

**Grade Eight**  
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**Instructional Mathematical Goals and Objectives**

The following concepts and skills are required by all students completing eighth grade. The **Major Concepts** should be taught in depth using a variety of methods and applications so that all students have accessibility to and an understanding of these concepts. **Maintenance Concepts** have been taught previously and are a necessary foundation for success in mathematics at this level.

**MAJOR CONCEPTS**

**Patterns-**

**Equations, Inequalities, Formulas**

**Number Sense-**

**Rational Numbers, Exponents**

**Geometry-Solid**

**Volume, Surface Area, Similarity,  
Ratio and Proportion**

**Data Analysis and Statistics**

**Graph Analysis, Sampling**

**MAINTENANCE CONCEPTS**

**Patterns-**

**Algebraic Expressions,  
Equations**

**Number Sense, Computation-**

**Integers, Ratio, Proportion,  
Percent**

**Geometry-Plane**

**Area, Perimeter, Angles**

**Measurement-Metric**

**Compare, Convert, Compute,  
Tools**

**Data Analysis-Probability**

**Sampling, Predict Probabilities**

**THINK STARH**

Use the image of a star with **Content** at its center and **Problem Solving, Communications, Connections, Reasoning, and Representation** at its five points to design illuminating lessons (see page 77).

**I. Number Sense**

**A. Rational Numbers**

1. Represent, rename, compare, and order rational numbers (positive and negative integers, fractions, decimals) and justify their use in real-life situations (e.g., use number lines, two- and three-dimensional regional models).
2. Use the basic operations on rational numbers to solve problems (e.g., describe the effects of multiplying whole numbers by a fraction or a decimal less than 1).

**B. Exponents**

1. Demonstrate concepts of positive and negative exponents including zero using patterns and calculators.
2. Use rules of exponents (e.g.,  $7^2 \times 7^3 = 7^5$ ,  $a^m / a^n = a^{m-n}$ ).

3. Read, represent, and interpret large numbers and numbers less than one in expanded, exponential, and scientific notation; use benchmarks to discuss their magnitude.

## II. Algebraic Operations

### A. Equations

- \*1. Develop the concept of 2-step equations using concrete materials and models (e.g.,  $4x + 2 = 10$ ).
2. Model, write, and solve 2-step linear equations (some from problem situations) using concrete, informal, and formal methods.
3. Graph and interpret the solution to linear equations (on a number line—one variable, on a coordinate plane—two variables).
4. Predict the effects on the graph of a linear equation when  $m$  (the **slope**) in the equation  $y = mx + b$  is changed.

### B. Inequalities

1. Model, write, and solve 2-step linear inequalities (some from problem situations) using concrete, informal, and formal methods.
2. Graph the solution to linear inequalities (on a number line—one variable).

### C. Formulas

1. Develop, select, and apply appropriate formulas for given situations:
  - a. an equation (e.g.,  $d=rt$ )
  - b. geometry problems (e.g.,  $p=2l + 2w$ ,  $v=lwh$ )
2. Develop and use formulas for finding the area of a “region f a region” for simple composite figures (e.g., area of a rectangular picture frame).
3. Find the length of a line segment on a number line.

## III. Geometry—Solid

- A. Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid).
- B. Apply the concepts of surface area and volume to real world settings (e.g., unwrap a box to explore surface area; use rice, 1-inch cubes, centimeter cubes, cups . . . to **estimate** the volume of boxes, irregular shaped objects, containers).
- C. Use knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a 3-dimensional object to scale).

#### IV. Data Analysis and Statistics

- A. Select and apply appropriate formats in the presentation of collected data (e.g., line plots, bar graphs, **stem-and-leaf plots**, **scatter plots**, **histograms**, circle graphs).
- B. Explain the **mean**, its sensitivity to extremes, and its use in comparison with the **median** and **mode**.
- C. Explain the likelihood of uncertain events happening and relate this to a **ratio** in the form of a fraction, decimal, or percent (e.g., flip two coins, spinners).
- D. Determine how samples are chosen (random, limited, biased) and the extent to which results of a sample can be generalized to a population (e.g., is the average height of a men's college basketball team a good representative sample for height predictions?).
- E. Find all possible **combinations** and arrangements (**permutations**) involving a limited number of variables.
- F. Develop a tree diagram and list the elements.