Detailed Breakdown of Algebra and Geometry Instructional Scope

Algebra

Expressions, Equations, and Inequalities

- Simplifying and manipulating algebraic expressions: Combine like terms, distribute, and factor expressions. Work with exponents and radicals.

- Solving linear and quadratic equations: Solve linear equations algebraically; for quadratics, use factoring, completing the square, and the quadratic formula.

- Solving linear and nonlinear inequalities: Graph solution sets and interpret intervals for quadratic inequalities.

- Absolute value equations and inequalities: Solve $|x| = a$ as $x = a$ and $x = -a$; analyze compound inequalities like $|x| < 4$.

Polynomial, Rational, and Radical Relationships

- Adding, subtracting, multiplying, and dividing polynomials: Use algebraic properties for operations; explore polynomial division.

- Factoring techniques for polynomials: Apply grouping, difference of squares, and sum/difference of cubes.

- Simplifying and solving rational expressions and equations: Clear denominators; solve rational equations in real-world contexts.

- Simplifying and solving radical expressions and equations: Simplify roots; solve by isolating and squaring radicals.

Quadratic and Exponential Models

- Graphing and interpreting quadratic functions: Analyze vertex, axis of symmetry, and intercepts.

- Using the vertex form of a quadratic function: Rewrite $ax^2 + bx + c$ as $a(x-h)^2 + k$.

- Solving quadratic equations: Match solving techniques to equations; interpret solutions graphically.

- Modeling real-world scenarios with exponential growth and decay: Apply $y = a(1 + r)^t$ for growth, $y = a(1 - r)^t$ for decay.

Detailed Breakdown of Algebra and Geometry Instructional Scope

Solving Systems of Equations and Inequalities

- Solving systems of linear equations algebraically and graphically: Apply substitution, elimination, and graphing.

- Solving systems of linear inequalities: Graph solution regions and apply to optimization problems.

- Applications of systems in real-world problems: Solve practical scenarios such as resource optimization.

- Solving systems involving nonlinear equations: Extend to combinations like linear-quadratic systems.

Geometry

Congruence and Similarity

- Proving triangles congruent using SSS, SAS, ASA, and AAS: Use postulates for proofs.

- Using properties of similar triangles to solve problems: Calculate unknowns using proportional reasoning.

- Applying transformations to prove congruence and similarity: Explore rigid motions and dilations.

Circles and Conic Sections

- Properties of chords, tangents, and arcs: Solve problems using relationships between circles' elements.

- Equations of circles in the coordinate plane: Derive and analyze equations like $(x-h)^2 + (y-k)^2 = r^2$.

- Parabolas, ellipses, and hyperbolas: Introduction to standard equations, foci, and directrices.

Geometric Transformations

- Reflections, rotations, translations, and dilations: Explore effects of transformations on geometric properties.

- Describing transformations in the coordinate plane: Write transformation rules and analyze outcomes.

- Composition of transformations: Combine multiple transformations.

Trigonometry in Geometry

- Right triangle trigonometry (sine, cosine, tangent): Solve for unknowns in right triangles.

Detailed Breakdown of Algebra and Geometry Instructional Scope

- Applications of trigonometric ratios to solve problems: Apply elevation and depression to real-world questions.

- Law of Sines and Law of Cosines: Solve for unknowns in general triangles.

Measurement and Dimension

- Area and perimeter of two-dimensional figures: Apply and derive formulas for regular and composite shapes.

- Surface area and volume of three-dimensional solids: Solve practical problems with cones, spheres, and cylinders.

- Applications of scaling in measurement problems: Study effects of scale on area and volume ratios.

Geometric Modeling and Proofs

- Writing formal geometric proofs: Use logical structures like two-column and paragraph proofs.

- Modeling and solving problems with geometric shapes: Apply geometry to practical design and analysis.

- Using constructions to explore geometric relationships: Use tools to create bisectors and inscribed shapes.