtracting.
- Solve word problems using a system of two linear equations or inequalities.
- Identify, construct, and interpret functions.
- Graph absolute value functions.
- Describe arithmetic and geometric sequences and series.
- Identify matrices and perform matrix operations.
- Add, subtract, multiply, and divide complex numbers, and plot complex numbers in the plane.
- Graph linear equations in two variables.
- Use the slope and intercept of linear functions to write an equation from a graph, and draw a graph from an equation.
- Interpret graphs to solve problems and graph linear inequalities in two variables.
- Identify graphs from their equations.
- Identify the slope of parallel lines and the slope of a line that is perpendicular to another line.
- Divide a line segment based on a ratio.
- Use coordinates to compute perimeters and areas.
- Derive the equation, center, and radius of a circle.
- Describe conic sections while exploring parabolas and their graphs.
- Compare ellipses, circles, and their graphs.
- Use key features of hyperbolas to graph them.
- Describe basic geometric concepts.
- Represent transformations in a plane.
- Write mathematical proofs and apply them to simple geometric relationships.
- Prove theorems about lines, angles, triangles, and parallelograms.
- Prove the slope criteria for parallel and perpendicular lines to solve geometric problems.
- Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
- Identify and describe relationships among inscribed angles, radii, and chords.
- Represent three-dimensional figures using nets made up of rectangles and triangles, and find the surface area of these figures.
- Examine trigonometric graphs and trigonometric functions using a unit circle.
- Examine and apply the basic trigonometric identities.
- Describe and use the relationship between the sine and cosine of complementary angles.
- Describe trigonometric ratios and apply the Pythagorean Theorem to solve right triangles.

## General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word-processing software, such as Microsoft Word or Google Docs.
- Complete basic operations with presentation software, such as Microsoft PowerPoint or Google Docs presentation.
- Perform online research using various search engines and library databases.
- Communicate through email.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Plato Student Orientation document, found at the beginning of this course.

## Course Materials

- notebook
- pencils or ink pens
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft PowerPoint or equivalent

## Course Structure

### Unit 1: Pre-Algebra

#### Summary

In this unit, you will solve real-life problems by using the addition, subtraction, multiplication, and division methods. You will also use fractions to solve these problems. Using a standard algorithm, you will add, subtract, multiply, and divide decimals. You will write and explain statements of order for rational numbers in real-world situations. You describe the absolute value of a rational number as its distance from zero on the number line. You will also compare absolute value and statements about order. In this unit, you will express a sum of two whole numbers with a common factor as a multiple of a sum of two whole numbers with no common factor. You identify ratios to describe relationships between quantities. You will then find the percentage of a quantity as a rate per 100 and solve problems that involve finding the whole, given a part and the percentage. You will also write and evaluate numerical expressions involving whole-number exponents. Then you will be introduced to scientific notation, and you will solve problems using square and cube roots. You will use numbers expressed in the form of a single digit to estimate large and small quantities. You will use square and cube root

symbols to represent solutions to equations and evaluate square and cube roots of small perfect squares. You will also recognize statistical questions and examine the patterns in the data collected to answer them. You will describe the nature of an attribute under investigation, including how it was measured and its units of measurement. You will display numerical data on a number line and plots, including dot plots, histograms, and box plots. You will relate the choice of measures of center and variability to the shape of the data distribution. You will state that the likelihood that a chance event will occur can be expressed as a number between 0 and 1. Further, recognize statistics, where you will measure data sets, explore descriptive statistics, and interpret statistics. Finally, the last lesson will formally introduce you to probability.

## Unit 2: Elementary Algebra

### Summary

In Unit 2, you will add, subtract, and multiply binomials and monomials, and divide a binomial by a monomial. You will evaluate rational expressions and create and solve equations. You will also rewrite equations to solve for a single variable. You will apply the rules for exponents when the exponents are rational numbers. Further, you will find solutions for quadratic equations of the form  $x^2 + bx = 0$ . You will find the solution set of quadratic equations that factor as the difference of two squares or that are the perfect square of binomials. Finally, you will find the solution set for other quadratic equations by factoring.

## Unit 3: Intermediate Algebra

### Summary

Unit 3 begins with simplifying rational and polynomial expressions where you will simplify rational expressions with exponents and radicals. You will prove and use polynomial identities and the Binomial Theorem. In order to find a solution set for a quadratic equation, you will use the quadratic formula. Then, you will solve linear inequalities using addition, subtraction, multiplication, and division. You will graph solution sets of associated inequalities and solve a system of equations using addition or subtraction. You will also solve word problems using a system of two linear equations or inequalities. In this unit, you will be introduced to functions where you will construct and interpret functions, and graph absolute value functions. You will write rules for arithmetic and geometric sequences and find sums of arithmetic and geometric series. You will also carry out matrix operations and plot complex numbers in the complex number plane. Lastly, you will add, subtract, multiply, and divide complex numbers.

## Unit 4: Coordinate Geometry

### Summary

In Unit 4, you will determine whether a point is on the graph of a linear equation. You will use the slope and y-intercept of linear functions to write an equation from a graph, and draw a graph from an equation. You will interpret graphs to solve problems and also graph linear inequalities in two variables. You will identify graphs from their equations and determine parallel and perpendicular lines from their slopes. You will divide a line segment based on a ratio and use coordinates to compute perimeters and areas. In this unit, you will derive the equation of a circle and describe conic sections while exploring parabolas and their graphs. Finally, you will compare ellipses and circles and their graphs and use key features of hyperbolas to graph them.

## Unit 5: Plane Geometry

### Summary

In Unit 5, you will describe basic geometric concepts and represent transformations in a plane. You will write mathematical proofs and apply that knowledge to simple geometric relationships. You will prove theorems about lines, angles, triangles, and parallelograms. In addition, you will prove the slope criteria for parallel and perpendicular lines and solve geometric problems. You will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. At the end of the unit, you will identify and describe relationships among inscribed angles, radii, and chords, and represent three-dimensional figures.

## Unit 6: Trigonometry

### Summary

Unit 6 begins with examining trigonometric functions using a unit circle. You will also examine trigonometric graphs and apply the basic trigonometric identities. You will compare trigonometric ratios and explain and use the relationship between the sine and cosine of complementary angles. Lastly, you will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

### Course Map

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the [course map](#).