

Math Curriculum

Adopted 2016-2017

Philosophy Statement

Mathematics teaches students the concepts of order, exactness, and correctness, which reflect the order and exactness of God's wonderful creation. It also serves to prepare students for their lives by supplying them with a knowledge useful for good stewardship of God's gifts. At St. Paul's we hope to lead our students to wisely and prudently use their God-given gifts to the best of their abilities for the glory of God. To accomplish this, our students must be well-grounded in basic mathematical skills. These mathematical skills will enable students to succeed in an increasingly scientific and technological world.

Gr. K-3: Primary grade students progress through well-planned teacher-led math lessons (modeling, guided practice, and independent practice). Learning takes place through the memorization of facts and procedures through drill, repetition, recitation, and student practice in real life context. These years will build a foundation for abstract thinking by using manipulatives to enhance concrete learning.

Gr. 4-8: Students are taught the rules of mathematics by analyzing real-life math experiences through well-planned teacher-led or facilitated lessons (modeling, guided practice, and independent practice). Learning takes place through discussions, demonstrations, observations, memorization of basic formulas, and student practice. The application of previously learned foundational skills will transition students towards abstract thinking.

Course Introduction

A thorough math curriculum is critical for success in our ever-changing world. The traditional math approach at St. Paul's Lutheran School gives students a firm foundation in computation, math concepts, problem solving strategies, data interpretation, algebraic expressions and equations, geometry, and statistics and probability. This foundation is constructed through daily instruction, concrete manipulatives when appropriate, and review in a cumulative manner. Ample time is provided to grant individual assistance until the concepts are mastered.

Course Standards

K-8 Math benchmarks:

1. Counting and Cardinality
2. Operations and Algebraic thinking
3. Number and Operations in Base Ten
4. Number and Operations in Fractions
5. Measurement and Data
6. Geometry
7. Ratios and Proportional Relationships
8. The Number System

- 9. Expressions and Equations
- 10. Statistics and Probability
- 11. Functions

Exit Goals for Graduation from St. Paul's

1. Number Sense:

- a. Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- b. Understand meanings of operations and how they relate to one another
- c. Compute fluently and make reasonable estimates.

2. Algebra:

- a. Understand patterns, relations, and functions.
- b. Represent and analyze mathematical situations and structures using algebraic symbols.
- c. Understand and solve expressions and equations including linear equations and systems of linear equations.
- d. Apply mathematical procedures to binomials and polynomials.

3. Geometry:

- a. Analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships
- b. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.
- c. Apply transformations and use symmetry to analyze mathematical situations.
- d. Use visualization, spatial reasoning, and geometric modeling to solve problems through the use of geometric formulas

3. Measurements:

- a. Understand measurable attributes of objects and the units, systems, and processes of measurement.
- b. Apply appropriate techniques, tools, and formulas to determine measurements.

4. Data Analysis and Probability

- a. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- b. Select and use appropriate statistical methods to organize and analyze data.
- c. Develop and evaluate inferences and predictions that are based on data.
- d. Understand and apply basic concepts of probability.

5. Problem Solving:

- a. Build new mathematical knowledge through problem solving

- b. Apply and adapt a variety of appropriate strategies to solve problems that arise in mathematics and in other contexts
 - c. Monitor and reflect on the process of mathematical problem solving
6. Reasoning and Proof:
- a. Recognize reasoning and proof as fundamental aspects of mathematics
 - b. Make and investigate mathematical conjectures
 - c. Develop and evaluate mathematical arguments and proofs
 - d. Select and use various types of reasoning and methods of proof
7. Communication:
- a. Organize and consolidate their mathematical thinking through communication
 - b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
 - a. Analyze and evaluate the mathematical thinking and strategies of others.
 - b. Use the language of mathematics to express mathematical ideas precisely.
4. Connections:
- a. Recognize and use connections among mathematical ideas
 - b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
 - c. Recognize and apply mathematics in contexts outside of mathematics.
5. Representation
- a. Create and use representation to organize, record, and communicate mathematical ideas.
 - b. Select, apply, and translate among mathematical representation to solve problems
 - c. Use representations to model and interpret mathematical occurrences

Grade Level Measurable Objectives:

Kindergarten Math Measureable Objectives:

- 1. Counting and cardinality
 - K.1.1 Know number names and the count sequence.
 - K.1.2 Count to tell the number of objects
 - K.1.3 Compare numbers
 - K.1.4 Count with one-to-one correspondence
- 2. Operations and algebraic thinking
 - K.2.1 Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
- 3. Number and Operations in Base Ten
 - K.3.1 Work with numbers 11-20 to gain foundations for place value.

4. Measurement and Data
 - K.4.1 Describe and compare measurable attributes.
 - K.4.2 Measure and order length using nonstandard units
 - K.4.3 Classify objects and count the number of objects in each category.
 - K.4.4 Use a calendar
 - K 4.5 Analyze and create graphs and tally tables.

5. Geometry
 - K.5.1 Identify and describe plane and solid shapes (square, circles, triangles, rectangles, cubes, cones, cylinders, pyramids, rectangular prisms, and spheres).
 - K.5.2 Analyze, compare, create, and compose shapes.
 - K 5.3 Understand and use positional words (above, below, over , under, in front of, behind, inside, outside)
 - K 5. 4 Sort and classify by alike, different, color, shape, size, and in more than one way.
 - K 5.5 Identify sorting rules.
 - K 5.6 Identify symmetrical figures and shapes.

First Grade Math Measureable Objectives:

1. Counting and Cardinality
 - 1.1.1 Count to 100
 - 1.1.2 Compare and order numbers to 20

2. Operations and Algebraic Thinking
 - 1.2.1 Represent and solve problems involving addition and subtraction.
 - 1.2.2. Add and subtract within 20.

3. Number and Operations in Base Ten
 - 1.3.1 Understand place value to tens
 - 1.3.2 Use place value understanding and properties of operations to add and subtract.
 - 1.3.3 Utilize different counting strategies

4. Measurement and Data
 - 1.4.1 Work with time and money.
 - 1.4.2 Represent and interpret data.

5. Geometry
 - 1.5.1 Identify and describe regular polygons (square, circle, triangle, rectangle, trapezoid, rhombus, hexagon) and solid shapes (sphere, cylinder, cube, pyramid, rectangular prism, cone) and their attributes.
 - 1.5.2 Perform basic transformations

6. Numbers and Operations - Fractions

1.6.1 Understand unit fractions up to $\frac{1}{4}$

Second Grade Math Measureable Objectives:

1. Counting and Cardinality
 - 2.1.1 Count to 1000
 - 2.1.2 Compare and order 3-digit numbers
 - 2.1.3 Use ordinal numbers
2. Operations and Algebraic Thinking
 - 2.2.1 Represent and solve problems involving addition and subtraction.
 - 2.2.2 Understand and apply properties of operations and the relationship between addition and subtraction.
 - 2.2.3 Add and subtract within 20.
 - 2.2.4 Work with addition and subtraction equations.
 - 2.2.5 Work with equal groups of objects to gain foundations for multiplication.
3. Number and Operations in Base Ten
 - 2.3.1 Understand place value to hundreds.
 - 2.3.2 Use place value understanding and properties of operations to add and subtract 2-digit numbers.
 - 2.3.3 Use different counting estimation strategies.
4. Measurement and Data
 - 2.4.1 Measure length, weight, capacity, and temperature using nonstandard, standard, and metric units.
 - 2.4.2 Tell and write time to the nearest hour, half hour, and 5 minutes.
 - 2.4.3 Represent and interpret data using various charts and graphs.
 - 2.4.4 Count money up to \$1.00 and makes change
5. Geometry
 - 2.5.1 Identify and describe regular polygons (square, circle, triangle, rectangle, trapezoid, rhombus, hexagon, octagon) and solid shapes (sphere, cylinder, cube, pyramid, rectangular prism, cone) and their attributes.
 - 2.5.2 Identify and apply congruence, symmetry, and transformations
6. Numbers and Operations - Fractions
 - 2.6.1 Understand and compare fractions up to and equal to 1

Third Grade Math Measureable Objectives:

1. Operations and Algebraic Thinking
 - 3.1.1 Work with equal groups of objects to gain foundation of multiplication
 - 3.1.2 Memorize, represent and solve problems involving multiplication and division up to 12
 - 3.1.3 Understand properties of multiplication and the relationship between multiplication and division.
 - 3.1.4 Solve problems involving the four operations, and identify and explain patterns in arithmetic.

2. Number and Operations in Base Ten
 - 3.2.1 Learn place value up to the hundred thousands place
 - 3.2.2 Use place value understanding and properties of operations to perform up to four digit arithmetic.
3. Number and Operations- Fractions
 - 3.3.1 Develop understanding of fractions and mixed numbers as numbers.
 - 3.3.2 Simplify, add, and subtract fractions with denominators up to 12
4. Measurement and Data
 - 3.4.1 Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
 - 3.4.2 Represent and interpret data from different graphs.
 - 3.4.3 Geometric measurement:
 - 3.4.3.1 Understand concepts of area and relate area to multiplication and addition.
 - 3.4.3.2 Find perimeter and area of rectangles
5. Geometry
 - 3.5.1 Identify two and three dimensional objects and identify the parts of them like lines, angles, rays, edges, faces, and vertices.
 - 3.5.1.1 Find the relationships between different shapes up to eight sides
 - 3.5.1.2 Identify, describe, and find the relationships among three-dimensional shapes
6. Expressions and Equations
 - 3.6.1 Solve equations using all four operations
7. Statistics and Probability
 - 3.7.1 Use probability terms to answer questions about the likelihood of events

Grade 4 Math Measureable Objectives:

1. Operations and Algebraic Thinking
 - 4.1.1 Use the four operations and the order of operations to solve problems
 - 4.1.2 Gain familiarity with factors and multiples
 - 4.1.3 Identify prime and composite numbers
 - 4.1.4 Generate and analyze patterns.
 - 4.1.5 Review basic multiplication and division facts
2. Number and Operations in Base Ten
 - 4.2.1 Understanding place value for multi-digit whole numbers up to millions.
 - 4.2.2 Use place value understanding and properties of operations to perform multi-digit arithmetic.
3. Number and Operations- Fractions
 - 4.3.1 Order fractions and mixed numbers and find their equivalents

- 4.3.2 Add and subtract fractions and mixed numbers with like and unlike denominators
- 4.3.3 Find relationships between fractions and decimals and compare them
- 4. Measurement and Data
 - 4.4.1 Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
 - 4.4.2 Represent and interpret data.
 - 4.4.3 Geometric measurement of understanding concepts of angle and measure angles.
- 5. Geometry
 - 4.5.1 Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
 - 4.5.2 Three dimensional figures
 - 4.5.2.1 Build a basic understanding of volume of a rectangle
 - 4.5.2.2 Find the area of irregular figures
- 6. The Number System
 - 4.6.1 Compare and order numbers and solve basic inequalities
- 7. Statistics and Probability
 - 4.7.1 Solve problems using mean, median, and mode
 - 4.7.2 Represent and interpret data from a variety of graphs

Grade 5 Math Measureable Objectives:

- 1. Operations and Algebraic Thinking
 - 5.1.1 Write and interpret numerical expressions.
 - 5.1.2 Write and solve simple one step equations.
- 2. Number and Operations in Base Ten
 - 5.2.1 Understand the place value system up through the billions.
 - 5.2.2 Perform operations with multi-digit whole numbers and with decimals to hundredths.
- 3. Number and Operations- Fractions
 - 5.3.1 Use equivalent fractions as a strategy to add and subtract fractions.
 - 5.3.2 Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
 - 5.3.3 Simplify Fractions
 - 5.3.4 Rename and Regroup Fractions
- 4. Measurement and Data
 - 5.4.1 Represent and interpret data in a variety of graphs.
 - 5.4.2 Geometric measurement:
 - 5.4.2.1 Students will understand how to find the area and angle measures of a variety of shapes
 - 5.4.3 Measurement:

5.4.3.1 Students will measure with rulers up to the nearest 16th of an inch.

5.4.3.2 Students will be able to measure with time.

5. Geometry

5.5.1 Classify two-dimensional figures into categories based on their properties.

6. Ratios and Proportional Relationships

6.5.1 Students will learn how to identify simple percents.

6.5.2 Students will understand simple unit rates.

7. The Number System

7.5.1 The students will grow their understanding of the number system by:

7.5.1.1 Through being introduced to number theories

7.5.1.2 Through the ordering of fractions and decimals

8. Expressions and Equations

8.5.1 The students will master writing expressions

8.5.2 The students will use inverse operations and the order of operations to solve and simplify simple equations

8.5.3 The students will master the understanding and use of inequality signs

9. Statistics and Probability

9.5.1 Students will be able to identify the mean, median, and mode in a data set.

9.5.2 Students will be able to identify and create a variety of graphs and including histograms, picto, bar, and circle graphs.

9.5.3 Students will solve intermediate level probability, combination, and arrangement problems.

Grade 6 Math Measureable Objectives:

1. Ratios and Proportional Relationships

6.1.1 Students will understand ratio and rate concepts and will use ratio reasoning to solve problems.

6.1.2 Students will understand proportion and scale factor, and how to solve a variety of proportion and scale factor problems including indirect measurement problems

6.1.3 Students will understand what changing dimensions do to the area and perimeter of shapes.

2. The Number System

6.2.1 Students will be able to order integers, decimals, and fractions

6.2.2 Students will be able to compute fluently with multi-digit numbers and find common factors, prime factors, and multiples.

6.2.3 Apply and extend previous understandings of numbers to the system of rational numbers.

3. Expressions and Equations

6.3.1 Students will apply and extend previous understandings of arithmetic to algebraic expressions.

- 6.3.2 Students will be able to use the order of operations and inverse operations to simplify and solve equations including those containing:
 - 6.3.1 Decimals
 - 6.3.2 Fractions
 - 6.3.3 Eponents
 - 6.3.3 Students will represent and analyze quantitative relationships between dependent and independent variables.
 - 6.3.4 Students will solve one and two step inequalities
4. Geometry
- 6.4.1 Students will master the names of types of angles and simple geometric terms
 - 6.4.2 Students will master the classification of a variety of polygons by their sides and angles
 - 6.4.3 Students will identify similar and congruent figures
 - 6.4.4 Students will understand how to create and identify different shape transformations
5. Statistics and Probability
- 6.5.1 Students will solve a variety of probability problems including:
 - 6.5.1.1 Experimental probability
 - 6.5.1.2 Theoretical probability
 - 6.5.1.3 Compound events
 - 6.5.1.4 Dependent events
 - 6.5.2 Students will be able to identify the mean, median, mode, and range in a data set
 - 6.5.3 Students will be able to develop and identify a variety data displays and graphs including:
 - 6.5.3.1 Coordinate grids
 - 6.5.3.2 Data displays
6. Operations and Algebraic Thinking
- 6.6.1 Students will identify perfect squares up through 15 squared
7. Numbers And Operations In Base Ten
- 6.7.1 Students will master real and estimate long division and multiplication
 - 6.7.2 Students will take their multiplication and division to develop a solid understanding of how to divide and multiply with decimals.
8. Measurement and Data
- 6.8.1 Understand how to work with a variety of measurements:
 - 6.8.1.1 Customary and Metric
 - 6.8.1.2 Areas of regular and irregular 2D shapes
 - 6.8.1.3 Angle Measurement
 - 6.8.1.4 Surface Area
 - 6.8.1.5 Volume of 3D shapes
 - 6.8.2 Students will know how to convert between customary and metric measurements.
 - 6.8.3 Students will master the creation and analyzation of the parts of the graph.

9. Numbers and Operations-Fractions

6.9.1 Students will master using a variety of operations with fractions including:

6.9.1.1 Renaming Fractions

6.9.1.2 Regrouping Fractions

6.9.1.3 Simplifying Fractions

6.9.2 Students will be able to convert fractions to decimals, decimals to percents, and vice versa

Grade 7 Math Measureable Objectives:

1. Ratios and Proportional Relationships

7.1.1 Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.1.2 Convert decimals, fractions, and percents interchangeably.

2. The Number System

7.2.1 Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.2.2 Use prime factorization to determine greatest common factor and least common multiple.

7.2.3 Compare and order rational numbers from least to greatest.

3. Expressions and Equations

7.3.1 Use properties of operations to generate equivalent and simplify algebraic expressions.

7.3.2 Solve real-life and mathematical problems using numerical and algebraic expressions to solve two-step and multi-step equations.

7.3.3 Solve equations containing integers, fractions, decimals, and exponents.

7.3.4 Solve simple and multi-step inequality problems by using mathematical operations.

4. Geometry

7.4.1 Draw, construct, describe, and analyze geometric figures and describe the relationships between them.

7.4.2 Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.4.3 Use formulas to in relationships to geometric shapes.

7.4.4 Create and apply transformations.

5. Statistics and Probability

7.5.1 Use random sampling to draw inferences about a population.

7.5.2 Draw informal comparative inferences about two populations.

7.5.3 Investigate chance processes and develop, use, and evaluate probability models.

7.5.4 Read, use, and create frequency tables, box-and-whisker plots, stem-and-leaf plots, and line plots.

7.5.5 Use both experimental and theoretical probability to determine outcomes.

7.5.6 Determine the sample space and probability in independent and dependent events.

7.5.7 Solve problems using combinations.

6. Measurement and Data

7.6.1 Use customary and metric measurements and convert them to equivalent measures.

7. Functions

7.7.1 Determine the parts of a coordinate plane to interpret and create graphs.

7.7.2 Determine simple functions, create tables, and graph sequences using both linear and nonlinear functions.

7.7.3 Solve problems with slope, rates of change, and both direct and inverse variation.

7.7.4 Use the slope-intercept form to identify and graph irrational numbers.

Grade 8 Math Measureable Objectives:

1. The Number System

8.1.1 Know that there are numbers that are not rational, and approximate them by rational numbers.

8.1.2 Use prime factorization to determine greatest common factor and least common multiple.

8.1.3 Compare and order rational numbers from least to greatest.

2. Expressions and Equations

8.2.1 Work with radicals and integer exponents.

8.2.2 Simplify, evaluate, and write algebraic expressions.

8.2.3 Understand and solve problems and equations relating to exponents, scientific notation, squares, and square roots.

8.2.4 Understand the connections between proportional relationships, lines, and linear equations.

8.2.5 Analyze and solve linear equations and pairs of simultaneous linear equations through multiple means including graphing.

8.2.6 Analyze and solve inequalities through multiple means including graphing

8.2.7 Apply mathematical operations to polynomials and binomials

3. Functions

8.3.1 Define, evaluate, and compare functions.

8.3.2 Use functions to model relationships between quantities.

8.3.3 Solve and graph functions (linear, exponential, quadratic, and inverse variation) and equations on a coordinate plane

8.3.4 Solve various sequences including arithmetic, geometric, and other various sequences

8.3.5 Interpret and solve function problems related to graphs

4. Geometry

8.4.1 Understand congruence and similarity using two dimensional drawings, physical models, and transparencies to find an unknown

8.4.2 Understand and apply geometric formulas in relationship to geometric shapes including area, volume, surface area.

- 8.4.3 Apply the Pythagorean Theorem in solving problems.
- 8.4.4 Solve real-world and mathematical problems involving volume and surface area of cylinders, cones, and spheres.

5. Statistics and Probability

- 8.5.1 Investigate patterns of association in bivariate data (data with two variables)
- 8.5.2 Organize data through various means (scatterplot, histograms, box-n-whisker plots, frequency plots, and stem-n-leaf plots) while understanding the relationship of measures of central tendencies
- 8.5.3 Analyze the best representation of data and recognize sampling errors and bias.
- 8.5.4 Demonstrate experimental and theoretical probability
- 8.5.5 Solve problems using permutations and combinations

6. Ratios and Proportional Relationships

- 8.6.1 Use ratios and proportions to solve word problems and problems related to scale drawings and models
- 8.6.2 Apply percents to word problems in relation to increase and decrease
- 8.6.3 Find a percent when a number is known and find a number when a percent is known.

Course of Study

Grade K-5: Harcourt Math

Grade 6-8: Holt McDougal Mathematics

Assessments

Students in Grades K-8 shall be assessed in the following ways:

- Formative assessments such as observations, written quizzes, oral quizzes and exit cards
- Summative assessments such as daily math assignments, memorization of math facts and written tests.