# Mt. Calvary-Grace Lutheran School
## *Mathematics & Algebra Curriculum Guide*

**Philosophy of Mathematics**

Students will develop an understanding of mathematics through experiences that enable them to become active flexible thinkers and problem solvers adept at the use of mathematics.

Calculators will be used by students *after* a skill has been mastered and by students who have diagnosed learning difficulties.

**Grade Level Objectives for Mathematics & Algebra**
- Students will recognize the order of God's creation through the theories of mathematics
- Students will become problem solvers and develop concepts through the use of manipulates, visuals, and print.
- Students will gain a broad perspective of mathematics content structure and the inter relationships among the various instruction strands or branches
- Students will become competent in the use of technological tools for thinking and learning

**By the end of Pre-Kindergarten, students will be able to:**
1. Classify objects
2. Estimate the larger of two objects or sets
3. Identify figures having the same shape
4. Identify circles squares rectangles and triangles
5. Duplicates a simple pattern
6. Continue a simple pattern
7. Match pairs of objects
8. Discriminate distance shorter longer
9. Describe an object in relation to a boundary (in, out, beside, under, above, front, behind, before, after)
10. Identify numerals one through ten
11. Identify one tool story for four five on checks
12. County to twenty
13. Read and use a calendar
14. Introduce the coins penny, nickel, and dime
15. Collect data and make a picture graph
16. Sequence events

**By the end of Kindergarten, students will be able to:**
1. Read and write numerals through
2. Construct a model representing numerals through 20
3. Count up to 100 by ones and tens
4. Count up to 25 by fives
5. Identify penny, nickel, and dime coins
6. Collect data and make pictographs, real graphs, and bar graphs of the data
7. Identify and build patterns using manipulatives
8. Instantly recognize groups up to six
9. Compare relative length (shorter, longer)
10. Identify positions (front, behind, under, beside, between, before, after)
11. Compare relative quantities (fewer, same, more)
12. Recognize and reproduce shapes (triangles, circle, square, rectangle, oval, diamond)

13. Understand ordinals up to fifth
14. Count backwards from twelve
15. Sequence events
16. Estimate quantities of objects
17. Demonstrate knowledge of subtraction in a concrete way not symbolic)
18. Supply a numeral that represents a concrete number group

**By the end of grade 1, students will be able to:**
1. Demonstrate an understanding of the concept of place value using various proportional and nonproportional models.
2. Read and write numerals through 100.
3. Order any set of numbers between 1 and 100.
4. Count up to 100 by ones and skip count by twos, fives, and tens.
5. Use proportional and nonproportional models to model addition and subtraction.
6. Write an addition or subtraction sentence that describes a modeled situation.
7. Demonstrate the commutative, the associative, and the identity properties for addition.
8. Find the sum of three one-digit numbers.
9. Work two-digit addition and subtraction problems.
10. Perform do two-digit addition and subtraction calculations.
11. Make estimates before making measurements, performing computations, and solving word problems.
12. Identify coins and determine the value of a given set of coins.
13. Identify two-dimensional and three-dimensional figures and describe similarities and differences between figures.
14. Identify congruent figures and lines of symmetry.
15. Measure objects using both nonstandard units and standard units (cm, in. and ft.).
16. Order a set of objects given some measurable attribute.
17. Determine length, capacity, weight, area, and time.
18. Collect data and make pictographs and bar graphs of the data.
19. Draw conclusions and make informal predictions based on experience or graphed data.
20. Identify some events that are sure to happen and some that are not sure to happen.
21. Orally identify halves, thirds, and fourths of regions.
22. Duplicate, continue, and reverse a pattern of concrete objects.
23. Identify and describe patterns that occur in real-life situations.

**By the end of grade 2, students will be able to:**
1. Demonstrate an understanding of the concept of place value using various proportional and nonproportional models.
2. Read, write, and order any set of numerals between 1 and 1,000.
3. Write a number sentence that describes the relationship between any pair of whole numbers.
4. Count by ones to any whole number, and skip count by twos, threes, fours, fives, and tens.
5. Identify whether a number is even or odd.
6. Find the sum of three or four single-digit addends.
7. Estimate and find the sum or difference of two-digit and three-digit numbers.
8. Round two-digit numbers to the nearest ten, and round three-digit numbers to the nearest ten and to the nearest hundred.
9. Write number sentences that describe modeled multiplication sentences.
10. Use a calculator to make mathematical discoveries and to do up to three-digit addition and subtraction problems.

11. Identify coins and bills and determine the value of a given set of coins and bills.
12. Identify, describe, and compare two- and three- dimensional figures.
13. Identify congruent and symmetrical figures.
14. Estimate and measure length, perimeter, capacity, weight (mass), temperature, and area by using various nonstandard, metric, and English units.
15. Tell time on a traditional (analog) clock to the nearest hour, half-hour, quarter-hour, and five minutes.
16. Collect data and make pictographs and bar graphs of the data.
17. Describe data displayed on a graph and make predictions and draw conclusions based on the graphed data.
18. Determine the likelihood that an event will occur.
19. Locate on a graph in a coordinate plane the point whose coordinates are a given pair of numbers between 0 and
20. Recognize different physical representations for the same fraction.
21. Give the appropriate fraction symbol and name for a fraction model.
22. Use different strategies to determine basic facts.
23. Identify and extend patterns of objects and symbols.

### By the end of grade 3, students will be able to:
1. Count by ones to any whole number needed and skip count by twos, threes, fives, and tens.
2. Read, write, order, and use numerals through 999,000 and decimals to the hundredths.
3. Write a number sentence that describes the relationship between any pair of whole numbers.
4. Identify the place value of any numeral up to 6 spaces to the left of the decimal point and two spaces to the right of the decimal point.
5. Round a number to the nearest ten, hundred, or thousand.
6. Estimate and find the sum of three or more whole numbers and the sum or difference of two-, three-, and four-digit numbers.
7. Write number sentences that describe modeled multiplication or division sentences.
8. Do mental calculations by using various properties of addition and subtraction.
9. Demonstrate the relationship between addition and multiplication, subtraction and division, and multiplication and division.
10. Find the product of two one-digit whole numbers and a one-digit number multiplied by a two-digit number.
11. Find the quotient when the dividend is a two-digit whole number and the divisor is a one-digit whole number.
12. Use a calculator to make mathematical discoveries, add or subtract any pair of whole numbers, and multiply any two whole numbers.
13. Compare, order, and round money amounts; make change for dollar amounts up to$5; express the value for a given amount of money in words; and add and subtract money using models.
14. Identify, describe, and compare two- and three-dimensional figures.
15. Identify congruent and symmetrical figures.
16. Find the area and the perimeter of two-dimensional figures by using both nonstandard units and standard units.
17. Determine elapsed time.
18. Choose the appropriate metric or English unit for making a measurement.
19. Convert linear measurements from centimeters to meters, inches to feet, and vice versa.
20. Collect and display data in the form of tables, bar graphs, and pictographs. Formulate questions and make predictions based on organized data.
21. Locate or name ordered pairs on a coordinate grid.

22. Compare and order fractions and mixed numbers using concrete models. (To be able to do these students will need to be able to model several different equivalent fractions for a given fraction.)
23. Use different strategies to determine basic multiplication and division facts.
24. Determine the relationship that exists between each pair of elements in a given set of ordered pairs and then use this relationship (rule) to generate additional ordered pairs.

**By the end of Math 54, students will be able to:**
1. Read, write, order, and use numerals through 1,000,000,000 and decimals to the hundredth, and mixed numbers.
2. Write a number sentence that describes the relationship between any pair of whole numbers.
3. Round a number to the nearest ten, hundred, thousand, ten thousand, or hundred thousand and round money amounts to the nearest $.10, $1.00, or $00.
4. Estimate and find the sum or difference of two-, three-, and four-digit numbers.
5. Illustrate how the distributive property of multiplication over addition can be used to find the product of a one-digit number and a two- or three-digit number.
6. Estimate and find the product of any two-digit number multiplied by a one- or two-digit number.
7. Estimate and find the quotient of a two-digit whole number dividend and a one-digit whole number divisor.
8. Do mental calculations by using various properties of addition, subtraction, and multiplication.
9. Add several numbers, and subtract or multiply a given pair of whole numbers.
10. Estimate and find the sum, difference, or product of decimals to the nearest hundredth.
11. Make change for dollar amounts up to $20; express the value for a given amount of money in words; and find sums and differences of money amounts.
12. Identify and construct models of a line; a line segment; an angle, including its sides; a right angle; two parallel lines; two intersecting lines; two perpendicular lines; a radius; a diameter; and certain two- and three-dimensional figures.
13. Identify congruent, similar, and symmetrical figures.
14. Transform plane figures, i.e., be able to illustrate the reflection, the rotation, and the translation of a geometric figure using concrete models.
15. Estimate and measure length, perimeter, capacity, weight (mass), temperature, and area by using various nonstandard, metric, and English units.
16. Convert linear measurements in centimeters, decimeters, or meters from one unit to another or in inches, feet, or yards from one unit to another.
17. Collect, record, and organize data into tables, charts, bar graphs, line graphs, and pictographs.
18. Formulate questions and make predictions based on organized data.
19. Find the likelihood (probability) of an event and make predictions. In order to determine the likelihood, students will need to be able to list the possible outcomes for various experiments and list the different arrangements (permutations) for a given set of objects.
20. Find the mean (average), median, and range for a set of data.
21. Locate or name ordered pairs on a coordinate grid.
22. Find factors and multiples of numbers and identify prime and composite numbers.
23. Order fractions, mixed numbers, and decimals.
24. Find equivalent fractions and simplify fractions.
25. Find the sum of any two fractions or mixed numbers which have a common denominator.

**By the end of Math 65, students will be able to:**
1. Read, write, round, order, and use numerals through billions, decimals to thousandths, fractions, and mixed numbers.
2. Estimate and find the sum or difference of two 3 5 digit whole numbers, the product of a one-, two-, or a three-digit whole number by a one-, two-, or a three-digit whole number by a one-, two-,

or three-digit whole number, and to find the quotient for division problems that have one- or two-digit divisors.

3. Estimate and find the sum or difference of any two decimals to the thousandths.
4. Multiply and divide decimals by whole numbers.
5. Use a calculator to find the sum or difference of any two decimal numerals, the product of any decimal and whole number, and the quotient of a decimal divided by a whole number.
6. Determine the prime factorization of a number. (Finding the prime factorization is easier if students know the tests for divisibility by 2, 3, 4, 5, and )
7. Find the greatest common factor and the least common multiple of two or more numbers.
8. Develop the ability to find equivalent fractions for a given fraction and to reduce fractions.
9. Add and subtract fractions and mixed numbers with like and unlike denominators.
10. Multiply a whole number by a fraction, a fraction by a whole number, and a fraction by a fraction.
11. Convert a common fraction or mixed numeral to a decimal and a decimal to a common fraction or mixed numeral. Simplify an expression, including symbols of inclusion.
12. Use formulas to compute the circumference of a circle, and the area of a square, a rectangle, a triangle, and a parallelogram.
13. Describe the relationships that exist between various units of volume and between volume and capacity for the metric system.
14. Convert from one unit of measure to another unit of measure within the same measurement system.
15. Express a relationship as a ratio, determine if two ratios are equal, and determine the missing term given two equivalent ratios. Interpret and use scale drawings.
16. Represent situations and number patterns with tables, graphs, verbal rules, and equations that include variables.
17. Analyze tables and graphs to identify properties and relationships.
18. Systematically collect, organize, and summarize data in a table or a pictograph. Construct, read, and interpret tables, charts, and graphs. Compute measures of central tendency (mean, median, and mode) and the range.
19. Determine the empirical probability of a simple event by conducting experiments and finding the theoretical probability of a simple event by constructing a sample space for the set of all possible outcomes and the set of all favorable outcomes.
20. Predict outcomes based on theoretical probability and empirical probability. Identify by name polygons with 4, 5, 6, 8, or 10 sides and classify plane figures, angles, and space figures.
21. Construct circles and identify the radius, diameter, chord, center, and circumference of circles.
22. Measure and draw angles using a protractor.
23. Transform plane figures and identify how a figure was transformed.

**By the end of Math 76, students will be able to:**
1. Read, write, round, compare, order, and use whole numbers, decimals, fractions, and mixed numbers.
2. Estimate and find the sum, difference, or product of any two whole numbers or decimals.
3. Estimate and find the quotient of a decimal divided by a whole number or by a decimal with two digits.
4. Express a number which has repeated factors in exponential form and evaluate expressions written in exponential form.
5. Find the greatest common factor and the least common multiple of two or more numbers.
6. Estimate and find sums and differences of fractions and mixed numbers.
7. Find the products of mixed numbers and fractions.
8. Demonstrate the meaning of percent with concrete models and express a given percent as a decimal fraction or decimal and vice versa.
9. Use the concepts of ratio, proportion, and percent to solve application problems.

10. Express large numbers in scientific notation and rewrite numbers written in scientific notation in regular decimal notation.
11. Use a calculator to find a given power of a given number and a given percent of a given number.
12. Simplify expressions that include symbols of inclusion.
13. Approximate the area of irregular figures by using grids; compute the area of common polygons (triangle, parallelogram, square, and rectangle) by using formulas; and compute the circumference and the area of a circle of a given radius and vice versa.
14. Determine and describe the effect changing the linear dimensions of a figure has on the area of the figure.
15. Convert from one unit of measure to another unit of measure within the same measurement system.
16. Find the sum of any two integers using various models.
17. Represent situations and number patterns with tables, graphs, verbal rules, and equations.
18. Analyze tables and graphs to identify properties and relationships.
19. Plot integers on a number line and solve simple linear equations.
20. Systematically collect, organize, and summarize data; construct, read, and interpret tables, charts, and graphs; and compute measures of central tendency (mean, median, and mode) and the range.
21. Determine the empirical probability of simple events by conducting experiments and the theoretical probability of a simple event by constructing a sample space for the set of all possible outcomes. (Students should be able to express the probability as a fraction, a ratio, a decimal, or a percent.)
22. Make and refine predictions by determining probabilities for different sample sizes.
23. Classify angles, pairs of lines, triangles, quadrilateral, and polygons.
24. Identify congruent, similar, or symmetric figures.
25. Identify transformations of given figures.
26. Build models of three-dimensional figures such as pyramids, cones, or prisms with polygonal bases and determine some of the properties of these solids.

**By the end of Math 87, students will be able to:**
1. Read, write, round, compare and order, and use whole numbers, decimals, fractions, and mixed numbers.
2. Estimate and find the sum, difference, or product of any two whole numbers and decimals on paper.
3. Estimate and find the quotient of any two whole numbers or of a decimal divided by a whole number or a decimal with two digits on paper.
4. Convert between whole numbers, fractions, decimals, and percents mentally, on paper.
5. Estimate and find sums, differences, products, and quotients of fractions and mixed numbers on paper, and with a calculator.
6. Use the concepts of ratio, proportion, and percent to solve application problems.
7. Evaluate expressions written in exponential form which have integral exponents and find the product of two powers which have the same base.
8. Multiply large numbers and small numbers, using scientific notation.
9. Use a calculator to find the square root and the square of a given number.
10. Find the missing terms and the sum of a sequence of numbers.
11. Find the area of a trapezoid and the surface area of three-dimensional figures.
12. Find and use formulas for finding volume of prisms, cylinders, cones, and pyramids.
13. Determine and describe the effect changing the linear dimensions of a figure has on its volume.
14. Convert from one unit of measure to another unit of measure within the same measurement system and between metric and standard unit systems.
15. Interpret and use scale drawings.

16. Represent situations and number patterns with tables, graphs, verbal rules, and equations.
17. Analyze tables and graphs to identify properties and relationships.
18. Graph ordered pairs on a four-quadrant grid.
19. Find the sum, difference, product, or quotient of any two integers and the absolute value of any integer.
20. Solve simple linear equations and solve simple linear inequalities. (Students should also be able to graph the solution on a number line.)
21. Translate word phrases and sentences into algebraic expressions and evaluate algebraic expressions.
22. Systematically collect, organize, and summarize data (students should be able to use box and whisker graphs, stem and leaf plots, and histograms to display information); construct, read, and interpret tables, charts, and graphs; and compute measures of central tendency (mean, median, and mode) and the range.
23. Determine the empirical probability of simple events by conducting experiments and the theoretical probability of simple events by constructing a sample space for the set of all possible outcomes and the set of all favorable outcomes.
24. Make and refine predictions by determining probabilities for different sample sizes.
25. Identify and classify angles, pairs of lines, triangles, quadrilaterals, and polygons.
26. Identify congruent, similar, or symmetric figures and identify transformations of given figures.
27. Use compass and straightedge to construct the perpendicular bisector of a line segment, perpendicular lines, parallel lines, congruent angles, angle bisectors, and triangles.
28. Construct a model of a three-dimensional figure when shown the top, side, and front views.
29. Discover geometric relationships such as the sum of the interior angles of a polygon, the number of diagonals of a polygon, etc.

### By the end of Algebra ½ and Algebra 1, students will be able to:
1. Read, write, round, compare and order, and use whole numbers, decimals, fractions, and mixed numbers.
2. Estimate and find the sum, difference, product, or quotient of any two decimals.
3. Convert between whole numbers, fractions, decimals, and percents mentally, and on paper.
4. Estimate and find sums, differences, products, and quotients of fractions and mixed numbers.
5. Use the concepts of ratio, proportion, and percent to solve application problems.
6. Use a calculator to perform all arithmetic operations, including work with percents, square roots, powers, and use of calculator memory.
7. Identify a real number as rational or irrational and find a real number that lies between any two distinct real numbers.
8. Describe some properties of rational, irrational, and real numbers.
9. Use radical notation and fractional notation to write square and cube roots.
10. Find the nth term in an arithmetic or geometric sequence.
11. Find the product or quotient of two powers that have the same base.
12. Multiply and divide large numbers and small numbers using scientific notation.
13. Find the perimeter and the area of two-dimensional figures and find the volume and surface area of prisms, pyramids, cones, cylinders, and spheres.
14. Convert from one unit of measure to another unit of measure within the same measurement system and between metric and standard unit systems.
15. Describe the difference between the accuracy and the precision of a measurement and determine the amount of error possible in a measurement given the precision of the measurement.
16. Graph relations of real numbers in order to determine whether the relation represents a function.
17. Solve a formula for any given variable.
18. Translate word phrases and sentences into algebraic expressions and evaluate algebraic expressions.

19. Use the Pythagorean Theorem to determine the measure of one side of a triangle, given the measure of the other two sides, and to determine whether a triangle is a right triangle.
20. Solve word problems involving direct or inverse variation or applications of the Pythagorean Theorem or which require writing and solving a simple linear equation or inequality.
21. Find the slope, the x-intercept, and the y-intercept of a linear equation in two variables.
22. Add and subtract polynomial expressions.
23. Solve a system of two equations in two unknowns.
24. Find horizontal, vertical, and diagonal lengths in the coordinate plane.
25. Systematically collect, organize, and summarize data; construct, read, and interpret tables, charts, and graphs; and find the mean, the median, and the mode of a given set of numbers. (Students need to be able to interpret and display data from frequency tables, bar graphs, line graphs, circle graphs, histograms, scattergrams, stem-and-leaf plots, and box-and-whisker plots.)
26. Distinguish between useful and misleading graphs and between useful and misleading statistics.
27. Determine the probability of independent and dependent events.
28. Determine the empirical probability of simple events and compound events by conducting experiments and determine the theoretical probability of simple and compound events by constructing sample spaces for the sets of all possible outcomes and the sets of all favorable outcomes.
29. Find the number of permutations and the number of combinations using factorial notation.
30. Identify transformations of given figures.
31. Construct congruent line segments, congruent angles, the perpendicular bisector of a line segment, an angle bisector, the perpendicular from a point to a line, and the perpendicular to a point on a line.
32. Construct a geometric figure congruent to a given geometric figure.
33. Construct a model of a three-dimensional figure shown from different perspectives.
34. Identify similar triangles and find the missing parts of similar triangles.
35. Graph similar figures, reflections, and translations in a coordinate plane.
36. Identify a chord of a circle and complementary or supplementary angles.
37. Discover and describe the relationships between angles formed by two lines and a transversal.