

Michigan Mathematics Content Standards and Working Draft Benchmarks: Middle School, Correlated to *Glencoe Pre-Algebra*



Lessons in which the Benchmarks are a primary focus are indicated in **bold**.

Standard and Working Draft Benchmarks		Student Edition Lesson(s)
I. PATTERNS, RELATIONSHIPS, AND FUNCTIONS		
Content Standard 1: Students recognize similarities and generalize patterns, use patterns to create models and make predictions, describe the nature of patterns and relationships, and construct representations of mathematical relationships. (Patterns)		
MS.I.1.1	Describe, analyze and generalize patterns arising in a variety of contexts and express them in general terms.	1-1, 5-10, 5-10F
MS.I.1.2	Represent and record patterns in a variety of ways including tables, charts and graphs, and translate between various representations.	1-1, 8-1P, 8-1
MS.I.1.3	Use patterns and their generalizations to make and justify inferences and predictions.	1-1, 5-10, 5-10F
MS.I.1.4	Explore and describe visual and numeric patterns, including linear expressions, near-linear patterns and symmetric and spatial patterns.	1-1, 5-10, 5-10F, 8-1P, 8-1, 8-2
MS.I.1.5	Use patterns and generalizations to solve problems and explore new content.	1-1, 5-10, 8-1P
Content Standard 2: Students describe the relationships among variables, predict what will happen to one variable as another variable is changed, analyze natural variation and sources of variability, and compare patterns of change. (Variability and Change)		
MS.I.2.1	Identify and describe the nature of change; recognize change in more abstract and complex situations and explore different kinds of change and patterns of variation.	8-4, 8-5P, 8-5
MS.I.2.2	Connect an initial state to a final state and generalize a rule that describes a pattern of change.	4-6F, 8-4P, 8-5
MS.I.2.3	Begin to investigate applications in bivariate data and linear relationships and explore questions of what will happen to one quantity if another variable is changed.	1-7P, 1-7, 8-1P, 8-1, 8-2P, 8-2, 8-5P, 8-5
MS.I.2.4	Represent variability or change by ordered pairs, tables, graphs and equations.	1-7P, 1-7, 4-6F, 8-1P, 8-1, 8-2P, 8-5P, 8-5

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MS.I.2.5	Differentiate between functions and relationships such as linear vs. not linear or continuous vs. non-continuous.	8-2, 13-5
MS.I.2.6	Continue to explore relationships arising from interesting contexts and use variables and relationships to solve mathematical problems.	1-5, 1-6, 1-7P, 1-7, 3-6, 4-1, 4-4, 4-6F, 5-6, 5-10, 5-10F, 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 8-1, 8-2, 8-4P, 8-4, 8-5P, 8-5, 8-7, 8-8, 8-9, 8-10, 13-5
II. GEOMETRY AND MEASUREMENT		
Content Standard 1: Students develop spatial sense, use shape as an analytic and descriptive tool, identify characteristics and define shapes, identify properties and describe relationships among shapes. (Shape and Shape Relationships)		
MS.II.1.1	Distinguish among shapes and differentiate between examples and non-examples of shapes based on their properties; generalize about shapes of graphs and data distributions.	1-7P, 1-7, 5-8, 9RM, 9-3, 9-4 , 10-1, 10-2, 10-4 , 10RM, 10-6 , 11-1, 12-3 , 12-3F, 12-4, 12-4F, 12-5 , PS15
MS.II.1.2	Generalize the characteristics of shapes and apply their generalizations	9RM, 9-3, 9-4 , 10-1, 10-2, 10-4 , 10RM, 10-6 , 11-1, 11-3
MS.II.1.3	Derive generalizations about shapes and apply those generalizations to develop classifications of familiar shapes.	9RM, 9-3, 9-4 , 10-1, 10-2, 10-4 , 10RM, 10-6 , 11-1, 11-3
MS.II.1.4	Construct familiar shapes using coordinates, appropriate tools (including technology), sketching and drawing two- and three-dimensional shapes.	10-1F, 10-5P, 11-1P , 11-2
MS.II.1.5	Combine, dissect and transform shapes.	10-3P, 10-3 , 10-3F, 10-4, 10-5P , 10-5, 10-6, 10-6F , 10-7, 10-8, 11-1P, 11-4, 11-5
MS.II.1.6	Generalize about the common properties of similar, congruent, parallel and perpendicular shapes and verify their generalizations informally.	9-7, 10-1, 10-2, 10-6, 11-1, 11-6P, 11-6

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MS.II.1.7	Use shape, shape properties and shape relationships to describe the physical world and to solve problems.	9-3, 9-4, 9-5, 9-7, 9-8, 10-1, 10-2, 10-3, 10-4, 10-6, 10-7, 10-8, 11-1, 11-6
Content Standard 2: Students identify locations of objects, identify location relative to other objects, and describe the effects of transformations (e.g., sliding, flipping, turning, enlarging, reducing) on an object. (Position)		
MS.II.2.1	Locate and describe objects in terms of their position, including compass directions, Cartesian coordinates, latitude and longitude and midpoints.	1-6, 2-6, 8-1, 8-2, 8-3, 9-6, 9-7, 10-3, 10-3F, 13-6
MS.II.2.2	Locate and describe objects in terms of their orientation and relative position, including coincident, collinear, parallel, perpendicular; differentiate between fixed (e.g., N- S- E- W) and relative (e.g., right-left) orientations; recognize and describe examples of bilateral and rotational symmetry.	1-6, 2-6, 8-9, 10-1, 10-3P, 10-3, 10-3F
MS.II.2.3	Describe translations, reflections, rotations and dilations using the language of transformations and employ transformations to verify congruence of figures.	10-3P, 10-3, 10-3F, 10-6, 10-6F
MS.II.2.4	Locate the position of points or objects described by two or more conditions; locate all the points (locus) that satisfy a given condition.	1-6, 2-6, 10-3, 10-3F
MS.II.2.5	Use concepts of position, direction and orientation to describe the physical world and to solve problems.	1-6, 2-6, 8-1, 8-2, 8-3, 9-6, 9-7, 10-3, 10-3F, 13-6
Content Standard 3: Students compare attributes of two objects, or of one object with a standard (unit), and analyze situations to determine what measurement(s) should be made and to what level of precision. (Measurement)		
MS.II.3.1	Select and use appropriate tools; measure objects using standard units in both the metric and common systems and measure angles in degrees.	3-4, 9-3, 11RM, 11-7, PS13, PS14
MS.II.3.2	Identify the attribute to be measured and select the appropriate unit of measurement for length, mass (weight), time, temperature, perimeter, area, volume and angle.	7-2, 8-9, 9-3, 10-5, 10-7, 10-8, 11-2, 11-3, 11-4, 11-5
MS.II.3.3	Estimate measures with a specified degree of accuracy and decide if an estimate or a measurement is “close enough.”	11RM, 11-7
MS.II.3.4	Interpret measurements and recognize that two objects may have the same measurement on one attribute (e.g., area) but not necessarily on another (e.g., perimeter).	3-7F, 11-3, 13-5
MS.II.3.5	Use proportional reasoning and indirect measurements to draw inferences.	6-2, 6-2F, 6-3, 6-5, 9-7

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MS.II.3.6	Apply measurement to describe the real world and to solve problems.	3-7, 9-3, 9-5, 9-6, 9-7, 9-8, 10-1, 10-2, 10-5, 10-7, 11-2, 11-3, 11-4, 11-5, 11-6, 11RM, 11-7
III. DATA ANALYSIS AND STATISTICS		
Content Standard 1: Students collect and explore data, organize data into a useful form, and develop skill in representing and reading data displayed in different formats. (Collection, Organization and Presentation of Data)		
MS.III.1.1	Collect and explore data through observation, measurement, surveys, sampling techniques and simulations.	1-7P, 4-6F, 5-8P, 5-10F, 6-2F, 6-9F, 8-4P, 12-9, 12-9F
MS.III.1.2	Organize data using tables, charts, graphs, spreadsheets and data bases.	8-2P, 9-3F, 12-1, 12-3, 12-3F, 12-4, 12-4F, PS3, PS15
MS.III.1.3	Present data using a variety of appropriate representations and explain why one representation is preferred over another or how a particular representation may bias the presentation.	1-7P, 1-7, 12-1, 12-3, 12-3F, 12-4, 12-4F, 12-5, 12RM, PS15
MS.III.1.4	Identify what data are needed to answer a particular question or solve a given problem, and design and implement strategies to obtain, organize and present those data.	1-7P, 4-6F, 5-8P, 5-10F, 6-2F, 8-4P, 8-5P
Content Standard 2: Students examine data and describe characteristics of a distribution, relate data to the situation from which they arose, and use data to answer questions convincingly and persuasively. (Description and Interpretation)		
MS.III.2.1	Critically read data from tables, charts or graphs and explain the source of the data and what the data represent.	1-7P, 1-7, 6RM, 8-8, 12-1, 12-2, 12-4
MS.III.2.2	Describe the shape of a data distribution and identify the center, the spread, correlations and any outliers.	1-7, 12-1, 12-3, 12-3F
MS.III.2.3	Draw, explain and justify conclusions based on data.	1-7P, 1-7, 5-8P, 5-10F, 6-2F, 8-4P, 8-8, 12-6F
MS.III.2.4	Critically question the sources of data; the techniques used to collect, organize and present data; the inferences drawn from the data; and the possible sources of bias in the data or their presentation.	12-5, 12RM
MS.III.2.5	Formulate questions and problems and gather and interpret data to answer those questions.	1-7P, 4-6F, 5-8P, 5-10F, 6-2F, 8-4P

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Content Standard 3: Students draw defensible inferences about unknown outcomes, make predictions, and identify the degree of confidence they have in their predictions. (Inference and Prediction)		
MS.III.3.1	Make and test hypotheses.	1-7P, 4-6F, 5-8P, 5-10F, 6-2F, 6-9P, 6-9, 8-1P, 8-4P, 8-5P, 11-2P, 11-6P, 12RM, 12-6F, 12-9F
MS.III.3.2	Design experiments to model and solve problems using sampling, simulations and controlled investigations.	1-7P, 4-6F, 5-8P, 5-10F, 6-2F, 8-4P, 12-9, 12-9F
MS.III.3.3	Formulate and communicate arguments and conclusions based on data and evaluate their arguments and those of others.	1-7, 6-9, 6-9F, 8-8
MS.III.3.4	Make predictions and decisions based on data, including interpolations and extrapolations.	1-7, 6-9, 6-9F, 8-8
MS.III.3.5	Employ investigations, mathematical models and simulations to make inferences and predictions to answer questions and solve problems.	1-7P, 1-7, 1-7F, 6-9F, 8-8, 12-9F
IV. NUMBER SENSE AND NUMERATION		
Content Standard 1: Students experience counting and measuring activities to develop intuitive sense about numbers, develop understanding about properties of numbers, understand the need for and existence of different sets of numbers, and investigate properties of special numbers. (Concepts and Properties of Numbers)		
MS.IV.1.1	Develop an understanding of integers and rational numbers and represent rational numbers in both fraction and decimal form.	2-1, 5-1, 5-2, 6-4
MS.IV.1.2	Extend their understanding of numeration systems to include decimal numeration, scientific numeration and non-decimal numeration systems.	4-2, 4-2F, 4-7, 4-8, 5-1, 5-2, 9-1, 9-2
MS.IV.1.3	Develop an understanding of the properties of the integer and rational number systems (e.g., order, density) and of the properties of special numbers including 0, 1 and π , and the additive and multiplicative inverse.	2-1, 2-2, 2-3, 3-3, 5-2, 5-4, 9-2
MS.IV.1.4	Apply their understanding of number systems to model and solve mathematical and applied problems.	2-1, 2-2, 2-3, 3-3, 4-2, 4-8, 5-1, 5-2, 5-4, 6-4, 9-2

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Content Standard 2: Students recognize that numbers are used in different ways such as counting, measuring, ordering and estimating, understand and produce multiple representations of a number, and translate among equivalent representations. (Representation and Uses of Numbers)		
MS.IV.2.1	Give geometric representations of fractions, prime and composite numbers, triangular and square numbers, and other number concepts; represent rational numbers and integers on the number line.	2-1, 3-1, 4-3, 4-5, 5-1, 5-2, 5-3, 6-4, 6-5P, 6-6, PS-5
MS.IV.2.2	Recognize equivalent representations of a number, especially fractions, decimals and percents, and translate freely among representations.	4-2, 4-3, 4-5, 4-7, 4-8, 5-1, 5-2, 6-4
MS.IV.2.3	Distinguish between numbers that are used for counting, numbers that are used for ordering, numbers that are used for measuring and numbers that are used for naming.	Beyond the scope of this program.
MS.IV.2.4	Develop and refine strategies for estimating quantities, including fractional quantities, and evaluate the reasonableness and appropriateness of their estimates.	1-1, 2-3, 3-5, 3-6, 4-8, 9-7, 10-7, 11-6, PS7, PS9, PS11, PS12
MS.IV.2.5	Select appropriate representations for numbers, including integers and rational numbers, in order to simplify and solve problems.	1-5, 2-1, 4-2, 4-5, 4-7, 4-8, 5-1, 5-2, 5-3, 5-4, 5-5, 5-7, 6-4, 9-1, 9-2
Content Standard 3: Students investigate relationships such as equality, inequality, inverses, factors and multiples, and represent and compare very large and very small numbers. (Number Relationships)		
MS.IV.3.1	Compare and order integers and rational numbers using relations of equality and inequality.	1-1, 1RM, 1-2, 1-3, 1-4, 1-5, 2-1, 2RM, 3-3P, 3-3, 3-4, 3-5, 3RM, 3-6, 4-8, 5-6, 6-1, 6-2, 7-1P, 7-1, 7-2, 7RM, 7-3, 7-4, 7-5, 7-6, 8-2, 8RM, 8-7, 8-9, 8-10, 8-10F, 13-5, 13-6, PS5
MS.IV.3.2	Express numerical comparisons as ratios and rates.	6-1, 6RM, 6-2, 6-3, 8-5P, 8-5
MS.IV.3.3	Distinguish between prime and composite numbers; identify factors, multiples, common factors and multiples, and relatively prime numbers; and apply divisibility tests to numbers.	2-1, 2-2P, 2-2, 2-3, 2-4, 2-5, 4-1, 4-3, 4-4, 4-5, 4-6, 5RM, 5-6, 5-7
MS.IV.3.4	Explain the meaning of powers and roots of numbers and use calculators to compute powers and square roots.	4-2, 4RM, 4-7, 9-1

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MS.IV.3.5	Apply their understanding of number relationships in solving problems.	This standard is addressed throughout the text.
V. NUMERICAL AND ALGEBRAIC OPERATIONS AND ANALYTICAL THINKING		
Content Standard 1: Students understand and use various types of operations (e.g., addition, subtraction, multiplication, division) to solve problems. (Operations and their Properties).		
MS.V.1.1	Use manipulatives and diagrams to model operations and their inverses with integers and rational numbers and relate the models to their symbolic expressions.	2-2P, 2-2, 2-3, 2-4, 2-5, 3-3P, 3-5, 7-1P
MS.V.1.2	Compute with integers, rational numbers and simple algebraic expressions using mental computation, estimation, calculators and paper-and-pencil; explain what they are doing and how they know which operations to perform in a given situation.	1-1, 1-3F, 1-4, 1-5, 2-2, 3-1, 3-2, 3-5, 3-6, 4-1, 4-3, 5-1, 5-5, 5-7, 6-4, 6-6, 9-1, 9-4, 9-8, 11-2, 11-6, PS7, PS9, PS11, PS12
MS.V.1.3	Describe the properties of operations with rationals and integers (e.g., closure; associative, commutative and distributive properties) and give examples of how they use those properties.	1-4, 2-2P, 2-2, 2-4, 3-1, 4-4, 7-2, 10-5, 13-4
MS.V.1.4	Efficiently and accurately apply operations with integers, rational numbers and simple algebraic expressions in solving problems.	1-1, 1-3F, 1-4, 1-5, 2-2, 3-1, 3-2, 3-5, 3-6, 4-1, 4-3, 5-1, 5-5, 5-7, 6-4, 6-6, 9-1, 9-4, 9-8, 11-2, 11-6, PS7, PS9, PS11, PS12
Content Standard 2: Students analyze problems to determine an appropriate process for solution, and use algebraic notations to model or represent problems. (Algebraic and Analytic Thinking)		
MS.V.2.1	Read and write algebraic expressions; develop original examples expressed verbally and algebraically; simplify expressions and translate between verbal and algebraic expressions; and solve linear equations and inequalities.	1RM, 1-2, 1-3, 1-5, 3-1, 3-2, 3-3P, 3-3, 3-4, 3-5, 3RM, 3-6, 5-9, 6-2, 7-1P, 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 8-2, 8-7, 8-9, 8-10
MS.V.2.2	Represent algebraic concepts with geometric models (e.g., algebra tiles), physical models (e.g., balance beam), tables and graphs; and write algebraic expressions to correspond to the multiple representations.	2-2P, 3-3P, 3-3, 3-4, 3-5, 3-6, 8-1P, 8-1, 8-2P, 8-2, 8-3, 8-4, 8-5, 8-6, 8-8, 8-9, 8-10, 8-10F, 13-1F, 13-2, 13-3, 13-4P, 13-4, 13-5, 13-6

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MS.V.2.3	Solve linear equalities and inequalities using algebraic and geometric methods, and use the context of the problem to interpret and explain their solutions.	8-2, 8-7, 8-9, 8-10, 8-10F
MS.V.2.4	Analyze problems modeled by linear functions, determine strategies for solving the problems and evaluate the adequacy of the solutions in the context of the problems.	8-1, 8-2P, 8-2, 8-3, 8-4P, 8-4, 8-5P, 8-5, 8-6, 8-7, 8-8, 8-9, 8-10
MS.V.2.5	Explore problems that reflect the contemporary uses of mathematics in significant contexts and use the power of technology and algebraic and analytic reasoning to experience the ways mathematics is used in society.	1-3, 1-3F, 1-7, 1-7F, 2-1, 2-2, 2-5, 2-6, 3-1, 3-2, 3-4, 3-5, 3-6, 4-2, 4-6, 5-1, 5-2, 5-3, 5-5, 5-6, 5-7, 5-8, 5-9, 5-10, 6-1, 6-2, 6-3, 6-5, 6-6, 6-7, 6-7F, 6-8, 6-9P, 6-9, 6-9F, 7-1, 7-3, 7-4, 7-5, 7-6, 8-1, 8-2, 8-3, 8-4P, 8-4, 8-5P, 8-5, 8-7, 8-8, 8-9, 10-3, 11-1, 11-5, 11-7, 12-1, 12-3, 13-5, 13-6
VI. PROBABILITY AND DISCRETE MATHEMATICS		
Content Standard 1: Students develop an understanding of the notion of certainty and of probability as a measure of the degree of likelihood that can be assigned to a given event based on the knowledge available, and make critical judgments about claims that are made in probabilistic situations. (Probability)		
MS.VI.1.1	Describe events as likely or unlikely and give qualitative and quantitative descriptions of the degree of likelihood.	6-9, 6-9F, 12-6, 12-6F, 12-7, 12-8, 12-9, 12-9F
MS.VI.1.2	Describe probability as a measure of certainty ranging from 0 to 1 and conduct activities that allow them to express probabilities of simple events in mathematical terms.	6-9, 6-9F, 12-6, 12-6F, 12-7, 12-8, 12-9, 12-9F
MS.VI.1.3	Conduct experiments and give examples to illustrate the difference between dependent and independent events.	12-9, 12-9F
MS.VI.1.4	Explain the difference between probabilities determined from experiments or chance events (empirical) and probabilities derived mathematically (theoretical), and explain how the empirical probability changes for a large number of trials.	6-9, 6-9F
MS.VI.1.5	Conduct probability experiments and simulations to model and solve problems.	6-9F, 12-9F

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Content Standard 2: Students investigate practical situations such as scheduling, routing, sequencing, networking, organizing and classifying, and analyze ideas like recurrence relations, induction, iteration, and algorithm design. (Discrete Mathematics)		
MS.VI.2.1	Use manipulatives, diagrams and the fundamental theorem of counting to count permutations and combinations.	12-6, 12-6F, 12-7
MS.VI.2.2	Use sets and set relationships to explore and solve simple algebraic and geometric problems.	1-4, 2-1, 3-1, 5-2, 9-2
MS.VI.2.3	Solve problems involving networks, for example planning delivery routes or counting paths between points.	2-6, 12-7
MS.VI.2.4	Explore recurrence relations and iterations.	5-10, 5-10F, 6-7F
MS.VI.2.5	Continue to use manipulatives and drawings to model the concepts and procedures for the standard arithmetic algorithms, and develop and analyze their own and other students' algorithms to accomplish a task or solve a mathematical problem.	2-2P, 2-2, 3-4P, 3-7, 4-2F, 4-3, 6-4, 7-5, 8-4P
MS.VI.2.6	Use discrete mathematics concepts as described above to model situations and solve problems; and look for whether or not there is a solution (existence problems), determine how many solutions there are (counting problems) and decide upon a best solution (optimization problems).	4-4, 4-5, 6-2, 12-6

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