

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Algebra: Part One****Adding and Subtracting Polynomials**

Add and subtract polynomials, determining the degree and number of terms of the sum or difference.

Find and evaluate polynomial sums or differences that model real-world situations.

**Multiplying Polynomials and Simplifying Expressions**

Interpret the structure of an expression involving addition, subtraction, and multiplication of polynomials in order to write it as a single polynomial in standard form.

Multiply a binomial by a trinomial algebraically and by using geometric models.

**Exponential Growth Functions**

Graph an exponential growth function, and state the domain and range.

Identify an exponential growth function given tables, graphs, and function rules, determining the rate of change.

State the domain and range of an exponential growth function.

Write an exponential growth function to model a real-world problem, pointing out constraints in the modeling context.

**Modeling with Quadratic Equations**

Write and solve quadratic equations to model real-world scenarios, estimating where appropriate and identifying solutions that are not viable in terms of the context.

**Equations in One Variable**

Create two-step, one-variable linear equations to model problems.

Explain the steps used to solve a two-step, one-variable linear equation.

Solve two-step, one-variable linear equations and simple absolute value equations, pointing out solutions that are viable or not viable in a modeling context.

**Inequalities in One Variable**

Create two-step one-variable linear inequalities to model and solve problems, pointing out solutions that are viable or not viable in the context.

Explain the steps used to solve a two-step one-variable linear inequality.

Solve two-step one-variable linear inequalities, and state the solution in set or interval notation or graph it on a number line.

**Vertical Asymptotes of Rational Functions**

Determine the vertical asymptotes and holes in the graph of a rational function having the  $x$ -axis as its only horizontal asymptote.

Solve problems involving inverse variation.

**Modeling with Quadratic Functions**

Use quadratic functions to solve mathematical and real-world problems.

Write quadratic functions to model problems.

**Writing and Graphing Equations in Two Variables**

Construct a table of values and a graph for a two-variable linear equation that models a situation, pointing out solutions that are viable or not viable based on the context.

Interpret graphs and rates by examining the quantities represented by each axis.

Write a two-variable linear equation to model a quantitative relationship, describing the constraints of the model based on the context.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Writing Linear Equations**

Use linear models to solve problems.

Write two-variable linear equations in different forms using varying pieces of information about the relationships.

**Modeling with Systems of Linear Equations**

Create a system of linear equations to model a problem.

Interpret the solution of a system of linear equations in a modeling context.

**Literal Equations**

Rearrange a literal equation to highlight a quantity of interest and use it to solve problems.

**Solving Linear Equations: Variable on One Side**

Create one-variable linear equations, having the variable on one side only, to model and solve problems.

Determine the input value that produces the same output value for two functions from a table or graph.

Explain the steps used to solve a one-variable linear equation having the variable on one side only.

Solve one-variable linear equations having the variable on one side only, pointing out solutions that are viable or not viable in a modeling context.

**Rational Equations**

Determine the reasonableness of a solution to a rational equation.

Solve rational equations and determine extraneous solutions.

Use rational equations to model and solve real-world problems.

**Radical Equations and Extraneous Roots**

Model and solve mathematical and real-world problems using radical equations, and determine extraneous roots.

**Solving Linear Equations: Distributive Property**

Create one-variable linear equations involving the distributive property to model and solve problems.

Determine if a one-variable linear equation has zero, one, or infinite solutions.

Solve one-variable linear equations involving the distributive property.

**Algebra: Part Two****Solving One-Variable Inequalities**

Explain the steps used to solve a multistep one-variable linear inequality.

Graph the solution sets of one-variable linear inequalities.

Solve multistep one-variable linear inequalities.

**Completing the Square**

Determine key aspects of the graph of a quadratic function given in standard form and with  $a = 1$  by writing it in vertex form.

Relate the geometric model of completing the square to the algebraic process.

Relate the parameters of a quadratic function in vertex form to transformations of the graph  $y = x^2$ .

Write quadratic functions given in standard form and with  $a = 1$  into vertex form by completing the square.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Introduction to the Quadratic Formula**

- Determine the values of  $a$ ,  $b$ , and  $c$  from a given quadratic equation in standard form.
- Justify the steps used to derive the quadratic formula by completing the square.
- Recognize an expression that uses the quadratic formula to find the solutions of a quadratic equation.
- Relate the discriminant in the quadratic formula to the types of solutions of a quadratic equation.

**The Quadratic Formula**

- Find real and complex solutions of quadratic equations using the quadratic formula.
- Use the discriminant to determine the number and type of roots of a quadratic equation.

**Solving Quadratic Equations: Square Root Property**

- Use the square root property to solve quadratic equations.

**Solving Quadratic Equations: Completing the Square**

- Solve a quadratic equation whose leading coefficient is 1 by completing the square.

**Solving Quadratic Equations: Factoring**

- Solve problems by rewriting quadratic equations in standard form and factoring, pointing out the solutions that are viable or not viable in a modeling context.
- Write a quadratic equation that models a scenario.

**Solving Systems of Linear Equations: Graphing**

- Analyze a system of linear equations to determine if it has one solution, no solution, or infinitely many solutions.
- Use technology to find or approximate the solution of a system of linear equations graphically.

**Solving Systems of Linear Equations: Substitution**

- Interpret the solution of a system of linear equations in a modeling context.
- Solve a system of linear equations using substitution.

**Solving Linear-Quadratic Systems**

- Solve a system of equations consisting of a line and a parabola algebraically and graphically, using technology where appropriate.

**Graphing Two-Variable Linear Inequalities**

- Relate the graph of a two-variable linear inequality to its algebraic representation.

**Solving Systems of Linear Inequalities**

- Determine a system of two-variable linear inequalities given a solution set.
- Graph a system of two-variable linear inequalities.
- Identify solutions of a system of two-variable linear inequalities.

**Factoring Polynomials: GCF**

- Determine an appropriate way to factor a polynomial for a given context.
- Determine the greatest common monomial factor of two or more terms.
- Write a polynomial as the product of a monomial and polynomial having the same number of terms.

**Factoring Polynomials Completely**

- Analyze the structure of a polynomial to write it in completely factored form.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Rewriting Exponential Functions**

Use alternative forms of an exponential function to highlight different information about that function and the real-world situation it models.

Write exponential functions and expressions in equivalent forms, using the properties of exponents to justify steps.

**Functions: Part One****Introduction to Functions**

Analyze a mapping diagram, table, graph, or scenario to recognize functional relationships.

Determine the domain and range of a functional relationship given in a mapping diagram, table, graph, or scenario.

**Function Notation**

Identify the input and output of a functional relationship, pointing out constraints on the domain and range.

Interpret function notation that models a real-world situation.

Use function notation to represent a functional relationship.

**Evaluating Functions**

Analyze a function represented by an equation, table, or graph to determine the output when given the input, and vice versa.

Find input and output values of two functions graphed in the same coordinate plane.

Write the inverse of a given linear function.

**Analyzing Functional Relationships**

Graph a function given a verbal description of a relationship.

Interpret key features of a function represented graphically in terms of a real-world context.

Interpret key features of a function represented tabularly in terms of a real-world context.

**Domain and Range**

Determine the domain and range of a function in both mathematical and real-world contexts.

**Rate of Change**

Calculate the average rate of change of a function over a specified interval.

Interpret the average rate of change of a function over a specified interval.

Solve problems involving direct variation.

**Slope-Intercept Form of a Line**

Analyze how a change in a parameter of a linear function affects its graph or the scenario it represents.

Identify the slope and  $y$ -intercept of a linear function, and use them to graph the function.

Write a linear function, in slope-intercept form, for a given relationship.

**Point-Slope Form of a Line**

Graph a line given its equation in point-slope form, identifying the slope and intercepts.

Write the equation of a line given its slope and a point on the line in point-slope form, and express the relationship as a function.

**Quadratic Functions: Standard Form**

Graph a quadratic function given in standard form, identifying the key features of the graph.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Quadratic Functions: Factored Form**

Identify a product that results in the difference of squares or a perfect square trinomial.

Multiply a binomial by a monomial or binomial algebraically and by using geometric models.

**Quadratic Functions: Vertex Form**

Graph a quadratic function given in vertex form, identifying the key features of the graph.

Relate the parameters of a quadratic function in vertex form to transformations of the graph  $y = x^2$ .

**The Cube Root Function**

Graph the cube root function, and translations and reflections of it.

State the key features of the cube root function, and translations and reflections of it.

**Absolute Value Functions and Translations**

Analyze key features of the absolute value function and its translations.

Graph the absolute value function and its translations.

**Step Functions**

Evaluate a step function.

Graph a step function.

Interpret a step function in terms of the problem it models.

State the domain and range of step functions.

**Functions: Part Two****Graphing Radical Functions**

Determine the domain and range of square root and cube root functions.

Relate transformations to the graphs of square root and cube root functions to their parent function.

**Piecewise Defined Functions**

Determine the domain, range, and continuity of piecewise defined functions.

Evaluate piecewise defined functions.

Graph piecewise defined functions.

**Graphing Polynomial Functions**

Graph polynomial functions using key features.

**Graphing Rational Functions**

Determine the horizontal asymptotes of a rational function.

Graph rational functions that have only vertical or horizontal asymptotes.

**Graphing Exponential Functions**

Determine the domain and range of exponential functions.

Graph exponential functions.

Identify exponential functions.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

### Graphing Logarithmic Functions

Determine the domain and range of logarithmic functions.

Identify and analyze the graphs of logarithmic functions.

Identify logarithmic functions.

### Introduction to Linear Functions

Calculate the rate of change of a function and, if constant, the initial value of the function.

Determine if a relationship is linear by analyzing the rate of change.

### Function Operations

Combine functions using arithmetic operations, expressing the results both algebraically and graphically.

Evaluate sums, differences, products, and quotients of functions.

### Recognizing Patterns

Analyze a sequence of numbers to determine the pattern, and identify whether it is arithmetic or geometric.

Use a recursive rule to calculate a term of a sequence.

Write a recursive rule for a sequence.

### Geometric Sequences

Graph and analyze geometric sequences as a special case of exponential functions with the domain restricted to natural numbers.

Write recursive and explicit rules for geometric sequences using function notation.

### Linear Growth vs. Exponential Growth

Use tables and graphs to compare the growth of an exponential function vs. a linear function over equal intervals.

Use tables and graphs to show that exponential functions grow by equal factors over equal intervals.

### Comparing Exponential, Linear, and Quadratic Growth

Use tables and graphs to compare the growth of an exponential function to the growth of a linear function over equal intervals.

Use tables and graphs to compare the growth of an exponential function to the growth of a quadratic or a polynomial function over equal intervals.

Use tables and graphs to show that exponential functions grow by equal factors over equal intervals.

### Solving Exponential and Logarithmic Equations

Solve exponential and logarithmic equations using inverses, properties, and algorithms.

### Exponential Decay Functions

Graph an exponential decay function, and state the domain and range.

Identify an exponential decay function given tables, graphs, and function rules, determining the rate of change.

Relate exponential growth and decay functions using laws of exponents and reflections over the  $y$ -axis.

Write an exponential decay function to model a real-world problem, pointing out constraints in the modeling context.

## Geometry

### Defining Terms

Identify and name a pair of parallel lines, a pair of perpendicular lines, a ray, an angle, an arc, a circle, and a line segment.

Use undefined terms to precisely define parallel lines, perpendicular lines, ray, angle, arc, circle, and line segment.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

### Volume of Pyramids

- Calculate the volume or an unknown measure of a right pyramid based on a mathematical or real-world model.
- Calculate the volume or an unknown measure of an oblique pyramid based on a mathematical or real-world model.
- Write expressions to represent the volumes or unknown measures of right and oblique pyramids.

### Volume of Cylinders, Cones, and Spheres

- Solve mathematical and real-world problems involving the volume of right and oblique cones.
- Solve mathematical and real-world problems involving the volume of right and oblique cylinders.
- Solve mathematical and real-world problems involving the volume of spheres.
- Write expressions to represent the volumes or unknown measures of cylinders and cones.

### Density and Design Problems

- Solve problems involving density of an area.
- Use geometric concepts to solve design problems.

### Cavalieri's Principle and Volume of Composite Figures

- Calculate the volumes of composite figures, including those that model real-world objects.
- Write an expression to represent the volume of a composite figure.

### Area of Composite Figures

- Solve problems involving the area of composite figures.

### Surface Area

- Solve mathematical and real-world problems about lateral and surface areas of composite figures.
- Solve mathematical and real-world problems involving lateral area of prisms, cylinders, pyramids, and cones.
- Solve mathematical and real-world problems involving surface area of prisms, cylinders, cones, spheres, and pyramids.

### Volume of Composite Figures

- Calculate volumes of composite figures.

### Using Triangle Congruence Theorems

- Complete the steps to prove angles, segments, and triangles are congruent using triangle congruence theorems and CPCTC.
- Identify the triangle congruency theorem that can be used to prove two triangles congruent.

### Using Triangle Similarity Theorems

- Complete the steps to prove theorems involving similar triangles.
- Solve for unknown measures of similar triangles using the side-splitter theorem and its converse.
- Solve for unknown measures of similar triangles using the triangle midsegment theorem.

### Finding the Hypotenuse in Right Triangles

- Approximate the length of the hypotenuse of a right triangle to solve real-world problems.
- Use the Pythagorean theorem to find the length of the hypotenuse of a right triangle.

### Unknown Leg Lengths in Right Triangles

- Approximate the length of a leg of a right triangle to solve real-world problems.
- Given the length of one leg and the hypotenuse of a right triangle, use the Pythagorean theorem to find the length of the other leg.

Unit	Lesson	Lesson Objectives
------	--------	-------------------

**Pythagorean Theorem in Three Dimensions**

- Identify diagonals and right triangles within cubes.
- Solve for unknown side lengths of right triangles within a cube.

**Triangle Congruence: SAS**

- Complete the steps to prove triangles are congruent using SAS.
- Determine the isometric transformations that would map one triangle onto another triangle given that two corresponding sides and the included angle are congruent.
- Identify the sides and angle that can be used to prove triangle congruency using SAS.

**Number and Quantity****Quantitative Reasoning**

- Describe a quantitative relationship shown in a table or graph, including graphs without scales.
- Interpret a graph given with or without a scale to determine the quantitative relationship it describes.

**Dimensional Analysis**

- Use dimensional analysis to convert units and compare quantities, attending to limitations on the unit of measurement.

**Precision in Measurement**

- Determine the margin of error for a measurement.
- Indicate and compare the accuracy and precision of measurements.
- Use significant figures to determine the most precise result of an operation.

**Simplifying Nonperfect Roots**

- Simplify nonperfect roots without rationalizing.

**Rational Exponents**

- Evaluate numeric expressions using properties of rational exponents.
- Simplify algebraic expressions using properties of rational exponents.

**Operations on Rational and Irrational Numbers**

- Explain why the product of a nonzero rational number and an irrational number is irrational.
- Explain why the sum and product of two rational numbers are rational.
- Explain why the sum of a rational number and an irrational number is irrational.

**Statistics and Probability****Measures of Center**

- Calculate the mean and median for a set of data using technology when appropriate.
- Compare the mean and median of a set of data that is symmetrical and for a set of data that is not symmetrical, determining which is a better measure of center for a given data set.
- Create a dot plot or histogram for a set of data.
- Discuss the effect of outliers on measures of center.

Unit	Lesson	Lesson Objectives
		<b>Box Plots</b> <ul style="list-style-type: none"><li>Analyze box plots for symmetry and outliers.</li><li>Compare box plots.</li><li>Create and interpret box plots.</li></ul>
		<b>Comparing Data Sets</b> <ul style="list-style-type: none"><li>Choose which measure of center, measure of variability, and display should be used to describe a data set.</li><li>Compare two distributions in terms of center, variability, and shape.</li></ul>
		<b>Two-Way Tables</b> <ul style="list-style-type: none"><li>Calculate relative frequencies and display them in a two-way relative frequency table.</li><li>Display data in a two-way frequency table given a scenario or Venn diagram, and identify joint and marginal frequencies.</li><li>Interpret joint and marginal relative frequencies in the context of the data.</li></ul>
		<b>Relative Frequencies and Association</b> <ul style="list-style-type: none"><li>Create conditional relative frequency tables, by row and by column.</li><li>Determine whether there is an association between two variables by analyzing conditional relative frequencies.</li><li>Interpret conditional relative frequencies in the context of the data.</li></ul>
		<b>Line of Best Fit</b> <ul style="list-style-type: none"><li>Determine if a data set shows a correlation and, if so, the type of correlation.</li><li>Determine if a given linear function is a reasonable model for a set of data arising from a real-world situation.</li><li>Use a line of best fit to make a prediction.</li><li>Use technology to determine the line of best fit for a data set, and interpret the parameters of the model in context.</li></ul>
		<b>Strength of Correlation</b> <ul style="list-style-type: none"><li>Analyze data to draw conclusions about correlation and causation.</li><li>Calculate the correlation coefficient for a linear model using technology.</li><li>Interpret the strength of a linear model based on the correlation coefficient.</li></ul>
		<b>Populations and Sampling</b> <ul style="list-style-type: none"><li>Determine when sampling is an appropriate and helpful measure of a population and when it is not.</li><li>Explain that statistics can be used to gain information about a population by examining a sample of the population.</li></ul>
		<b>Inferences and Predictions</b> <ul style="list-style-type: none"><li>Examine sample size and the effect on a prediction using the results of a simulation.</li><li>Make an inference about the whole population based on a sample by using proportional reasoning.</li></ul>
		<b>Probability of Compound Events</b> <ul style="list-style-type: none"><li>Find probabilities of dependent compound events using organized lists, tables, or tree diagrams.</li><li>Find probabilities of independent compound events using organized lists, tables, or tree diagrams.</li></ul>