Course Syllabus
Mathematics, Grade 8

Grade 8 Math, Final
Guardian Angels School

The Foundations of Learning (1999) curriculum offers kindergarten through grade 12 objectives for the Knowledge and Comprehension levels of Bloom's Taxonomy. EdVISION developed this curriculum based on extensive research of standardized and state tests. Additional objectives were added to enhance the content areas.

The mathematics component of the Foundations of Learning curriculum focuses on basic skills. Objectives primarily involve the identification, recognition, comprehension, or understanding of various math topics.

The Principles and Standards for School Mathematics describe the mathematical understanding, knowledge, and skills that students should acquire from prekindergarten through grade 12.

The ITBS Form A for mathematics measures the skills and achievement of students.

In this area students concentrate on making mathematical connections and using principles of mathematics to communicate, reason, and solve problems. Students engage in projects which require them to apply number systems, operations, and forms in real-world contexts.

The MEAP assesses student progress in Mathematics.

The Michigan Curriculum Framework describes Mathematics as the science of patterns and relationships and as the language and logic of our technological world. The Michigan Curriculum Framework states that Mathematical power is the ability to explore, to conjecture, to reason logically, and to use a variety of mathematical methods effectively to solve problems; whereas the ultimate goal of mathematics education is for all students to develop mathematical power to participate fully as a citizen and worker in our contemporary world.

The Michigan Curriculum Framework Mathematics Vision Statement states that a mathematically powerful individual should be able to:

* reason mathematically
* communicate mathematically
* problem solve using mathematics
* make connections within mathematics and between mathematics and other fields.

The Foundations of Learning curriculum provides objectives for eighth grade students.

The Principles and Standards for School Mathematics provide standards for students in grades 6-8.

The ITBS Form A for mathematics measures the skills and achievement of students in eighth grade.

In this course students learn foundational mathematics concepts needed for a variety of vocational, industrial, and professional career fields. Students engage in activities which provide them with opportunities to perform operations and conversions with whole numbers, decimals, fractions, and percents. The course emphasizes the need for students to explore strategies which help them identify, approach, understand, and solve problems in real-world contexts.

The MEAP assesses student performance in mathematics at grade eight.

The Michigan Curriculum Framework for Mathematics outlines Content Standards for students in grade eight.

Algebraic Concepts

The Algebraic Concepts Unit includes Competencies/Objectives which focus on algebraic equations and operations. Students explore the symbolic nature of algebraic concepts by identifying and extending patterns in algebra, by following algebraic procedures, and by proving theorems with properties.

- The learner will be able to apply the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition in order to simplify computations with integers, fractions, and decimals.
- The learner will be able to investigate relationships between symbolic expressions and graphs of lines, focusing on the meaning of intercept and slope.

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- The learner will be able to comprehend the meaning and effects of operations on fractions, decimals, and integers.
- The learner will be able to comprehend and apply inverse relationships of addition and subtraction, multiplication and division, and squares and square roots in order to simplify computations and obtain problem solutions.
- The learner will be able to choose suitable methods and tools for computations with fractions and decimals from among mental calculation, approximation, calculators or computers, and paper and pencil, as appropriate for the situation, and use the chosen methods.
- The learner will be able to apply symbolic algebra to represent scenarios and obtain solutions to problems, focusing on those that involve linear relationships.
- The learner will be able to create, describe, and analyze methods for obtaining solutions to problems involving proportions.
- The learner will be able to determine the correct order of operations for an equation containing fractions.
- The learner will be able to find equivalent equations.
- The learner will be able to obtain solutions to linear equations.
- The learner will be able to identify the written phrase that will make an integer number a certain value.
- The learner will be able to identify equivalent forms for simple algebraic expressions.
- The learner will be able to apply inverse operations to determine the value of a variable given as a written expression.
- The learner will be able to create equivalent forms for simple algebraic expressions.
- The learner will be able to translate sentences into algebraic expressions and/or vice versa.
- The learner will be able to demonstrate an understanding of the value of a number represented in exponential form.
- The learner will be able to comprehend the relationships among operations.
- The learner will be able to develop a beginning conceptual understanding of the various uses of variables.
- The learner will be able to compute fluently.
- The learner will be able to show ways of performing basic operations.
- The learner will be able to apply variable expressions to illustrate scenarios.
- The learner will be able to solve inequalities.
- The learner will be able to obtain solutions to multiple-step problems.
- The learner will be able to solve given equations.
- The learner will be able to apply operational symbols.
- The learner will be able to apply relational symbols.
- The learner will be able to make interpretations of operational symbols.
- The learner will be able to make interpretations of relational symbols.

Data Interpretation

The Data Interpretation Unit includes Competencies/Objectives which focus on the study and use of graphical forms. Students collect and classify data, organize and display data, use logical reasoning, and problem solving.

- The learner will be able to determine the number represented by a fraction on a given circle graph.
- The learner will be able to determine percents when given fractional amounts on a circle graph.

- The learner will be able to use the values from a given table to identify ratios.
- The learner will be able to use logic to follow a flow chart.
- The learner will be able to interpret data shown in a stem-and-leaf graph.
- The learner will be able to read amounts from the scales of bar graphs.
- The learner will be able to interpret data shown in a circle graph.
- The learner will be able to read amounts from the scales of line graphs.
- The learner will be able to read amounts by finding a particular cell in a table.

Decimals

The Decimals Unit includes Competencies/Objectives which focus on number sense and operations with decimals. Students compare and compute decimals, study money, estimate decimals, problem solve using decimals, and reason using decimals.

- The learner will be able to work flexibly with decimals in order to obtain solutions to problems.
- The learner will be able to perform addition of decimals with differing numbers of decimal places.
- The learner will be able to add decimals which are of the same place value.
- The learner will be able to divide a decimal number by a whole number.
- The learner will be able to divide a decimal number by a decimal number.
- The learner will be able to multiply 2 decimal numbers.
- The learner will be able to multiply a decimal by a whole number.
- The learner will be able to subtract decimals which are of the same place value.
- The learner will be able to subtract decimal numbers with differing numbers of decimal places.

Fractions

The Fractions Unit includes Competencies/Objectives which focus on number sense and operations with fractions. Students compare and order fractions, study fraction parts, estimate with fractions, reason using fractions, and problem solve using fractions.

- The learner will be able to work flexibly with fractions in order to obtain solutions to problems.
- The learner will be able to add two fractions with different denominators.
- The learner will be able to divide a fraction by a whole number.
- The learner will be able to divide two basic fractions.
- The learner will be able to multiply two basic fractions.
- The learner will be able to multiply fractions and whole numbers.
- The learner will be able to subtract fractions that possess different denominators.

Functions

The Functions Unit includes Competencies/Objectives which focus on exploring polynomial, rational, exponential, logarithmic, trigonometric, and circular functions.

- The learner will be able to recognize functions as linear or nonlinear and contrast their properties from tables, graphs, or equations.
- The learner will be able to comprehend relations.
- The learner will be able to understand functions.

Geometry

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The Geometry Unit includes Competencies/Objectives which focus on exploring geometric concepts from multiple perspectives. Students study properties and construction of figures, proofs and theorems, history of geometry, transformations, logic, and problem solving.

- The learner will be able to precisely explain, classify, and comprehend relationships among types of two- and three-dimensional objects by applying their defining properties.
- The learner will be able to apply transformations in order to examine the congruence, similarity, and line or rotational symmetry of objects.
- The learner will be able to explain sizes, positions, and orientations of shapes under informal transformations.
- The learner will be able to identify and use geometric concepts and relationships in topics outside of the mathematics classroom.
- The learner will be able to formulate and assess inductive and deductive arguments with regard to geometric concepts and relationships.
- The learner will be able to apply two-dimensional representations of three-dimensional objects to visualize and obtain solutions to problems.
- The learner will be able to apply geometric models to illustrate and describe numerical and algebraic relationships.
- The learner will be able to draw geometric objects with given properties.
- The learner will be able to study the characteristics of three-dimensional solids.
- The learner will be able to study the properties of three-dimensional solids.
- The learner will be able to study the characteristics of two-dimensional shapes.
- The learner will be able to study the properties of two-dimensional shapes.
- The learner will be able to use the basic elements of rays.
- The learner will be able to estimate the measure of a given angle.
- The learner will be able to determine possible values for either radius, diameter, or chords of a circle with given measurements.
- The learner will be able to apply transformations to study mathematical situations.
- The learner will be able to use spatial reasoning to solve problems.
- The learner will be able to choose from many different methods of proofs.
- The learner will be able to apply many different methods of proofs.
- The learner will be able to apply symmetry to study mathematical scenarios.
- The learner will be able to determine side - angle - side (SAS) and angle - side - angle (ASA) congruence in triangles using the angle sum property for triangles and the Pythagorean theorem.
- The learner will be able to obtain solutions to problem situations with geometric models.
- The learner will be able to obtain solutions to problems using spatial visualization.
- The learner will be able to comprehend relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects.
- The learner will be able to create mathematical arguments about geometric relationships.
- The learner will be able to classify geometric figures.
- The learner will be able to compare figures.
- The learner will be able to identify various geometric figures.

- The learner will be able to recognize geometric relationships.
- The learner will be able to recognize properties of geometric figures.

Integers

The Integers Unit includes Competencies/Objectives which focus on number sense and operations with integers. Students compare integers, perform operations with integers, convert integers to other number forms, use manipulatives to demonstrate integers, and solve problems with integers in real world contexts.

- The learner will be able to create meaning for integers and illustrate and compare quantities with them.

Mathematics Processes

The Mathematics Processes Unit includes Competencies/Objectives which focus on mathematical connections. Students communicate and model concepts and procedures.

- The learner will be able to integrate their mathematical thought processes through communication.
- The learner will be able to study and evaluate the mathematical thought processes and strategies of others.
- The learner will be able to comprehend how mathematical concepts interconnect and build on one another to create a coherent whole.
- The learner will be able to express mathematical thought processes in an understandable and precise way to peers, teachers, and others.
- The learner will be able to create and evaluate mathematical arguments and proofs.
- The learner will be able to identify reasoning and proof as fundamental aspects of mathematics.
- The learner will be able to create new mathematical knowledge through the problem solving process.
- The learner will be able to make mathematical representations for organizing, recording, and explaining mathematical concepts.
- The learner will be able to apply representations to illustrate and interpret physical, social and mathematical scenarios.
- The learner will be able to apply a variety of mathematical representations for organizing, recording, and explaining mathematical concepts.
- The learner will be able to apply conjectures to create new questions and design new studies to answer them.
- The learner will be able to identify mathematics in contexts outside of mathematics.
- The learner will be able to organize their mathematical thought processes through communication.
- The learner will be able to use mathematics in contexts outside of mathematics.
- The learner will be able to relate various forms of representations for a relationship.
- The learner will be able to make comparisons of various forms of representations for a relationship.
- The learner will be able to choose various types of reasoning strategies.
- The learner will be able to use many different reasoning strategies.
- The learner will be able to state mathematical ideas clearly using mathematical language.
- The learner will be able to identify connections among mathematical concepts.
- The learner will be able to apply connections among mathematical concepts.
- The learner will be able to explore mathematical conjectures.
- The learner will be able to formulate conjectures.

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Measurement

The Measurement Unit includes Competencies/Objectives which focus on measurement concepts, applications, and analysis. Students study length, area, circumference, perimeter, volume, weight, formulas, distance, calendar, money, tools, accuracy, units, constructions, patterns, and problem solving.

- The learner will be able to comprehend the measurable characteristics of objects and the units, systems, and processes of measurement.
- The learner will be able to understand, choose, and apply units of suitable size and type to measure angles, perimeter, area, surface area, and volume.
- The learner will be able to create strategies in order to find the surface area and volume of given prisms, pyramids, and cylinders.
- The learner will be able to create and apply formulas to find the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and create methods to determine the area of more complex shapes.
- The learner will be able to choose and use strategies and tools to accurately determine length, area, volume, and angle measures to suitable levels of precision.
- The learner will be able to use various methods to determine measurements.
- The learner will be able to comprehend the relationships between units.
- The learner will be able to comprehend the metric system of measurement.
- The learner will be able to comprehend the customary system of measurement.
- The learner will be able to obtain solutions to simple problems involving rates and other derived measures.
- The learner will be able to find the circumference of a circular object when given the diameter and necessary formula.
- The learner will be able to find the area of a circle in terms of pi when no formula is given.
- The learner will be able to calculate the area of a circle.
- The learner will be able to use capacity in problem solving situations.
- The learner will be able to convert different units of capacity within the standard system when given a real life scenario.
- The learner will be able to apply common benchmarks to choose appropriate methods for approximating measurements.
- The learner will be able to use various formulas to determine measurements.
- The learner will be able to accurately convert, within a measurement system, from one unit to another.
- The learner will be able to use various tools for determining measurements.
- The learner will be able to apply area concepts to obtain problem solutions.
- The learner will be able to approximate measurements with appropriate precision.
- The learner will be able to measure length.
- The learner will be able to measure mass.
- The learner will be able to apply perimeter concepts to obtain problem solutions.
- The learner will be able to measure temperature and time.
- The learner will be able to apply suitable units of measurement.
- The learner will be able to identify a suitable unit of measure for use in a particular situation.
- The learner will be able to measure the volume of figures.

- The learner will be able to use the concept of volume.
- The learner will be able to measure weight.

Number Theory

The Number Theory Unit includes Competencies/Objectives which focus on manipulating number forms and classifications. Students make connections between number forms and their real world applications.

- The learner will be able to develop a comprehension of large numbers and identify and appropriately apply exponential, scientific, and calculator notation.
- The learner will be able to comprehend and apply ratios and proportions to illustrate quantitative relationships.
- The learner will be able to illustrate and analyze mathematical situations and structures by applying algebraic symbols.
- The learner will be able to apply ratio and proportion to obtain solutions to problems involving scale factors.
- The learner will be able to use relatively prime numbers to obtain problem solutions.
- The learner will be able to use multiples to obtain problem solutions.
- The learner will be able to apply factors to obtain solutions to problems.
- The learner will be able to use prime factorization to solve problems.
- The learner will be able to understand number relationships.
- The learner will be able to understand the various ways of representing numbers.
- The learner will be able to comprehend number systems.
- The learner will be able to make classifications of numbers according to divisibility.
- The learner will be able to write whole numbers in expanded notation.
- The learner will be able to illustrate numbers in various forms.
- The learner will be able to apply place value.
- The learner will be able to correctly write numbers in exponential notation.
- The learner will be able to write numbers in standard form.

Numeration

The Numeration Unit includes Competencies/Objectives which focus on exploring ordinality, identifying and extending number patterns, comparing numbers, and demonstrating number relationships.

- The learner will be able to make comparisons and place in order fractions, decimals, and percents efficiently and determine their approximate locations on a number line.
- The learner will be able to represent, study, and generalize many different patterns with tables, graphs, words, and symbolic rules, when possible.
- The learner will be able to comprehend quantitative relationships using mathematical models.
- The learner will be able to illustrate quantitative relationships using mathematical models.
- The learner will be able to compare values of exponential numbers.
- The learner will be able to identify what equation, using variables, shows that pattern.
- The learner will be able to comprehend patterns.
- The learner will be able to order a sequence of numbers which may include whole numbers, decimals, fractions, percents, and integers.
- The learner will be able to analyze change in many different contexts.

- The learner will be able to apply estimation to obtain reasonable approximations.
- The learner will be able to comprehend numbers.
- The learner will be able to compare and order numbers.
- The learner will be able to apply order of magnitude to approximate.
- The learner will be able to apply number sense to approximate.
- The learner will be able to apply standard rounding to approximate.
- The learner will be able to describe the properties of numbers.
- The learner will be able to use properties of numbers.
- The learner will be able to comprehend number patterns.
- The learner will be able to identify geometric patterns.
- The learner will be able to investigate many different types of number patterns.
- The learner will be able to make comparisons of quantities to determine ratios.
- The learner will be able to make comparisons of quantities to find sums and differences.

Percents

The Percent Unit includes Competencies/Objectives which focus on the concepts of percent. Students perform operations with percents, convert percents to other number forms, use manipulatives to demonstrate percents, and solve problems with percents in real world contexts.

- The learner will be able to create meaning for percents greater than one hundred and less than one.
- The learner will be able to work flexibly with percents in order to obtain solutions to problems.
- The learner will be able to determine the discount received when given both the regular and discounted price of an item.

Probability/Statistics

The Probability/Statistics Unit includes Competencies/Objectives which focus on data analysis and probability concepts. Students collect, analyze, and make sense of real world data (including overlapping data, inconclusive data, etc.).

- The learner will be able to apply proportionality and a basic comprehension of probability to formulate and test conjectures about the results of experiments and simulations.
- The learner will be able to create questions and gather, organize, and illustrate data to answer those questions.
- The learner will be able to determine, apply, and interpret measures of central tendency and spread, including mean and interquartile range.
- The learner will be able to formulate conjectures about potential relationships between two attributes of a sample on the basis of scatterplots of the data and approximate lines of best fit.
- The learner will be able to apply and understand appropriate vocabulary in order to explain complementary and mutually exclusive events.
- The learner will be able to create questions, compose studies, and gather data about an attribute shared by two populations or different attributes within one population.
- The learner will be able to choose, create, and apply suitable graphical representations of data, including histograms, box plots, and scatterplots.
- The learner will be able to describe and comprehend the correspondence between sets of data and their graphical representations, focusing on histograms, stem-and-leaf plots, box plots, and scatterplots.
- The learner will be able to comprehend the basic concept of probability.
- The learner will be able to calculate the probabilities for simple compound events.

- The learner will be able to determine the probability of an event and express it as a ratio in fraction form.
- The learner will be able to use the basic concepts of probability.
- The learner will be able to make predictions based on a given set of data.
- The learner will be able to apply observations about the differences between two or more samples to formulate conjectures about the populations from which the samples were taken.
- The learner will be able to choose suitable statistical methods to analyze data.
- The learner will be able to apply suitable statistical methods to analyze data.
- The learner will be able to formulate inferences and/or predictions for data.
- The learner will be able to evaluate inferences from data.
- The learner will be able to make interpretations of relationships and trends to form generalizations or generate conclusions.
- The learner will be able to make interpretations of relationships and trends to distinguish rates or recognize trends.
- The learner will be able to make interpretations of relationships and trends to comprehend underlying and functional relationships.
- The learner will be able to apply counting methods.
- The learner will be able to apply the measures of central tendency.
- The learner will be able to understand the standard measures of central tendency.
- The learner will be able to apply the concepts of probability.
- The learner will be able to apply measures of variability.
- The learner will be able to comprehend measures of variability.

Problem Solving

The Problem Solving Unit includes Competencies/Objectives which focus on analyzing problems, evaluating solutions, exploring problems, and developing strategies for solving problems.

- The learner will be able to choose, use, and translate among mathematical representations to obtain solutions to problems.
- The learner will be able to adapt many different appropriate strategies in order to obtain problem solutions.
- The learner will be able to apply a variety of strategies to obtain problem solutions.
- The learner will be able to solve mathematical problems.
- The learner will be able to obtain solutions to problems that arise in contexts outside of mathematics.
- The learner will be able to apply visual tools to obtain solutions to problems.
- The learner will be able to reflect on the processes applied to solve a problem.
- The learner will be able to monitor the processes applied to obtain solutions to mathematical problems.
- The learner will be able to obtain solutions to contextualized problems using many different representations.
- The learner will be able to apply visual tools to represent problems.
- The learner will be able to model contextualized problems using many different representations.

- The learner will be able to identify when information is extraneous or missing.
- The learner will be able to select strategies for obtaining solutions to problems.

Rational and Irrational Numbers

The Rational and Irrational Numbers Unit includes Competencies/Objectives which focus on number concepts. Students manipulate, compare, and perform operations with rational and irrational numbers.

- The learner will be able to create and apply methods to estimate the results of computations with rational numbers and judge the reasonableness of the results.

Real Numbers and the Coordinate Plane

The Real Numbers and the Coordinate Plane Unit includes Competencies/Objectives which focus on graphing concepts. Students graph equations and make connections between algebraic concepts and their geometric correspondences.

- The learner will be able to apply coordinate geometry to represent the properties of geometric shapes.
- The learner will be able to apply coordinate geometry to examine the properties of geometric shapes.
- The learner will be able to examine special geometric shapes by applying coordinate geometry.
- The learner will be able to apply graphs to study the nature of changes in quantities in linear relationships.

Whole Numbers

The Whole Numbers Unit includes Competencies/Objectives which focus on whole number concepts. Students perform operations with whole numbers, use manipulatives to demonstrate whole number concepts, and solve problems with whole numbers in real world contexts.

- The learner will be able to understand the meaning of operations.
- The learner will be able to add whole numbers, regrouping when necessary.
- The learner will be able to divide whole numbers when remainders are present.
- The learner will be able to multiply whole numbers without regrouping.
- The learner will be able to multiply whole numbers, regrouping when necessary.
- The learner will be able to subtract whole numbers, regrouping when necessary.