Unit	Lesson	Lesson Objectives

Extending the Number System

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.

Complex Numbers

Determine the absolute value of a complex number.

Represent complex numbers in the form a + bi or in the complex plane.

Represent square roots of negative numbers as multiples of i.

Simplify powers of i using their cyclic nature.

Operations with Complex Numbers

Identify the field properties of complex numbers.

Perform addition, subtraction, and multiplication of complex numbers.

Function Operations

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

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

Function Inverses

Find the inverse of a function.

Use composition to verify that functions are inverses.

Solving Equations

Create multistep equations in one variable and use them to solve problems.

Simplify and solve multistep equations

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.

Radicals

Laws of Exponents

Apply the properties of whole-number exponents to generate equivalent expressions.

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.

Unit	Lesson	Lesson Objectives

Adding and Subtracting Radicals

Add and subtract radical expressions.

Identify like radicals.

Multiplying Radicals

Perform multiplication of radical expressions.

Dividing Radicals

Perform division of radical expressions, rationalizing the denominator when necessary.

Quadratic Functions

Introduction to Quadratic Functions

Calculate the rate of change of a quadratic function over an interval of its domain, and compare it to linear and exponential functions.

Evaluate a quadratic function using tables, graphs, and equations.

Identify a quadratic function and the values of the coefficients and constant from the standard form.

Quadratic Functions: Standard Form

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

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 $y = x2$.

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

Completing the Square (Continued)

Determine key aspects of the graph of a quadratic function given in standard form by writing it in vertex form.

Relate the parameters of a quadratic function in vertex form to transformations of the graph $y = x2$.

Write quadratic functions given in standard form into vertex form by completing the square.

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.

Quadratic Inequalities

Create quadratic inequalities in one variable and use them to solve problems.

Find real solutions of quadratic inequalities algebraically and graphically.

Unit	Lesson	Lesson Objectives

Solving Quadratic Equations

Solving Quadratic Equations: Zero Product Property

Solve problems by factoring quadratic equations given in standard form.

Write quadratic equations given rational solutions.

Solving Quadratic Equations by Factoring

Find real solutions for quadratic equations using the zero product property.

Use key attributes of a quadratic function to solve word problems.

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.

Completing the Square

Find complex solutions to quadratic equations by completing the square.

Recognize the pattern of a perfect-square trinomial as the square of a binomial.

Use the square root property to solve equations.

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.

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.

Solving Linear-Quadratic Systems

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

Regression Models

Determine an exponential, quadratic, or linear model for a given data set using technology.

Identify limitations of models in real-world contexts.

Interpret the graph of a regression model in the context of the problem.

Use a linear, quadratic, or exponential regression model to make a prediction.

Unit	Lesson	Lesson Objectives

Polynomial Expressions

Introduction to Polynomials

Classify a polynomial by degree and number of terms.

Identify a polynomial and its equivalent forms.

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 Monomials and Binomials

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.

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.

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: Double Grouping

Factor a polynomial by double grouping or indicate that the polynomial is prime.

Factoring Trinomials: a = 1

Determine if a trinomial with a leading coefficient of 1 and a positive constant is factorable and, if so, write it in factored form.

Relate the factorization of a trinomial with a leading coefficient of 1 and a positive constant to a geometric model.

Factoring Trinomials: a = 1 (Continued)

Determine if a trinomial with a leading coefficient of 1 and a negative constant is factorable and, if so, write it in factored form.

Relate the factorization of a trinomial with a leading coefficient of 1 and a negative constant to a geometric model.

Factoring Trinomials: a > 1

Determine if a trinomial with a leading coefficient greater than 1 is factorable and, if so, write it in factored form.

Relate the factorization of a trinomial with a leading coefficient greater than 1 to a geometric model.

Factoring Polynomials: Difference of Squares

Determine if a polynomial is factorable by recognizing that it is a difference of two squares and, if so, applying the identity.

Identify a monomial that is a perfect square and find the square root.

Unit	Lesson	Lesson Objectives

Angle and Triangle Relationships

Special Angle Pairs
- Calculate angle measures by using definitions and theorems about special angle pairs
- Define and identify special angle pairs

Congruent Angle Pairs
- Apply theorems about congruent angle pairs to calculate angle measures
- Identify angle relationships by using theorems about congruent angle pairs

Parallel Lines and Angles
- Apply theorems about angles formed by parallel lines cut by a transversal to calculate angle measures
- Identify angle pairs formed by lines cut by a transversal

Interactive: Proving Angles Congruent
- Prove angle relationships given parallel lines cut by a transversal

Proving Lines Parallel
- Calculate angle measures in order to justify that lines are parallel
- Identify theorems used to justify that lines are parallel
- Prove lines are parallel using various proof formats

Bisectors in a Triangle
- Apply properties of bisectors of a triangle to solve problems
- Identify the properties of the circumcenter and incenter of a triangle

Medians and Altitudes of a Triangle
- Apply properties of medians and altitudes of a triangle to solve problems
- Identify the properties of the orthocenter and centroid of a triangle

Midsegments of a Triangle
- Apply the triangle midsegment theorem to solve problems
- Identify the triangle midsegment theorem and use it to justify relationships

Isosceles Triangles
- Apply theorems related to isosceles triangles to solve problems
- Identify theorems related to isosceles triangles and use them to justify side and angle relationships

Pythagorean Theorem
- Apply the Pythagorean theorem to find side lengths of a right triangle
- Solve problems using the Pythagorean theorem in modeling situations

Unit	Lesson	Lesson Objectives

Proportional Geometry

Dilations

Similar Polygons

 Identify and apply properties of similar polygons

 Use proportions to solve problems involving similar polygons

Similar Triangles

 Calculate angle measures and side lengths of similar triangles

 Identify and apply the AA similarity postulate and the SSS and SAS similarity theorems

Right Triangle Similarity

 Apply theorems to solve problems involving geometric means

 Identify similar right triangles formed by an altitude and write a similarity statement

Interactive: Proving Triangles Similar

 Complete proofs involving similar triangles

Special Segments and Proportions

 Solve problems using theorems about special segments and triangles

Perimeter and Area of Similar Figures

 Identify the relationships between the side lengths, perimeters, and areas of similar figures

 Use the relationships between similar figures to calculate perimeters and areas

Introduction to Trigonometry and Quadrilaterals

Right Triangles

 Determine the sine, cosine, and tangent of an acute angle by using technology

 Determine the sine, cosine, and tangent of an angle using right triangles

 Identify sides and corresponding angles of a right triangle

 Use proportions to determine side lengths of similar right triangles

Special Right Triangles

 Solve problems involving special right triangles in modeling situations

 Use properties of 45°-45°-90° and 30°-60°-90° triangles to find side lengths

Trigonometric Ratios

 Apply trigonometric relationships to complementary angles to write equivalent expressions

 Determine the exact values of sine, cosine, and tangent for 30°, 45°, and 60°

 Identify and apply the trigonometric ratios of sine, cosine, and tangent

Solving Right Triangles

 Solve problems involving right triangles in modeling situations

 Use trigonometric ratios to find missing parts of a right triangle

Unit	Lesson	Lesson Objectives

Angles of Elevation and Depression
- Identify angles of elevation and depression in problem situations
- Solve problems involving angles of elevation and depression

Evaluating the Six Trigonometric Functions
- Evaluate the six trigonometric functions for angles in degrees or radians based on one or more given trigonometric function values.
- Evaluate the six trigonometric functions for angles in degrees or radians given a point on the terminal ray.

Classifying Quadrilaterals
- Apply properties of various quadrilaterals to calculate angle measures and side lengths
- Apply the quadrilateral angle sum theorem to calculate angle measures
- Classify and describe relationships within the family of quadrilaterals

Properties of Parallelograms
- Apply theorems about parallelograms to calculate angle and segment measures
- Complete proofs involving properties of parallelograms
- Identify theorems about the properties of parallelograms

Proving a Quadrilateral Is a Parallelogram
- Identify and apply theorems that determine if a quadrilateral is a parallelogram
- Prove a quadrilateral is a parallelogram

Special Parallelograms
- Apply theorems about special parallelograms to calculate angle and segment measures
- Complete proofs involving the diagonals of special parallelograms
- Identify theorems about the diagonals of rectangles, rhombi, and squares

Interactive: Proving Special Parallelograms
- Complete proofs involving rectangles, rhombi, and squares

Circles

Introduction to Circles
- Calculate the circumference and area of a circle
- Identify terms related to circles
- Solve problems related to circles in modeling situations

Tangents to a Circle
- Complete proofs involving the relationships between tangents and circles
- Identify and apply theorems about tangents and radii
- Identify common tangents between circles

Unit	Lesson	Lesson Objectives

Arcs, Chords, and Central Angles

Complete proofs involving the relationships between arcs and chords of a circle

Identify relationships between arcs and central angles and apply them to solve problems

Identify theorems about arcs and chords and apply them to solve problems

Inscribed Angles

Calculate the measures of angles and their intercepted arcs

Complete proofs involving the relationships of angles and arcs of a circle

Identify relationships between inscribed angles and arcs

Secants, Tangents, and Angles

Identify relationships between arcs and angles formed by secants, tangents, and chords

Solve problems involving angles and arcs formed by secants, tangents, and chords

Special Segments

Calculate the lengths of segments formed by chords, secants, and tangents

Identify relationships between segments formed by chords, secants, and tangents

Arc Length and Area of a Sector

Calculate arc lengths

Calculate the areas of sectors and segments of circles

Relate the degree and radian measures of an angle

Interactive: Circle Constructions

Use a straightedge and compass to create constructions involving circles

Construct Regular Polygons

Construct regular polygons inscribed in a circle.

Prove that all circles are similar.

Dimensions and Algebraic Connections

Volume

Calculate the volume of prisms, cylinders, pyramids, and cones

Describe the effect on volume when the dimensions of a solid figure are changed

Solve problems involving the volume of prisms, cylinders, pyramids, and cones

Spheres

Apply the formulas for volume and surface area of a sphere to determine unknown measurements.

Use given measurements of a sphere or hemisphere to find the volume or surface area.

Unit	Lesson	Lesson Objectives

Similar Solids

Calculate the surface areas and volumes of similar solids

Identify the relationships between the surface areas and volumes of similar solids

Geometric Figures in the Coordinate Plane

Complete proofs involving geometric figures in the coordinate plane

Use coordinate geometry to verify the properties of a geometric figure

Conic Sections: Circles

Given specific information about a circle, determine its equation in standard form

Given the equation of a circle in standard form, identify the center, the radius, and the graph

Conic Sections: Parabolas

Relate the algebraic and geometric representations of parabolas

Applications of Probability

Set Theory

Find subsets, complements, and cross products of sets

Identify and describe the relationships and the notation used in set theory

Venn Diagrams and Sets

Use symbolic notation to describe events displayed in Venn diagrams involving unions, intersections, and complements

Use Venn diagrams to explore set relationships

Use Venn diagrams to solve problems involving sets

Random Behavior

Apply lists, diagrams, and the fundamental counting principle to determine the number of outcomes possible in a given situation

Identify experimental and theoretical probabilities and apply the law of large numbers to determine probabilities

Mutually Exclusive and Independent Events

Calculate probabilities using the addition rule of mutually exclusive events

Calculate probabilities using the multiplication rule of independent events

Identify and describe mutually exclusive and independent events

Conditional Probability

Use calculations to determine if two events are independent

Use formulas and Venn diagrams to calculate conditional probabilities

Use general probability rules to calculate probabilities of compound events

Geometric Probability

Calculate geometric probability using segment and area models

Solve problems involving geometric probability in modeling situations

Unit	Lesson	Lesson Objectives

Probability and Two-Way Tables

    Calculate conditional probabilities from data displayed in a two-way table

    Use a two-way table to determine if two events are independent

Decision Making Using Probability

    Calculate probabilities and make decisions in modeling situations

    Construct a theoretical probability model from all possible outcomes

Probability with Combinations and Permutations

    Quantify outcomes using combinations and permutations

    Use combinations and permutations to compute probabilities of compound events

Nonlinear Functions and Transformations

Absolute Value Functions

    Analyze absolute value functions to determine key features of the graph.

    Model and solve mathematical and real-world problems with absolute value functions.

Step Functions

    Analyze step functions to determine key features of the graph.

    Evaluate step functions.

    Use step functions to model real-world problems.

Piecewise Defined Functions

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

    Evaluate piecewise defined functions.

    Graph piecewise defined functions.

Transformations of Quadratic Functions

    Describe the effects of changes in a, h, and k to the graph of a function in the form $y = a(x - h)2 + k$.

    Use completing the square to write quadratic functions in the form $y = a(x - h)2 + k$.

Transformations of Functions

    Analyze a function rule or graph to determine transformations of the parent function.

    Identify a function as belonging to a family of functions.

Modeling with Functions

    Find the equation of a function that best models a data set.

    Use function models to solve problems.