

Fifth Grade **MATHEMATICS**

Grade Level Content *Expectations*
aligned with
Michigan Curriculum Framework
Content Standards and *Benchmarks*



MATHEMATICS

Fifth Grade

STRAND I: PATTERNS, RELATIONSHIPS, AND FUNCTIONS

Content Standard 1: Patterns

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.

Key Ideas:

- Recognizing, describing and generalizing patterns is the starting point of mathematics.
- Patterns and relationships are represented and communicated in diverse ways.
- Patterns enable students to describe and understand the physical world and to make informed predictions.
- Recognizing and classifying families of patterns enables students to understand and use their mathematical properties.
- Pattern recognition and analysis provide an important key to solving problems and learning new mathematics.

Middle School (Fifth Grade) Benchmark 1

Describe, analyze and generalize patterns arising in a variety of contexts and express them in general terms.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Represent and record patterns in a variety of ways including tables, charts and graphs, and translate between various representations.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Use patterns and their generalizations to make and justify inferences and predictions.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Use patterns and their generalizations to make and justify inferences and predictions.

Alignment	
GLCE Code	GLCE Description
None	

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Middle School (Fifth Grade) Benchmark 5

Use patterns and their generalizations to make and justify inferences and predictions.

Alignment	
GLCE Code	GLCE Description
None	

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Content Standard 2: Variability and Change

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.

Key Ideas:

- Studying change and variability in physical and abstract contexts is an important objective of mathematics.
- Variability becomes understandable when students recognize patterns of change and natural variation.
- Changes are frequently interdependent; understanding patterns of change in one variable can help students predict changes in another.
- Variability is represented in a variety of symbolic forms.
- Functions and relationships are used to model patterns of variability arising from physical and mathematical contexts.
- Understanding variability and change is a basis for making sense of the world and of mathematical ideas.

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
D.RE.05.01	Construct and interpret line graphs: -Read and interpret line graphs, and solve problems based on line graphs, e.g., distance - time graphs, and problems with two or three line graphs on same axes, comparing different data

Middle School (Fifth Grade) Benchmark 2

Connect an initial state to a final state and generalize a rule that describes a pattern of change.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

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Middle School (Fifth Grade) Benchmark 4

Represent variability or change by ordered pairs, tables, graphs and equations.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 5

Differentiate between functions and relationships such as linear vs. not linear or continuous vs. non-continuous.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 6

Continue to explore relationships arising from interesting contexts and use variables and relationships to solve mathematical problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

STRAND II: GEOMETRY AND MEASUREMENT

Content Standard 1: Shape and Shape Relationships

Students develop spatial sense, use shape as an analytic and descriptive tool, identify characteristics and define shapes, identify properties and describe relationships among shapes.

Key Ideas:

- Spatial sense relies on the ability to recognize and describe shape.
- Recognizing attributes and characteristics of shapes is a prerequisite for understanding.
- Comparing, sorting and classifying shapes leads to useful generalizations.
- Drawing and constructing shapes in two and three dimensions are important ways to represent the world.
- Understanding shapes requires recognition of what happens when shapes are combined, dissected or transformed.
- Figures that are alike in size and/or shape and figures that have special relationships to each other lead to important generalizations.
- Shape, shape properties, and shape relationships help students to describe and make sense of the physical world and to solve problems.

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Generalize the characteristics of shapes and apply their generalizations to classes of shapes.

Alignment	
GLCE Code	GLCE Description
G.GS.05.02	Know the meaning of angles, and solve problems: -Measure angles with a protractor and classify them as acute, right, obtuse or straight
G.GS.05.06	Know the meaning of angles, and solve problems: -Understand why the sum of the interior angles of a triangle is 180 and the sum of the interior angles of a quadrilateral is 360 , and use these properties to solve problems

Middle School (Fifth Grade) Benchmark 3

Derive generalizations about shapes and apply those generalizations to develop classifications of familiar shapes.

Alignment	
GLCE Code	GLCE Description
None	

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Middle School (Fifth Grade) Benchmark 4

Construct familiar shapes using coordinates, appropriate tools (including technology), sketching and drawing two- and three-dimensional shapes.

Alignment	
GLCE Code	GLCE Description
M.TE.05.08	Understand the concept of volume: -Build solids with unit cubes and state their volumes

Middle School (Fifth Grade) Benchmark 5

Combine, dissect and transform shapes.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 6

Generalize about the common properties of similar, congruent, parallel and perpendicular shapes and verify their generalizations informally.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 7

Use shape, shape properties and shape relationships to describe the physical world and to solve problems.

Alignment	
GLCE Code	GLCE Description
None	

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Content Standard 2: Position

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.

Key Ideas:

- Locating physical objects or points in space requires understanding of position.
- Concepts of direction, orientation, relative position and symmetry enable students to describe objects relative to their surroundings.
- Certain actions can change the size, shape, position or orientation of an object.
- Locating all the points that satisfy a condition or the special points that satisfy two or more conditions is an important spatial ability.
- Concepts of position, direction and orientation enable students to describe the physical world and to solve problems.

Middle School (Fifth Grade) Benchmark 1

Locate and describe objects in terms of their position, including compass directions, Cartesian coordinates, latitude and longitude and midpoints.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Describe translations, reflections, rotations and dilations using the language of transformations and employ transformations to verify congruence of figures.

Alignment	
GLCE Code	GLCE Description
G.TR.05.01	Know the meaning of angles, and solve problems: -Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90 , 180 , 270 , and 360 are associated, respectively, with 1/4, 1/2, 3/4 and full turns

Middle School (Fifth Grade) Benchmark 4

Locate the position of points or objects described by two or more conditions; locate all the points (locus) that satisfy a given condition.

Alignment	
GLCE Code	GLCE Description

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None

Middle School (Fifth Grade) Benchmark 5

Use concepts of position, direction and orientation to describe the physical world and to solve problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Content Standard 3: Measurement

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.

Key Ideas:

- A fundamental component of measurement and learning to measure is the comparison of an object or property to a unit of comparison.
- Measurement requires that students identify the attribute to be measured and an appropriate unit.
- Students develop a better understanding of the physical world if they regularly estimate before they measure and evaluate their estimates after they measure.
- Measurement is incomplete unless students interpret the meaning and significance of their results.
- It is not always possible to measure a quantity directly; in such cases students must use other indirect means.
- Measurement reflects the usefulness and practicality of mathematics and puts students in touch with the physical world.

Middle School (Fifth Grade) Benchmark 1

Select and use appropriate tools; measure objects using standard units in both the metric and common systems and measure angles in degrees.

Alignment	
GLCE Code	GLCE Description
M.TE.05.09	Understand the concept of volume: -Use filling (unit cubes or liquid), and counting or measuring to find the volume of a cube and rectangular prism
G.TR.05.01	Know the meaning of angles, and solve problems: -Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90 , 180 , 270 , and 360 are associated, respectively, with 1/4, 1/2, 3/4 and full turns
G.GS.05.02	Know the meaning of angles, and solve problems: -Measure angles with a protractor and classify them as acute, right, obtuse or straight

Middle School (Fifth Grade) Benchmark 2

Identify the attributes to be measured and select the appropriate unit of measurement for length, mass (weight), area, perimeter, capacity, time, temperature and money.

Alignment	
GLCE Code	GLCE Description
M.UN.05.01	Know, and convert among, measurement units within a given system: -Recognize the equivalence of 1 liter, 1000 ml and 1000 cm ³ and include conversions among liters, milliliters, and cubic centimeters
M.UN.05.02	Know, and convert among, measurement units within a given system: -Know the units of measure of volume: cubic centimeter, cubic meter, cubic inches, cubic feet, cubic yards, and use their abbreviations: cm ³ , m ³ , in ³ , ft ³ , yd ³
M.UN.05.03	Know, and convert among, measurement units within a given system: -Compare the relative sizes of one cubic inch to one cubic foot, and one cubic centimeter to one cubic meter

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Middle School (Fifth Grade) Benchmark 3

Estimate measures with a specified degree of accuracy and decide if an estimate or a measurement is "close enough."

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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).

Alignment	
GLCE Code	GLCE Description
M.PS.05.05	Find areas of geometric shapes using formulas: -Represent relationships between areas of rectangles, triangles and parallelograms using models

Middle School (Fifth Grade) Benchmark 5

Use proportional reasoning and indirect measurements to draw inferences.

Alignment	
GLCE Code	GLCE Description
M.UN.05.01	Know, and convert among, measurement units within a given system: -Recognize the equivalence of 1 liter, 1000 ml and 1000 cm ³ and include conversions among liters, milliliters, and cubic centimeters
M.UN.05.04	Know, and convert among, measurement units within a given system: -Convert measurements of length, weight, area, volume, and time within a given system, using easily manipulated numbers
M.TE.05.06	Find areas of geometric shapes using formulas: Understand and know how to use the area formula of a triangle: - $A = \frac{1}{2}bh$ (where b is length of the base and h is the height), and represent using models and manipulatives
M.TE.05.07	Find areas of geometric shapes using formulas: Understand and know how to use the area formula for a parallelogram: - $A = bh$, and represent using models and manipulatives
G.GS.05.04	Find areas of geometric shapes using formulas: -Find unknown angles in problems involving angles on a straight line, angles surrounding a point and vertical angles
G.GS.05.05	Find areas of geometric shapes using formulas: -Know that angles on a straight line add up to 180 and angles surrounding a point add up to 360 ; justify informally by "surrounding" a point with angles
G.GS.05.07	Solve problems about geometric shapes: -Find unknown angles using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids

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Middle School (Fifth Grade) Benchmark 6

Apply measurement to describe the real world and to solve problems.

Alignment	
GLCE Code	GLCE Description
M.PS.05.10	Understand the concept of volume: -Solve applied problems about the volumes of rectangular prisms using multiplication and division and using the appropriate units

MATHEMATICS

STRAND III: DATA ANALYSIS AND STATISTICS

Content Standard 1: Collection, Organization and Presentation of Data

Students collect and explore data, organize data into a useful form, and develop skill in representing and reading data displayed in different formats.

Key Ideas:

- Data drive many facets of modern society; knowing what data to collect and when and how to obtain them is the starting point of quantitative literacy.
- Data are of little use until they are organized and presented in a meaningful format.
- Since different representations highlight different patterns in the data, students must make critical judgments.
- To solve problems, students frequently must decide what data are needed and plan how to obtain, organize and present them.

Middle School (Fifth Grade) Benchmark 1

Collect and explore data through observation, measurement, surveys, sampling techniques and simulations.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Organize data using tables, charts, graphs, spreadsheets and data- bases.

Alignment	
GLCE Code	GLCE Description
D.RE.05.02	Construct and interpret line graphs: -Construct line graphs from tables of data; include axis labels and scale

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
D.RE.05.01	Construct and interpret line graphs: -Read and interpret line graphs, and solve problems based on line graphs, e.g., distance - time graphs, and problems with two or three line graphs on same axes, comparing different data
D.RE.05.02	Construct and interpret line graphs: -Construct line graphs from tables of data; include axis labels and scale

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Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Content Standard 2: Description and Interpretation

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.

Key Ideas:

The ability to read and interpret data has become a basic-literacy skill in today’s world.

Patterns in data distributions help students to interpret the findings.

Students learn to draw conclusions and to convince and persuade using data to justify their positions.

Students should think critically about the data they encounter and exercise judgment in describing and interpreting data.

Gathering and interpreting data are important strategies for analyzing and solving problems.

Middle School (Fifth Grade) Benchmark 1

Critically read data from tables, charts or graphs and explain the source of the data and what the data represent.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Describe the shape of a data distribution and identify the center, the spread, correlations and any outliers.

Alignment	
GLCE Code	GLCE Description
D.AN.05.03	Find and interpret mean and mode for a given set of data: -Given a set of data, find and interpret the mean (using the concept of fair share) and mode

Middle School (Fifth Grade) Benchmark 3

Draw, explain and justify conclusions, such as trends based on data.

Alignment	
GLCE Code	GLCE Description
D.RE.05.01	Construct and interpret line graphs: -Read and interpret line graphs, and solve problems based on line graphs, e.g., distance - time graphs, and problems with two or three line graphs on same axes, comparing different data
D.AN.05.04	Construct and interpret line graphs: -Solve multi-step problems involving means

MATHEMATICS

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
D.RE.05.01	Construct and interpret line graphs: -Read and interpret line graphs, and solve problems based on line graphs, e.g., distance - time graphs, and problems with two or three line graphs on same axes, comparing different data

Middle School (Fifth Grade) Benchmark 5

Formulate questions and problems and gather and interpret data to answer those questions.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Content Standard 3: Inference and Prediction

Students draw defensible inferences about unknown outcomes, make predictions, and identify the degree of confidence they have in their predictions.

Key Ideas:

- Making and testing hypotheses is an essential technique for gaining new knowledge.
- In order to test hypotheses, students must carefully design their experimental techniques.
- Critical judgment develops as students learn to formulate, communicate and evaluate arguments and conclusions based on data.
- Patterns in known data give students confidence in making inferences about unknown situations.
- Students learn that inferences and predictions are powerful tools for answering questions and solving problems.

Middle School (Fifth Grade) Benchmark 1

Make and test hypotheses.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Design experiments to model and solve problems using sampling, simulations and controlled investigations.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Formulate and communicate arguments and conclusions based on data and evaluate their arguments and those of others.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Make predictions and decisions based on data, including interpolations and extrapolations.

Alignment	
GLCE Code	GLCE Description
None	

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Middle School (Fifth Grade) Benchmark 5

Employ investigations, mathematical models and simulations to make inferences and predictions to answer questions and solve problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

STRAND IV: NUMBER SENSE AND NUMERATION

Content Standard 1: Concepts and Properties of Numbers

Students experience counting and measuring activities to develop intuitive sense about numbers, develop understanding about properties of numbers, understand the need for the existence of different sets of numbers, and investigate properties of special numbers.

Key Ideas

- An intuitive quantitative sense develops from students' investigations of numbers and their properties.
- A solid understanding of the numeration system is essential for later success with calculations.
- Important properties provide students with deeper insight into numbers and their uses.
- Numeration systems become most useful as students use them to model and describe problems.

Middle School (Fifth Grade) Benchmark 1

Develop an understanding of integers and rational numbers and represent rational numbers in both fraction and decimal form.

Alignment	
GLCE Code	GLCE Description
N.ME.05.10	Understand fractions as division statements; find equivalent fractions: -Understand a fraction as a statement of division, e.g., $2 \div 3 = \frac{2}{3}$, using simple fractions and pictures to represent

Middle School (Fifth Grade) Benchmark 2

Extend their understanding of numeration systems to include decimal numeration, scientific numeration and non-decimal numeration systems.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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 inverses.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Apply their understanding of number systems to model and solve mathematical and applied problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Content Standard 2: Representation and Uses of Numbers

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.

Key Ideas:

- Students recognize and understand numbers that they encounter in varied formats.
- Numeracy requires that students recognize when numbers are equivalent even though they may be represented in different formats.
- Numbers are used for varied purposes, and it is important to differentiate among their uses.
- Estimation is one of the most important skills for students to develop and use on a regular basis.
- Knowing what numbers to use and how to represent them is key to students' abilities to solve problems.

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
N.ME.05.10	Understand fractions as division statements; find equivalent fractions: -Understand a fraction as a statement of division, e.g., $2 \div 3 = \frac{2}{3}$, using simple fractions and pictures to represent

Middle School (Fifth Grade) Benchmark 2

Recognize equivalent representations of a number, especially fractions, decimals and percents, and translate freely among representations.

Alignment	
GLCE Code	GLCE Description
N.ME.05.08	Understand meaning of decimal fractions and percentages: -Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., 1 is 10 tenths, one tenth is 10 hundredths
N.ME.05.09	Understand meaning of decimal fractions and percentages: Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage
N.ME.05.11	Understand fractions as division statements; find equivalences: Given two fractions, express them as equivalent fractions with a common denominator, but not necessarily a <u>least</u> common denominator, e.g., $\frac{1}{2} \rightarrow \frac{4}{8}$ and $\frac{3}{4} \rightarrow \frac{6}{8}$; use denominators less than 12, or factors of 100
N.MR.05.22	Express, interpret, and use ratios; find equivalences: Express fractions and decimals as percentages, and vice versa
N.ME.05.23	Express, interpret, and use ratios; find equivalences Express ratios in several ways, given applied situations, e.g., 3 cups to 5 people, 3:5, $\frac{3}{5}$; recognize and find equivalent ratios

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Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Develop strategies for estimating quantity and evaluate the reasonableness of their estimates.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 5

Select appropriate numbers and representations in order to solve problems.

Alignment	
GLCE Code	GLCE Description
None	

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Content Standard 3: Number Relationships

Students investigate relationships such as equality, inequality, inverses, factors and multiples, and represent and compare very large and very small numbers.

Key Ideas:

- Relationships of equality and inequality are among the most fundamental in mathematics.
- Students learn the importance of making comparisons between numbers, especially as ratios and rates.
- By classifying numbers according to their properties and identifying important numerical relationships, students develop a deeper understanding of numbers.
- Numbers that are related exponentially exhibit important relationships that students will encounter in a variety of applications.
- Students can invoke important number relationships to help them understand and solve problems.

Middle School (Fifth Grade) Benchmark 1

Compare and order integers and rational numbers using relations of equality and inequality.

Alignment	
GLCE Code	GLCE Description
N.ME.05.08	Understand meaning of decimal fractions and percentages: -Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., 1 is 10 tenths, one tenth is 10 hundredths

Middle School (Fifth Grade) Benchmark 2

Express numerical comparisons as ratios and rates.

Alignment	
GLCE Code	GLCE Description
N.ME.05.23	Express, interpret, and use ratios; find equivalences: -Express ratios in several ways, given applied situations, e.g., 3 cups to 5 people, 3:5, $\frac{3}{5}$; recognize and find equivalent ratios

Middle School (Fifth Grade) Benchmark 3

Distinguish between prime and composite numbers; identify factors, multiples, common factors and multiples, and relatively prime numbers; and apply divisibility tests to numbers.

Alignment	
GLCE Code	GLCE Description
N.MR.05.07	Find prime factorizations of whole numbers -Find the prime factorization of numbers between 1 and 50, express in exponential notation, e.g., $24 = 2^3 \times 3^1$, and understand that every whole number can be expressed as a product of primes

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Middle School (Fifth Grade) Benchmark 4

Explain the meaning of powers and roots of numbers and use calculators to compute powers and square roots.

Alignment	
GLCE Code	GLCE Description
N.MR.05.15	Multiply and divide by powers of ten: Multiply a whole number by powers of 10: 0.01, 0.1, 1, 10, 100, and 1000; identify patterns

Middle School (Fifth Grade) Benchmark 5

Apply their understanding of number relationships in solving problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

STRAND V: NUMERICAL AND ALGEBRAIC OPERATIONS AND ANALYTICAL THINKING

Content Standard 1: Operations and their Properties

Students understand and use various types of operations (e.g., addition, subtraction, multiplication, division) to solve problems.

Key Ideas:

- Understanding the basic computational operations is essential for competence in mathematics, but there is no one way to perform a calculation.
- Methods of computation include proficiency with mental calculation, paper and pencil, and calculators; students must know which method is most appropriate for a given task.
- Understanding the operations requires that students also understand the properties of those operations and how to apply them.
- The ultimate reason for mastering the computational operations and their algorithms is to solve problems.

Middle School (Fifth Grade) Benchmark 1

Use manipulatives and diagrams to model operations and their inverses with integers and rational numbers and relate the models to their symbolic expressions.

Alignment	
GLCE Code	GLCE Description
N.MR.05.01	Understand division of whole numbers: -Understand the meaning of division of whole numbers, with and without remainders; relate division to fractions and to repeated subtraction
N.MR.05.02	Understand division of whole numbers: -Relate division of whole numbers with remainders to the form $a = bq + r$; e.g., $34 \div 5 = 6 \text{ r } 4$, so $5 \cdot 6 + 4 = 34$; note remainder (4) is less than divisor (5)

Middle School (Fifth Grade) Benchmark 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

Alignment	
GLCE Code	GLCE Description
N.FL.05.04	Multiply and divide whole numbers: -Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors such as not accounting for place value
N.FL.05.06	Multiply and divide whole numbers: -Divide fluently up to a four-digit number by a two-digit number
N.FL.05.12	Multiply and divide fractions: -Find the product of two unit fractions with small denominators using area model
N.FL.05.13	Multiply and divide fractions: -Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions

GRADE LEVEL CONTENT EXPECTATIONS ALIGNED TO MICHIGAN CURRICULUM FRAMEWORK

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Alignment	
GLCE Code	GLCE Description
N.FL.05.14	Add and subtract fractions using common denominators: -Add and subtract fractions with unlike denominators of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 100, using the common denominator that is the product of the denominators of the 2 fractions, e.g., $\frac{3}{8} + \frac{7}{10} = \frac{(3 \times 10) + (7 \times 8)}{80}$ $= \frac{30 + 56}{80}$ $= \frac{86}{80}$
N.FL.05.16	Multiply and divide by powers of ten -Divide numbers by 10's, 100's, 1000's, using mental strategies
N.MR.05.17	Multiply and divide by powers of ten -Multiply one-digit and two-digit whole numbers by decimals up to two decimal places
N.FL.05.20	Solve applied problems with fractions -Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money

Middle School (Fifth Grade) Benchmark 3

Describe the properties of operations with rationales and integers (e.g., closure; associative, commutative and distributive properties) and give examples of how they use those properties.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Efficiently and accurately apply operations with integers, rational numbers and simple algebraic expressions in solving problems.

Alignment	
GLCE Code	GLCE Description
N.MR.05.05	Multiply and divide whole numbers: -Solve applied problems involving multiplication and division of whole numbers
N.MR.5.19	Solve applied problems with fractions: -Solve word problems that involve finding sums and differences of fractions with unlike denominators, using knowledge of equivalent fractions
N.FL.05.20	Solve applied problems with fractions: -Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money

MATHEMATICS

Content Standard 2: Algebraic and Analytic Thinking

Students analyze problems to determine an appropriate process for solution, and use algebraic notations to model or represent problems.

Key Ideas:

- Students develop both symbol sense and number sense as they learn to read, write and speak the language of mathematics.
- Mathematical representations, which may be numerical, literal, symbolic, graphical, pictorial or physical, enable students to visualize and understand problems.
- Solving mathematical problems involves a process as well as a product; the context of the problem determines the nature of the solution.
- Students learn analytic thinking most effectively when it is studied in the context of problems and applications.
- Students employ algebraic and analytic thinking and the power of technology to explore problems that reveal the many ways that mathematics is used in a wide variety of contemporary applications.

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Solve linear equalities and inequalities using algebraic and geometric methods, and use the context of the problem to interpret and explain their solutions.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

STRAND VI: PROBABILITY AND DISCRETE MATHEMATICS

Content Standard 1: Probability

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.

Key Ideas:

- Students develop an understanding of the concepts of chance and uncertainty.
- Students express the likelihood of chance events in terms of probabilities.
- Through experiments students learn that some outcomes are affected by prior events, while others are independent.
- Students also learn to examine outcomes and search for explanations, and they realize the difference between probabilities determined from observations and probabilities derived mathematically.
- Making predictions and decisions in the face of uncertainty are essential skills for coping with the modern world.

Middle School (Fifth Grade) Benchmark 1

Describe events as likely or unlikely and give qualitative and quantitative descriptions of the degree of likelihood.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Conduct experiments and give examples to illustrate the difference between dependent and independent events.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 5

Conduct probability experiments and simulations to model and solve problems.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Content Standard 2: Discrete Mathematics

Students investigate practical situations such as scheduling, routing, sequencing, networking, organizing and classifying, and analyze ideas like recurrence relations, induction, iteration, and algorithm design.

Key Ideas:

- Problems involving counting and arranging finite collections of objects occur in many applications.
- Concepts of sets and set relationships give students useful tools for representing problems.
- Many important practical applications involve networks.
- Many important practical applications are modeled by recurrence relations.
- Mathematical applications frequently require students to develop their own procedures for solving problems.
- Applications of discrete mathematics drawn from many important practical situations introduce students to contemporary uses of mathematics.

Middle School (Fifth Grade) Benchmark 1

Use manipulatives, diagrams and the fundamental theorem of counting to count permutations and combinations.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 2

Use sets and set relationships to explore and solve simple algebraic and geometric problems.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 3

Solve problems involving networks, for example planning delivery routes or counting paths between points.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 4

Explore recurrence relations and iterations.

Alignment	
GLCE Code	GLCE Description
None	

MATHEMATICS

Middle School (Fifth Grade) Benchmark 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.

Alignment	
GLCE Code	GLCE Description
None	

Middle School (Fifth Grade) Benchmark 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).

Alignment	
GLCE Code	GLCE Description
None	

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