

# Math

## GRADE 6

### STANDARD 1

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

To meet this standard, the student will:

**Benchmark 6.1.1: Represent, and explore the relationships among decimals, percents, multiples, factors, rates, and ratios using concrete materials and drawings**

**Indicators:**

- 6.1.1.1 Recognize and read numbers from 0.0001 to any number greater than 1,000,000
- 6.1.1.2 Read and write whole numbers, integers and decimals in standard, expanded, and exponential forms
- 6.1.1.3 Represent the place value of whole numbers and decimals from 0.0001 to 1,000,000 using concrete materials, drawings, and symbols
- 6.1.1.4 Read and write decimal numbers to millionths
- 6.1.1.5 Represent and convert numbers in scientific notation and standard form
- 6.1.1.6 Explore the relationships between fractions, decimals, and simple percents using a calculator, concrete materials, and drawings
- 6.1.1.7 Relate fractions to decimals, percents, rates, and ratios using concrete materials, drawings, and symbols
- 6.1.1.8 Identify and describe the characteristics of multiples and factors, and composite and prime numbers, to 100
- 6.1.1.9 Use skip counting to assist in solving questions about factors and denominators
- 6.1.1.10 Identify Lowest Common Multiple and Greatest Common Factor of a set of numbers
- 6.1.1.11 Represent whole numbers as prime factorization
- 6.1.1.12 Represent whole numbers using exponents
- 6.1.1.13 Demonstrate an understanding of ratio and rate

**Benchmark 6.1.2: Compare and order decimals, percents, rates, and ratios using concrete materials and drawings**

**Indicators:**

- 6.1.2.1 Compare and order whole numbers and decimals from 0.0001 to 1,000,000 using concrete materials, drawings, and symbols
- 6.1.2.2 Order fractions and decimals on any number line

**Benchmark 6.1.3: Compare and order, the relationship, of mixed numbers, improper and proper fractions with like and unlike denominators using concrete materials and drawings**

**Indicators:**

- 6.1.3.1 Write and simplify equivalent fractions
- 6.1.3.2 Compare and order mixed numbers, proper and improper fractions with like and unlike denominators using concrete materials drawings and symbols

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**Benchmark 6.1.4: Understand and use basic operations (addition, subtraction, multiplication and division)**

**Indicators:**

- 6.1.4.1 Add and subtract decimal numbers to thousandths
- 6.1.4.2 Multiply and divide decimals without a calculator
- 6.1.4.3 Multiply and divide decimal numbers to thousandths by a one or two digit whole number
- 6.1.4.4 Multiply and divide a decimal to thousandths by a decimal
- 6.1.4.5 Add and subtract fractions with like and unlike denominators
- 6.1.4.6 Add and subtract mixed numbers
- 6.1.4.7 Multiply and divide with fractions
- 6.1.4.8 Use order of operations to simplify multi-step operations
- 6.1.4.9 Estimate and calculate percent (e.g., find the percent of blue balls in a box)

**Benchmark 6.1.5 Justify and verify the method chosen for calculations with whole numbers, fractions, decimals, and percents**

**Indicators:**

- 6.1.5.1 Justify the choice of method for calculations: estimation, mental computation, concrete materials, algorithms, or calculators
- 6.1.5.2 Justify the choice of method for problem solving
- 6.1.5.3 Use a variety of strategies for problem solving
- 6.1.5.4 Estimate solutions using a variety of strategies for reasonableness
- 6.1.5.5 Use and verify estimation strategies (e.g., rounding) to determine the reasonableness of solutions to problems
- 6.1.5.6 Explain processes and solutions with fractions and decimals using mathematical language
- 6.1.5.7 Pose problems involving whole numbers, decimals, and percents, and solve them using the appropriate calculation method: pencil and paper, or calculator or computer (e.g., using a calculator, calculate how many people live within a square kilometer on an island that is 127 km<sup>2</sup> and has a population of 12,453,000)
- 6.1.5.8 Explain their thinking when solving problems involving whole numbers, fractions, decimals, and percents (e.g., explain the calculation of the average rainfall for the month of April in Toronto)

**Benchmark 6.1.6: Be proficient at mental calculations**

**Indicators:**

- 6.1.6.1 Recall multiplication and division facts to 12 x 12
- 6.1.6.2 Identify the halves, thirds, fourths, and tenths as fractions, decimals and percents
- 6.1.6.3 Multiply whole numbers by 0.1, 0.01, and 0.001
- 6.1.6.4 Mentally multiply decimals by 1000
- 6.1.6.5 Mentally divide decimals by 100
- 6.1.6.6 Use mental computation strategies to solve number problems (e.g.,  $5 \times 13 = [5 \times 10] + [5 \times 3]$ )

**Benchmark 6.1.7: Understand the significance of numbers in the greater world and evaluate the use of numbers in the media**

**Indicators:**

- 6.1.7.1 Solve problems involving percents
- 6.1.7.2 Identify the use of number in various careers
- 6.1.7.3 Identify real-world applications of integers (e.g., reading below-zero temperatures)
- 6.1.7.4 Identify, interpret, and evaluate the use of numbers in the media
- 6.1.7.5 Discuss the use of numbers in the Bible

*Key: 1. Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator*

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# Math

## GRADE 6

### STANDARD 2

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

To meet this standard, the student will:

**Benchmark 6.2.1: Recognize and discuss the mathematical relationships among patterns**

**Indicators:**

- 6.2.1.1 Recognize relationships and use them to summarize and generalize patterns (e.g., in the number pattern 1, 2, 4, 8, 16 . . . recognize and report that each term is double the term before it)
- 6.2.1.2 Use and explain the addition and multiplication properties (commutative, associative, identity, zero, and distributive)

**Benchmark 6.2.2: Identify, extend, and create patterns (in a variety of contexts)**

**Indicators:**

- 6.2.2.1 Identify, extend, and create patterns that identify changes in terms of two variables (e.g. 1, 3, 7, 15, 31 . . . double the previous term and add one)
- 6.2.2.2 Given a rule expressed in mathematical language, extend a pattern
- 6.2.2.3 Identify examples of patterns from the Bible

**Benchmark 6.2.3: Analyze and discuss patterning rules**

**Indicators:**

- 6.2.3.1 Describe patterns encountered in any context (e.g., elevation maps, newspapers)
- 6.2.3.2 Analyze number patterns and state the rule for any relationships
- 6.2.3.3 Discuss and defend the choice of a pattern rule
- 6.2.3.4 Translate between verbal and algebraic expressions and equations

**Benchmark 6.2.4: Display pattern relationships graphically and numerically**

**Indicators:**

- 6.2.4.1 Make models of the patterns, and create charts to display the patterns
- 6.2.4.2 State a rule (equation) for the relationship between terms in a given data table of values (function)

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**Benchmark 6.2.5: Apply patterning strategies to problem-solving situations**

**Indicators:**

- 6.2.5.1 Identify and extend patterns to solve problems in meaningful contexts (e.g., notes in music, patterns on graphs)
- 6.2.5.2 Pose and solve problems by recognizing a pattern (e.g., comparing the perimeters of rectangles with equal area)

**Benchmark 6.2.6: Identify and solve simple algebraic equations**

**Indicators:**

- 6.2.6.1 Determine the value of a missing term or factor in simple formulas using guess-and-test methods, with and without the use of calculators.
- 6.2.6.2 Identify and evaluate expression
- 6.2.6.3 Solve addition/subtraction equations with whole numbers, integers, and fractions
- 6.2.6.4 Solve multiplication and division equations with whole numbers, integers, and fractions

**Benchmark 6.2.7: Understand and apply proportions to a variety of situations**

**Indicators:**

- 6.2.7.1 Solve simple rate and ratio problems.
- 6.2.7.2 Solve proportions for missing values
- 6.2.7.3 Solve problems using proportions like similar figures and conversion problems

# Math

## GRADE 6

### STANDARD 3

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

To meet this standard, the student will:

**Benchmark 6.3.1: Identify, describe, compare, and classify geometric figures**

**Indicators:**

- 6.3.1.1 Identify and name basic geometric figures in a plane (such as point, line, plane, segment, ray, angle)
- 6.3.1.2 Sort regular polygons according to the angles and sides
- 6.3.1.3 Classify two-dimensional shapes according to angle and side properties (e.g., acute, isosceles)
- 6.3.1.4 Describe the relationships of lines and angles
- 6.3.1.5 Identify parts of a circle

**Benchmark 6.3.2: Identify congruent and similar figures**

**Indicators:**

- 6.3.2.1 Demonstrate an understanding of similar and congruent figures
- 6.3.2.2 Demonstrate congruence of figures by measuring angles and sides and matching corresponding parts
- 6.3.2.3 Use proportions/similar figures to find unknown measures
- 6.3.2.4 Construct congruent and similar two-dimensional shapes given specific measures of angles and sides, using a protractor

**Benchmark 6.3.3: Explore transformations of geometric figures**

**Indicators:**

- 6.3.3.1 Apply and analyze translations, reflections, and rotations in a variety of geometric contexts
- 6.3.3.2 Visualize and describe the effect of translations, reflections, and rotations (more than one transformation)

**Benchmark 6.3.4: Investigate the attributes, draw, and construct three-dimensional geometric figures**

**Indicators:**

- 6.3.4.1 Identify nets for a variety of polyhedra from drawings by visualizing the two-dimensional faces of the three-dimensional figures
- 6.3.4.2 Identify the parts of polyhedrons (edge, base, face, etc.)
- 6.3.4.3 Sketch the net for a three-dimensional figure by looking at a three-dimensional figure

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**Benchmark 6.3.5: Use mathematical language effectively to describe geometric concepts, reasoning, and investigations, and coordinate systems**

**Indicators:**

- 6.3.5.1 Demonstrate an understanding of coordinates in a Cartesian plane in all four quadrants and plot points.
- 6.3.5.2 Use mathematical language to describe geometric ideas (e.g., obtuse-angled triangle, triangular prism)
- 6.3.5.3 Estimate the size of angles within a reasonable range
- 6.3.5.4 Recognize and describe in mathematical language the occurrence and application of geometric properties and principles in the everyday world
- 6.3.5.5 Discuss geometric concepts with peers and use mathematical language to explain their understanding of the concepts
- 6.3.5.6 Explain, make conjectures about, and articulate hypotheses about geometric properties and relationships

# Math

## GRADE 6

### STANDARD 4

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

To meet this standard, the student will:

**Benchmark 6.4.1: Demonstrate an understanding of and ability to apply appropriate metric prefixes in measurement and estimation activities**

**Indicators:**

- 6.4.1.1 Use prefixes in the metric system correctly
- 6.4.1.2 Select the most appropriate standard unit (millimeter, centimeter, decimeter, meter, or kilometer) to measure linear dimensions and the perimeter of irregular polygons
- 6.4.1.3 Determine the relationship between milligrams, grams, and kilograms

**Benchmark 6.4.2: Identify relationships among measurement concepts (linear, square, cubic, temporal)**

**Indicators:**

- 6.4.2.1 Determine the relationship between linear, square, and cubic units (e.g., compare cubic centimeters and cubic meters by constructing a cubic meter with rolled newspaper)
- 6.4.2.2 Make simple conversions among metric units (e.g., meters to kilometers, grams to kilograms)
- 6.4.2.3 Convert among linear units (American)
- 6.4.2.4 Relate time and distance and speed: kilometers per hour
- 6.4.2.5 Convert measures of time and temperature
- 6.4.2.6 Measure angles accurately with a protractor

**Benchmark 6.4.3: Solve problems related to the calculation and comparison of the perimeter and the area of regular and irregular polygons**

**Indicators:**

- 6.4.3.1 Solve problems involving perimeter of polygons
- 6.4.3.2 Relate dimensions of rectangles and area to factors and products (e.g., in a rectangle 2 cm by 3 cm the side lengths are factors and the area,  $6\text{ cm}^2$ , is the product of the factors)
- 6.4.3.3 Estimate the area of irregular shapes using a grid
- 6.4.3.4 Understand the relationship between the area of a parallelogram and the area of a rectangle, between the area of a triangle and the area of a rectangle, and between the area of a triangle and the area of a parallelogram, and between the area of a trapezoid and a parallelogram
- 6.4.3.5 Estimate and calculate the areas of a parallelogram, a triangle, and a trapezoid using a formula
- 6.4.3.6 Understand the relationship between area and lengths of sides and between perimeter and lengths of sides for squares, rectangles, triangles, parallelograms and trapezoids
- 6.4.3.6 Solve problems involving circumference and area of circles

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**Benchmark 6.4.4: Estimate, measure, and record the mass of objects and the volume of prisms, and compare the measures**

**Indicators:**

- 6.4.4.1 Estimate and calculate the volume and surface area of rectangular prisms
- 6.4.4.2 Develop rules for calculating the volume and surface area of rectangular prisms, generalize rules, and develop formulas (e.g., volume = surface area of the base x height)
- 6.4.4.3 Select among commonly used SI units of length, mass, capacity, area, and volume in solving problem
- 6.4.4.4 Find the volume of cylinders

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## GRADE 6

### STANDARD 5

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

To meet this standard, the student will:

**Benchmark 6.5.1: Systematically collect and organize data**

**Indicators:**

- 6.5.1.1 Design surveys, organize the data into self-selected categories and ranges, and record the data on spreadsheets or tally charts
- 6.5.1.2 Construct tables, line plots, bar graphs, histograms, line graphs and stem-and-leaf plots by hand

**Benchmark 6.5.2: Interpret displays of data and present the information using mathematical language**

**Indicators:**

- 6.5.2.1 Explain how the choice of intervals affects the appearance of data (e.g., in comparing two graphs drawn with different intervals by hand or by using graphing calculators or computers)
- 6.5.2.2 Calculate the mean, median, mode and range of a set of data
- 6.5.2.3 Identify any outliers in a set of data
- 6.5.2.4 Recognize misleading displays of data

**Benchmark 6.5.3: Evaluate data and make conclusions from the analysis of data**

**Indicators:**

- 6.5.3.1 Evaluate and explore how data were collected and how the results represent the population
- 6.5.3.2 Recognize that different types of graphs can present the same data differently (e.g., a circle graph will show the relationship between the data and a part of the data, a bar graph will show the relationship between separate parts of the data)
- 6.5.3.3 Make inferences and convincing arguments based on the analysis of tables, charts, and graphs

**Benchmark 6.5.4: Demonstrate an understanding of probability concepts**

**Indicators:**

- 6.5.4.1 Use tree diagrams to record the results of systematic counting
- 6.5.4.2 Show an understanding of probability in making relevant decisions (e.g., the probability of tossing a head with a coin is not dependent on the previous toss)

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**Benchmark 6.5.5: Compare experimental probability results with theoretical results**

**Indicators:**

- 6.5.5.1 Connect the possible events and the probability of a particular event (e.g., in flipping a coin, there are two possibilities; in rolling a die, there are six possibilities)
- 6.5.5.2 Examine experimental probability results in the light of theoretical results

*Key: 1, Grade 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator*

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