

Math

GRADE 7

STANDARD 1

The student understands and applies the concepts and procedures of *number and operations*.

To meet this standard, the student will:

Benchmark 7.1.1: Compare, order, and represent decimals, integers, fractions, percents, multiples, factors, absolute value, and square roots

Indicators:

- 7.1.1.1 Compare and order decimals (e.g., on a number line)
- 7.1.1.2 Compare and order integers (e.g., on a number line)
- 7.1.1.3 Compare and order fractions (e.g., on a number line)
- 7.1.1.4 Compare and order percents, esp. as they relate to decimals and fractions
- 7.1.1.5 Convert among fractions, decimals, and percents
- 7.1.1.6 Memorize the fraction, decimal and percent equivalents for denominators of 2 - 10
- 7.1.1.7 Represent composite numbers as prime factorizations
- 7.1.1.8 Generate multiples and factors of given numbers
- 7.1.1.9 Identify numbers as part of the number system

Benchmark 7.1.2: Understand and explain operations with decimals

Indicator:

- 7.1.2.1 Add, subtract, multiply and divide decimals without calculators

Benchmark 7.1.3: Understand and explain operations with integers

Indicators:

- 7.1.3.1 Represent the addition and subtraction of integers using concrete materials, drawings, and symbols
- 7.1.3.2 Add, subtract, multiply and divide integers, with and without the use of manipulatives

Benchmark 7.1.4: Understand and explain operations with fractions

Indicators:

- 7.1.4.1 Convert among equivalent fractions
- 7.1.4.2 Demonstrate an understanding of operations with fractions using manipulatives
- 7.1.4.3 Add and subtract fractions with simple denominators using concrete materials, drawings, and symbols
- 7.1.4.4 Relate the repeated addition of fractions with simple denominators to the multiplication of a fraction by a whole number (e.g., $1/2 + 1/2 + 1/2 = 3 \times 1/2$)
- 7.1.4.5 Add, subtract, multiply, and divide fractions using the rules of fractions

Key: 1, Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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Benchmark 7.1.5: Demonstrate an understanding of the order of operations, including brackets

Indicator:

- 7.1.5.1 Demonstrate an understanding of the order of operations with brackets and apply the order of operations in evaluating expressions that involve whole numbers and decimals (without calculators)

Benchmark 7.1.6: Understand and explain that exponents represent repeated multiplication

Indicators:

- 7.1.6.1 Understand that repeated multiplication can be represented as exponents (e.g., in the context of area and volume)
- 7.1.6.2 Represent perfect squares and their square roots in a variety of ways (e.g., by using blocks, grids)
- 7.1.6.3 Convert numbers written in standard form and in scientific notation

Benchmark 7.1.7: Use estimation to justify or assess the reasonableness of calculations

Indicators:

- 7.1.7.1 Justify the choice of method for calculations: estimation, mental computation, concrete materials, pencil and paper, algorithms (rules for calculations), or calculators
- 7.1.7.2 Estimate reasonableness of calculations with decimals, fractions, and percents

Benchmark 7.1.8: Solve and explain multi-step problems involving simple fractions, decimals, and percents

Indicators:

- 7.1.8.1 Perform three-step problem solving that involves whole numbers and decimals related to real-life experiences
- 7.1.8.2 Solve problems that involve converting among fractions, decimals, and percents
- 7.1.8.3 Solve problems involving fractions and decimals using the appropriate strategies and calculation methods
- 7.1.8.4 Solve problems involving percents, using the appropriate strategies and calculation methods

Benchmark 7.1.9: Explain the process of problem solving using appropriate mathematical language

Indicators:

- 7.1.9.1 Explain numerical information in their own words and respond to numerical information in a variety of media
- 7.1.9.2 Ask "what if" questions; pose problems involving simple fractions, decimals, and percents; and investigate solutions
- 7.1.9.3 Explain the process used and any conclusions reached in problem solving and investigations
- 7.1.9.4 Reflect on learning experiences and describe their understanding using appropriate mathematical language
- 7.1.9.5 Use a calculator to solve number questions that are beyond the proficiency expectations for operations using pencil and paper

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STANDARD 2

The student understands and applies the concepts and procedures of *algebra*.

To meet this standard, the student will:

Benchmark 7.2.1: Identify the relationships between whole numbers and variables

Indicators:

- 7.2.1.1 Interpret a variable as a symbol that may be replaced by a given set of numbers
- 7.2.1.2 Evaluate simple algebraic expressions by substituting natural numbers for the variables
- 7.2.1.3 Identify and understand the properties of algebra (commutative, associative, identity, zero)

Benchmark 7.2.2: Identify, extend, and create patterns (using whole numbers and variables)

Indicators:

- 7.2.2.1 Describe patterns in a variety of sequences using the appropriate language and supporting materials
- 7.2.2.2 Extend a pattern, complete a table, and write words to explain the pattern
- 7.2.2.3 Recognize patterns and use them to make predictions
- 7.2.2.4 Present solutions to patterning problems and explain the thinking behind the solution process
- 7.2.2.5 Combine like terms

Benchmark 7.2.3: Identify, create, and solve simple algebraic equations

Indicators:

- 7.2.3.1 Establish that a solution to an equation makes the equation true (limit to equations with one variable)
- 7.2.3.2 Solve equations of the form $ax = c$, $x + b = c$, and $ax + b = c$ by inspection, systematic trial and the T-method
- 7.3.2.3 Solve problems giving rise to first-degree equations with one variable

Benchmark 7.2.4: Apply patterning strategies to problem-solving situations

Indicators:

- 7.2.4.1 Write statements to interpret simple algebraic expressions, formulas, and equations
- 7.2.4.2 Translate verbal statements into algebraic expressions or equations

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Benchmark 7.2.5: Understand the relationship between an equation and a point or set of points on a graph

Indicators:

- 7.2.5.1 Recognize the relationship between an ordered pair and a solution to an equation
- 7.2.5.2 Graph ordered pairs and identify ordered pairs from a graph in the coordinate plane

Benchmark 7.2.6: Understand and apply proportions to a variety of problem situations

Indicators:

- 7.2.6.1 Identify rates and ratios
- 7.2.6.2 Solve proportions for missing values
- 7.2.6.3 Solve problems using proportions like similar figures or conversion situations
- 7.2.6.4 Convert units of measurement, money etc. using idea of rates (dimensional analysis)

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STANDARD 3

The student understands and applies the concepts and procedures of *geometry*.

To meet this standard, the student will:

Benchmark 7.3.1: Identify, describe, compare, and classify geometric figures

Indicators:

- 7.3.1.1 Identify basic geometric figures in a plane (such as point, line, ray, segment, plane, parallel and perpendicular, etc.)
- 7.3.1.2 Classify basic geometric shapes like angles, triangles, quadrilaterals, and other polygons
- 7.3.1.3 Identify the parts of a circle

Benchmark 7.3.2: Identify congruent and similar figures

Indicators:

- 7.3.2.1 Explain why two shapes are congruent
- 7.3.2.2 Solve problems involving the congruence of shapes

Benchmark 7.3.3: Explore transformations of geometric figures

Indicators:

- 7.3.3.1 Understand, apply, and analyze key concepts in transformational geometry using concrete materials and drawings
- 7.3.3.2 Recognize the image of a two-dimensional shape under a translation, a reflection, and a rotation in a variety of contexts
- 7.3.3.3 Create and analyze designs that include translated, rotated, and reflected two-dimensional images using concrete materials and drawings, and using appropriate computer applications
- 7.3.3.4 Identify whether a figure will tile a plane
- 7.3.3.5 Construct and analyze tiling patterns with congruent tiles

Benchmark 7.3.4: Use mathematical language effectively to describe geometric concepts, reasoning, and investigations

Indicator:

- 7.3.4.1 Describe designs in terms of images that are congruent, translated, rotated, and reflected

Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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STANDARD 4

The student understands and applies the concepts and procedures of *measurement*.

To meet this standard, the student will:

Benchmark 7.4.1: Demonstrate a verbal and written understanding of and ability to apply accurate measurement strategies that relate to their environment

Indicators:

- 7.4.1.1 Create definitions of measurement concepts
- 7.4.1.2 Describe measurement concepts using appropriate measurement vocabulary
- 7.4.1.3 Measure angles and calculate angle measures in polygons
- 7.4.1.4 Make increasingly more informed and accurate measurement estimations based on an understanding of formulas and the results of investigations

Benchmark 7.4.2: Identify relationships between and among measurement concepts (linear, square, cubic, temporal)

Indicators:

- 7.4.2.1 Identify the relationship among a base edge, area and volume as related to their units
- 7.4.2.2 Convert among the metric system units
- 7.4.2.3 Convert among the American standard measuring units for capacity, length, and weight

Benchmark 7.4.3: Solve problems related to the calculation and comparison of the perimeter and the area of regular and irregular two-dimensional shapes

Indicators:

- 7.4.3.1 Understand that irregular two-dimensional shapes can be decomposed into simple two-dimensional shapes to find the area and perimeter
- 7.4.3.2 Estimate and calculate the perimeter and area of a regular and irregular two-dimensional shape (e.g., triangle, quadrilateral, trapezoid, hexagon)
- 7.4.3.3 Develop and apply the formulas for finding the area of a triangle, parallelogram, trapezoid, circles, etc.
- 7.4.3.4 Develop the formula for finding the surface area of a rectangular prism using nets

Benchmark 7.4.4: Apply volume formulas to problem-solving situations involving rectangular prisms

Indicators:

- 7.4.4.1 Develop the formula for finding the volume of a rectangular prism (area of base x height) using concrete materials
- 7.4.4.2 Understand the relationship between the dimensions and the volume of a rectangular prism
- 7.4.4.3 Calculate the surface area and the volume of a rectangular prism in a problem-solving context

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STANDARD 5

The student understands and applies the concepts and procedures of *data analysis and probability*.

To meet this standard, the student will:

Benchmark 7.5.1: Systematically collect and organize data

Indicators:

- 7.5.1.1 Collect and organize data on tally charts and stem-and-leaf plots, and display data on frequency tables and histograms, using simple data collected by the students (primary data) and more complex data collected by someone else (secondary data)
- 7.5.1.2 Understand how tally charts and frequency tables can be used to record data
- 7.5.1.3 Display data on bar graphs, pictographs, and circle graphs, with and without the help of technology
- 7.5.1.4 Use conventional intervals, symbols, titles, and labels when displaying data

Benchmark 7.5.2: Interpret displays of data and present the information using mathematical terms

Indicators:

- 7.5.2.1 Describe data using calculations of mean, median, and mode
- 7.5.2.2 Understand that each measure of central tendency (mean, median, mode) gives different information about the data
- 7.5.2.3 Identify and describe trends in graphs, using informal language to identify growth, clustering, and simple attributes (e.g., line graphs that level off)
- 7.5.2.4 Describe the distribution of data in terms of center, shape and extremes as presented on tally charts, stem-and-leaf plots, frequency tables, and histograms
- 7.5.2.5 Explain data in terms of direction in a scatter plot
- 7.5.2.6 Create and understand box-and-whisker plots

Benchmark 7.5.3: Evaluate data and make conclusions from the analysis of data

Indicator:

- 7.5.3.1 Read and report information about data presented on bar graphs, pictographs, circle graphs and line graphs, and use the information to solve problems

Benchmark 7.5.4: Develop an appreciation for statistical methods as a powerful means of decision making

Indicators:

- 7.5.4.1 Demonstrate the pervasive use of data and probability
- 7.5.4.2 Understand the impact that statistical methods have on decision making
- 7.5.4.3 Analyze bias in data-collection methods

Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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