Grade Seven
Ohio Mathematics Standards and Indicators

Number, Number Sense and Operations Standard

Number and Number Systems

1. Demonstrate an understanding of place value using powers of 10 and write large numbers in scientific notation.
2. Explain the meaning of exponents that are negative or 0.
3. Describe differences between rational and irrational numbers; e.g., use technology to show that some numbers (rational) can be expressed as terminating or repeating decimals and others (irrational) as non-terminating and non-repeating decimals.

Meaning of Operations

4. Use order of operations and properties to simplify numerical expressions involving integers, fractions and decimals.
5. Explain the meaning and effect of adding, subtracting, multiplying and dividing integers; e.g., how adding two integers can result in a lesser value.

Computation and Estimation

6. Simplify numerical expressions involving integers and use integers to solve real-life problems.
7. Solve problems using the appropriate form of a rational number (fraction, decimal or percent).
8. Develop and analyze algorithms for computing with percents and integers, and demonstrate fluency in their use.
9. Represent and solve problem situations that can be modeled by and solved using concepts of absolute value, exponents and square roots (for perfect squares).

Measurement Standard

Measurement Units

1. Select appropriate units for measuring derived measurements; e.g., miles per hour, revolutions per minute.
2. Convert units of area and volume within the same measurement system using proportional reasoning and a reference table when appropriate; e.g., square feet to square yards, cubic meters to cubic centimeters.

Use Measurement Techniques and Tools

3. Estimate a measurement to a greater degree of precision than the tool provides.
4. Solve problems involving proportional relationships and scale factors; e.g., scale models that require unit conversions within the same measurement system.
5. Analyze problem situations involving measurement concepts, select appropriate strategies, and use an organized approach to solve narrative and increasingly complex problems.
6. Use strategies to develop formulas for finding area of trapezoids and volume of cylinders and prisms.
7. Develop strategies to find the area of composite shapes using the areas of triangles, parallelograms, circles and sectors.
8. Understand the difference between surface area and volume and demonstrate that two objects may have the same surface area, but different volumes or may have the same volume, but different surface areas.
9. Describe what happens to the surface area and volume of a three- dimensional object when the measurements of the object are changed; e.g., length of sides are doubled.

Geometry and Spatial Sense Standard

Characteristics and Properties

1. Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.
2. Determine sufficient (not necessarily minimal) properties that define a specific two-dimensional figure or three-dimensional object. For example:
   a. Determine when one set of figures is a subset of another; e.g., all squares are rectangles.
   b. Develop a set of properties that eliminates all but the desired figure; e.g., only squares are quadrilaterals with all sides congruent and all angles congruent.
3. Use and demonstrate understanding of the properties of triangles. For example:
   a. Use Pythagorean Theorem to solve problems involving right triangles.
   b. Use triangle angle sum relationships to solve problems.

4. Determine necessary conditions for congruence of triangles.
5. Apply properties of congruent or similar triangles to solve problems involving missing lengths and angle measures.

Spatial Relationships

6. Determine and use scale factors for similar figures to solve problems using proportional reasoning.

Transformations and Symmetry

7. Identify the line and rotation symmetries of two-dimensional figures to solve problems.
8. Perform translations, reflections, rotations and dilations of two-dimensional figures using a variety of methods (paper folding, tracing, graph paper).

Visualization and Geometric Models

9. Draw representations of three-dimensional geometric objects from different views.

Patterns, Functions and Algebra Standard

Use Patterns, Relations and Functions

1. Represent and analyze patterns, rules and functions with words, tables, graphs and simple variable expressions.
2. Generalize patterns by describing in words how to find the next term.
3. Recognize and explain when numerical patterns are linear or nonlinear progressions; e.g., 1, 3, 5, 7... is linear and 1, 3, 4, 8, 16... is nonlinear.

Use Algebraic Representations

4. Create visual representations of equation-solving processes that model the use of inverse operations.
5. Represent linear equations by plotting points in the coordinate plane.
6. Represent inequalities on a number line or a coordinate plane.
7. Justify that two forms of an algebraic expression are equivalent, and recognize when an expression is simplified; e.g., $4m = m + m + m + m$ or $a \cdot 5 + 4 = 5a + 4$.
8. Use formulas in problem-solving situations.
9. Recognize a variety of uses for variables; e.g., placeholder for an unknown quantity in an equation, generalization for a pattern, formula.

Analyze Change

10. Analyze linear and simple nonlinear relationships to explain how a change in one variable results in the change of another.
11. Use graphing calculators or computers to analyze change; e.g., distance-time relationships.

Data Analysis and Probability Standard

Data Collection

1. Read, create and interpret box-and-whisker plots, stem-and-leaf plots, and other types of graphs, when appropriate.
2. Analyze how decisions about graphing affect the graphical representation; e.g., scale, size of classes in a histogram, number of categories in a circle graph.

Statistical Methods

3. Analyze a set of data by using and comparing combinations of measures of center (mean, mode, median) and measures of spread (range, quartile, interquartile range), and describe how the inclusion or exclusion of outliers affects those measures.
4. Construct opposing arguments based on analysis of the same data, using different graphical representations.
5. Compare data from two or more samples to determine how sample selection can influence results.
6. Identify misuses of statistical data in articles, advertisements, and other media.

Probability

7. Compute probabilities of compound events; e.g., multiple coin tosses or multiple rolls of number cubes, using such methods as organized lists, tree diagrams and area models.
8. Make predictions based on theoretical probabilities, design and conduct an experiment to test the predictions, compare actual results to predicted results, and explain differences.