2008

Mathematics Curriculum Guide

Catholic Diocese of Wilmington, Delaware

Kindergarten 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.

KINDERGARTEN

***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 KINDERGARTEN:

Standard 1 — Number Sense

Developing number sense is the foundation of mathematics. Students develop this understanding by first comparing the number of objects (such as blocks) in a given set. From comparing sets of objects, they develop the concept of counting: matching each object in a set with a counting number. Then they use counting to recognize, name, and order up to thirty objects. As preparation for learning about fractions, students practice dividing sets into equal groups and shapes into equal parts.

Standard 2 — Computation

Mastering computational skills is vital. As students learn about numbers, 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).

Standard 3 — Algebra and Functions

Understanding patterns, rules, and symbols is the foundation of Algebra. Students at this level sort and classify objects according to various rules. Students make and extend simple patterns with numbers and shapes.

Standard 4 — Geometry

Exploring shapes and developing spatial sense is the basis of Geometry. Students identify and describe simple shapes and solids, comparing and sorting them by such attributes as size and roundness. They learn the meaning of positional and directional words that relate to space.

Standard 5 — Measurement

Using measurement is essential to everyday life. Students begin their study of measurement by comparing objects' length, weight, temperature, etc. They use words like shorter, taller, heavier, and colder. They also learn concepts of time and money.

Standard 6 — Data Analysis and Probability

Analyzing data is a fundamental life skill. Students develop methods of collecting, organizing, describing, displaying, and interpreting data to answer questions that they have posed about themselves and their world. The students will create graphs and tables and begin to interpret their results.

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

The ability to read, write, listen, ask questions, think, and communicate about math will develop and deepen students' understanding of mathematical concepts. Students should read text, data, tables, and graphs with comprehension and understanding. Their writing should be detailed and coherent, and they should use correct mathematical vocabulary. Students should write to explain answers, justify mathematical reasoning, and describe problem-solving strategies.

Reasoning and Proof

Mathematics is developed by using known ideas and concepts to develop others. Repeated addition becomes multiplication. Multiplication of numbers less than ten can be extended to numbers less than one hundred and then to the entire number system. Knowing how to find the area of a right triangle extends to all right triangles. Extending patterns, finding even numbers, developing formulas, and proving the Pythagorean Theorem are all examples of mathematical reasoning. Students should learn to observe, generalize, make assumptions from known information, and test their assumptions.

Representation

The language of mathematics is expressed in words, symbols, formulas, equations, graphs, and data displays. The concept of one-fourth may be described as a quarter, 1⁄4, one divided by four, 0.25, 1⁄8 _ 1⁄8, 25 percent, or an appropriately shaded portion of a pie graph. Higher-level mathematics involves the use of more powerful representations: exponents, logarithms, unknowns, statistical representation, algebraic and geometric expressions. Mathematical operations are expressed as representations: _, _, divide, square. Representations are dynamic tools for solving problems and communicating and expressing mathematical ideas and concepts.

Connections

Connecting mathematical concepts includes linking new ideas to related ideas learned previously, helping students to see mathematics as a unified body of knowledge whose concepts build upon each other. Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas (algebra, geometry, the entire number system). Mathematics is also the common language of many other disciplines (science, technology, finance, social science, geography) and students should learn mathematical concepts used in those disciplines. Finally, students should connect their mathematical learning to appropriate real-world contexts.

Standard 1

Number Sense

Students understand the relationship between numbers and quantities up to 10, and that a set of objects has the same number in all situations regardless of the position or arrangement of the objects.

K.1.1 Match sets of objects one-to-one.

Example: Take crayons from the box and give one to each student in the group. Explain what you are doing.

K.1.2 Compare sets of up to thirty objects and identify whether one set is equal to, more than, or less than another.

Example: Compare the blocks in two boxes. Tell which box contains more blocks and explain the way in which you decided on your answer.

K.1.3 Know that larger numbers describe sets with more objects in them than sets described by smaller numbers.

Example: Understand that a set of 7 apples contains more apples than a set of 3 apples.

K.1.4 Divide sets of ten or fewer objects into equal groups.

Example: Take 6 blocks and give the same number to each of 3 children.

K.1.5 Divide shapes into equal parts.

Example: Divide a piece of paper into 4 equal pieces.

K.1.6 Count, recognize, represent, name, and order a number of objects (up to 30).

Example: Count a group of seven pennies. Recognize that 7 is the number for this set.

K.1.7 Find the number that is one more than or one less than any whole number up to 30

Example: You have a bag of 7 apples. How many apples are in a box that holds one less than the bag of apples?

K.1.8 Use correctly the words *one/many*, *none/some/all*, *more/less*, and *most/least*.

Example: Take some of the blocks out of this box, but not all of them.

K.1.9 Record and organize information using objects and pictures.

Example: Ask some of your friends what pets they have. Use pictures of animals to show the number of pets your friends have.

Standard 2

Computation

Students understand and describe simple additions and subtractions.

K.2.1 Model addition by joining sets of objects (for any two sets with fewer than 10 objects when joined).

Example: Put together 3 pencils and 2 pencils. Count the total number of pencils.

K.2.2 Model subtraction by removing objects from sets (for numbers less than 10).

Example: From a pile of 9 crayons, take away 6 crayons. Count the number of crayons left in the pile.

K.2.3 Describe addition and subtraction situations (for numbers less than 10).

Example: In the last example, explain what operation you were using when you took away crayons from the pile.

Standard 3

Algebra and Functions

Students sort and classify objects.

K.3.1 Identify, sort, and classify objects by size, number, and other attributes. Identify objects that do not belong to a particular group.

Example: Find the squares in a collection of shapes. Sort these squares into large ones and small ones and explain how you decided which squares went in each pile.

K.3.2 Identify, copy, and make simple patterns with numbers and shapes.

Example: Make a pattern of squares and circles with one square, one circle, one square, one circle, etc.

Standard 4

Geometry

Students identify common objects around them and describe their geometric features and position.

K.4.1 Identify and describe common geometric objects: circle, triangle, square, rectangle, cube, cylinder, sphere, and cone.

Example: Look for cubes and circles at home and at school.

K.4.2 Compare and sort common objects by color, position, shape, size, roundness, and number of vertices.

Example: Compare the numbers of corners of triangles, squares, and rectangles.

K.4.3 Identify and use the terms: *inside*, *outside*, *between*, *above*, and *below*.

Example: Tell when a block is inside or outside a box.

Standard 5

Measurement

Students understand the concept of time and units to measure it. They understand that objects have length, capacity, weight, and temperature, and that they can compare objects using these qualities.

K.5.1 Make direct comparisons of the length, height, capacity, weight, and temperature of objects and recognize which object is shorter, longer, taller, lighter, heavier, warmer, cooler or holds more.

Example: Hold two books side by side to see which is shorter. Hold one in each hand to see which is heavier.

K.5.2 Understand concepts of time: morning, afternoon, evening, today, yesterday, tomorrow, week, month, and year. Understand that clocks and calendars are tools that measure time.

Example: Use a calendar to find the number of days in the month of your birthday.

Standard 6

Data Analysis and Probability

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

K.6.1 Collect data by observing and sorting actual objects.

Example: Gather apples and sort by color.

K.6.2 Estimate numbers by visualizing the amount in a group.

Example: Guess the number of apples in a group.

K.6.3 Organize and display data to chart the results.

Example: Making a graph showing the different colors of apples.

K.6.4 Draw conclusions based on the information displayed.

Example: Discuss results and compare to original predictions.

Standard 7

Problem Solving

Students make decisions about how to set up a problem.

K.7.1 Choose the approach, materials, and strategies to use in solving problems.

Example: Solve the problem: “There are four blocks on the table and a box of blocks that is closed. The teacher says that there are five blocks in the box. Find the number of blocks in all, without opening the box.” Decide to draw a picture.

K.7.2 Use tools such as objects or drawings to model problems.

Example: In the first example, draw a picture of the four blocks that you can see, and then draw five more blocks for the ones that you cannot see.

Students solve problems in reasonable ways and justify their reasoning.

K.7.3 Explain the reasoning used with concrete objects and pictures.

Example: In the first example, count the number of blocks that you have drawn and write the number that represents the total.

K.7.4 Make precise calculations and check the validity of the results in the context of the problem.

Example: In the first example, open the box of blocks and place them on the table. Count the total number of blocks on the table to see whether your drawing was correct.