

Michigan Grade Level Content Expectations	Boardworks Middle School Math Presentations
<b>Grade 6</b>	
<b>Number and Operations</b>	
<b>Multiply and divide fractions</b>	
N.MR.06.01 Understand division of fractions as the inverse of multiplication.	Multiplying fractions Dividing by fractions Mental math puzzles
N.FL.06.02 Given an applied situation involving dividing fractions, write a mathematical statement to represent the situation.	Dividing by fractions
N.MR.06.03 Solve for the unknown in equations.	Solving simple equations Writing expressions
N.FL.06.04 Multiply and divide any two fractions, including mixed numbers, fluently.	Multiplying fractions Dividing by fractions Finding a fraction of an amount
<b>Represent rational numbers as fractions or decimals</b>	
N.ME.06.05 Order rational numbers and place them on the number line.	Ordering integers Ordering decimals Ordering fractions Using negative numbers in context
N.ME.06.06 Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations.	Equivalent fractions Fractions and decimals
N.ME.06.07 Understand that a fraction or a negative fraction is a quotient of two integers	Ordering fractions Fractions of shapes

<b>Add and subtract integers and rational numbers</b>	
N.MR.06.08 Understand integer subtraction as the inverse of integer addition. Understand integer division as the inverse of integer multiplication.	Mental math puzzles
N.FL.06.09 Add and multiply integers between -10 and 10; subtract and divide integers using the related facts. Use the number line and chip models for addition and subtraction.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction Written methods for multiplication Written methods for division
N.FL.06.10 Add, subtract, multiply and divide positive rational numbers fluently.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction Written methods for multiplication Written methods for division Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions
<b>Find equivalent ratios</b>	

N.ME.06.11 Find equivalent ratios by scaling up or scaling down.	Ratio and rate Using scale factors Direct proportion Ratio and proportion problems
<b>Solve decimal, percentage and rational number problems</b>	
N.FL.06.12 Calculate part of a number given the percentage and the number.	Percentages and inverse operations
N.MR.06.13 Solve contextual problems involving percentages such as sales taxes and tips.	Percentage change Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator
N.FL.06.14 For applied situations, estimate the answers to calculations involving operations with rational numbers.	Calculating percentages mentally
N.FL.06.15 Solve applied problems that use the four operations with appropriate decimal numbers.	Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction
<b>Use exponents</b>	
N.ME.06.16 Understand and use integer exponents, excluding powers of negative bases; express numbers in scientific notation.	Powers Scientific notation

<b>Understand rational numbers and their location on the number line</b>	
N.ME.06.17 Locate negative rational numbers (including integers) on the number line; know that numbers and their negatives add to 0, and are on opposite sides and at equal distance from 0 on a number line.	Using negative numbers in context Absolute value
N.ME.06.18 Understand that rational numbers are quotients of integers (non zero denominators), e.g., a rational number is either a fraction or a negative fraction.	Rational and irrational numbers
N.ME.06.19 Understand that 0 is an integer that is neither negative nor positive.	Ordering integers
N.ME.06.20 Know that the absolute value of a number is the value of the number ignoring the sign; or is the distance of the number from 0.	Absolute value
<b>Algebra</b>	
<b>Calculate rates</b>	
A.PA.06.01 Solve applied problems involving rates, including speed, e.g., if a car is going 50 mph, how far will it go in 3 1/2 hours?	-
<b>Understand the coordinate plane</b>	
A.RP.06.02 Plot ordered pairs of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane.	Introducing coordinates
<b>Use variables, write expressions and equations, and combine like terms</b>	
A.FO.06.03 Use letters, with units, to represent quantities in a variety of contexts, e.g., y lbs., k minutes, x cookies.	Writing expressions Introducing formulas
A.FO.06.04 Distinguish between an algebraic expression and an equation.	Writing expressions
A.FO.06.05 Use standard conventions for writing algebraic expressions, e.g., $2x + 1$ means "two times x, plus 1" and $2(x + 1)$ means "two times the quantity (x + 1)."	Writing expressions
A.FO.06.06 Represent information given in words using algebraic expressions and equations.	Writing expressions Introducing formulas
A.FO.06.07 Simplify expressions of the first degree by combining like terms, and evaluate using specific values.	Combining like terms Substitution
<b>Represent linear functions using tables, equations, and graphs</b>	
A.RP.06.08 Understand that relationships between quantities can be suggested by graphs and tables.	Graphs of functions Reading and plotting graphs Conversion graphs Distance-time graphs Interpreting graphs Direct variations

A.PA.06.09 Solve problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers, e.g., given $c$ chairs, the “leg function” is $4c$ ; if you have 5 chairs, how many legs?; if you have 12 legs, how many chairs?	Introducing formulas Reading and plotting graphs
A.RP.06.10 Represent simple relationships between quantities using verbal descriptions, formulas or equations, tables, and graphs, e.g., perimeter-side relationship for a square, distance-time graphs, and conversions such as feet to inches.	Introducing formulas Reading and plotting graphs Distance-time graphs Conversion graphs Deriving formulas Transforming formulas Solving simple equations Using formulas
<b>Solve equations</b>	
A.FO.06.11 Relate simple linear equations with integer coefficients, e.g., $3x = 8$ or $x + 5 = 10$ , to particular contexts and solve.	Writing expressions
A.FO.06.12 Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.	Solving simple equations
A.FO.06.13 Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solutions.	Solving simple equations
A.FO.06.14 Solve equations of the form $ax + b = c$ , e.g., $3x + 8 = 15$ by hand for positive integer coefficients less than 20, use calculators otherwise, and interpret the results.	Solving simple equations
<b>Measurement</b>	
<b>Convert within measurement systems</b>	
M.UN.06.01 Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.	Converting metric units Customary unit conversions
<b>Find volume and surface area</b>	
M.PS.06.02 Draw patterns (of faces) for a cube and rectangular prism that, when cut, will cover the solid exactly (nets).	Nets Constructing nets

M.TE.06.03 Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.	Volume Surface area Using formulas
<b>Geometry</b>	
<b>Understand and apply basic properties</b>	
G.GS.06.01 Understand and apply basic properties of lines, angles, and triangles, including:	
triangle inequality	-
relationships of vertical angles, complementary angles, supplementary angles	Calculating angles
congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruencies imply parallel lines	Angles made with parallel lines
locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles	Angles in a triangle The sum of interior and exterior angles Angles in polygons
know that the sum of the exterior angles of a convex polygon is $360^\circ$ .	The sum of interior and exterior angles
<b>Understand the concept of congruence and basic transformations</b>	
G.GS.06.02 Understand that for polygons, congruence means corresponding sides and angles have equal measures.	Congruence
G.TR.06.03 Understand the basic rigid motions in the plane (reflections, rotations, translations), relate these to congruence, and apply them to solve problems.	Reflection Rotation Translation Congruence
G.TR.06.04 Understand and use simple compositions of basic rigid transformations, e.g., a translation followed by a reflection.	Combining transformations Translation Reflection Rotation
<b>Construct geometric shapes</b>	
G.SR.06.05 Use paper folding to perform basic geometric constructions of perpendicular lines, midpoints of line segments and angle bisectors; justify informally.	-

<b>Data and Probability</b>	
<b>Understand the concept of probability and solve problems</b>	
D.PR.06.01 Express probabilities as fractions, decimals, or percentages between 0 and 1; know that 0 probability means an event will not occur and that probability 1 means an event will occur.	The probability scale
D.PR.06.02 Compute probabilities of events from simple experiments with equally likely outcomes, e.g., tossing dice, flipping coins, spinning spinners, by listing all possibilities and finding the fraction that meets given conditions.	Experimental probability Probability diagrams
<b>Grade 7</b>	
<b>Number and Operations</b>	
<b>Understand derived quantities</b>	
N.MR.07.02 Solve problems involving derived quantities such as density, velocity, and weighted averages.	-
<b>Understand and solve problems involving rates, ratios, and proportions</b>	
N.FL.07.03 Calculate rates of change including speed.	Ratio and rate
N.MR.07.04 Convert ratio quantities between different systems of units, such as feet per second to miles per hour.	-
N.FL.07.05 Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$ ; know how to see patterns about proportional situations in tables.	Ratio and rate Direct proportion Using scale factors Dividing in a given ratio Ratio and proportion problems

<b>Recognize irrational numbers</b>	
N.MR.07.06 Understand the concept of square root and cube root, and estimate using calculators.	Square roots Cubes and cube roots
<b>Compute with rational numbers</b>	
N.FL.07.07 Solve problems involving operations with integers.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction Written methods for multiplication Written methods for division
N.FL.07.08 Add, subtract, multiply, and divide positive and negative rational numbers fluently.	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction Written methods for multiplication Written methods for division Adding and subtracting simple fractions Methods of adding and subtracting fractions Multiplying fractions Dividing by fractions Mental math puzzles

N.FL.07.09 Estimate results of computations with rational numbers.	Estimation and approximation
<b>Algebra</b>	
<b>Understand and apply directly proportional relationships and relate to linear relationships</b>	
A.PA.07.01 Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship.	Direct proportion Direct variations Reading and plotting graphs
A.RP.07.02 Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations.	Direct proportion Direct variations Reading and plotting graphs Introducing formulas Using formulas Deriving formulas Transforming formulas
A.PA.07.03 Given a directly proportional or other linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate $y = mx + b$ for specific $x$ values, e.g., weight vs. volume of water, base cost plus cost per unit.	The equation of a straight line Direct variations Reading and plotting graphs
A.PA.07.04 For directly proportional or linear situations, solve applied problems using graphs and equations, e.g., the heights and volume of a container with uniform cross-section; height of water in a tank being filled at a constant rate; degrees Celsius and degrees Fahrenheit; distance and time under constant speed.	The equation of a straight line Direct variations Reading and plotting graphs Conversion graphs Interpreting graphs Introducing formulas Using formulas
A.PA.07.05 Recognize and use directly proportional relationships of the form $y = mx$ , and distinguish from linear relationships of the form $y = mx + b$ , $b$ non-zero; understand that in a directly proportional relationship between two quantities one quantity is a constant multiple of the other quantity.	Direct proportion Direct variations The equation of a straight line
<b>Understand and represent linear functions</b>	
A.PA.07.06 Calculate the slope from the graph of a linear function as the ratio of 'rise/run' for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change.	Graphs of functions The equation of a straight line
A.PA.07.07 Represent linear functions in the form $y = x + b$ , $y = mx$ , and $y = mx + b$ , and graph, interpreting slope and y-intercept.	The equation of a straight line

A.FO.07.08 Find and interpret the x and/or y intercepts of a linear equation or function. Know that the solution to a linear equation of the form $ax+b=0$ corresponds to the point at which the graph of $y=ax+b$ crosses the x axis.	The equation of a straight line
<b>Understand and solve problems about inversely proportional relationships</b>	
A.PA.07.09 Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, e.g., the length and width of a rectangle with fixed area, and that an inversely proportional relationship is of the form $y = k/x$ where k is some non-zero number.	-
A.RP.07.10 Know that the graph of $y = k/x$ is not a line, know its shape, and know that it crosses neither the x nor the y-axis.	Exploring nonlinear graphs
<b>Apply basic properties of real numbers in algebraic contexts</b>	
A.PA.07.11 Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.	Properties of numbers
<b>Combine algebraic expressions and solve equations</b>	
A.FO.07.12 Add, subtract, and multiply simple algebraic expressions of the first degree, and justify using properties of real numbers.	Writing expressions Combining like terms Substitution Factoring expressions Properties of numbers
A.FO.07.13 From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$ , and interpret solutions.	Solving simple equations The equation of a straight line
<b>Geometry</b>	
<b>Draw and construct geometric objects</b>	
G.SR.07.01 Use a ruler and other tools to draw squares, rectangles, triangles, and parallelograms with specified dimensions.	Constructing triangles Constructing lines and angles Drawing lines and angles
G.SR.07.02 Use compass and straightedge to perform basic geometric constructions: the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle; understand informal justifications.	Constructing triangles Constructing lines and angles Drawing lines and angles

<b>Understand the concept of similar polygons, and solve related problems</b>	
G.TR.07.03 Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.	Congruence Using scale factors Dilation
G.TR.07.04 Solve problems about similar figures and scale drawings.	Dilation Scale drawings Finding missing lengths Congruence
G.TR.07.05 Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.	-
G.TR.07.06 Understand and use the fact that when two triangles are similar with scale factor of $r$ , their areas are related by a factor of $r^2$ .	-
<b>Data and Probability</b>	
<b>Represent and interpret data</b>	
D.RE.07.01 Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions.	Circle graphs Histograms Appropriate graphs Calculating statistics Quartiles and box plots
D.AN.07.02 Create and interpret scatter plots and find line of best fit; use an estimated line of best fit to answer questions about the data.	Scatter plots
<b>Compute statistics about data sets</b>	
D.AN.07.03 Calculate and interpret relative frequencies and cumulative frequencies for given data sets.	Experimental probability
D.AN.07.04 Find and interpret the median, quartiles, and interquartile range of a given set of data.	Interquartile range Quartiles and box plots Finding the median Finding the mode Finding the range Calculating the mean Calculating statistics

<b>Grade 8</b>	
<b>Number and Operations</b>	
<b>Understand real number concepts</b>	
N.ME.08.01 Understand the meaning of a square root of a number and its connection to the square whose area is the number; understand the meaning of a cube root and its connection to the volume of a cube.	Square roots Cubes and cube roots
N.ME.08.02 Understand meanings for zero and negative integer exponents.	Powers
N.ME.08.03 Understand that in decimal form, rational numbers either terminate or eventually repeat, and that calculators truncate or round repeating decimals; locate rational numbers on the number line; know fraction forms of common repeating decimals.	Ordering integers Ordering decimals Ordering fractions Fractions and decimals Rounding Using a calculator
N.ME.08.04 Understand that irrational numbers are those that cannot be expressed as the quotient of two integers, and cannot be represented by terminating or repeating decimals; approximate the position of familiar irrational numbers.	Rational and irrational numbers
N.FL.08.05 Estimate and solve problems with square roots and cube roots using calculators.	Square roots Cubes and cube roots
N.FL.08.06 Find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers.	Square roots Estimation and approximation
<b>Solve problems</b>	
N.MR.08.07 Understand percent increase and percent decrease in both sum and product form, e.g., 3% increase of a quantity $x$ is $x + .03x = 1.03x$ .	Percentage change
N.MR.08.08 Solve problems involving percent increases and decreases.	Percentage change
N.FL.08.09 Solve problems involving compounded interest or multiple discounts.	-
N.MR.08.10 Calculate weighted averages such as course grades, consumer price indices, and sports ratings.	-
N.FL.08.11 Solve problems involving ratio units, such as miles per hour, dollars per pound, or persons per square mile.	Ratio and rate Dividing in a given ratio Ratio and proportion problems

<b>Algebra</b>	
<b>Understand the concept of non-linear functions using basic examples</b>	
A.RP.08.01 Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships; cubics; roots; and exponentials; using tables, graphs, and equations.	Graphs of functions Graphs of nonlinear functions Nonlinear equations Exploring nonlinear graphs Introducing functions
A.PA.08.02 For basic functions, e.g., simple quadratics, direct and indirect variation, and population growth, describe how changes in one variable affect the others.	Direct variations
A.PA.08.03 Recognize basic functions in problem context, e.g., area of a circle is $\pi r^2$ , volume of a sphere is $\frac{4}{3}\pi r^3$ , and represent them using tables, graphs, and formulas.	Area of a circle Volume Surface area Area Perimeter Circumference of a circle Using formulas Formulas for shapes
A.RP.08.04 Use the vertical line test to determine if a graph represents a function in one variable.	-
<b>Understand and represent quadratic functions</b>	
A.RP.08.05 Relate quadratic functions in factored form and vertex form to their graphs, and vice versa; in particular, note that solutions of a quadratic equation are the x-intercepts of the corresponding quadratic function.	Graphs of nonlinear functions Exploring nonlinear graphs
A.RP.08.06 Graph factorable quadratic functions, finding where the graph intersects the x-axis and the coordinates of the vertex; use words 'parabola' and 'roots'; include functions in vertex form and those with leading coefficient -1.	Graphs of nonlinear functions Exploring nonlinear graphs
<b>Recognize, represent, and apply common formulas</b>	
A.FO.08.07 Recognize and apply the common formulas:	
$(a + b)^2 = a^2 + 2 ab + b^2$	-
$(a - b)^2 = a^2 - 2 ab + b^2$	-
$(a + b)(a - b) = a^2 - b^2$ ; represent geometrically.	-
A.FO.08.08 Factor simple quadratic expressions with integer coefficients	Nonlinear equations

A.FO.08.09 Solve applied problems involving simple quadratic equations; solve simple quadratic equations; verify solutions by evaluation.	Nonlinear equations Nonlinear equations and spreadsheets
A.FO.08.09 Solve applied problems involving simple quadratic equations.	-
<b>Understand solutions and solve equations, simultaneous equations, and linear inequalities</b>	
A.FO.08.10 Understand that to solve the equation $f(x) = g(x)$ means to find all values of $x$ for which the equation is true, e.g., determine whether a given value, or values from a given set, is a solution of an equation (0 is a solution of $3x^2 + 2 = 4x + 2$ , but 1 is not a solution).	Function notation and relations
A.FO.08.11 Solve simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions.	Systems of linear equations
	Solving linear inequalities Integers solutions to inequalities Inequalities on a number line Combined linear inequalities
A.FO.08.12 Solve linear inequalities in one and two variables, and graph the solution sets.	
A.FO.08.13 Set up and solve applied problems involving simultaneous linear equations and linear inequalities.	Combined linear inequalities

<b>Geometry</b>	
<b>Understand and use the Pythagorean Theorem</b>	
G.GS.08.01 Understand at least one proof of the Pythagorean Theorem; use the Pythagorean Theorem and its converse to solve applied problems including perimeter, area, and volume problems.	Pythagorean Theorem Pythagorean triples Calculating sides of right triangles Identifying right triangles
G.LO.08.02 Find the distance between two points on the coordinate plane using the distance formula; recognize that the distance formula is an application of the Pythagorean Theorem.	-
<b>Solve problems about geometric figures</b>	
G.SR.08.03 Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.	Circles Circumference of a circle Area of a circle
G.SR.08.04 Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).	Perimeter Area of irregular shapes
G.SR.08.05 Solve applied problems involving areas of triangles, quadrilaterals, and circles.	Area of a circle Area Area problems Using formulas
<b>Understand concepts of volume and surface area, and apply formulas</b>	
G.SR.08.06 Know the volume formulas for generalized cylinders, generalized cones and pyramids, and spheres and apply them to solve problems.	Cylinders, cones and spheres Formulas for shapes

G.SR.08.07 Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.	Surface area Cylinders, cones and spheres
<b>Visualize solids</b>	
G.SR.08.08 Sketch a variety of two-dimensional representations of three-dimensional solids including orthogonal views (top, front, and side), picture views (projective or isometric), and nets; use such two-dimensional representations to help solve problems.	2-D representations of 3-D shapes Nets Constructing nets Views of 3-D shapes
<b>Understand and apply concepts of transformation and symmetry</b>	
G.TR.08.09 Understand the definition of a dilation from a point in the plane, and relate it to the definition of similar polygons.	Dilation Congruence
G.TR.08.10 Understand and use reflective and rotational symmetries of two-dimensional shapes and relate them to transformations to solve problems.	Reflection symmetry Rotational symmetry
<b>Data and Probability</b>	
<b>Draw, explain, and justify conclusions based on data</b>	
D.AN.08.01 Determine which measure of central tendency (mean, median, mode) best represents a data set, e.g., salaries, home prices, for answering certain questions; justify the choice made.	Calculating the mean Finding the median Finding the mode Calculating statistics Comparing data
D.AN.08.02 Recognize practices of collecting and displaying data that may bias the presentation or analysis.	Misleading graphs Collecting data Population and sampling
<b>Understand probability concepts for simple and compound events</b>	
D.PR.08.03 Compute relative frequencies from a table of experimental results for a repeated event. Interpret the results using relationship of probability to relative frequency.	Experimental probability
D.PR.08.04 Apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams.	Probability diagrams
D.PR.08.05 Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.	Experimental probability
D.PR.08.06 Understand the difference between independent and dependent events, and recognize common misconceptions involving probability, e.g., Alice rolls a 6 on a die three times in a row; she is just as likely to roll a 6 on the fourth roll as she was on any previous roll.	The language of probability