2008

Mathematics Curriculum Guide

Catholic Diocese of Wilmington, Delaware

Grade 3 Standards

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Mission

The Catholic school has the responsibility to prepare all students to function effectively in today's society and to bring Christian values to their world. Integral to the complete formation of the child in our Catholic schools is the study of Mathematics. Students of the twenty-first century must be taught to value Mathematics and become competent and confident in reasoning, making connections, and communicating in order to be better problem solvers. They should be able to assimilate new information, solve unfamiliar problems in unconventional ways, and work cooperatively as well as independently. They should also be able to interpret issues, think critically and ethically, and act responsibility.

Vision

As life-long learners, we are challenged to use God's gifts to better understand and improve the world around us. We recognize that we live in a world that is increasingly mathematical and technological and that our students' futures depend on their mathematical competency. Students should be able to assimilate new information, solve unfamiliar problems in unconventional ways, and work cooperatively as well as independently. They should also be able to interpret issues, think critically and ethically, and act responsibly. Teaching strategies and learning experiences must be varied, meaningful, and engaging to students.

Philosophy

Mathematics is learned through an approach that begins with concrete explorations and leads students to an understanding of symbolic representations. All students must have equal access to rigorous, high quality instruction to become mathematically literate. The uniqueness of each student should be nurtured by using differentiated strategies in response to various learning styles. A broad variety of assessments must provide multiple indicators of student achievement.

Communicating mathematically enables students to solve problems by acquiring information through reading, listening, and observing. Students will be able to translate information into mathematical language and symbols, process the information mathematically, and present the results in written, oral, and visual formats to demonstrate their mathematical literacy.

Students achieve mastery of computational skills through the employment of age-appropriate materials while also developing higher-level critical thinking skills. In our progressively changing world, students need to know how to properly utilize innovative tools, media, and technology to solve cross-curricular mathematical problems. Technology, however, is not a replacement for the comprehension of mathematical concepts.

The Mathematics program prepares students to fulfill personal ambitions and career goals in an ever changing world. Classrooms that encourage investigation, collaboration, and

resourcefulness in the problem solving process empower students beyond the classroom. It is through the cornerstones of communication, teamwork, and opportunity that we instill into our students a deeper appreciation and knowledge of mathematics so that they may become productive Catholic citizens of the world.

Goals

All students will:

1. Learn to appreciate mathematics, reason mathematically, and communicate mathematically.
2. Utilize their mathematical skills to become competent problem solvers.
3. Make mathematical connections to real life situations and to other areas of the curriculum.
4. Use technology appropriately and effectively.
5. Apply ethical and critical thinking.

Expectations for Learning

We commit to the following expectations:

1. That all grade levels students:
    - Learn to think critically, logically, ethically, and analytically
    - Learn to express ideas orally and in writing using correct mathematical terminology
    - Learn to apply the techniques of mathematics to real world situations
    - Understand that mathematics is important to function in today's world
    - Utilize technology responsibly
1. That computers, calculators, manipulatives and other tools of learning should be used routinely as an integral part of both instruction and assessment.
2. That mathematics teachers be encouraged to participate in professional development activities.
3. That mathematics coordinators hold regularly scheduled faculty meetings to facilitate communication and to analyze the strengths and weaknesses within the program.
4. That the teacher utilize the mathematics curriculum guidelines for grade level instruction.
5. That teachers provide differentiated instruction and assessment.

GRADE THREE

***As life-long learners**, we are challenged to use God's gifts to better understand and improve the world around us. We recognize that we live in a world that is increasingly mathematical and technological and that our students' futures depend on their mathematical competency. Students should be able to assimilate new information, solve unfamiliar problems in unconventional ways, and work cooperatively as well as independently. They should also be able to interpret issues, think critically and ethically, and act responsibly. Teaching strategies and learning experiences must be varied, meaningful, and engaging to students.*

The Diocese of Wilmington has established the following mathematics Standards to clarify for teachers, students, and parents the knowledge, understanding, and skills students should attain in GRADE THREE:

Standard 1 — Number Sense

Developing number sense is the foundation of mathematics. Students extend their understanding of the place value system to count, read, and write numbers up to 10,000. They learn to order and round numbers up to 10,000. They develop the concept of equivalent fractions— and use this concept to compare fractions. They also begin to develop the concept of decimals as a different way of representing fractional numbers.

Standard 2 — Computation

Mastering computational skills is vital. As students learn about the whole numbers up to 10,000, they learn how to add and subtract them. They continue to develop the concepts of multiplication and division from addition and subtraction and learn basic multiplication and division facts. They also start to add and subtract fractions with the same denominators.

Standard 3 — Algebra and Functions

Understanding patterns, rules, and symbols is the foundation of Algebra. Students at this level represent relationships with numeric equations and use those equations to solve problems. They continue number patterns involving multiplication and use some of the rules for multiplication to check results. Students describe, represent, and analyze relationships among variable quantities. They begin to develop the concept of a functions and the relationship between numbers and number lines.

Standard 4 — Geometry

Exploring shapes and developing spatial sense is the basis of Geometry. Students identify quadrilaterals and learn about right angles as a basis for comparing other angles. They describe and classify three-dimensional shapes. They use the basic terms point, line, and line segment to describe shapes.

Standard 5 — Measurement

Using measurement is essential to everyday life. Students measure length to the nearest half-inch, add units of length, and find the perimeters of shapes. They estimate area and volume in preparation for developing formulas for calculating them. They estimate, measure, and compare weights, capacities, and temperatures in standard units. They also learn about money: the value of any collection of coins and dollars, writing money using the $ symbol, and deciding whether they have enough money to make a purchase.

Standard 6 — Data Analysis and Probability

Analyzing data is a fundamental life skill. Students develop an understanding of statistics and probability by solving problems in which there is a need to collect, appropriately represent, and interpret data; to make inferences or predictions; to present convincing arguments and to model mathematical situations to determine the probability.

Standard 7 — Problem Solving

Solving problems is the practical application of mathematics. In all mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. As students develop their skills with numbers, geometry, or measurement, they move from simple ideas to more complex ones by taking logical steps that build a better understanding of mathematics.

Students should also develop the following learning skills by Grade 12 that are integrated throughout the National Council of Teachers of Mathematics (NCTM) Standards:

Communication

As students are asked to communicate orally or in writing about the mathematics they are studying, they gain insights into their own thinking. In order to communicate their thinking to others, they naturally reflect on their learning and organize and consolidate their thinking about mathematics. Students should be encouraged and expected to increase their ability to express themselves clearly and coherently over time. In particular, the ability to express thoughts and describe solutions in writing should be a major focus of the mathematics curriculum.

Reasoning and Proof

Systematic reasoning is a defining feature of mathematics. Exploring, justifying, and using mathematical conjectures are common to all content areas and, with different levels of rigor, all grade levels. By the end of secondary school, students should be able to understand and produce some mathematical proofs – logically rigorous deductions of conclusions from mathematical hypotheses – and should appreciate the value of such arguments.

Connections

Mathematics is an integrated field of study, even though it is often studied in separate areas or topics. Viewing mathematics as a whole helps students learn that mathematics is not a set of isolated skills and arbitrary rules. Focusing on mathematics in context and establishing mathematical connections makes it easier to apply mathematical knowledge and makes it less likely that students will forget or misapply important mathematical skills and rules.

Representation

Representations are necessary to students' understanding of mathematical concepts and relationships. They allow students to communicate mathematical approaches, arguments, and understandings to themselves and others. Appropriate representations allow students to recognize connections among related concepts, and lead to efficient methods of solving problems.

It is important to encourage students to represent their mathematical ideas in ways that make sense to them, even if those representations are not conventional. At the same time, students should learn conventional forms of representation in ways that facilitate their learning of mathematics and their communication with others about mathematical ideas.

Standard 1

Number Sense

Students understand the relationships among numbers, quantities, and place value in whole numbers up to 1,000. They understand the relationship among whole numbers, simple fractions, and decimals.

3.1.1 Count, read, and write whole numbers up to 10,000.

Example: Write 2349 for the number "two thousand three hundred forty-nine."

3.1.2 Identify and interpret place value in whole numbers up to 10,000.

Example: Understand that the 7 in 21, 479 represents 7 tens or 70.

3.1.3 Use words, models, and expanded form to represent numbers up to 10,000.

Example: Recognize that 8,492 = 8000+ 400 + 90 + 2.

3.1.4 Identify any number up to 10,000 in various combinations of thousands, hundreds, tens, and ones.

Example: 2325 can be written as 2 thousands, 3 hundreds, 2 tens, and 5 ones, or as 2 thousands, 3 hundreds, 2 tens, and 5 ones.

3.1.5 Compare whole numbers up to 10,000 and arrange them in numerical order.

Example: What is the smallest whole number you can make using the digits 4, 9, and 1? Use each digit exactly once.

3.1.6 Round numbers less than 10,000 to the nearest ten and the nearest hundred.

Example: Round 5480 to the nearest hundred.

3.1.7 Identify odd and even numbers up to 10,000 and describe their characteristics.

Example: Find the even number: 47, 106, 357, 629.

3.1.8 Show equivalent fractions using equal parts.

Example: Draw pictures to show that $\frac{3}{5}$, $\frac{6}{10}$, and $\frac{9}{15}$ are equivalent fractions.

3.1.9 Identify a mixed number as a whole number and a fraction from diagrams and pictures, and models.

Example: Look at the picture and name it with a whole number and a fraction.

3.1.10 Identify and use correct names for numerators and denominators.

Example: In the fraction $\frac{3}{5}$, name the numerator and denominator.

3.1.11 Given a pair of fractions, decide which is larger or smaller by using objects or pictures.

Example: Is $\frac{3}{4}$ of a medium pizza larger or smaller than $\frac{1}{2}$ of a medium pizza? Explain your answer.

3.1.12 Given a set of objects or a picture, name and write a decimal to represent tenths and hundredths.

Example: You have a pile of 100 beans and 72 of them are lima beans. Write the decimal that represents lima beans as a part of the whole pile of beans.

3.1.13 Explain the relationship of a fraction with a denominator of 10 and a decimal number, using a picture or diagram.

Example: Shade the part of a square that represents 0.7 and write the number $\frac{7}{10}$.

Standard 2

Computation

Students solve problems involving addition and subtraction of whole numbers. They model and solve simple problems involving multiplication and division.

3.2.1 Add and subtract whole numbers up to 100,000 with or without regrouping, using relevant properties of the number system.

Example: 54,000 – 1427 = ?. Explain your method.

3.2.2 Represent the concept of multiplication as repeated addition.

Example: Lynn made 3 baskets each week for 4 weeks. Draw a picture to show how many baskets she made.

3.2.3 Represent the concept of division as repeated subtraction, equal sharing, and forming equal groups.

Example: Bob shared 10 cookies among 5 friends. Draw a picture to show how many cookies each friend got.

3.2.4 Know and use the inverse relationship between multiplication and division facts, such as $6 \times 7 = 42$, $42 \div 7 = 6$, $7 \times 6 = 42$, $42 \div 6 = 7$.

Example: Find other facts related to $8 \times 3 = 24$.

3.2.5 Show mastery of multiplication facts from 0 x 0 through 12 x 12

Example: Know the answer to 6×5.

3.2.6 Add and subtract simple fractions with the same denominator.

Example: Add $\frac{3}{8}$ and $\frac{1}{8}$. Explain your answer.

3.2.7 Use estimation to decide whether answers are reasonable in addition and subtraction problems.

Example: Your friend says that 79 – 22 = 27. Without solving, explain why you think the answer is wrong.

3.2.8 Use mental arithmetic to add or subtract with numbers less than 100.

Example: Subtract 35 from 86 without using pencil and paper.

3.2.9 Explore multiplication without regrouping; two and three digit numbers by a one digit number.

Example: 231 x 3 = ?

3.2.10 Explore division with and without remainders, using manipulatives; one and two digit dividend and one digit divisor.

Example: Use counters to show that 13 divided by 3 = 4 remainder 1

Standard 3

Algebra and Functions

Students select appropriate symbols, operations, and properties to represent, describe, simplify, and solve simple number and functional relationships.

3.3.1 Represent relationships of quantities in the form of an equation or inequality.

Example: Bill's mother gave him money to buy three drinks that cost 45 cents each at the concession stand. When he returned to the bleachers, he gave 25 cents change to his mother. Write an equation to find the amount of money Bill's mother originally gave him.

3.3.2 Solve problems involving an equation or inequality.

Example: Bill wants to spend 25 cents on a drink. He has 15 cents. How much more money does he need?

3.3.3 Choose appropriate symbols for operations and relations to make a number sentence true.

Example: What operation symbol is needed to make the number sentence 4 □ 3 = 12 true?

3.3.4 Understand and use the commutative, associative, identity properties of addition and multiplication and the zero property of multiplication.

Example: Multiply the numbers 7, 2, and 5 in this order. Now multiply them in the order 2, 5, and 7. Which was easier? Why?

3.3.5 Create, describe, and extend number patterns using multiplication.

Example: What is the next number: 3, 6, 12, 24, …? How did you find your answer?

3.3.6 Solve simple problems involving a functional relationship between two quantities.

Example: Ice cream sandwiches cost 20 cents each. Find the costs of 1, 2, 3, 4, … ice cream sandwiches. What pattern do you notice? Continue the pattern to find the cost of enough ice cream sandwiches for the class.

3.3.7 Plot and label numbers on a number line up to 1000.

Example: Mark the position of 700 on a number line up to 1000.

Mark the position of a number half way between two and three.

Standard 4

Geometry

Students describe and compare the attributes of plane and solid geometric shapes and use their understanding to show relationships and solve problems.

3.4.1 Identify quadrilaterals as four-sided shapes.

Example: Which of these are quadrilaterals: square, triangle, rectangle?

3.4.2 Identify right angles in shapes and objects and decide whether other angles are greater or less than a right angle.

Example: Identify right angles in your classroom. Open the classroom door until it makes a right angle with one wall and explain what you are doing.

3.4.3 Identify, describe, and classify: cube, sphere, prism, pyramid, cone, and cylinder.

Example: Describe the faces of a pyramid and identify its characteristics.

3.4.4 Identify common solid objects that are the parts needed to make a more complex solid object.

Example: Describe and draw a house made from a prism and a pyramid.

3.4.5 Draw a shape that is congruent to another shape.

Example: Draw a triangle that is congruent to a given triangle. You may use a ruler and pencil or the drawing program on a computer.

3.4.6 Use the terms *point*, *line*, and *line segment, and ray* in describing two-dimensional shapes.

Example: Describe the way a triangle is made of points and line segments and how you know it is a triangle.

3.4.7 Draw line segments and lines, both parallel and intersecting.

Example: Draw a line segment three inches long intersecting a line four inches long.

3.4.8 Identify and draw multiple lines of symmetry in geometric shapes (by hand or using technology).

Example: Use pencil and paper or a drawing program to draw four lines of symmetry in a square. Discuss your findings.

3.4.9 Sketch the mirror image reflections of shapes.

Example: Hold up a cardboard letter F to a mirror. Draw the letter and the shape you see in the mirror.

3.4.10 Recognize geometric shapes and their properties in the environment and specify their locations.

Example: Write the letters of the alphabet and draw all the lines of symmetry that you see.

3.4.11 Show the results of sliding, flipping, or turning by using concrete materials.

Example: Move the pattern block four squares to the right and tell if its shape position changed. Tell if this was a slide, flip, or turn.

Standard 5

Measurement

Students choose and use appropriate units and measurement tools for length, capacity, weight, temperature, time, and money.

3.5.1 Measure line segments to the nearest half-inch.

Example: Measure the length of a side of a triangle.

3.5.2 Add units of length that may require regrouping of inches to feet or centimeters to meters.

Example: Add the lengths of three sheets of paper. Give your answer in feet and inches.

3.5.3 Find the perimeter of a polygon.

Example: Find the perimeter of a table in centimeters. Explain your method.

3.5.4 Estimate and find the area of shapes by covering them with squares.

Example: How many square tiles do we need to cover this desk?

3.5.5 Estimate or find the volumes of objects by counting the number of cubes that would fill them.

Example: How many of these cubes will fill the box?

3.5.6 Estimate and measure capacity using quarts, gallons, and liters.

Example: This bottle holds one liter. Estimate how many liters the sink holds.

3.5.7 Estimate and measure weight using pounds and kilograms.

Example: Estimate the weight of your book bag in pounds.

3.5.8 Compare temperatures in Celsius and Fahrenheit.

Example: Measure the room temperature using a thermometer that has both Celsius and Fahrenheit units. If the temperature in the room measures 70ºF, will the Celsius measurement be higher or lower?

3.5.9 Tell time to the nearest minute and find how much time has elapsed.

Example: You start a project at 9:10 a.m. and finish the project at 9:42 a.m. How much time has passed?

3.5.10 Find the value of any collection of coins and bills. Write amounts less than a dollar using the ¢ symbol and decimal notation using the $ symbol.

Example: You have 5 quarters and 2 dollar bills. How much money is that? Write the amount.

3.5.11 Use play or real money to decide whether there is enough money to make a purchase.

Example: You have $5. Can you buy two books that cost $2.15 each? What about three books that cost $1.70 each? Explain how you know.

3.5.12 Carry out simple unit conversions within a measurement system (e.g., centimeters to meters, hours to minutes).

Example: How many minutes are in 3 hours?

Standard 6

Data Analysis and Probability

Students collect, organize, display, analyze, and interpret data to make decisions or predictions.

3.6.1 Interpret data displayed in a circle graph and answer questions about the situation.

Example: Have the students in your class choose the pizza they like best from these choices: cheese, sausage, pepperoni. Use a spreadsheet to enter the number of students who chose each kind and make a circle graph of the data. Determine the most popular and the least popular kind of pizza, and explain what the circle and each pie slice represent.

3.6.2 Identify whether everyday events are certain, likely, unlikely, or impossible.

Example: It is raining in your neighborhood. Is it certain, likely, unlikely, or impossible that the tree in your front yard will get wet?

3.6.3 Record the possible outcomes for a simple probability experiment.

Example: Have a partner toss a coin while you keep a tally of the outcomes. Exchange places with your partner and repeat the experiment. Explain your results to the class.

3.6.4 Create, interpret, and compare bar graphs, line graphs, pictographs, tables.
Example: Survey the class for favorite colors. Display your findings on a bar graph and on a pictograph.

Standard 7

Problem Solving

Students make decisions about how to approach problems and communicate their ideas.

3.7.1 Analyze problems by identifying relationships, explaining relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

Example: “Start with any number. If it is even, halve it. If it is odd, add 1. Do the same with the result and keep doing that. Find what happens by trying different numbers.

3.7.2 Decide when and how to break a problem into simpler parts.

Example: In the first example, find what happens to all the numbers up to 10. ”Try two or three numbers and look for patterns.

Students use strategies, skills, and concepts in finding and communicating solutions to problems.

3.7.3 Apply strategies and results from simpler problems to solve more complex problems.

Example: In the first example, use your results for the numbers up to 10 to find what happens to all the numbers up to 20.

3.7.4 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.

Example: In the first example, explain what happens to all the numbers that you tried.

3.7.5 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

Example: Measure the length and width of a room to the nearest meter to find how many student desks will fit in it. Would this be an accurate enough method if you were carpeting the room?

3.7.6 Know and use strategies for estimating addition and subtraction.

Example: You buy 2 bags of candy for $1.05 each. The cashier tells you that will be $1.70. Does that surprise you? Why or why not?

3.7.7 Make precise calculations and check the validity of the results in the context of the problem.

Example: In the first example, notice that the result of adding 1 to an odd number is always even. Use this to check your calculations.

Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.

3.7.8 Decide whether a solution is reasonable in the context of the original situation.

Example: In the example about fitting desks into a room, would an answer of 1,000 surprise you?

3.7.9 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.

Example: Change the first example so that you multiply odd numbers by 2 or 3 or 4 or 5, before adding 1. Describe the pattern you see.