General Topic: Quadratic Equations, Inequalities, and Functions

Lesson Overview:

Quadratic equations are equations of the form $ax^2 + bx + c = 0$, where a, b, and c are constants. **Quadratic inequalities** compare a quadratic expression to zero using inequality symbols. **Quadratic functions** describe parabolic relationships, often used to model real-life situations like projectile motion.

Key Concepts and Subtopics:

1. Forms of Quadratic Equations:

- Standard, factored, vertex form

2. Solving Methods:

- Factoring, completing the square, quadratic formula

3. Graph of a Quadratic Function:

- Vertex, axis of symmetry, direction of opening

4. Quadratic Inequalities:

- Interval notation, sign analysis

Real-Life Example:

Calculating the maximum height of a basketball shot using a quadratic function.

Remember This!

- *The graph of a quadratic function is always a parabola—its shape can tell you a lot about the situation it models.*

General Topic: Rational Algebraic Equations and Variations

Lesson Overview:

Rational algebraic equations contain fractions with polynomials in the numerator, denominator, or both. **Variations** describe direct, inverse, joint, and combined proportional relationships.

Key Concepts and Subtopics:

1. Restrictions:

- Values that make the denominator zero are excluded

2. Solving Rational Equations:

- Finding LCD, clearing fractions, solving resulting equation

3. Types of Variation:

- Direct ($y = kx$), inverse ($y = k/x$), joint, combined

Real-Life Example:

Determining how long it will take two people working together to complete a project based on their individual rates.

Remember This!

- *Always check for restrictions—solutions that make any denominator zero are not valid.*

General Topic: Radicals and Rational Exponents

Lesson Overview:

Radicals are expressions involving roots (square roots, cube roots, etc.). Rational exponents are another way to write radicals. Both follow specific rules for simplification and operations.

Key Concepts and Subtopics:

1. Relationship:

- $a^{(1/n)} = \sqrt[n]{a}$

2. Simplifying Radicals:

- Factoring out perfect powers

3. Operations:

- Adding, subtracting, multiplying, and dividing radicals

4. Rationalizing the Denominator

Real-Life Example:

Calculating the length of a ladder leaning against a wall using the Pythagorean theorem, which may require simplifying a square root.

Remember This!

- *Radicals and rational exponents are two sides of the same mathematical coin—use whichever form is easier for the problem.*

General Topic: Triangle Similarity and Basic Trigonometry

Lesson Overview:

Triangle similarity involves comparing triangles that have the same shape but different sizes. **Basic trigonometry** studies the relationships between angles and sides of right triangles.

Key Concepts and Subtopics:

1. Triangle Similarity Theorems:

- AA, SAS, SSS

2. Trigonometric Ratios:

- Sine, cosine, tangent (SOH-CAH-TOA)

3. Applications in Problem-Solving:

- Heights, distances, navigation

Real-Life Example:

Using trigonometry to find the height of a tree by measuring your distance from it and the angle of elevation.

Remember This!

- *Similar triangles open the door to indirect measurement—perfect for solving problems without direct access to an object.*