

Highlights: 2017 Revisions to the Mathematics Standards

This resource presents revisions to the Massachusetts mathematics standards that educators should keep in mind as they develop curriculum and plan instruction. Changes to standards for Pre-Kindergarten through grade 8 are shown first, followed by changes to high school standards. Changes to high school standards are presented in two ways: the traditional pathway and the integrated pathway. Note: the notation used in the 2017 standards introduces lettered cluster headings (e.g., 2.NBT.A.2) which are included in the listings below.

Pre-Kindergarten Mathematics

- **PK.CC.C.4:** edited to include “recognize the ‘one more’, ‘one less’ patterns” as a way to highlight that recognizing patterns in numbers is key to mathematics and fundamental for algebraic thinking

Kindergarten Mathematics

- **K.CC.B.4c:** edited to include “recognize the one more pattern of counting using objects” as a way to reinforce a learning progression related to patterns that builds students’ algebraic thinking skills.

Grade 1 Mathematics

- **1.OA.A.1:** adapted to incorporate the term “number sentences” from 2010 Standard 1.OA.MA.9.
- **1.NBT.C.5:** added emphasis on identifying number patterns using strategies to enhance the development of number sense in grade 1 students as they identify and make use of mathematical structures.
- **1.MD.MA.5:** deleted and replaced with **1.MD.D.5**, which clarifies that grade 1 students must be able to work with money “up to 100¢.”

Grade 2 Mathematics

- **2.OA.B.2:** incorporates the learning expectation that students know from memory related subtraction facts of sums of two one-digit numbers from the deleted 2010 standard **2.OA.MA.2.a**.
- **2.NBT.A.2:** edited to include patterns in skip counting starting at any number to enhance the conceptual development of numbers in grade 2 students as they look for and make use of mathematical structures.
- **2.MD.MA.7a:** deleted and replaced with **2.MD.C.7.a**, which incorporates the learning expectation that students know the “approximate number of weeks in a month and weeks in a year.”
- **2.MD.C.8:** edited to clarify that grade 2 students must be able to work with money “up to \$10.”
- **2.MD.D.9:** edited to include the phrase “dot plot” because it is a more commonly used statistical term than “line plot.”

Grade 3 Mathematics

- **3.OA.B.5:** edited to clarify the properties of operations applicable to multiplication.
- **3.NF.A:** edited the “Number and Operations – Fractions” cluster heading to specify that grade 3 students should work with fractions with denominators of 2, 3, 4, 6, and 8.
- **3.MD.A.2:** edited to clarify that the focus of this standard is the metric system.

Grade 4 Mathematics

- **4.NBT.A:** edited the “Number and Operations in Base Ten” cluster heading to specify that grade 4 students should have place value understanding for numbers less than or equal to 1,000,000.
- **4.NBT.MA.5a:** deleted and replaced with **4.OA.A.3.a**, which was edited to clarify that multiplication facts and related division facts through 12×12 are the parameters of the standard. This content has been moved from the “Number and Operations in Base Ten” domain to the “Operations and Algebraic Thinking” domain as this standard extends the expectation of standard **3.OA.C.7**.
- **4.NF.A, B:** edited the “Number and Operations – Fractions” cluster headings to specify that grade 4 students should work with fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.
- **4.NF.A.1:** edited to clarify that the expectation includes generating equivalent fractions for fractions greater than 1.
- **4.NF.B.3a:** edited to clarify the meaning of the term “whole” in grade 4 to address the development of students’ understanding of the concept of ‘whole’ as they progress through grades 3-5.
- **4.MD.A.3:** note added to clarify expectation regarding unit notation for operations with quantities.

Grade 5 Mathematics

- **5.NBT.A.1:** edited to include the term “decimal” as a possible multi-digit number.
- **5.NF.A.2:** edited to clarify the concept of whole as being a single unit or a set of objects.
- **5.NF.B.4a:** edited to maintain mathematical rigor by providing options such as “area model” as a way of showing conceptual understanding when multiplying fractions by whole numbers.
- **5.NS.MA.1:** deleted to maintain focus in grade 5 on fluency in multi-digit whole numbers and multiplying fractions. Integers are introduced in grade 6.
- **5.MD.C.5b:** edited to clarify that “B,” in formulas such as “ $V=Bh$,” represents the area of the base.

Grade 6 Mathematics

- **6.RP.A:** edited the “Ratios and Proportional Relationships” cluster heading to emphasize “rate” since it is a critical concept at this grade level.

- **6.RP.A.1:** edited to emphasize student understanding of ratio relationships and to distinguish between part:part and part:whole relationships.
- **6.RP.A.2:** edited to emphasize the relationship between ratios and rates and units of rates.
- **6.RP.A.3.d:** edited to clarify the expectation of conversion between and within measurement systems.
- **6.RP.MA.3e:** deleted and replaced with **6.RP.A.3.e**. Content remains unchanged.
- **6.NS.MA.4a:** deleted and replaced by **6.NS.B.4**, which establishes “prime factorization” as an expectation for students in grade 6.
- **6.G.MA.1a:** incorporated into the revised standard **7.G.B.4** which is focused on the development of measurement concepts related to circles.
- **6.G.MA.1b:** incorporated into the revised standard **7.G.B.4** which is focused on the development of measurement concepts related to circles.
- **6.SP.MA.4a:** deleted and replaced with **6.SP.B.4.a**. Content remains unchanged.
- **6.SP.B.5c:** edited to create a coherent learning progression from grade 6 to grade 7 related to summarizing and describing distributions. In grade 6 the focus is on developing understanding of measures of center and spread. Mean absolute deviation is studied in grade 7.

Grade 7 Mathematics

- **7.NS.A.1, 2, 3:** edited to specify that integers and other rational numbers are included in these standards.
- **7.EE.A.1:** edited to clarify the expectations for factoring and expanding linear expressions.
- **7.EE.MA.4.c:** deleted and replaced with **7.EE.B.4c**. Content remains unchanged.
- **7.G.B.4 :** edited to improve the coherence and focus of the learning progression and expectations for students to know, calculate, and solve problems related to circumferences and areas of circles.
- **7.G.MA.7:** deleted to maintain the focus in grade 7 on finding the surface area of objects that can be decomposed into two-and-three dimensional polygonal shapes.
- **7.SP.B.3:** edited to improve the clarity of the standard. The wording of the example was edited to reinforce the intent of drawing informal comparative inferences about two populations.

Grade 8 Mathematics

- **8.EE.C.8b:** edited to identify “elimination and substitution” as strategies for solving systems of equations in grade 8.

- **8.G.B.6:** edited to clarify student expectations for understanding and explaining the Pythagorean Theorem in grade 8 and to maintain the mathematical rigor of the standard. Proving theorems is introduced in high school mathematics. In grade 8 students will demonstrate their understanding of the Pythagorean Theorem by analyzing and justifying the relation among the sides of a right triangle and applying the Pythagorean Theorem to solve problems in a variety of contexts

High School Mathematics: Traditional Pathway – Model Algebra I

- **A-SSE.A:** edited the “Seeing Structure in Expressions” cluster heading to clarify the focus for interpreting and using the structure of expression for the model Algebra I course. The example in standard **A-SSE.A.2** was edited to align with the Algebra I focus on linear, quadratic, and exponential expressions.
- **A-APR.A.1:** edited to clarify the expectation for comparing integer and polynomial systems and performing operations on polynomials in the model Algebra I course.
- **A-CED.A.1, 3, 4:** edited to clarify the focus and expectations for creating equations that describe numbers or relationships in the model Algebra I course.
- **A-REI.A.1:** edited to align with Standard for Mathematical Practice 3; construct viable arguments and critique the reasoning of others.
- **A-REI.D.10, 11:** edited to clarify the focus and expectation for representing and solving equations and inequalities graphically in the model Algebra I course.
- **F-IF.A.2:** edited to provide a financial context for evaluating functions and interpreting statements that use function notation in the model Algebra I course.
- **F-IF.B:** edited the “Interpreting Functions” cluster heading to clarify the model Algebra I course is limited to interpreting linear, quadratic, and exponential functions.
- **F-IF.C.7b, e, 8b:** edited to clarify the focus and provide a context for using different representations to analyze functions.
- **F-IF.MA.10:** deleted from the model Algebra I course. Content added to the model Algebra II course to maintain consistent expectations related to functions in Algebra I.
- **F-BF.A.1, B. 3, B.4a:** edited to clarify the focus for writing functions (including linear, quadratic, and exponential) that model relationships and building new functions from existing functions (including linear, quadratic, exponential, and absolute value) for the model Algebra I course.
- **S-ID.A:** edited the “Interpreting Categorical and Quantitative Data” cluster heading to clarify the expectation of appropriate technology use when summarizing, representing, and/or interpreting data for the model Algebra I course.
- **S-ID.A.4:** deleted from the model Algebra I course. Content added to the model Algebra II course to maintain consistent expectations about summarizing, representing and interpreting data in the model Algebra I course.

High School Mathematics: Traditional Pathway – Model Geometry

- **G-CO.C:** edited the “Congruence” cluster heading to include an expectation for proving the converse of theorems for the model Geometry course.
- **G-CO.C.9, 10:** edited to include proving converses involving parallel lines and isosceles triangles.
- **G-CO.C.11.a:** edited to include the expectation of problem solving using properties of polygons and the angles of polygons.
- **G-GPE.B.4:** edited to include the expectation of using the distance formula and its relationship to the Pythagorean Theorem when proving theorems algebraically.
- **S-MD.B.6, 7:** deleted from the model Geometry course. Added to the model Algebra II course as optional (+) standards.

High School Mathematics: Traditional Pathway – Model Algebra II

- **A-SSE.A:** edited the “Seeing Structure in Expressions” cluster heading to clarify the focus on exponential, polynomial, and rational functions when interpreting and using the structure of expression in the model Algebra II course.
- **A-APR.A.1:** edited to clarify that comparing integer and polynomial systems and performing operations on polynomials (including division of polynomials) is an expectation of the model Algebra II course.
- **A-CED.A.1:** edited to clarify the focus and expectations for creating equations (including simple root functions) that describe numbers or relationships in the model Algebra II course.
- **A-REI.D.11:** edited to clarify the focus on polynomial, rational and logarithmic functions when representing and solving equations and inequalities graphically in the model Algebra II course.
- **F-IF.B:** edited the “Interpreting Functions” cluster heading to clarify the model Algebra II course is limited to interpreting polynomial, rational, square and cube root, trigonometric, and logarithmic functions.
- **F-IF.C.8a:** new to the model Algebra II course. Progresses from expectations in the model Algebra I course related to analyzing quadratic functions using different representations. The focus in Algebra II is on analyzing polynomial and rational functions using different representations.
- **F-IF.C.10:** new to the model Algebra II course. The focus and expectation of the standard is to recognize functions (including polynomial, rational, logarithmic, exponential and trigonometric) that are represented algebraically, graphically, and numerically.
- **F-BF.A.1, 3:** edited to clarify the focus for writing functions that model relationships and building new functions from existing functions for the model Algebra II course. Functions include simple rational, radical, logarithmic, and trigonometric.
- **S-ID.A:** edited cluster heading to clarify the expectation of appropriate technology use when summarizing, representing, and/or interpreting data in the model Algebra II course.

High School Mathematics: Integrated Pathway – Model Mathematics I

- **A-SSE.A:** edited the “Seeing Structure in Expressions” cluster heading to clarify the focus on linear and exponential expressions when interpreting and using the structure of expression in Math I.
- **A-CED.A.1, 3, 4:** edited to clarify the focus and expectations for creating equations that describe numbers or relationships in the model Math course.
- **A-REI.A.1:** edited to align with Standard for Mathematical Practice 3; construct viable arguments and critique the reasoning of others.
- **A-REI.D.10, 11:** edited to clarify the focus and expectation for representing and solving equations and inequalities graphically in the model Math I course.
- **F-IF.A.2:** edited to provide a financial context for evaluating functions and interpreting statements that use function notation in the model Math I course.
- **F-IF.B:** edited the “Interpreting Functions” cluster heading to clarify the model Math I course is limited to interpreting linear and exponential functions.
- **F-IF.C.7a, e, 9:** edited to clarify the focus and provide a context for using different representations to analyze functions.
- **F-IF.MA.10:** deleted from the model Math I course. Content was added to the model Math III course to maintain consistent expectations related to functions in Math I.
- **F-BF.A.1, B.3:** edited to clarify the focus for writing functions (including linear and exponential) that model relationships and building new functions from existing functions for the model Math I course.
- **F-LE.A.3, B.5:** edited to clarify the focus and expectations for comparing and interpreting function models (linear and exponential) in the model Math I course.
- **G-GPE.B.4:** deleted from the model Math I course and added to the model Math II course to strengthen the progression of expressing geometric properties with equations.
- **S-ID.A:** edited the “Interpreting Categorical and Quantitative Data” cluster heading to clarify the expectation of appropriate technology use when summarizing, representing, and/or interpreting data in the model Math I course.
- **S-ID.B.6:** edited to clarify the focus and expectation for fitting a function (linear) to data and using the fitted function to solve problems.

High School Mathematics: Integrated Pathway – Model Mathematics II

- **N-CN.C.8, 9:** deleted from the model Math II course. Added to the model Math III course as optional (+) standards.
- **A-SSE.A, B:** edited the “Seeing Structure in Expressions” cluster headings to clarify the focus for interpreting and using the structure of expression for the model Math II course. The example in standard **A-SSE.A.2** was edited to align with the Math II focus on quadratic and exponential expressions.

- **A-APR.A.1:** edited to clarify the expectation for comparing integer and polynomial systems and performing operations on polynomials in the model Math II course.
- **A-CED.A.1, 4:** edited to clarify the focus and expectations for creating equations that describe numbers or relationships in the model Math II course.
- **F-IF.B:** edited the “Interpreting Functions” cluster heading to clarify the model Math II course is limited to interpreting quadratic and exponential functions.
- **F-IF.C.7a, b, 8b:** edited to clarify the focus and provide a context for using different representations to analyze functions.
- **F-IF.MA.10:** deleted from the model Math II course. Content added to the model Math III course to maintain consistent expectations related to functions in Math II.
- **F-BF.A.1, B.3, 4a:** edited to clarify the focus for writing functions that model relationships and building new functions from existing functions for the model Math II course. Functions include linear, quadratic, exponential, and absolute value.
- **G-CO.C:** edited the “Congruence” cluster heading to include an expectation for proving the converse of theorems for the model Math II course.
- **G-CO.C.9, 10:** edited to include proving converses involving parallel lines and isosceles triangles.
- **G-CO.C.11.a:** edited to include the expectation of problem solving using properties of polygons and the angles of polygons.
- **G.SRT:** edited the “Similarity, Right Triangles, and Trigonometry” cluster heading to include an expectation for using a variety of ways to write proofs in the model Math II course.
- **G-GPE.B.4:** new to the model Math II course. Edited to include the expectation of using the distance formula and its relationship to the Pythagorean Theorem when proving theorems algebraically.
- **G.GMD.B.4:** deleted from the model Math II course and added to the model Math III course, which includes a focus on geometric measurement and dimension.
- **S-MD.B.6, 7:** deleted from the model Math II course. Added to the model Math III course as optional (+) standards.

High School Mathematics: Integrated Pathway – Model Mathematics III

- **A-SSE.A:** edited the “Seeing Structure in Expressions” cluster heading to clarify the focus on polynomial and rational functions when interpreting and using the structure of expression in the model Math III course.
- **A-APR.A.1:** edited to clarify that comparing integer and polynomial systems and performing operations on polynomials (including division of polynomials) is an expectation of the model Math III course.
- **A-CED.A.1, 3:** edited to clarify the focus and expectations for creating equations (including simple root functions) that describe numbers or relationships in the model Math III course.

- **A-REI.D.11:** edited to clarify the focus on polynomial, rational and logarithmic functions when representing and solving equations and inequalities graphically in the model Math III course.
- **F-IF.B:** edited the “Interpreting Functions” cluster heading to clarify the model Math III course is limited to interpreting polynomial, rational, square and cube root, trigonometric, and logarithmic functions.
- **F-IF.C.7b, 8a, 9:** edited to clarify the focus and provide a context for using different representations to analyze functions. The focus in the model Math III course is on analyzing simple root, polynomial and rational functions using different representations.
- **F-IF.C.10:** new to the model Math III course. The focus and expectation of the standard is to recognize functions (including polynomial, rational, logarithmic, exponential and trigonometric) that are represented algebraically, graphically, and numerically.
- **F-BF.A.1, B.3, 4a:** edited to clarify the focus for writing functions that model relationships and building new functions from existing functions for the model Math III course. Functions include simple rational, radical, logarithmic, and trigonometric.
- **F-TF.C.8:** new to the model Math III course. The focus on proving and applying trigonometric identities in Math III progresses from Math II standards for defining trigonometric ratios, solving problems involving right triangles, and proving theorems involving similarity.
- **S-ID.A:** edited the “Interpreting Categorical and Quantitative Data” cluster heading to clarify the expectation of appropriate technology use when summarizing, representing, and/or interpreting data in the model Math III course.