2008

Mathematics Curriculum Guide

Catholic Diocese of Wilmington, Delaware

Grade 1 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 ONE

***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 ONE:

Standard 1 — Number Sense

Developing number sense is the foundation of mathematics. Students develop this understanding by first counting sets of objects and then moving on to writing numerals. They learn how we group numbers in tens and ones, allowing them to write numbers up to 100. They find the number one more or one less than a given number. They put numbers up to 10 in order of size and use the terms *first*, *second*, *third*, etc. Students also learn about fractions, understanding that fractions compare a part of a set to the whole set.

Standard 2 — Computation

Mastering computational skills is vital. As students learn about the whole numbers up to 100, they also learn how to add and subtract them. They use objects to join sets together (for addition) and to remove objects from sets (for subtraction). They become familiar with different ways of looking at the same number using objects and figures. They also learn that addition and subtraction are opposites of each other and that zero has special properties.

Standard 3 — Algebra and Functions

Understanding patterns, rules, and symbols is the foundation of Algebra. Students relate word problems to number sentences in symbols, such as 7 + □ = 13, and learn some of the rules relating to addition and subtraction. They also continue number patterns using addition and subtraction. Students describe, represent, and analyze relationships among variable quantities.

Standard 4 — Geometry

Exploring shapes and developing spatial sense is the basis of Geometry. Students describe and construct simple shapes, comparing and sorting them by attributes such as size, number of sides, and lines of symmetry. Students learn the meaning of positional words, and use the words to follow directions. They identify objects as two- or three-dimensional and describe the faces of solid objects. They also recognize geometric shapes in the world around them.

Standard 5 — Measurement
Using measurement is essential to everyday life. Students begin their study of measurement by comparing objects' length, weight, temperature, etc. Then they become more precise as they move toward understanding the need for standard units of the U.S. Customary and Metric Systems. They learn how about time and money.

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 they develop their skills with numbers, geometry, or measurement, for example, students at this level 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 symbols, objects, and pictures used to represent numbers up to 100 and show an understanding of fractions.

1.1.1 Count, read, and write whole numbers up to 100.
Example: Read "seventy-two" for the number 72.

1.1.2 Count and group objects in ones and tens.
Example: Separate a group of 34 blocks into three groups of 10 blocks and 4 single blocks.

1.1.3 Recognize place value ones and tens in numbers through 99.
Example: How many tens and how many ones are in 56? Explain your answer.

1.1.4 Use the number line to name the number that is one more than or one less than any number up to 100.
Example: Name the number one less than 78.

1.1.5 Compare whole numbers up to 10 using the symbols >, <, and =.
Example: Arrange the numbers 5, 2, and 9 in order from greatest to least.

Use a comparison symbol: 6 ? 4

1.1.6 Match the ordinal numbers (*first*, *second*, *third*, etc.) with an ordered set of up to 10 items.
Example: Point out the fifth child from the front of a line of children.

1.1.7 Recognize when a shape is divided into congruent (matching) parts.
Example: Given a rectangle with lines dividing it into parts, decide whether the parts are the same size.

1.1.8 For a shape divided into 4 or fewer congruent parts, describe a shaded portion as "__ out of __ parts" and write the fraction.
Example: Given a circle divided into 4 equal parts with 3 of the parts shaded, describe the shaded portion as "3 out of 4 parts" and write the fraction for the shaded portion.

1.1.9 For a set of 4 or fewer objects, describe a subset as "__ out of __ parts" and write the fraction.
Example: Given 3 red pencils and 2 blue pencils, describe the subset of red pencils as "3 out of 5 parts" and write the fraction of the pencils that are red.

Standard 2

Computation

Students demonstrate the meaning of addition and subtraction and use these operations to solve problems.

1.2.1 Model addition (putting together, increasing) using manipulatives.
Example: Put together 3 pencils and 5 pencils. Tell how many pencils you have and explain what you are doing.

1.2.2 Model subtraction (taking away, comparing, finding the difference) using objects.
Example: Take away 6 blocks from a group of 10. Tell how many blocks are left and explain what you are doing.

1.2.3 Show equivalent forms of the same number (up to 20) using objects, diagrams, and numbers.
Example: Write 15 as 8 + 7, 5 + 5 + 5, 10 + 5, 15 + 0, 17 – 2, etc.

1.2.4 Demonstrate mastery of the addition facts (for totals up to 20) and the corresponding subtraction facts.
Example: Add 11 + 8, subtract 16 – 9, add 4 + 7.

1.2.5 Understand the meaning of the symbols +, –, and =.
Example: Use symbols to write the number sentence "one added to three equals four."

1.2.6 Understand the role of zero in addition and subtraction.
Example: You start with 6 eggs and then give away 0 eggs. How many eggs do you have now?

1.2.7 Understand and use the inverse relationship between addition and subtraction facts (such as 4 + 2 = 6, 6 – 2 = 4, etc.) to solve simple problems.
Example: List three other facts using addition or subtraction that are related to 3 + 5 = 8.

1.2.8 Add and subtract one and two digit numbers without regrouping, both horizontally and vertically.

Examples: 13 + 72 = 84

$$\begin{array}{r} 13 \\ +72 \\ \hline 84 \end{array}$$

Standard 3

Algebra and Functions

Students use number sentences with the symbols +, -, =, and to solve problems.

1.3.1 Write and solve number sentences from problem situations involving addition and subtraction.
Example: You have 3 pencils and your friend has 2 pencils. You want to know how many pencils you have altogether. Write a number sentence for this problem and use it to find the total number of pencils.

1.3.2 Create word problems that match given number sentences involving addition and subtraction.
Example: Tell a story or draw a picture for a problem that can be solved using the number sentence 3 + 6 = 9.

1.3.3 Recognize and use the relationship between addition and subtraction.
Example: 3 + 16 = □ 19 -□ = 3 3 + □ = 19

1.3.4 Create and extend number patterns using addition.
Example: A number pattern begins with these numbers: 1, 3, 5, … . Tell what the next number will be and explain how you decided on that number.

Standard 4

Geometry

Students identify common geometric shapes, classify them by common attributes, and describe their relative position or their location in space.

1.4.1 Identify, describe, compare, sort, and draw triangles, rectangles, squares, and circles.
Example: Draw a square and a circle and write their names next to them.

1.4.2 Identify objects: triangles, rectangles, squares, and circles as the faces of three-dimensional objects: sphere, cone, cube, and cylinder.
Example: Look at a collection of solid objects and find triangles and squares on their sides.

1.4.3 Classify and sort familiar plane and solid objects by position, shape, size, roundness, and other attributes. Explain the rule used.
Example: Group a collection of objects by something they have in common. Explain your grouping.

1.4.4 Identify objects as two-dimensional or three-dimensional.
Example: Sort various objects (cube, square, triangle, prism, sphere) into the categories "two-dimensional" and "three-dimensional." Explain your choices.

1.4.5 Give and follow directions for finding a place or object.
Example: Show someone how to get to the school library by making a map or diagram.

1.4.6 Arrange and describe objects in space by position and direction: near, far, under, over, up, down, behind, in front of, next to, to the left or right of.
Example: Name objects that are near your desk and objects that are in front of it. Explain why there may be some objects in both groups.

1.4.7 Identify geometric shapes and structures in the environment and specify their location.
Example: Find as many rectangles as you can in your classroom. Record the rectangles that you found by making drawings or using a camera.

1.4.8 Explore two dimensional figures for symmetry and congruence.

Examples: Draw two congruent squares.

Draw a line of symmetry on a heart.

1.4.9 Determine if a positional change is a slide, flip, or turn.

Example: Hands on a clock represent a turn.

Standard 5

Measurement

Students learn how to measure length, as well as how to compare, order, and describe other kinds of measurement.

1.5.1 Measure the length of objects by repeating a nonstandard unit or a standard unit.
Example: Measure the length of your desk in pencil-lengths.

1.5.2 Use different units to measure the length of the same object and to predict whether the measure will be greater or smaller when a different unit is used.
Example: If you measure your desk with a shorter pencil, will the number of pencil-lengths be more or less? Measure the desk to find out your answer.

1.5.3 Recognize the need for a fixed unit of length.
Example: Give students different lengths of string and have them measure the width of a doorway. Talk about why their answers are different and the kinds of problems this can cause.

1.5.4 Measure and estimate the length of an object to the nearest inch and centimeter.
Example: Have some students measure the width of the doorway in inches and some measure it in centimeters. Discuss why these are better ways of measuring than using the pieces of string.

1.5.5 Compare and order objects according to length, area, capacity, weight, and temperature, using direct comparison or a nonstandard unit.
Example: Use a scale or balance to see how many crayons weigh the same as a shoe.

1.5.6 Tell time to the nearest half-hour and relate time to events (before/after, shorter/longer). Use both analog and digital clocks.
Example: Is recess before or after lunch?

1.5.7 Identify and give the values of collections of pennies, nickels, dimes, quarters, and half-dollars
Example: How many nickels have the same value as one quarter?

1.5.8 Sequence and identify days of the week, months of the year, and seasons.

Example: Yesterday was _____.

Today is _____.

Tomorrow will be _____.

Standard 6

Data Analysis and Probability

Students collect data by observing, measuring, surveying, and counting. They create and interpret graphs to make decisions or predications.

1.6.1 By visual comparison, estimate the size of a group and sort by attributes.
Example: Estimate the number of beans and sort by size and shape.

1.6.2 Collect data by surveying and tallying results.
Example: Survey and tally favorite colors of classmates.

1.6.3 Represent, compare, and interpret data using pictures, picture graphs, bar graphs, and concrete graphs.
Example: Use a picture graph to show how many dogs, cats, etc. your friends have. Which kind of pet appears most often? Explain your answer.

1.6.4 Make a prediction of the outcome of a simple probability activity using *more likely*, *less likely, certain, or impossible.*
Example: Are you more likely to get a 6 or a 4 when you roll a die?

Standard 7

Problem Solving

Students make decisions about how to set up a problem.

1.7.1 Use manipulatives or drawings to model problems.
Example: Show the number 10 using addition of whole numbers by counting out ten blocks. Divide them into two piles and write a number sentence that shows the number in each pile of blocks.

1.7.2 Choose an approach, materials, and strategies to solve a problem.
Example: Find how many ways you can write the number 10 by using addition.

Students solve problems and justify their reasoning.

1.7.3 Explain the reasoning used and justify the procedures selected in solving a problem.
Example: In the first example, make two piles of ten blocks; separate one block from the first pile and count the number of blocks left. Separate two blocks from the second pile and count the number left. Describe any pattern of numbers that you find.

1.7.4 Make precise calculations and check the validity of the results in the context of the problem.
Example: In the first example, check your results by setting out 10 blocks showing 1 + 9, another 10 blocks showing 2 + 8, and so on. Continue to count out piles of 10 blocks to find the total number of ways that ten blocks can be separated into two piles. Describe the patterns that you find and how you know that you have found all of them.

1.7.5 Understand and use connections between two problems.
Example: Use the problem you have just solved to find how many ways you can write 16 by adding two numbers.