

Massachusetts Mathematics Learning Standards	Boardworks Middle School Math Presentations
Grade 6	
Number Sense and Operations	
6.N.1 Demonstrate an understanding of positive integer exponents, in particular, when used in powers of ten.	Powers Scientific notation
6.N.2 Demonstrate an understanding of place value to billions and thousandths.	Place value
6.N.3 Represent and compare very large (billions) and very small (thousandths) positive numbers in various forms such as expanded notation without exponents.	Place value Scientific notation
6.N.4 Demonstrate an understanding of fractions as a ratio of whole numbers, as parts of unit wholes, as parts of a collection, and as locations on the number line.	Ordering fractions One number as a fraction of another Finding a fraction of an amount Fractions of shapes
6.N.5 Identify and determine common equivalent fractions, mixed numbers, decimals, and percents.	Equivalent fractions Equivalent fractions, decimals and percentages Fractions and decimals Introducing percentages
6.N.6 Find and position integers, fractions, mixed numbers, and decimals (both positive and negative) on the number line.	Ordering integers Ordering decimals Ordering fractions Using negative numbers in context
6.N.7 Compare and order integers (including negative integers), and positive fractions, mixed numbers, decimals, and percents.	Ordering integers Ordering decimals Ordering fractions Using negative numbers in context Equivalent fractions Equivalent fractions, decimals and percentages Fractions and decimals Introducing percentages

6.N.8 Apply number theory concepts—including prime and composite numbers, prime factorization, greatest common factor, least common multiple, and divisibility rules for 2, 3, 4, 5, 6, 9, and 10—to the solution of problems	Prime numbers Prime factorization GCF and LCM Divisibility Multiples and factors
6.N.9 Select and use appropriate operations to solve problems involving addition, subtraction, multiplication, division, and positive integer exponents with whole numbers, and with positive fractions, mixed numbers, decimals, and percents.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Powers Mental math puzzles Mental math and place value
6.N.10 Use the number line to model addition and subtraction of integers, with the exception of subtracting negative integers.	Adding and subtracting integers
6.N.11 Apply the Order of Operations for expressions involving addition, subtraction, multiplication, and division with grouping symbols (+, −, ′, ÷).	Order of operations and PEMDAS
6.N.12 Demonstrate an understanding of the inverse relationship of addition and subtraction, and use that understanding to simplify computation and solve problems.	Mental math puzzles

6.N.13 Accurately and efficiently add, subtract, multiply, and divide (with double-digit divisors) whole numbers and positive decimals.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Mental multiplication Place value Multiplying and dividing by 0.1 and 0.01 Multiplying by numbers between 0 and 1
6.N.14 Accurately and efficiently add, subtract, multiply, and divide positive fractions and mixed numbers. Simplify fractions.	Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions
6.N.15 Add and subtract integers, with the exception of subtracting negative integers.	Adding and subtracting integers Adding and subtracting integers activities
6.N.16 Estimate results of computations with whole numbers, and with positive fractions, mixed numbers, decimals, and percents. Describe reasonableness of estimates.	Estimation and approximation
Patterns, Relations and Algebra	
6.P.1 Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions.	Introducing sequences Sequences from geometrical patterns Describing and continuing sequences Generating sequences from flow charts Generating sequences and rules Finding the nth term Sequences from practical contexts
6.P.2 Replace variables with given values and evaluate/simplify.	Substitution Mapping functions
6.P.3 Use the properties of equality to solve problems.	Solving simple equations

6.P.4 Represent real situations and mathematical relationships with concrete models, tables, graphs, and rules in words and with symbols, e.g., input-output tables.	Reading and plotting graphs Distance-time graphs Conversion graphs Interpreting graphs Introducing formulas Transforming formulas Using formulas Deriving formulas Function machines Mapping functions Solving linear inequalities Direct variations Sequences from practical contexts
6.P.5 Solve linear equations using concrete models, tables, graphs, and paper-pencil methods.	Solving simple equations Direct variations Mapping functions Graphs of functions
6.P.6 Produce and interpret graphs that represent the relationship between two variables in everyday situations.	Distance-time graphs Conversion graphs Reading and plotting graphs Interpreting graphs Direct variations
6.P.7 Identify and describe relationships between two variables with a constant rate of change. Contrast these with relationships where the rate of change is not constant.	The equation of a straight line Direct proportion
Geometry	
6.G.1 Identify polygons based on their properties, including types of interior angles, perpendicular or parallel sides, and congruence of sides, e.g., squares, rectangles, rhombuses, parallelograms, trapezoids, and isosceles, equilateral, and right triangles.	Polygons Triangles Quadrilaterals
6.G.2 Identify three-dimensional shapes (e.g., cubes, prisms, spheres, cones, and pyramids) based on their properties, such as edges and faces.	Solid shapes Cylinders, cones and spheres
6.G.3 Identify relationships among points, lines, and planes, e.g., intersecting, parallel, perpendicular.	Parallel and perpendicular lines
6.G.4 Graph points and identify coordinates of points on the Cartesian coordinate plane (all four quadrants).	Introducing coordinates
6.G.5 Find the distance between two points on horizontal or vertical number lines.	-

6.G.6 Predict, describe, and perform transformations on two-dimensional shapes, e.g., translations, rotations, and reflections.	Combining transformations Translation Rotation Reflection
6.G.7 Identify types of symmetry, including line and rotational.	Rotational symmetry Reflection symmetry
6.G.8 Determine if two shapes are congruent by measuring sides or a combination of sides and angles, as necessary; or by motions or series of motions, e.g., translations, rotations, and reflections.	Congruence Translation Reflection Rotation
6.G.9 Match three-dimensional objects and their two-dimensional representations, e.g., nets, projections, and perspective drawings.	2-D representations of 3-D shapes Nets Views of 3-D shapes
Measurement	
6.M.1 Apply the concepts of perimeter and area to the solution of problems. Apply formulas where appropriate.	Perimeter Area Area problems Area of a circle Circumference of a circle Using formulas
6.M.2 Identify, measure, describe, classify, and construct various angles, triangles, and quadrilaterals.	Constructing triangles Triangles Quadrilaterals Calculating angles Measuring angles Angles in a triangle Angles in polygons Angles made with parallel lines The sum of interior and exterior angles Drawing lines and angles Constructing lines and angles Labeling lines and angles
6.M.3 Solve problems involving proportional relationships and units of measurement, e.g., same system unit conversions, scale models, maps, and speed.	Scale drawings Converting metric units Customary unit conversions Direct variations

6.M.4 Find areas of triangles and parallelograms. Recognize that shapes with the same number of sides but different appearances can have the same area. Develop strategies to find the area of more complex shapes.	Triangles Quadrilaterals Area Area problems Area of irregular shapes
6.M.5 Identify, measure, and describe circles and the relationships of the radius, diameter, circumference, and area (e.g., $d = 2r$, $p = C/d$), and use the concepts to solve problems.	Circles Area of a circle Circumference of a circle
6.M.6 Find volumes and surface areas of rectangular prisms.	Volume Surface area
6.M.7 Find the sum of the angles in simple polygons (up to eight sides) with and without measuring the angles.	The sum of interior and exterior angles Measuring angles
Data Analysis, Statistics and Probability	
6.D.1 Describe and compare data sets using the concepts of median, mean, mode, maximum and minimum, and range.	Comparing data Finding the median Finding the mode Calculating the mean Finding the range
6.D.2 Construct and interpret stem-and-leaf plots, line plots, and circle graphs.	Circle graphs Appropriate graphs
6.D.3 Use tree diagrams and other models (e.g., lists and tables) to represent possible or actual outcomes of trials. Analyze the outcomes.	Probability diagrams Experimental probability
6.D.4 Predict the probability of outcomes of simple experiments (e.g., tossing a coin, rolling a die) and test the predictions. Use appropriate ratios between 0 and 1 to represent the probability of the outcome and associate the probability with the likelihood of the event.	Experimental probability The probability scale Calculating probability part 1 The language of probability

Grade 7	
Number Sense and Operations	
7.N.1 Compare, order, estimate, and translate among integers, fractions and mixed numbers (i.e., rational numbers), decimals, and percents.	Ordering integers Ordering decimals Ordering fractions Estimation and approximation Equivalent fractions Fractions and decimals Equivalent fractions, decimals and percentages Introducing percentages
7.N.2 Use ratios and proportions in the solution of problems involving unit rates, scale drawings, and reading of maps.	Ratio and rate Ratio and proportion problems Dividing in a given ratio Scale drawings
7.N.3 Represent numbers in scientific notation (positive powers of ten only) and use that notation in problem situations.	Scientific notation
7.N.4 Demonstrate an understanding of absolute value.	Absolute value
7.N.5 Apply the rules of positive integer exponents to the solution of problems. Extend the Order of Operations to include positive integer exponents.	Powers Order of operations and PEMDAS
7.N.6 Use the inverse relationships of addition and subtraction, and of multiplication and division, to simplify computations and solve problems.	Mental math puzzles

<p>7.N.7 Estimate and compute with fractions (including simplification of fractions), integers, decimals, and percents (including those greater than 100 and less than 1).</p>	<p>Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Mental math puzzles Mental math and place value Multiplying and dividing by 0.1 and 0.01 Multiplying by numbers between 0 and 1</p>
<p>7.N.8 Determine when an estimate rather than an exact answer is appropriate and apply in problem situations.</p>	<p>Estimation and approximation Estimating measurements</p>

<p>7.N.9 Select and use appropriate operations—addition, subtraction, multiplication, division, and positive integer exponents—to solve problems with rational numbers (including negatives).</p>	<p>Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Powers Mental math puzzles</p>
<p>Patterns, Relations and Algebra</p>	
<p>7.P.1 Extend, represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic expressions. Include arithmetic and geometric progressions, e.g., compounding.</p>	<p>Introducing sequences Sequences from geometrical patterns Describing and continuing sequences Generating sequences from flow charts Generating sequences and rules Finding the nth term Sequences from practical contexts</p>
<p>7.P.2 Evaluate simple algebraic expressions for given variable values.</p>	<p>Substitution</p>
<p>7.P.3 Create and use symbolic expressions for linear relationships and relate them to verbal, tabular, and graphical representations.</p>	<p>Solving simple equations Solving linear inequalities The equation of a straight line Writing expressions Direct variations</p>

	Solving simple equations Graphs of functions Mapping functions The equation of a straight line Equations involving parentheses and division
7.P.4 Solve linear equations using tables, graphs, models, and algebraic methods.	
7.P.5 Identify, describe, and analyze linear relationships between two variables. Compare positive rate of change, e.g., $y = 3x + 1$, to negative rate of change, e.g., $y = -3x + 1$.	The equation of a straight line Graphs of functions
7.P.6 Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.	Direct variations
Geometry	
7.G.1 Analyze, apply, and explain the relationship between the number of sides and the sums of the interior angle measures of polygons.	The sum of interior and exterior angles
7.G.2 Classify figures in terms of congruence and similarity, and apply these relationships to the solution of problems.	Congruence Finding missing lengths Dilation
7.G.3 Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal.	Angles made with parallel lines Calculating angles
7.G.4 Graph points and identify coordinates of points on the Cartesian coordinate plane (all four quadrants).	Introducing coordinates
7.G.5 Use a ruler, protractor, and compass to draw polygons and circles.	Drawing lines and angles Constructing triangles Constructing lines and angles
7.G.6 Predict the results of translations and reflections of figures on unmarked or coordinate planes and draw the transformed figure.	Translation Reflection
7.G.7 Identify three-dimensional figures (e.g., prisms, pyramids) by their physical appearance, distinguishing attributes, and spatial relationships such as parallel faces.	Solid shapes Cylinder, cones and shapes
Measurement	
7.M.1 Select, convert (within the same system of measurement), and use appropriate units of measurement or scale.	Converting metric units Customary unit conversions
7.M.2 Given the formulas, convert from one system of measurement to another. Use technology as appropriate.	Customary unit conversions

<p>7.M.3 Demonstrate an understanding of the concepts and apply formulas and procedures for determining measures, including those of area and perimeter/circumference of parallelograms, trapezoids, and circles. Given the formulas, determine the surface area and volume of rectangular prisms and cylinders. Use technology as appropriate.</p>	<p>Using formulas Perimeter Area Area problems Circumference of a circle Area of a circle Surface area Volume Cylinders, cones and spheres Formulas for shapes</p>
<p>Data Analysis, Statistics, and Probability</p>	
<p>7.D.1 Select, create, interpret, and utilize the following tabular and graphical representations of data: circle graphs, Venn diagrams, stem-and-leaf plots, tables, and charts.</p>	<p>Circle graphs Venn diagrams Appropriate graphs Calculating statistics</p>
<p>7.D.2 Find, describe, and interpret appropriate measures of central tendency (mean, median, and mode) and spread (range) that represent a set of data. Use these notions to compare different sets of data.</p>	<p>Calculating the mean Finding the median Finding the mode Finding the range Comparing data Calculating statistics</p>
<p>7.D.3 Use tree diagrams, tables, organized lists, and area models to compute probabilities for simple compound events, e.g., multiple coin tosses or rolls of number cubes.</p>	<p>Probability diagrams</p>
<p>Grade 8</p>	
<p>Number Sense and Operations</p>	
<p>8.N.1 Compare, order, estimate, and translate among integers, fractions and mixed numbers (i.e., rational numbers), decimals, and percents.</p>	<p>Ordering integers Ordering decimals Ordering fractions Estimation and approximation Equivalent fractions Fractions and decimals Equivalent fractions, decimals and percentages Introducing percentages Using negative numbers in context</p>
<p>8.N.2 Define, compare, order, and apply frequently used irrational numbers, such as $\sqrt{2}$ and π.</p>	<p>Rational and irrational numbers</p>

8.N.3 Use ratios and proportions in the solution of problems, in particular, problems involving unit rates, scale factors, and rate of change.	Ratio and rate Using scale factors Ratio and proportion problems Dividing in a given ratio
8.N.4 Represent numbers in scientific notation, and use them in calculations and problem situations.	Scientific notation
8.N.5 Apply number theory concepts, including prime factorization and relatively prime numbers, to the solution of problems.	Prime factorization Prime numbers Multiples and factors Divisibility
8.N.6 Demonstrate an understanding of absolute value.	Absolute value
8.N.7 Apply the rules of powers and roots to the solution of problems. Extend the Order of Operations to include positive integer exponents and square roots.	Powers Square roots Cubes and cube roots Order of operations and PEMDAS
8.N.8 Demonstrate an understanding of the properties of arithmetic operations on rational numbers. Use the associative, commutative, and distributive properties; properties of the identity and inverse elements and the notion of closure of a subset of the rational numbers under an operation (e.g., the set of odd integers is closed under multiplication but not under addition).	Properties of numbers
8.N.9 Use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems, e.g. multiplying by $\frac{1}{2}$ or 0.5 is the same as dividing by 2.	Mental math puzzles Square roots Multiplying by numbers between 0 and 1

<p>8.N.10 Estimate and compute with fractions (including simplification of fractions), integers, decimals, and percents (including those greater than 100 and less than 1).</p>	<p>Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Estimation and approximation Mental math puzzles Mental math and place value</p>
<p>8.N.11 Determine when an estimate rather than an exact answer is appropriate and apply in problem situations.</p>	<p>Estimation and approximation</p>

<p>8.N.12 Select and use appropriate operations—addition, subtraction, multiplication, division, and positive integer exponents—to solve problems with rational numbers (including negatives).</p>	<p>Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental addition and subtraction Mental multiplication Mental division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Powers Mental math puzzles Mental math and place value</p>
<p>Patterns, Relations and Algebra</p>	
<p>8.P.1 Extend, represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic expressions. Include arithmetic and geometric progressions, e.g., compounding.</p>	<p>Introducing sequences Sequences from geometrical patterns Describing and continuing sequences Generating sequences from flow charts Generating sequences and rules Finding the nth term Sequences from practical contexts</p>
<p>8.P.2 Evaluate simple algebraic expressions for given variable values.</p>	<p>Substitution</p>
<p>8.P.3 Demonstrate an understanding of the identity $(-x)(-y) = xy$. Use this identity to simplify algebraic expressions,</p>	<p>Multiplying algebraic terms</p>

	Solving simple equations Inequalities Inequalities on a number line The equation of a straight line Writing expressions Graphs of functions Nonlinear equations Graphs of nonlinear functions Exploring nonlinear graphs Function machines Mapping functions
8.P.4 Create and use symbolic expressions and relate them to verbal, tabular, and graphical representations.	
8.P.5 Identify the slope of a line as a measure of its steepness and as a constant rate of change from its table of values, equation, or graph. Apply the concept of slope to the solution of problems.	The equation of a straight line
8.P.6 Identify the roles of variables within an equation, e.g., $y = mx + b$, expressing y as a function of x with parameters m and b .	The equation of a straight line
8.P.7 Set up and solve linear equations and inequalities with one or two variables, using algebraic methods, models, and/or graphs.	Solving simple equations Systems of linear equations Solving linear inequalities Combined linear inequalities Integer solutions for inequalities Inequalities and regions
8.P.8 Explain and analyze—both quantitatively and qualitatively, using pictures, graphs, charts, or equations—how a change in one variable results in a change in another variable in functional relationships.	Function machines Mapping functions Inverse functions Graphs of functions Function notation and relations Direct variations Reading and plotting graphs
8.P.9 Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.	Solving simple equations The equation of a straight line
8.P.10 Use tables and graphs to represent and compare linear growth patterns. In particular, compare rates of change and x - and y -intercepts of different linear patterns.	Graphs of functions Reading and plotting graphs The equation of a straight line Mapping functions
Geometry	

8.G.1 Analyze, apply, and explain the relationship between the number of sides and the sums of the interior and exterior angle measures of polygons.	The sum of interior and exterior angles
8.G.2 Classify figures in terms of congruence and similarity, and apply these relationships to the solution of problems.	Congruence Dilation Finding missing lengths Scale drawings
8.G.3 Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal.	Angles made with parallel lines Calculating angles
8.G.4 Demonstrate an understanding of the Pythagorean theorem. Apply the theorem to the solution of problems.	Pythagorean Theorem Pythagorean triples Calculating sides of right triangles Identifying right triangles
8.G.5 Use a straight-edge, compass, or other tools to formulate and test conjectures, and to draw geometric figures.	Constructing triangles Constructing lines and angles Drawing lines and angles Constructing nets
8.G.6 Predict the results of transformations on unmarked or coordinate planes and draw the transformed figure, e.g., predict how tessellations transform under translations, reflections, and rotations.	Tessellation Translation Reflection Rotation Combining transformations Dilation
8.G.7 Identify three-dimensional figures (e.g., prisms, pyramids) by their physical appearance, distinguishing attributes, and spatial relationships such as parallel faces.	Solid shapes Cylinders, cones and spheres
8.G.8 Recognize and draw two-dimensional representations of three-dimensional objects, e.g., nets, projections, and perspective drawings.	2-D representations of 3-D shapes Constructing nets Nets Views of 3-D shapes
Measurement	
8.M.1 Select, convert (within the same system of measurement), and use appropriate units of measurement or scale.	Converting metric units Customary unit conversions
8.M.2 Given the formulas, convert from one system of measurement to another. Use technology as appropriate.	Customary unit conversions Ratio and proportion problems

<p>8.M.3 Demonstrate an understanding of the concepts and apply formulas and procedures for determining measures, including those of area and perimeter/ circumference of parallelograms, trapezoids, and circles. Given the formulas, determine the surface area and volume of rectangular prisms, cylinders, and spheres. Use technology as appropriate.</p>	<p>Using formulas Perimeter Area Area problems Circumference of a circle Area of a circle Surface area Volume Cylinders, cones and spheres Fomulas for shapes</p>
<p>8.M.4 Use ratio and proportion (including scale factors) in the solution of problems, including problems involving similar plane figures and indirect measurement.</p>	<p>Scale drawings Direct variations Ratio and proportion problems Using scale factors Finding missing lengths Dilation Dividing in a given ratio</p>
<p>8.M.5 Use models, graphs, and formulas to solve simple problems involving rates, e.g., velocity and density.</p>	<p>-</p>
<p>Data Analysis, Statistics and Probability</p>	
<p>8.D.1 Describe the characteristics and limitations of a data sample. Identify different ways of selecting a sample, e.g., convenience sampling, responses to a survey, random sampling.</p>	<p>Population and sampling</p>
<p>8.D.2 Select, create, interpret, and utilize various tabular and graphical representations of data, e.g., circle graphs, Venn diagrams, scatterplots, stem-and-leaf plots, box-and-whisker plots, histograms, tables, and charts. Differentiate between continuous and discrete data and ways to represent them.</p>	<p>Circle graphs Venn diagrams Scatter plots Histograms Appropriate graphs Quartiles and box plots Comparing data Calculating statistics Collecting data Organizing data</p>

<p>8.D.3 Find, describe, and interpret appropriate measures of central tendency (mean, median, and mode) and spread (range) that represent a set of data. Use these notions to compare different sets of data.</p>	<p>Calculating the mean Finding the median Finding the mode Finding the range Calculating statistics Comparing data</p>
<p>8.D.4 Use tree diagrams, tables, organized lists, basic combinatorics (“fundamental counting principle”), and area models to compute probabilities for simple compound events, e.g., multiple coin tosses or rolls of dice.</p>	<p>Probability diagrams</p>