

ISPS Math Standards & Benchmarks

(Adapted from AERO standards)

Grade 5

(Revised Sept. 2009)

Process Standards

1. Problem Solving
2. Reasoning, Proof, and Connection
3. Communication and Representation
4. Technology

Strands

1. Number Sense
2. Measurement and Geometry
3. Algebra
4. Data Analysis and Probability

Process Standards

Problem Solving:

Standard 1 - Students will apply a wide variety of mathematical concepts, processes, and skills to solve a broad range of problems in various content areas and everyday situations.

Benchmarks - By the end of Grade 5, students will:

- 1 – 1 Know how to select and use mathematical tools and methods (such as manipulatives, mental math, computer, and paper-and-pencil techniques) as a part of the problem-solving process.
- 1 – 2 Develop and apply a variety of problem-solving strategies (for example, make an organized list, guess-and-check) and justify choice of strategies.
- 1 – 3 Interpret results in the context of the problem being solved (for example, when determining the number of buses necessary to transport students, the remainder must be rounded up).
- 1 – 4 Differentiate between relevant and irrelevant information
- 1 – 5 Understand how to break a complex problem into simpler parts.

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Reasoning, Proof and Connection:

Standard 2 - Students will apply mathematical reasoning skills to investigate, evaluate, justify, and connect approaches and solutions to situations in mathematics and in other disciplines.

Benchmarks - By the end of Grade 5, students will:

- 2 – 1 Describe the connections and translate between various representations of equivalent numbers (such as $\frac{3}{3} = 1$, 10% of a dollar = 1 dime)..
- 2 – 2 Use models, number facts, properties, and relationships to check and verify predictions and explain reasoning.
- 2 – 3 Given a rule or generalization, determine whether the example fits
- 2 – 4 Draw logical conclusions about mathematical situations using informal inductive and deductive reasoning (e.g., observing that the angles of several triangles add up to 180 degrees and concluding that the angles of all triangles add up to 180 degrees; concluding that since all rectangles have 4 90-degree corners, a square must be a rectangle).
- 2 – 5 Interpret statements made with the precise language of logic (such as all, every, none, some).
- 2 – 6 Independently apply mathematical concepts to other content areas such as science, geography, and music.

Communication and Representation:

Standard 3 - Students will understand mathematical information presented and obtained in a variety of ways and will accurately and clearly present and justify mathematical ideas in diverse formats.

Benchmarks - By the end of Grade 5, students will:

- 3 – 1 Identify, communicate, and model key mathematical concepts and situations using oral, written, concrete, pictorial, and graphic methods, making certain that the situation is represented clearly and accurately.
- 3 – 2 Explain and justify mathematical ideas, strategies, and solutions to others, using the correct mathematical vocabulary.
- 3 – 3 Demonstrate an ability to understand alternative strategies or explanations.

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Technology:

Standard 4 - Students will select and use a wide variety of tools and technology to support and validate mathematical results, when appropriate.

Benchmarks - By the end of Grade 5, students will:

- 4 – 1 Use calculators or software to verify estimations and in problem-solving situations.
- 4 – 2 Use technology to gather, analyze, and display mathematical data and information.

STRAND1- NUMBER SENSE and OPERATIONS

Standard 5 - Students will understand and apply numbers, ways of representing numbers, relationships among numbers, and number systems.

Benchmarks - By the end of Grade 5, students will:

- 5 – 1 Model and connect physical, verbal, and symbolic representations of fractions, decimals, percentages, whole numbers, and mixed numbers.
- 5 – 2 Order fractions, mixed numbers, decimals, and whole numbers using physical, verbal, and symbolic representations.
- 5 – 4 Use concepts of negative numbers in concrete situations (such as on a number line, with temperature).
- 5 – 5 Identify and describe different uses for the same numerical representation (for example, $\frac{1}{4}$ can represent a fraction, a division problem) and different representations for the same number (for example, 2,343 is the same as $2,000 + 300 + 40 + 3$; 1 equals $\frac{16}{16}$; and exponential form).
- 5 – 6 Use, model, and identify place value and describe its relationship to a billion.
- 5 – 7 Demonstrate that mathematical operations can represent a variety of problem situations (for example, multiplication can represent repeated addition and a model for finding area).
- 5 – 8 Explain the relative effect of operations with fractions and decimals (for example, what happens to 10 when you divide by or multiply by .75).
- 5 – 9 Explain, compare, and use properties of operations and relationships among operations.
- 5 – 10 Explain and apply number theory concepts (such as primes, multiples, and composites).
- 5 – 11 Read, write, and order numbers to hundreds of a million.

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Standard 6 - Students will estimate, compute, and assess reasonableness of solutions.

Benchmarks - By the end of Grade 5, students will:

- 6 – 1 Demonstrate proficiency with and memorize multiplication and division facts through 12.
- 6 – 2 Select and use the most efficient computational methods, choosing among concrete materials, paper and pencil, estimation, mental computation, and calculators.
- 6 – 3 Create and solve practical problems involving addition, subtraction, multiplication, and division of whole numbers, fractions, mixed numbers and percentages.
- 6 – 4 Develop, analyze, and compare algorithms for computing with fractions, decimals, percents, and integers and compute with them efficiency and accuracy, including in multi-step problems that require application of order of operations.
- 6 – 5 Know and convert among fractions, decimals, and percents for $\frac{1}{10}$, $\frac{1}{5}$, $\frac{_}{_}$, and $\frac{_}{_}$.
- 6 – 6 Apply beginning number theory including identifying and using multiples, factors, divisibility, properties of identity (zero and one), and prime and composite numbers.
- 6 – 7 Apply, explain, and assess the appropriateness of a variety of estimation strategies (such as rounding to compatible numbers).
- 6 – 8 Use various forms of estimation, including rounding, to determine the reasonableness of calculated answers; determine if an estimate is too high or too low.
- 6 – 9 Use a variety of strategies to make change and solve problems using U.S. and host country's currency, and to convert between host country and U.S. currency.

STRAND 2- MEASUREMENT and GEOMETRY

Standard 7 - Students will estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools, and technologies.

Benchmarks - By the end of Grade 5, students will:

- 7 – 1 Select and use appropriate instruments and customary and metric units for measuring quantities, including perimeter, volume, area, weight, time, and temperature, with specified accuracy; match tools with the attribute they measure (for example, rulers measure length, thermometers measure temperature).

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- 7 – 2 Understand and apply formulas for finding perimeter, volume of simple solids (excluding cylinders), and area.
- 7 – 3 Add and subtract measurements (e.g., 12 m. – 6.2 m.).
- 7 – 4 Identify and use equivalent measurements as required by the situation (for example, 60 minutes = 1 hour, 7 days = 1 week).
- 7 – 5 Identify the approximate size of basic standard units of measurement and the relationship between them (for example, there are 100 centimeters in a meter).
- 7 – 6 Solve calendar problems involving days, weeks, months, and years.
- 7 – 7 Determine and compare elapsed time using AM and PM and a 24-hour clock.

Standard 8 - Students will use spatial reasoning and apply the properties and relationships of geometric figures to represent, investigate, analyze, and solve problems.

Benchmarks - By the end of Grade 5, students will:

- 8– 1 Locate and describe objects in terms of their position with and without compass directions; identify coordinates for a given point or locate points of given coordinates on a single quadrant grid.
- 8 – 2 Compare, contrast, and describe plane and solid figures and shapes using their attributes (such as number of sides, parallel or perpendicular sides, number of vertices, classification of angles).
- 8 – 3 Sketch and identify line segments, midpoint, intersections, and parallel and perpendicular lines.
- 8 – 4 Identify, draw, and measure, using a protractor, right, obtuse, and acute angles and their parts, including rays, points, and vertices.
- 8 – 5 Identify and model geometric figures that are congruent, similar, or symmetrical or some combination of these properties.
- 8– 6 Identify the diameter, radius, chord and circumference of a circle.
- 8– 7 Determine area and perimeter, finding both using a variety of methods
- 8 – 8 Analyze and model transformations of geometric figures and rotations of line segments, describing the motions as slides, flips or rotations.
- 8 – 9 Use a compass.

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STRAND 3- ALGEBRA

Standard 9-Students will use algebraic methods to represent, analyze, and solve abstract and practical mathematical situations involving patterns and functional relationships.

Benchmarks - By the end of Grade 5, students will:

- 9 – 1 Use rules and variables to describe and solve patterns, functions, and other relationships and to solve equations.
- 9 –2 Solve simple equations using methods such as inverse operations, mental math, and guess-and-check.
- 9– 3 Use concrete objects and combinations of symbols and numbers to create expressions that model mathematical situations.

STRAND 4- DATA ANALYSIS and PROBABILITY

Standard 10 - Students will pose a question, collect, organize, analyze, and represent data in order to make decisions and predictions.

Benchmarks – By the end of Grade 5, students will:

- 10– 1 . Solve problems that involve systematically collecting, organizing, and analyzing data.
- 10– 2 Discuss the appropriateness of different types of data displays, and use a variety of displays (such as line, bar, double bar and charts).
- 10 – 3 Use data to calculate the arithmetic mean, median, mode andrange.

Standard 11 - Students will understand and apply basic concepts of probability.

Benchmarks – By the end of Grade 5, students will:

- 11 – 1 Make predictions based on intuitive, experimental, and theoretical probabilities.
- 11– 2 Conduct simple probability experiments using concrete materials (e.g. tossing one or more coins, spinning a spinner of even or uneven divisions, drawing objects from a container with and without replacement) and represent the results using fractions and probability.
- 11 - 3 Find all possible outcomes of a simple experiment using straightforward methods (such as organized lists, tree diagrams).