

Grade 6 - Mathematics

Standards I: Mathematical Processes.

- A. Use a variety of tools and strategies in problem solving. I-A
- B. Apply mathematical knowledge and skills routinely in other content areas and practical situations. I-B
- C. Recognize and use connections between equivalent representations and related procedures. I-C
- D. Evaluate the reasonableness of predictions, estimations and solutions. I-D
- E. Use a variety of mathematical representations to organize, record, and communicate mathematical ideas. I-E
- F. Use mathematical language and symbols to explain, analyze, and justify mathematical ideas, strategies, and solutions. I-F
- G. Write clearly and coherently about mathematical thinking and ideas. I-G

Benchmarks for Standard I:

- Clarify problem-solving situations and identify potential solution processes; e.g., consider different strategies and approaches to a problem, restate problem from various perspectives.
- Use representations to organize and communicate mathematical thinking and problem solutions.
- Communicate mathematical thinking to others and analyze the mathematical thinking and strategies of others.
- Recognize and use mathematical language and symbols when reading, writing and conversing with others.

Standards II: Number, Number Sense and Operations.

- A. 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." II-C

- B. Find and use the prime factorization of composite numbers. For example: II-C
 1. Use the prime factorization to recognize the greatest common factor (GCF).
 2. Use the prime factorization to recognize the least common multiple (LCM).
 3. Apply the prime factorization to solve problems and explain solutions.
- C. Explain why a number is referred to as being "rational," and recognize that the expression $\frac{a}{b}$ can mean a parts of size $\frac{1}{b}$ each, a divided by b, or the ratio of a to b. II-A
- D. Describe what it means to find a specific percent of a number, using real-life examples. II-A
- E. Use models and pictures to relate concepts of ratio, proportion and percent, including percents less than 1 and greater than 100. II-A, I-E
- F. Use the order of operations, including the use of parentheses, exponents, decimals and rational numbers, to simplify numerical expressions. II-B
- G. 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? II-A
- H. 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 $2\frac{2}{3} \div \frac{1}{6}$. II-A, I-E
 - I. Give examples of how ratios are used to represent comparisons; e.g., part-to-part, part-to-whole, whole-to-part. II-C
 - J. Recognize that a quotient may be larger than the dividend when the divisor is a fraction; e.g., $6 \div \frac{1}{2} = 12$. II-B
- K. Perform fraction and decimal computations and justify their solutions; e.g., using manipulatives, diagrams, mathematical reasoning. II-B
- L. Develop and analyze algorithms for computing with fractions and decimals, and demonstrate fluency in their use. II-D

- M. Estimate reasonable solutions to problem situations involving fractions and decimals; e.g., $\frac{7}{8} + \frac{12}{13} \approx 2$ and $4.23 \times 5.8 \approx 25$. II-D
- N. Use proportional reasoning, ratios and percents to represent problem situations and determine the reasonableness of solutions. II-C
- O. Compare, order and convert fractions, decimals and percents. II-C

Benchmarks for Standard II:

- Compare, order and convert among fractions, decimals and percents.
- Demonstrate an understanding of percents, including percents greater than 100 and less than 1.
- Apply and explain the use of prime factorization, common factors and common multiples in problem situations.
- Perform operations (addition, subtraction, multiplication and division) with fractions and mixed numbers with like and unlike denominators.

Standard III: Measurement.

- A. Understand and describe the difference between surface area and volume. III-D
- B. Use strategies to develop formulas for finding circumference and area of circles, and to determine the area of sectors; e.g., $1/2$ circle, $2/3$ circle, $1/3$ circle and $1/4$ circle. III-D
- C. Estimate perimeter or circumference and area for circles, triangles and quadrilaterals, and surface area and volume for prisms and cylinders by: III-C
 1. estimating lengths using string or links, areas using tiles or grid, and volumes using cubes;
 2. measuring attributes (diameter, side lengths, or heights) and using established formulas for circles, triangles, rectangles, parallelograms and rectangular prisms.
- D. 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. III-B

- E. 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. III-D
- F. 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. III-D.
- G. Use formulas to solve perimeter, area and circumference of triangles, circles and quadrilaterals. III-C

Benchmarks for Standard III:

- **Select a tool and measure accurately to a specified level of precision.**
- **Convert units of length, mass and time within the same measurement system.**
- **Identify appropriate formulas and apply appropriate techniques for measuring angles, perimeter and area of triangles circles, and quadrilaterals.**
- **Understand and demonstrate the independence of perimeter and area for two-dimensional shapes.**
- **Analyze and explain what happens to area and perimeter when the dimensions of an object are changed.**

Standard IV: Geometry and Spatial Sense.

- A. Use physical models to determine the sum of the interior angles of triangles and quadrilaterals. IV-D, I-E
- B. 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. IV-A
- C. Use standard language to define geometric vocabulary: vertex, face, altitude, diagonal, isosceles, equilateral, acute, obtuse and other vocabulary as appropriate. IV-G
- D. Use multiple classification criteria to classify triangles; e.g., right scalene triangle. IV-A
- E. Identify and define relationships between planes; i.e., parallel, perpendicular and intersecting. IV-A

- F. Predict and describe sizes, positions and orientations of two-dimensional shapes after transformations such as reflections, rotations, translations and dilations. IV-F
- G. 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. IV-E
- H. Build three-dimensional objects with cubes, and sketch the two-dimensional representations of each side; i.e., projection sets. IV-E
- I. Extend understanding of coordinate system to include points whose x or y values may be negative numbers. IV-B
- J. Draw circles and identify and determine the relationships among radius, diameter, center and circumference. IV-A

Benchmarks for Standard IV:

- **Draw circles, and identify and determine the relationships among radius, diameter, center and circumference.**
- **Predict and describe results (size, position, orientation) of transformations of two-dimensional figures.**

Standard V: Patterns, Functions and Algebra.

- A. Represent and analyze patterns, rules and functions, using physical materials, tables and graphs. V-D
- B. Use words and symbols to describe numerical and geometric patterns, rules and functions. V-G
- C. 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 $2l + 2w$. V-I
- D. Solve simple linear equations and inequalities using physical models, paper and pencil, tables and graphs. V-J
- E. Produce and interpret graphs that represent the relationship between two variables. V-D
- F. Evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations. V-I,L

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

Benchmarks for Standard V:

- **Represent, analyze and generalize a variety of patterns and functions with tables, graphs, words and symbolic rules.**
- **Use symbolic algebra to represent and explain mathematical relationships.**
- **Use formulas in problem-solving situations.**

Standard VI: Data Analysis and Probability.

- A. Read, construct and interpret line graphs, circle graphs and histograms. VI-B
- B. Select, create and use graphical representations that are appropriate for the type of data collected. VI-B
- C. Compare representations of the same data in different types of graphs, such as a bar graph and circle graph. VI-C
- D. Understand the different information provided by measures of center (mean, mode and median) and measures of spread (range). VI-C
- E. 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. VI-B
- F. Make logical inferences from statistical data. VI-F
- G. Design an experiment to test a theoretical probability and explain how the results may vary. VI-G

Benchmarks for Standard VI:

- **Read, create and use line graphs and histograms.**
- **Evaluate interpretations and conclusions as additional data are collected, modify conclusions and predictions, and justify new findings.**
- **Determine and use the range, mean, median and mode to analyze and compare data, and explain what each indicates about the data.**

- Describe the probability of an event using ratios, including fractional notation.
- Make and justify predications based on experimental and theoretical probabilities.

Key to using this document:

- **Items in bold with Roman numerals are COS standards.**

- **Items in bold without Roman numerals are benchmarks.**

- Items in regular print are state grade level indicators with the COS letter/number correlation.

- *Items in italics are in the diocesan course of study, not state standards.*