Grade Six
Ohio Mathematics Standards and Indicators

Number, Number Sense and Operations Standard

Number and Number Systems

1. Decompose and recompose whole numbers using factors and exponents (e.g., $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$), and explain why "squared" means "second power" and "cubed" means "third power."
2. Find and use the prime factorization of composite numbers. For example:
    a. Use the prime factorization to recognize the greatest common factor (GCF).
    b. Use the prime factorization to recognize the least common multiple (LCM).
    c. Apply the prime factorization to solve problems and explain solutions.
3. Explain why a number is referred to as being "rational," and recognize that the expression C can mean *a* parts of size $\frac{1}{b}$ each, *a* divided by *b*, or the ratio of *a* to *b*.
4. Describe what it means to find a specific percent of a number, using real-life examples.
5. Use models and pictures to relate concepts of ratio, proportion and percent, including percents less than 1 and greater than 100.

Meaning of Operations

6. Use the order of operations, including the use of exponents, decimals and rational numbers, to simplify numerical expressions.
7. Use simple expressions involving integers to represent and solve problems; e.g., if a running back loses 15 yards on the first carry but gains 8 yards on the second carry, what is the net gain/loss?
8. Represent multiplication and division situations involving fractions and decimals with models and visual representations; e.g., show with pattern blocks what it means to take $2\frac{2}{3} \div \frac{1}{6}$.
9. Give examples of how ratios are used to represent comparisons; e.g., part-to-part, part-to-whole, whole-to-part.
10. Recognize that a quotient may be larger than the dividend when the divisor is a fraction; e.g., $6 \div \frac{1}{2} = 12$.

Computation and Estimation

11. Perform fraction and decimal computations and justify their solutions; e.g., using manipulatives, diagrams, mathematical reasoning.
12. Develop and analyze algorithms for computing with fractions and decimals, and demonstrate fluency in their use.
13. Estimate reasonable solutions to problem situations involving fractions and decimals; e.g., $\frac{7}{8} + \frac{12}{13} \approx 2$ and $4.23 \times 5.8 \quad 25$.
14. Use proportional reasoning, ratios and percents to represent problem situations and determine the reasonableness of solutions.
15. Determine the percent of a number and solve related problems; e.g., find the percent markdown if the original price was $140, and the sale price is $100.

Measurement Standard

Measurement Units

1. Understand and describe the difference between surface area and volume.

Use Measurement Techniques and Tools

2. Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g., $\frac{1}{2}$ circle, $\frac{2}{3}$ circle, $\frac{1}{3}$ circle, $\frac{1}{4}$ circle.
3. Estimate perimeter or circumference and area for circles, triangles and quadrilaterals, and surface area and volume for prisms and cylinders by:
    a. estimating lengths using string or links, areas using tiles or grid, and volumes using cubes;
    b. measuring attributes (diameter, side lengths, or heights) and using established formulas for circles, triangles, rectangles, parallelograms and rectangular prisms.
4. Determine which measure (perimeter, area, surface area, volume) matches the context for a problem situation; e.g., perimeter is the context for fencing a garden, surface area is the context for painting a room.

5. Understand the difference between perimeter and area, and demonstrate that two shapes may have the same perimeter, but different areas or may have the same area, but different perimeters.
6. Describe what happens to the perimeter and area of a two-dimensional shape when the measurements of the shape are changed; e.g. length of sides are doubled.

Geometry and Spatial Sense Standard

Characteristics and Properties

1. Classify and describe two-dimensional and three-dimensional geometric figures and objects by using their properties; e.g., interior angle measures, perpendicular/parallel sides, congruent angles/sides.
2. Use standard language to define geometric vocabulary: vertex, face, altitude, diagonal, isosceles, equilateral, acute, obtuse and other vocabulary as appropriate.
3. Use multiple classification criteria to classify triangles; e.g., right scalene triangle.
4. Identify and define relationships between planes; i.e., parallel, perpendicular and intersecting.

Spatial Relationships

5. Predict and describe sizes, positions and orientations of two-dimensional shapes after transformations such as reflections, rotations, translations and dilations.

Transformations and Symmetry

6. Draw similar figures that model proportional relationships; e.g., model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.

Visualization and Geometric Models

7. Build three-dimensional objects with cubes, and sketch the two-dimensional representations of each side; i.e., projection sets.

Patterns, Functions and Algebra Standard

Use Patterns, Relations and Functions

1. Represent and analyze patterns, rules and functions, using physical materials, tables and graphs.
2. Use words and symbols to describe numerical and geometric patterns, rules and functions.

Use Algebraic Representations

3. Recognize and generate equivalent forms of algebraic expressions, and explain how the commutative, associative and distributive properties can be used to generate equivalent forms; e.g., perimeter as $2(l + w)$ or $2l + 2w$.
4. Solve simple linear equations and inequalities using physical models, paper and pencil, tables and graphs.
5. Produce and interpret graphs that represent the relationship between two variables.
6. Evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations.

Analyze Change

7. Identify and describe situations with constant or varying rates of change, and compare them.
8. Use technology to analyze change; e.g., use computer applications or graphing calculators to display and interpret rate of change.

Data Analysis and Probability Standard

Data Collection

1. Read, construct and interpret line graphs, circle graphs and histograms.
2. Select, create and use graphical representations that are appropriate for the type of data collected.
3. Compare representations of the same data in different types of graphs, such as a bar graph and circle graph.
4. Understand the different information provided by measures of center (mean, mode and median) and measures of spread (range).

Statistical Methods

5. Describe the frequency distribution of a set of data, as shown in a histogram or frequency table, by general appearance or shape; e.g., number of modes, middle of data, level of symmetry, outliers.

Probability

6. Make logical inferences from statistical data.
7. Design an experiment to test a theoretical probability and explain how the results may vary.