



## **Algebra 2**

### **Semester A Summary:**

In this course, the student will explore quadratic, rational, and radical equations, as well as polynomial, exponential, and logarithmic functions. The student will practice identifying, writing, and solving a variety of equations and apply their understanding of functions. Introductory topics related to trigonometry are also included.

### **Semester A Outline**

#### **1. Course Introduction**

1. Algebra 2 A Course Overview
2. Student Course Introduction Quick Check

#### **2. Quadratic Equations**

1. Quadratic Equations Introduction
  - In this unit, you will learn about solving quadratic equations, including those with complex solutions. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.
2. Introduction to Complex Numbers
  - In this section, you will identify  $i$  as a complex number such that  $i^2 = -1$  and describe complex numbers using the form  $a+bi$ , where  $a$  and  $b$  are real numbers.
3. Introduction to Complex Numbers Quick Check
4. Operations with Complex Numbers
  - In this section, you will calculate the sum, difference, and product of complex numbers.
5. Operations with Complex Numbers Quick Check
6. Writing Quadratic Equations
  - In this section, you will write the quadratic function given three specified points in the plane.
7. Writing Quadratic Equations Quick Check
8. Graphing Quadratic Functions
  - In this section, you will use the strategy of completing the square to rewrite quadratic functions into the form  $y = a(x - h)^2 + k$ .
9. Graphing Quadratic Functions Quick Check
10. Representations of Quadratic Equations
  - In this section, you will use graphs to represent real-world problems that can be modeled with quadratic functions.
11. Representations of Quadratic Equations Quick Check
12. Solve Quadratic Equations by Factoring
  - In this section, you will solve a quadratic equation in one variable by factoring.

13. Solve Quadratic Equations by Factoring Quick Check
14. Solving by Inspection or Square Root
  - In this section, you will solve a quadratic equation in one variable by inspection or by taking the square root.
15. Solving by Inspection or Square Root Quick Check
16. Solving by Completing the Square
  - In this section, you will solve a quadratic equation in one variable by completing the square.
17. Solving by Completing the Square Quick Check
18. Solving Using the Quadratic Formula
  - In this section, you will solve a quadratic equation in one variable by using the quadratic formula.
19. Solving Using the Quadratic Formula Quick Check
20. Quadratics with Non-real Solutions
  - In this section, you will identify and solve a quadratic equation with real coefficients in one variable that has non-real solutions.
21. Quadratics with Non-real Solutions Quick Check
22. Quadratic Equations Apply
23. Quadratic Equations Apply Portfolio
24. Quadratic Equations Review Online Practice
25. Quadratic Equations Review
26. Quadratic Equations Sample Work
27. Quadratic Equations Unit Test

### 3. Polynomial Functions

1. Polynomial Functions Introduction
2. Rewrite Polynomial Expressions
  - In this section, you will use the structure of a polynomial expression to identify ways to rewrite it.
3. Rewrite Polynomial Expressions Quick Check
4. Prove Polynomial Identities
  - In this section, you will write proofs of polynomial identities and use them to describe numerical relationships.
5. Prove Polynomial Identities Quick Check
6. The Remainder Theorem
  - In this section, you will apply the Remainder Theorem to solve a variety of problems.
7. The Remainder Theorem Quick Check
8. Graph Polynomials Using Zeros
  - In this section, you will graph polynomial functions, by identifying and using zeros when suitable factorizations are available.
9. Graph Polynomials Using Zeros Quick Check
10. Derive Equation of Parabola
  - In this section, you will develop the equation of a parabola given a focus and directrix.
11. Derive Equation of Parabola Quick Check
12. Transform Polynomial Functions
  - In this section, you will identify the effect of a transformation on the graph of a polynomial function (replacing  $f(x)$  with  $f(x) + k$ ,  $k f(x)$ ,  $f(kx)$ , or  $f(x + k)$  for specific positive and negative values of  $k$ ) and determine the value of  $k$  when given a transformed graph.
13. Transform Polynomial Functions Quick Check
14. Polynomial Functions Apply

15. Polynomial Functions Portfolio
16. Polynomial Functions Online Practice
17. Polynomial Functions Review
18. Polynomial Functions Sample Work
19. Polynomial Functions Unit Test

#### 4. **Rational Functions**

1. Rational Functions Introduction
2. Rewrite Simple Rational Expressions
  - In this section, you will use the structure of a rational expression to identify ways to rewrite it, including by inspection and using long division.
3. Rewrite Simple Rational Expressions Quick Check
4. Solve Rational Equations
  - In this section, you will solve simple rational equations in one variable, justify each step, and identify any extraneous solutions.
5. Solve Rational Equations Quick Check
6. Problem Solving with Rational Equations
  - In this section, you will use rational equations and inequalities in one variable to represent and solve problems.
7. Problem Solving w/ Rational Equations Quick Check
8. Graph Rational Functions
  - In this section, you will graph rational functions, by identifying zeros and asymptotes when suitable factorizations are available.
9. Graph Rational Functions Quick Check
10. Rational Functions Apply
11. Rational Functions Online Practice
12. Rational Functions Review
13. Rational Functions Sample Work
14. Rational Functions Unit Test

#### 5. **Exponentials & Logarithms**

1. Exponentials & Logarithms Introduction
  - In this unit, you will learn about exponential and logarithmic functions. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.
2. Problem Solving with Exponentials
  - In this section, you will use exponential equations and inequalities in one variable to represent and solve problems.
3. Problem Solving with Exponentials Quick Check
4. Construct an Exponential Function
  - In this section, you will write exponential functions given a graph, a description of a relationship, or two input-output pairs.
5. Construct an Exponential Function Quick Check
6. Graph Exponential Functions
  - In this section, you will graph exponential functions, showing the intercepts and end behavior.
7. Graph Exponential Functions Quick Check
8. Transform Exponential Functions
  - In this section, you will identify the effect of a transformation on the graph of an exponential function (replacing  $f(x)$  with  $f(x) + k$ ,  $k f(x)$ ,  $f(kx)$ , or  $f(x + k)$  for specific positive and negative values of  $k$ ) and determine the value of  $k$  when given a transformed graph.
9. Transform Exponential Functions Quick Check

## 10. Interpret Exponential Functions

- In this section, you will interpret the parameters in an exponential function in terms of a context and classify the function as representing exponential growth or decay.

## 11. Interpret Exponential Functions Quick Check

## 12. Rewrite Exponential Expressions

- In this section, you will use the structure of an exponential expression to identify ways to rewrite it.

## 13. Rewrite Exponential Expressions Quick Check

## 14. Solve Exponential Models with Logs

- In this section, you will write logarithms to solve exponential functions in the form  $ab^{(ct)} = d$  where  $a$ ,  $c$ , and  $d$  are numbers and the base  $b$  is 2, 10, or  $e$ . You will also evaluate the logarithms using technology.

## 15. Solve Exponential Models with Logs Quick Check

## 16. Graph Logarithmic Functions

- In this section, you will graph logarithmic functions, showing the intercepts and end behavior.

## 17. Graph Logarithmic Functions Quick Check

## 18. Transform Logarithmic Functions

- In this section, you will identify the effect of a transformation on the graph of a logarithmic function (replacing  $f(x)$  with  $f(x) + k$ ,  $k f(x)$ ,  $f(kx)$ , or  $f(x + k)$  for specific positive and negative values of  $k$ ) and determine the value of  $k$  when given a transformed graph.

## 19. Transform Logarithmic Functions Quick Check

## 20. Exponentials & Logarithms Apply

## 21. Exponentials & Logarithms Online Practice

## 22. Exponentials & Logarithms Review

## 23. Exponentials & Logarithms Sample Work

## 24. Exponentials & Logarithms Unit Test

## 6. Radical Functions

### 1. Radical Functions Introduction

- In this unit, you will learn about radical equations, radical functions, and rational exponents. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.

### 2. Radical Expressions

- In this section, you will rewrite radical expressions by simplifying.

### 3. Radical Expressions Quick Check

### 4. Solve Radical Equations

- In this section, you will solve simple radical equations in one variable, justify each step, and identify any extraneous solutions.

### 5. Solve Radical Equations Quick Check

### 6. Graph Radical Functions

- In this section, you will graph square root and cube root functions.

### 7. Graph Radical Functions Quick Check

### 8. Transforming Square Root Functions

- In this section, you will identify the effect of a transformation on the graph of a square root function (replacing  $f(x)$  with  $f(x)+k$  for specific positive and negative values of  $k$ ).

### 9. Transforming Square Root Functions Quick Check

### 10. Transformations of Cube Root Functions

- In this section, you will identify the effect of a transformation on the graph of a cube root function (replacing  $f(x)$  with  $f(x)+k$  for specific positive and negative values of  $k$ ).

11.Transformations of Cube Root Functions Quick Check

12.Rewrite Radical Expressions

- In this section, you will explain how the properties of integer exponents can be extended to rational exponents, allowing you to rewrite radical expressions using rational exponents.

13.Rewrite Radical Expressions Quick Check

14.Using Properties of Exponents

- In this section, you will use the properties of exponents to rewrite expressions involving radicals and rational exponents.

15.Using Properties of Exponents Quick Check

16.Radical Functions Apply

17.Radical Functions Online Practice

18.Radical Functions Review

19.Radical Functions Sample Work

20.Radical Functions Unit Test

## 7. Trigonometric Functions

1. Trigonometric Functions Introduction

- In this unit, you will learn about radian measure, and then use radian measure to extend trigonometric functions to all real numbers. You will also learn how to graph trigonometric functions and transformations of them, and how to use trigonometric functions to model periodic phenomena. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.

2. Radian Measure

- In this section, you will describe the radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

3. Radian Measure Quick Check

4. The Unit Circle

- In this section, you will explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers.

5. The Unit Circle Quick Check

6. Special Right Triangles

- In this section, you will use special triangles and geometry to determine the values of sine for  $\frac{\pi}{3}$ ,  $\frac{\pi}{4}$ , and  $\frac{\pi}{6}$ .

7. Special Right Triangles Quick Check

8. Trigonometric Transformations

- In this section, you will use the unit circle to express the values of sine for  $\pi - x$ ,  $\pi + x$ , and  $2\pi - x$  in terms of their values for  $x$ , where  $x$  is any real number.

9. Trigonometric Transformations Quick Check

10.Graph Trigonometric Functions

- In this section, you will graph trigonometric functions, showing period, midline, and amplitude.

11.Graph Trigonometric Functions Quick Check

12.Transform Trigonometric Functions

- In this section, you will identify the effect of a transformation on the graph of a trigonometric function (replacing  $f(x)$  with  $f(x)+k$ ,  $kf(x)$ ,  $f(kx)$ , or  $f(x+k)$  for specific positive and negative values of  $k$ ) and determine the value of  $k$  when given a transformed graph.

- 13.Transform Trigonometric Functions Quick Check
- 14.Modeling with Trigonometric Functions
  - In this section, you will use trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
- 15.Modeling with Trigonometric Functions Quick Check
- 16.Pythagorean Identity
  - In this section, you will write a proof to prove the Pythagorean identity  $\sin^2(\theta)+\cos^2(\theta)=1$  and then use it to find  $\sin(\theta)$ ,  $\cos(\theta)$ , or  $\tan(\theta)$  given  $\sin(\theta)$ ,  $\cos(\theta)$ , or  $\tan(\theta)$  and the quadrant of the angle.
- 17.Pythagorean Identity Quick Check
- 18.Solving Trigonometric Equations
  - In this section, you will use inverse functions to solve trigonometric equations that appear in modeling.
- 19.Solving Trigonometric Equations Quick Check
- 20.Trigonometric Functions Apply
- 21.Trigonometric Functions Review Online Practice
- 22.Trigonometric Functions Review
- 23.Trigonometric Functions Sample Work
- 24.Trigonometric Functions Unit Test

## 8. Algebra 2 A Semester Review and Test

1. Algebra 2 A Online Practice
2. Algebra 2 A Semester Review
3. Algebra 2 A Semester Exam

## Semester B Summary:

In this course, the student will deepen their understanding of functions, equations, and graphs. The student will apply this understanding while exploring probability and statistics.

## Semester B Outline

### 1. Course Introduction

1. Algebra 2 B Course Introduction
2. Student Course Introduction Quick Check

### 2. Special Functions

1. Special Functions Introduction
  - In this unit, you will learn about combined functions, even and odd functions, inverse functions, and piecewise functions. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.
2. Combined Functions
  - In this section, you will combine standard function types using arithmetic operations.
3. Combined Functions Quick Check
4. Even and Odd Functions
  - In this section, you will determine if a function is even or odd, given the graph or equation of the function.
5. Even and Odd Functions Quick Check
6. Inverse Functions
  - In this section, you will solve an equation of the form  $f(x)=c$  for a simple function  $f$  that has an inverse and write an expression for that inverse.

7. Inverse Functions Quick Check
8. Graphs of Inverse Functions
  - In this section, you will discover that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another function.
9. Graphs of Inverse Functions Quick Check
10. Solve Problems with Inverse Functions
  - In this section, you will write inverse functions to solve contextual problems.
11. Solve Problems with Inverse Functions Quick Check
12. Absolute Value Equations and Functions
  - In this section, you will use absolute value to solve one-variable equations and inequalities.
13. Absolute Value Equations and Functions Quick Check
14. Transforming Absolute Value Functions
  - In this section, you will identify the effect on a graph of replacing an absolute value function,  $f(x)$ , by  $f(x) + k$  for specific values of  $k$ .
15. Transforming Absolute Value Functions Quick Check
16. Graph Piecewise-defined Functions
  - In this section, you will graph piecewise-defined functions.
17. Graph Piecewise-defined Functions Quick Check
18. Transforming Piecewise Functions
  - In this section, you will identify the effect of a transformation on the graph of a piecewise-defined function (replacing  $f(x)$  with  $f(x)+k$  for specific positive and negative values of  $k$ ).
19. Transforming Piecewise Functions Quick Check
20. Solve  $f(x) = g(x)$  Graphically
  - In this section, you will explain why the  $x$ -coordinates of the points where the graphs of the equations  $y=f(x)$  and  $y=g(x)$  intersect are the solutions of the equation  $f(x)=g(x)$ . You will also approximate their solutions.
21. Solve  $f(x) = g(x)$  Graphically Quick Check
22. Descriptive Modeling
  - In this section, you will define appropriate quantities for the purpose of descriptive modeling.
23. Descriptive Modeling Quick Check
24. Special Functions Apply
25. Special Functions Portfolio
26. Special Functions Online Practice
27. Special Functions Review
28. Special Functions Sample Work
29. Special Functions Unit Test

### 3. Features of Graphs

1. Features of Graphs Introduction
2. Rate of Change from Equations
  - In this section, you will calculate and interpret the average rate of change of a function presented symbolically over a specified interval.
3. Rate of Change from Equations Quick Check
4. Rate of Change from Table or Graph
  - In this section, you will calculate and interpret the average rate of change of a function presented as a table or as a graph.
5. Rate of Change from Table or Graph Quick Check
6. Interpret Key Features of Graphs

- In this section, you will interpret key features of functions that are represented by graphs or tables, in terms of the quantities they model.
7. Interpret Key Features of Graphs Quick Check
  8. Use Key Features to Sketch Graph
    - In this section, you will use a verbal description of a functional relationship between two quantities to sketch a graph of the function, which includes key features.
  9. Use Key Features to Sketch Graph Quick Check
  10. Compare Functions
    - In this section, you will compare properties of functions that are represented in different ways.
  11. Compare Functions Quick Check
  12. Systems of Equations & Inequalities
    - In this section, you will solve systems of equations in two variables using substitution and elimination.
  13. Systems of Equations & Inequalities Quick Check
  14. Systems of Three Linear Equations
    - In this section, you will solve a system of three linear equations in three variables algebraically and use a graph of such a system to approximate the solutions.
  15. Systems of Three Linear Equations Quick Check
  16. Solving Problems with Systems
    - In this section, you will use a system of linear equations in three variables to represent and solve real-world problems.
  17. Solving Problems with Systems Quick Check
  18. Linear and Quadratic Systems
    - In this section, you will solve a system of equations consisting of a linear equation and a quadratic equation in two variables both algebraically and graphically.
  19. Linear and Quadratic Systems Quick Check
  20. Features of Graphs Apply
  21. Features of Graphs Portfolio
  22. Features of Graphs Online Practice
  23. Features of Graphs Review
  24. Features of Graphs Sample Work
  25. Features of Graphs Unit Test

#### 4. Sequences and Series

1. Sequences and Series Introduction
  - In this unit, you will learn about constructing explicit and recursive formulas that represent a sequence. First, you will complete each lesson and the corresponding quick check. Then, you will apply what you learned to solve a problem. Last, you will take the unit test.
2. Writing Arithmetic Sequences
  - In this section, you will write recursive and explicit formulas to represent arithmetic sequences, use the formulas to model situations, and translate between the two forms.
3. Writing Arithmetic Sequences Quick Check
4. Writing Geometric Sequences
  - In this section, you will write recursive and explicit formulas to represent geometric sequences, use the formulas to model situations, and translate between the two forms.
5. Writing Geometric Sequences Quick Check



6. Describe Sequences as Functions
  - In this section, you will describe sequences, sometimes defined recursively, as functions whose domain is a subset of the integers.
7. Describe Sequences as Functions Quick Check
8. Determine a Function from a Sequence
  - In this section, you will write a linear function given an arithmetic sequence and write an exponential function given a geometric sequence.
9. Determine a Function from a Sequence Quick Check
10. The Sum of a Finite Geometric Series
  - In this section, you will develop the formula for the sum of a finite geometric series and use it to solve problems.
11. The Sum of a Finite Geometric Series Quick Check
12. Determine an Explicit Expression
  - In this section, you will determine an explicit expression to model a polynomial, exponential, logarithmic, or trigonometric relationship between two quantities for a given context.
13. Determine an Explicit Expression Quick Check
14. Determine a Recursive Process
  - In this section, you will determine a recursive expression to model a polynomial, exponential, logarithmic, or trigonometric relationship between two quantities for a given context.
15. Determine a Recursive Process Quick Check
16. Determine Steps for Calculation
  - In this section, you will determine the steps needed to calculate a term in, or the sum of, a sequence that models a polynomial, exponential, logarithmic, or trigonometric relationship.
17. Determine Steps for Calculation Quick Check
18. Sequences and Series Apply
19. Sequences and Series Online Practice
20. Sequences and Series Review
21. Sequences and Series Sample Work
22. Sequences and Series Test

## 5. **Probability**

1. Probability Introduction
2. Events, Outcomes, and Sample Space
  - In this section, you will describe events as subsets of a sample space using characteristics of the outcomes.
3. Events, Outcomes, and Sample Space Quick Check
4. Unions, Intersections, and Complements
  - In this section, you will describe events as unions, intersections, or complements of other events.
5. Unions, Intersections, and Complements Quick Check
6. Probabilities Involving Sets
  - In this section, you will understand and use simple probability formulas involving unions of events.
7. Probabilities Involving Sets Quick Check
8. Independent Events
  - In this section, you will determine if two events A and B are independent.
9. Independent Events Quick Check
10. Conditional Probability
  - In this section, you will describe the conditional probability of A given B and use it to interpret the independence of A and B.

11. Conditional Probability Quick Check
12. Construct Two-way Frequency Tables
  - In this section, you will create and interpret two-way frequency tables.
13. Construct Two-way Frequency Tables Quick Check
14. Use Two-way Frequency Tables
  - In this section, you will use two-way frequency tables to determine independence of events and to approximate conditional probabilities.
15. Use Two-way Frequency Tables Quick Check
16. Apply Conditional Probability
  - In this section, you will recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
17. Apply Conditional Probability Quick Check
18. Conditional Probability as a Fraction
  - In this section, you will determine and interpret the conditional probability of A given B as the fraction of B's outcomes that also belong to A.
19. Conditional Probability as a Fraction Quick Check
20. Addition Rule for Probabilities
  - In this section, you will calculate probabilities using the Addition Rule and interpret them in terms of the model.
21. Addition Rule for Probabilities Quick Check
22. Probability Apply
23. Probability Online Practice
24. Probability Review
25. Probability Sample Work
26. Probability Unit Test

## 6. **Statistics**

1. Statistics Introduction
  - In this unit, you will learn some of the ways that statistics can be used to model different situations and to make predictions.
2. Introduction to Statistics
  - In this section, you will describe statistics as a process for making inferences about population parameters based on a random sample from that population.
3. Introduction to Statistics Quick Check
4. Statistical Models
  - In this section, you will determine if a specified model is consistent with results from a given data-generating process.
5. Statistical Models Quick Check
6. Surveys, Experiments, & Observations
  - In this section, you will determine whether a given scenario represents a sample survey, experiment, or observational study and justify your answer.
7. Surveys, Experiments, & Observations Quick Check
8. Sample Mean and Proportion
  - In this section, you will use data from a sample survey to estimate a population mean or proportion.
9. Sample Mean and Proportion Quick Check
10. Margin of Error
  - In this section, you will use data from a sample survey to develop a margin of error through the use of simulation models for random sampling.
11. Margin of Error Quick Check
12. Compare Statistical Treatments

- In this section, you will use data from a randomized experiment to compare two treatments and use simulations to decide if the difference between the parameters is significant.
13. Compare Statistical Treatments Quick Check
  14. Evaluate Statistical Reports
    - In this section, you will evaluate reports based on data.
  15. Evaluate Statistical Reports Quick Check
  16. Normal Distributions
    - In this section, you will use the mean and standard deviation of a data set, if appropriate, to fit it to a normal distribution and to estimate population percentages.
  17. Normal Distributions Quick Check
  18. Normal Distributions: Estimating Area
    - In this section, you will use calculators, spreadsheets, and tables to estimate the area under the normal curve for a given data set with a normal distribution.
  19. Normal Distributions: Estimating Area Quick Check
  20. Fitting a Function to Plotted Data
    - In this section, you will graph bivariate data on a scatter plot, fit a function to the plotted data, and use the function to solve problems.
  21. Fitting a Function to Plotted Data Quick Check
  22. Statistics Apply
  23. Statistics Online Practice
  24. Statistics Review
  25. Statistics Sample Work
  26. Statistics Unit Test
- 7. Algebra 2 B Semester Review and Test**
1. Algebra 2 B Semester Online Practice
  2. Algebra 2 B Semester Review
  3. Algebra 2 B Semester Exam