

Diocese of Lansing

Curriculum Guidelines for Mathematics

Kindergarten through Grade Eight



**Grade 8
2008**

Mathematics K-8

June, 2008

VISION STATEMENT

Mathematics plays an integral role in the Catholic School, home, community and world, reflecting the beauty, order and unity in God's universe. Basic knowledge and skills in mathematics are important to every individual. Mathematics contributes to the development of the whole person by providing a practical tool for daily living.

Society demands mathematical knowledge which helps students develop their ability to reason and to think logically, as well as to discover creative ways of solving problems.

Our goal is to provide the mathematics teachers with an overview of the broad spectrum of mathematical concepts. These specific standards are provided so that students can learn to apply mathematical concepts through the use of higher level thinking skills, critical analysis, application of technology and problem solving.

Integrating Catholic Social Teaching into Mathematics Instruction

“The Church’s social teaching is a rich treasure of wisdom about building a just society and living lives of holiness amidst the challenges of modern society”.

(United States Council of Catholic Bishops)

Diocese of Lansing mathematics teachers should integrate Catholic social teachings whenever applicable. Examples of this could include faith-based data collection, economics and statistics respectful of the life and dignity of the human person, proportions and graphical representations that are illustrative of solidarity with our brothers and sisters, problem solving that will ensure the right to life and dignity, as well as math-based community service projects to encourage stewardship of creation.

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Purpose of this Document

- This document is designed to be used as a tool to guide instruction.
 - To provide Grade Level Content Expectations (GLECs) as developed by the State of Michigan (SOM) Department of Education
 - To assist schools with grade level and school-wide curriculum mapping.
 - To provide a means of measuring progress at grade level
 - To provide a means of communicating progress between grade levels
 - To provide continuity between schools within the Diocese of Lansing
- This document also offers main focus areas for each grade level.
- This document offers scope and sequence of objectives across grade levels.
- This document contains suggestions for incorporating Catholic faith and values into mathematics instruction.
- This document contains an analysis of current mathematical textbooks from a wide range of publishers.

With appreciation

To Michael Goetz,

Math Department Chair for grades K-8 at Grand Blanc Community Schools

for sharing his expertise, knowledge and materials with us.

Grade Eight

In 8th grade, students gain understanding of concepts of linear and non-linear functions, incorporating and representing quadratic equations. This culminates in the recognition and application of solutions involving number theory, rational and irrational numbers, equations and inequalities.

Students should recognize and apply two-dimensional and three-dimensional formulas, including the Pythagorean Theorem, surface area and volume.

Students should understand probability concepts for simple and compound events and be able to explain and justify conclusions based on data.

The expectations in this document are divided into strands with multiple domains within each, as shown below. The skills and content addressed in these expectations will in practice be woven together into a coherent, Mathematics curriculum. The domains in each mathematics strand are broader, more conceptual groupings.

In several of the strands, the “domains” are similar to the “standards” in Principles and Standards for School Mathematics from the National Council of Teachers of Mathematics.

To allow for ease in referencing expectations, each expectation has been coded with a strand, domain, grade-level, and expectation number.

For example, **M.UN.00.01** indicates:

M-Measurement strand

UN-Units & systems of measurement domain of the Measurement strand

01-First Expectation in the Grade-Level view of the Measurement strand

Strand 1 Number & Operations	Strand 2 Algebra	Strand 3 Measurement	Strand 4 Geometry	Strand 5 Data & Probability
Domains				
Meaning, notation, place value, and comparisons (ME)	Patterns, relations, functions, and change (PA)	Units and systems of measurement (UN)	Geometric shape, properties, and mathematical arguments (GS)	Data representation (RE)
Number relationships and meaning of operations (MR)	Representation (RP)	Techniques and formulas for measurement (TE)	Location and spatial relationships (LO)	Data interpretation and analysis (AN)
Fluency with operations and estimation (FL)	Formulas, expressions, equations, and inequalities (RP)	Problem solving involving measurement (PS)	Spatial reasoning and geometric modeling (SR)	Probability (PR)
			Transformation and symmetry (TR)	

MEAP Correlations: [Core]-core item [Core-NC] No calculator [Ext-NC]- extension no calculator [Ext] - extension of core [Fut] – future core item [NASL] – Not assessed at State level

8th Grade GLCEs

SOM-GLCE's Code	OBJECTIVES	Completed	Date	Chapters
Strand 1	NUMBER AND OPERATIONS			
	Understand real number concepts			
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.			
N.ME.08.02	Understand meanings for zero and negative integer exponents.			
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, e.g., $0.\bar{1} = \frac{1}{9}$; $0.\bar{3} = \frac{1}{3}$.			
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, e.g., $\sqrt{2}$, $\sqrt{3}$, π , on the number line.			
N.FL.08.05	Estimate and solve problems with square roots and cube roots using calculators.			
N.FL.08.06	Find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers, e.g., $\sqrt{130}$ is between 11 and 12.			
	Solve problems			
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 $x + .03x = 1.03x$.			

SOM-GLCE's Code	OBJECTIVES	Completed	Date	Chapters
N.MR.08.08	Solve problems involving percent increases and decreases.			
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.			
Strand 2	ALGEBRA			
	Understand the concept of non-linear functions using basic examples			
A.RP.08.01	Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships ($y = k/x$); cubics ($y = ax^3$); roots ($y = \sqrt{x}$); and exponentials ($y = a^x$, $a > 0$); using tables, graphs, and equations.			
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.			
A.PA.08.03	Recognize basic functions in problem context, e.g., area of a circle is πr^2 , volume of a sphere is $\frac{4}{3}\pi r^3$, and represent them using tables, graphs, and formulas.			
A.RP.08.04	Use the vertical line test to determine if a graph represents a function in one variable.			
	Understand and represent quadratic functions			
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.			
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			

SOM-GLCE's Code	OBJECTIVES	Completed	Date	Chapters
	vertex form and those with leading coefficient -1 , e.g., $y = x^2 - 36$, $y = (x - 2)^2 - 9$; $y = -x^2$; $y = -(x - 3)^2$.			
	Recognize, represent, and apply common formulas			
A.FO.08.07	Recognize and apply the common formulas: $(a + b)^2 = a^2 + 2ab + b^2$, $(a - b)^2 = a^2 - 2ab + b^2$, $(a + b)(a - b) = a^2 - b^2$; represent geometrically.			
A.FO.08.08	Factor simple quadratic expressions with integer coefficients, e.g., $x^2 + 6x + 9$, $x^2 + 2x - 3$, and $x^2 - 4$; solve simple quadratic equations, e.g., $x^2 = 16$ or $x^2 = 5$ (by taking square roots); $x^2 - x - 6 = 0$, $x^2 - 2x = 15$ (by factoring); verify solutions by evaluation.			
A.FO.08.09	Solve applied problems involving simple quadratic equations.			
	Understand solutions and solve equations, simultaneous equations, and linear inequalities			
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).			
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.			
A.FO.08.12	Solve linear inequalities in one and two variables, and graph the solution sets.			

SOM-GLCE's Code	OBJECTIVES	Completed	Date	Chapters
A.FO.08.13	Set up and solve applied problems involving simultaneous linear equations and linear inequalities.			
Strand 4	GEOMETRY			
	Understand and use the Pythagorean Theorem			
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.			
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.			
	Solve problems about geometric figures			
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.			
G.SR.08.04	Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).			
G.SR.08.05	Solve applied problems involving areas of triangles, quadrilaterals, and circles.			
	Understand concepts of volume and surface area, and apply formulas			
G.SR.08.06	Know the volume formulas for generalized cylinders ((area of base) x height), generalized cones and pyramids ($\frac{1}{3}$ (area of base) x height), and spheres ($\frac{4}{3}\pi$ (radius) ³) and apply them to solve problems.			
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.			

	Visualize solids			
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.			
	Understand and apply concepts of transformation and symmetry			
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.			
G.TR.08.10	Understand and use reflective and rotational symmetries of two-dimensional shapes and relate them to transformations to solve problems.			
Strand 5	DATA AND PROBABILITY			
	Draw, explain, and justify conclusions based on data			
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.			
D.AN.08.02	Recognize practices of collecting and displaying data that may bias the presentation or analysis.			
	Understand probability concepts for simple and compound events			
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.			

SOM-GLCE's Code	OBJECTIVES	Completed	Date	Chapters
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.			
D.PR.08.05	Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.			
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.			