

Mathematics

Learning Outcomes

Kindergarten

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Demonstrates a variety of ways to solve math problems.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

CPS Construct number meaning by using objects and pictures to represent concepts of number.

K.N.1 Count a set of 1 to 20 objects.

MfA Compare two sets of objects using one-to-one correspondence.

K.N.2 Represent quantities to 10, physically, pictorially, and symbolically.

K.N.2 Read and write numerals to 10.

K.N.2 Compare and order sets of objects using appropriate terms (same, more, less).

MfA Develop understanding of the operations of addition and subtraction as joining together and taking apart.

K.N.7 Represent and solve addition and subtraction situations, using objects and pictures, involving quantities to 6.

CPS Find combinations of numbers to 6.

PATTERNS, RELATIONS, AND ALGEBRA

K.P.1, Describe physical attributes or properties of objects and sort and classify them

K.P.2 accordingly.

K.P.3 Recognize and describe a variety of visual, verbal, motor, number and geometric patterns.

K.P.3 Reproduce, extend, and create a variety of visual, verbal, motor and geometric patterns.

Learning Outcomes **Kindergarten *Continued***

Students will

Standard #

GEOMETRY

K.G.1 Begin to recognize and name two-dimensional shapes.

K.G.2, Describe properties of two-dimensional and three-dimensional shapes.

K.G.3

CPS Fill a region with geometric shapes.

MEASUREMENT

K.M.1 Compare and order objects according to length.

K.M.2, Estimate and measure lengths of objects with nonstandard units.

K.M.3

CPS Recognize time sequences as measured by the calendar.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

MfA Pose questions and gather data to answer the questions.

MfA Represent and organize data using concrete objects, pictures, numbers, lists, **K.D.1** grids, and simple graphs.

Key to abbreviations:

CPS refers to Concord Public Schools Mathematics Program Standards.

NCTM refers to Principles and Standards for School Mathematics (Reston, VA: National Council of Teachers of Mathematics, 2000).

MfA refers to Mathematics for All, developed for Massachusetts students by Massachusetts educators.

K.N, K.P, K.G, K.M, and K.D refer to specific learning standards in the Massachusetts Mathematics Curriculum Framework, November 2000.

Mathematics Learning Outcomes Grade 1

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Choose and carry out strategies for solving mathematical problems and exploring math concepts.

NCTM Use oral language and drawings to describe their mathematical thinking.

NCTM Recognize and use connections among mathematical ideas.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

MfA Count sets of objects by 1, 5, and 10, to 100.

CPS Count backward from 20.

CPS Represent quantities to 20, physically, pictorially, and symbolically.

(2.N.1) Read, write, and sequence numbers to 100.

(2.N.6) Use and identify coins and their values (pennies, nickels, dimes, and quarters).

2.N.7 Begin to understand addition (combining) and subtraction (comparing and separating), using objects, pictures and numbers.

CPS Translate real-world situations into addition and subtraction statements.

CPS Use informal language and pictures to describe addition and subtraction.

(2.N.9) Find combinations of numbers to 20.

(2.N.12) Solve addition and subtraction situations involving quantities to 20, using objects, pictures, and numbers.

Learning Outcomes

Grade 1 *Continued*

Students will

Standard #

PATTERNS, RELATIONS, AND ALGEBRA

MfA Sort objects according to two properties.

2.P.1 Recognize, describe, reproduce, extend and create a variety of visual, verbal, motor, number and geometric patterns.

GEOMETRY

2.G.1 Describe properties of three-dimensional and two-dimensional objects.

2.G.2 Recognize and name a variety of two-dimensional and three-dimensional shapes.

2.G.6 Demonstrate and predict the results of combining, subdividing and changing shapes.

MEASUREMENT

2.M.1 Identify days of the week and months of the year; identify dates using a calendar.

(2.M.2) Tell time by the hour and half-hour, using a clock face in the context of daily events; make connections between analog and digital clocks.

(2.M.4) Compare, order, estimate and assign units of measurement (standard and nonstandard) to the length of objects.

(2.M.5) Read a thermometer.

(2.M.6) Compare, order, and begin to estimate and assign units of measurement (nonstandard) to the weight of objects.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

2.D.1, Pose questions about themselves and their surroundings and gather data by **MfA** interviewing, surveying, and making observations to answer the questions posed.

Learning Outcomes Grade 1 *Continued*

Students will

Standard #

DATA ANALYSIS, STATISTICS, AND PROBABILITY

(2.D.2) Represent data using concrete objects, pictures, numbers, tables, lists, tallies, and graphs (bar graphs and pictographs).

2.D.3 Describe and interpret data by drawing conclusions and making conjectures.

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**Mathematics
Learning Outcomes
Grade 2**

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Build new mathematical knowledge through problem solving.

NCTM Use oral language, drawings, and written language to communicate mathematical thinking to peers, teachers, and others.

NCTM Recognize and use connections among mathematical ideas.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

CPS Demonstrate understanding of our numeration system by relating counting and grouping (by twos, fives, and tens) and place value concepts, up to 100.

2.N.1 Read, write, and sequence numbers to 100, identifying the place value of the digits.

2.N.3 Demonstrate a beginning understanding of the basic concepts of fractions (halves, thirds and fourths), as parts of wholes and as parts of groups.

2.N.6 Use and identify coins and their values; demonstrate familiarity with coin equivalencies

CPS Translate real-world situations into addition and subtraction statements.

2.N.7 Demonstrate an understanding of addition (combining) and subtraction (comparing and separating), using objects, pictures, and numbers.

2.N.8 Understand when to use the operations of addition and subtraction and describe their relationships to each other.

2.N.9 Model, explain, and develop proficiency with basic number combinations through 20.

2.N.10 Begin to combine, compare, and separate (add and subtract two-digit numbers), using a variety of algorithms which emphasize the value of the numbers.

2.N.12 Apply estimation when working with quantities, measurement, and computation.

Learning Outcomes **Grade 2 *Continued***

Students will

Standard #

PATTERNS, RELATIONS, AND ALGEBRA

2.P.1 Identify, compare, sort and classify objects and numbers based on a variety of patterns.

2.P.4 Use skip counting strategies to count by twos, fives, and tens, up to at least 100.

2.P.6 Write number sentences to represent addition and subtraction situations.

GEOMETRY

2.G.1 Describe and classify attributes of two- and three-dimensional shapes.

2.G.5 Investigate symmetry in two-dimensional shapes.

2.G.7 Relate geometric ideas to numerical ideas (e.g., seeing rows in an array as a model of repeated addition).

MEASUREMENT

2.M.2 Demonstrate understanding of time (to the quarter-hour), money, and temperature.

2.M.4 Measure and compare common objects using nonstandard and standard units of length.

2.M.5 Apply the processes for measuring length, weight, time, money, and temperature.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

2.D.1,

2.D.2, Investigate a question that involves collecting, representing, and analyzing data.

2.D.3

2.D.2 Construct, read, and interpret displays of data (picture graphs, bar graphs, and tally marks).

Learning Outcomes

Grade 2 *Continued*

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Mathematics

Learning Outcomes

Grade 3

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Build new mathematical knowledge through problem solving.

NCTM Monitor and reflect on the process of mathematical problem solving.

CPS Model, explain, and apply a variety of problem-solving strategies, moving from the concrete to the abstract.

NCTM Communicate mathematical thinking coherently and clearly to peers, teachers, and others.

NCTM Recognize and use connections among mathematical ideas.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

MfA Select and use appropriate methods and tools for computation, including mental computation, estimation, calculators, and pencil-paper, according to the nature of the computation.

(4.N.1) Demonstrate an understanding of our numeration system by relating counting, grouping, and place value concepts (from 0 to 1000).

(4.N.1) Read and write numerals to 1000.

(4.N.4) Demonstrate an understanding of the basic concepts of fractions (halves, thirds, fourths, sixths, and eighths).

CPS Translate real-world situations into addition, subtraction, multiplication, and division statements.

(4.N.10) Recognize when to use the operations of addition, subtraction, multiplication, and division; and describe how they relate to each other.

(4.N.11) Model, explain and develop proficiency with basic number combinations (addition and subtraction facts through 20; multiplication and division facts with factors of 1, 2, 3, 4, 5, and 10).

Learning Outcomes

Grade 3 *Continued*

Students will

Standard #

NUMBER SENSE AND OPERATIONS *Continued*

(4.N.12) Demonstrate computational fluency (efficiency and accuracy) with respect to adding (combining) and subtracting (comparing and separating) two- and three-digit numbers, with and without regrouping, using a variety of different algorithms, one of which is the U.S. algorithm.

(4.N.16) Apply estimation when working with quantities, measurement, and computation, to check solutions and determine whether they make sense.

PATTERNS, RELATIONS, AND ALGEBRA

(4.P.1) Identify, describe, extend, and create a wide variety of geometric and numeric patterns and apply them to mathematical relationships.

(4.P.4) Use pictures, models, tables, charts, graphs, words, number sentences, and mathematical notations to interpret mathematical relationships.

GEOMETRY

4.G.1 Identify the attributes of common two- and three-dimensional shapes and describe how they are related to each other.

MfA Use geometric models to develop numerical ideas (arrays, fractions, area, angles).

CPS Apply problem-solving strategies to geometric concepts (measuring distance and turns, creating two-dimensional shapes, exploring attributes of two-dimensional shapes, and combining shapes to form figures).

MEASUREMENT

4.M.1 Develop and apply the process for measuring length (English and metric), weight, time, money, temperature, and area.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

CPS Investigate a question that involves collecting, representing, and analyzing data.

(4.D.3) Construct, read, and interpret displays of data (line plots and bar graphs).

Learning Outcomes **Grade 3 *Continued***

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4.N, 4.P, 4.G, 4.M, and 4.D refer to specific learning standards in the Massachusetts Mathematics Curriculum Framework, November 2000, for Grades 3-4. (Identifiers in parentheses indicate that the outcome is partially addressed in Grade 3, and continues into Grade 4.)

Mathematics Learning Outcomes Grade 4

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Build new mathematical knowledge through problem solving.

NCTM Monitor and reflect on the process of mathematical problem solving.

CPS Model, explain, and apply a variety of problem-solving strategies, moving from the concrete to the abstract.

NCTM Communicate mathematical thinking coherently and clearly to peers, teachers, and others.

NCTM Recognize and use connections among mathematical ideas.

NCTM Select and use various types of reasoning and proof.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

MfA Select and use appropriate methods and tools for computation, including mental computation, estimation, calculators, and pencil-paper, according to the nature of the computation.

4.N.1 Demonstrate understanding of numbers and our numeration system by relating counting, grouping, and place value concepts (from 0 to 10,000).

4.N.1 Read and write numerals to 10,000.

4.N.2 Represent, order, and compare numbers to 10,000.

4.N.3 Demonstrate an understanding of the basic concepts of fractions (halves, thirds, fourths, sixths, eighths, and twelfths) as parts of sets and as parts of wholes.

CPS Translate real-world situations into addition, subtraction, multiplication and division statements.

4.N.7 Recognize classes of numbers (odds and evens, factors and multiples, squares) and identify numbers in those classes.

Learning Outcomes **Grade 4 *Continued***

Students will

Standard #

NUMBER SENSE AND OPERATIONS *Continued*

4.N.9 Explore and demonstrate an understanding of the concept of commutative properties for addition and multiplication.

4.N.10 Recognize when to use the operations of addition, subtraction, multiplication and division, and describe how they relate to each other.

MfA Use visual models, landmarks (0, $\frac{1}{2}$, 1, and 2), and equivalent forms to compare, order, and combine common fractions.

4.N.11 Model, explain, and develop proficiency with basic number combinations (addition and subtraction facts through 20; multiplication facts through 10×10 ; division facts through 10; factors of 6, 7, 8, and 9).

4.N.12, Demonstrate computational fluency (efficiency and accuracy) with respect to **4.N.14** adding

(combining) and subtracting (comparing and separating) three- and four-digit numbers, with and without regrouping, using a variety of different algorithms, one of which is the U.S. algorithm.

4.N.12, Demonstrate reasonable proficiency with multiplication (up to three-digit by
4.N.14 two-digit numbers), using at least two different algorithms, one of which is the U.S. algorithm.

4.N.13 Demonstrate reasonable proficiency with division (up to three-digit dividends by one-digit divisors), using at least two different algorithms.

4.N.16 Apply estimation when working with quantities, measurement, and computation, to check solutions and determine whether they make sense.

PATTERNS, RELATIONS, AND ALGEBRA

4.P.1 Identify, describe, extend, and create a wide variety of patterns, analyzing and applying them to mathematical relationships.

4.P.2 Explore and explain the use of variables and open sentences to express relationships.

CPS Form and write number sentences to represent addition, subtraction, multiplication and division situations.

Learning Outcomes **Grade 4 *Continued***

Students will

Standard #

GEOMETRY

4.G.1 Identify, describe, compare, and analyze the attributes of two- and three- dimensional shapes, using standard mathematical vocabulary (hexagon, parallel, acute angle, etc.).

4.G.2 Classify two- and three-dimensional shapes according to their attributes and use mathematical vocabulary for classes of shapes (triangles, prisms, etc.).

MfA Describe location and movement using common language and geometric vocabulary.

MEASUREMENT

4.M.1, Develop and apply the process for estimating and measuring length (English and **4.M.4**, metric), weight, time, money, temperature, capacity, area, perimeter, and volume
4.M.5 (of a cube).

MfA Recognize a 90 degree angle and use it as a landmark to estimate the size of other angles.

MfA Identify common measurements of turns (360 degrees in a full turn, 180 degrees in a half turn, 90 degrees in a quarter turn).

DATA ANALYSIS, STATISTICS, AND PROBABILITY

4.D.1, Construct, read, interpret and compare displays of data (line plots and bar graphs).
4.D.3

CPS Formulate questions and solve problems that involve collecting, representing and analyzing data.

4.D.4 Carry out experiments and simulations to determine probability.
4.D.6

Learning Outcomes **Grade 4 *Continued***

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Mathematics Learning Outcomes Grade 5

Students will

Standard #

PROBLEM SOLVING, REASONING, AND COMMUNICATION

NCTM Build new mathematical knowledge through problem solving.

NCTM Monitor and reflect on the process of mathematical problem solving.

CPS Model, explain, and apply a variety of problem-solving strategies, moving from the concrete to the abstract.

NCTM Communicate mathematical thinking coherently and clearly to peers, teachers, and others.

NCTM Recognize and use connections among mathematical ideas.

NCTM Select and use various types of reasoning and proof.

NCTM Create and use representations to organize, record, and communicate mathematical ideas.

NUMBER SENSE AND OPERATIONS

MfA Select and use appropriate methods and tools for computing with whole numbers and decimals, including mental computation, estimation, calculators, and pencil- paper, according to the nature of the computation.

(6.N.2) Demonstrate understanding of numbers and our numeration system by relating counting, grouping, and place value concepts (from 0 to 100,000).

CPS Develop competence with multiplication (3 X 3 digits), using at least two different algorithms, one of which is the U.S. algorithm, and division (three-digit dividends by two-digit divisors), introducing the U.S. algorithm as one possible method.

(6.N.4) Demonstrate an understanding of fractions as parts of unit wholes, as parts of a collection, and as locations on number lines.

(6.N.5) Identify and determine common equivalent fractions, decimals, and percents.

CPS Investigate and describe the relationships among fractions, decimals, and percents.

Learning Outcomes

Grade 5 *Continued*

Students will

Standard

NUMBER SENSE AND OPERATIONS *Continued*

(6.N.6) Order and compare common fractions, decimals, and percents efficiently and find their approximate locations on a number line.

(6.N.8) Create and apply number-theory concepts, including primes, factors, multiples, square, and even-odd numbers.

(6.N.9) Demonstrate an understanding the use of operations involving whole numbers, fractions (addition and subtraction with/without regrouping), decimals (addition and subtraction with/without regrouping), and rational numbers.

(6.N.14) Translate real-world situations into addition and subtraction with fractions, decimals, and percents.

(6.N.16) Read, write, estimate, and compute with whole numbers, fractions, decimals, and rational numbers; and apply these skills to problem-solving situations.

PATTERNS, RELATIONS, AND ALGEBRA

(6.P.1) Identify, describe, extend, and create a wide variety of patterns, analyzing and applying them to mathematical relationships.

MfA Express mathematical relationships using equations.

(6.P.2) Begin to understand and apply the concept of variables in equations.

(6.P.4) Represent and analyze tables and graphs to identify properties and relationships.

GEOMETRY

6.G.1 Describe, model, draw, and classify geometric shapes using standard mathematical vocabulary (hexagon, parallel, acute angle, etc.).

6.G.2 Visualize and draw geometric figures; explore and describe similar and congruent figures; apply

appropriate properties and relationships.

Learning Outcomes **Grade 5 *Continued***

Students will

Standard #

MEASUREMENT

6.M.1 Develop and apply the process for estimating and measuring length (English and metric), weight, area, and perimeter.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

MfA Formulate questions and solve problems that involve collecting, representing, analyzing, and arguing data.

(6.D.2) Construct, read, interpret and compare displays of data (line plots, bar graphs, circle graphs, coordinate grids).

MfA Devise and carry out experiments and simulations to determine probability.

(6.D.4) Use knowledge of probability to make reasonable predictions.

CPS Develop and explain the use of probability in the real world.

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6.N, 6.P, 6.G, 6.M, and 6.D refer to specific learning standards in the Massachusetts Mathematics Curriculum Framework, November 2000, for Grades 5-6. (Identifiers in parentheses indicate that the outcome is partially addressed in Grade 5, and continues into Grade 6.)