2008

Mathematics Curriculum Guide

Catholic Diocese of Wilmington, Delaware

Grade 5 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 FIVE

***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 FIVE:

Standard 1 — Number Sense

Developing number sense is the foundation of mathematics. Students extend their understanding of the magnitudes of numbers to rounding whole numbers and decimals to any place value. They order and compare whole numbers and decimals using the correct symbols for greater than and less than. They develop the concept of percentage as parts of a hundred and compare different ways of looking at fractions. They identify whole numbers as prime or composite, and they compare fractions, decimals, and mixed numbers on a number line.

Standard 2 — Computation

Mastering computational skills is vital. Students extend the standard methods for multiplying and dividing to larger numbers. They add and subtract more complex fractions and decimals, learning how these different representations of numbers can be manipulated. They also develop an understanding of how to multiply and divide fractions.

Standard 3 — Algebra and Functions

Understanding patterns, rules, and symbols is the foundation of Algebra. Students at this level develop further the fundamental concept of a variable — having a letter stand for all numbers of a certain kind. They use this to write simple algebraic expressions and to evaluate them. They begin to develop the idea of linking an algebraic equation to a graph, by finding ordered pairs that fit a linear equation, plotting these as points on a grid, and drawing the resulting straight line. They also interpret graphs to answer questions.

Standard 4 — Geometry

Exploring shapes and developing spatial sense is the basis of Geometry. Students draw angles, parallel and perpendicular lines, the radius and diameter of circles, and other geometric shapes, using ruler, compass, protractor, and computer drawing programs. They identify congruent triangles and explain their reasoning using specific geometrical terms, such as equilateral, isosceles, acute, and obtuse. They classify polygons with five or more sides. They develop an

understanding of reflectional and rotational symmetry, and they construct prisms and pyramids, developing their ability to work in three dimensions.

Standard 5 — Measurement
Using measurement is essential to everyday life. Students develop and use the formulas for calculating perimeters and areas of triangles, parallelograms, and trapezoids. They extend these ideas to finding the volume and surface area of rectangular solids. They understand and use additional units for measuring weight: ounce, gram, and ton. They also add and subtract with money in decimal notation.

Standard 6 — Data Analysis and Probability
Analyzing data is a fundamental life skill. Data are all around us — in newspapers and magazines, in television news and commercials, in quality control for manufacturing — and students need to learn how to understand data. At this level, they use the mean, median, mode, and range to describe data sets. They further develop the concept of probability, recording probabilities as fractions between 0 and 1 and linking these to levels of certainty about the events described.

Standard 7 — Problem Solving
Solving problems is the practical application of mathematics. In all of their 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 algebra, geometry, or measurement, for example, students move from simple to more complex ideas 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 compute with whole numbers, decimals, and fractions and understand the relationship among decimals, fractions, and percents. They understand the relative magnitudes of numbers. They understand prime and composite numbers.

5.1.1 Read and write numbers through the billions and decimals to thousandths in standard form, expanded form, and word form.

Example: Write the number 198.536 in words.

5.1.2 Round whole numbers and decimals to any place value.

Example: Is 713,683,559 closer to 710,000,000 or 720,000,000? Explain your answer.

5.1.3 Arrange in numerical order and compare whole numbers, fractions, or decimals to thousandths by using the symbols for less than (<), equal to (=), and greater than (>).

Example: Write from smallest to largest: 0.5, 0.26, 0.089.

5.1.4 Interpret percents as a part of a hundred. Find decimal and percent equivalents for common fractions and explain why they represent the same value.

Example: Shade a 100-square grid to show 30%. What fraction is this?

5.1.5 Explain different interpretations of fractions: as parts of a whole, parts of a set, and division of whole numbers by whole numbers.

Example: What fraction of a pizza will each person get when 3 pizzas are divided equally among 5 people?

5.1.6 Describe and identify prime and composite numbers.

Example: Which of the following numbers are prime: 3, 7, 12, 17, 18? Justify your choices.

5.1.7 Identify on a number line the relative position of simple positive fractions, positive mixed numbers, and positive decimals.

Example: Find the positions on a number line of $1\frac{1}{4}$ and 1.4.

Standard 2

Computation

Students solve problems involving multiplication and division of whole numbers and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals.

5.2.1 Solve problems involving multiplication by three digit multipliers and division by two digit divisors.

Example: 2,867 $\times$ 314 = ?. Explain your method.

5.2.2 Find factors and multiples.

Example: Identify the factors of 36.

Example: Name the multiples of 15.

Find the prime factorization of numbers, greatest common factor, and least common multiple.

Example: Find the prime factorization of 27.

Example: Find the least common multiple of 3 and 5.

Add and subtract fractions (including mixed numbers) with different denominators. Use equivalent fractions to create common denominators'

Example: $\frac{4}{5} - \frac{2}{3}$ = 4/5 · 3/3 – 2/3 ·5/5 = 12/15 – 10/15 = ?

$\frac{4}{5} \cdot \frac{3}{3} = \frac{12}{15}$

$\frac{2}{3} \cdot \frac{5}{5} = \frac{10}{15}$

5.2.5 Use models to show an understanding of multiplication and division of fractions.

Example: Draw a rectangle 5 squares wide and 3 squares high. Shade $\frac{4}{5}$ of the rectangle, starting from the left. Shade $\frac{2}{3}$ of the rectangle, starting from the top. Look at the fraction of the squares that you have double-shaded and use that to show how to multiply $\frac{4}{5}$ by $\frac{2}{3}$.

5.2.6 Convert improper fractions to mixed numbers.

Example: Convert $5\frac{1}{4}$ to an improper fraction.

5.2.7 Multiply and divide fractions to solve problems.

Example: You have $3\frac{1}{2}$ pizzas left over from a party. How many people can have $\frac{1}{4}$ of a pizza each?

5.2.8 Use estimation to decide whether answers are reasonable in addition, subtraction, multiplication, and division problems.

Example: Your friend says that 2,867 × 34 = 20,069. Without solving, explain why you think the answer is wrong.

5.2.9 Add, subtract, multiply, and divide decimals and verify the reasonableness of the results.

Example: Compute 39.46 – 20.89 and check the answer by estimating.

5.2.10 Use mental arithmetic to add or subtract simple decimals.

Example: Add 0.006 to 0.027 without using pencil and paper.

5.2.11 Multiply and divide powers of 10.

Example: 52 x 1,000

Standard 3

Algebra and Functions

Students use variables in simple expressions, compute the value of an expression for specific values of the variable, and plot and interpret the results. They use two-dimensional coordinate grids to represent points and graph lines.

5.3.1 Apply order of operations.

Example: 2 + 3(9 – 7)

5.3.2 Use a variable to represent an unknown number.

Example: When a certain number is multiplied by 3 and then 5 is added, the result is 29. Let *n* stand for the unknown number and write an equation for the relationship.

5.3.3 Write simple algebraic expressions in one or two variables and evaluate them by substitution.

Example: Find the value of $5n + 2$ when $n = 3$.

5.3.4 Understand and use the properties of addition and multiplication in numerical equations and expressions.

Example: Explain how you know that $3(16 – 11) = 3 (16) – 3 (11)$.

5.3.5 Identify and graph ordered pairs of positive numbers.

Example: Plot the points (3, 1), (7, 2), and (9, 5).

5.3.6 Find ordered pairs (positive numbers only) that fit a linear equation, graph the ordered pairs, and draw the line they determine.

Example: For $n = 1, 2, 3$, and 4, find points that fit the equation $y = 2n + 1$. Plot those points on graph paper and join them with a straight line.

5.3.7 Use information taken from a graph or equation to answer questions about a problem situation.

Example: Given the formula: rate = distance/time. Use the graph to find the rate of the car after 5 seconds.

Standard 4

Geometry

Students identify, describe, and classify the properties of plane and solid geometric shapes and the relationships between them.

5.4.1 Measure (where applicable), identify, and draw line segments, lines, rays, angles, perpendicular and parallel lines, rectangles, triangles, and circles by using appropriate tools (e.g., ruler, compass, protractor, appropriate technology, media tools).

Example: Draw a rectangle with sides 5 inches and 3 inches.

5.4.2 Identify, describe, draw, and classify triangles as equilateral, isosceles, scalene, right, acute, and obtuse.

Example: Draw an isosceles right triangle.

5.4.3 Explore similar and congruent polygons and justify your decisions by referring to sides and angles.

Example: In a collection of triangles, pick out those that are the same shape and size and explain your decisions.

5.4.4 Identify, describe, draw, and classify polygons.

Example: In a collection of polygons, pick out a hexagon and identify the number of sides.

5.4.5 Identify and draw the radius and diameter of a circle and understand the relationship between the radius and diameter.

Example: On a circle, draw a radius and a diameter and describe the differences and similarities between the two.

5.4.6 Identify shapes that have reflectional and rotational symmetry.

Example: What kinds of symmetries have the letters M, N, and O?

5.4.7 Understand that 90°, 180°, 270°, and 360° are associated with quarter, half, three-quarters, and full turns, respectively.

Example: Face the front of the room. Turn through four right angles. Which way are you now facing?

5.4.8 Identify and construct prisms and pyramids using appropriate materials and identify the number of faces, edges and vertices.

Example: Make a square-based pyramid from construction paper.

5.4.9 Given a picture of a three-dimensional object, build the object with blocks.

Example: Given a picture of a house made of cubes and rectangular prisms, build the house.

Standard 5

Measurement

Students understand and compute the areas and volumes of simple objects, as well as measuring weight, temperature, time, and money.

5.5.1 Understand and apply the formulas for perimeter and area of a triangle, rectangle, square, and parallelogram.

Example: Find the area of a triangle with base 4 m and height 5 m.

5.5.2 Solve problems involving perimeters and/or areas of triangles, rectangles, squares, parallelograms, and trapezoids using appropriate units.

Example: A rectangular garden bed has a length 14 m and its width is 6 m. Find its area and the length of fencing needed to enclose it. Be sure to use correct units.

5.5.3 Use formulas for the areas of rectangles and triangles to find the area of complex shapes by dividing them into basic shapes.

Example: A square room of length 17 feet has a tiled fireplace area that is 6 feet long and 4 feet wide. You want to carpet the floor of the room, except the fireplace area. Find the area to be carpeted.

5.5.4 Find the volume of rectangular solids using appropriate units.

Example: Find the volume of a shoe box with length 30 cm, width 15 cm, and height 10 cm.

5.5.5 Understanding and using the smaller and larger units for measuring weight (mass), length, and capacity in US Customary and Metric units.

Example: How many ounces are in a pound?

5.5.6 Compare temperatures in Celsius and Fahrenheit, knowing that the freezing point of water is 0°C and 32°F and that the boiling point is 100°C and 212°F.

Example: What is the Fahrenheit equivalent of 50°C? Explain your answer.

5.5.7 Solve problems using units of time.

Example: The movie started at 4:56 and ended at 7:02, how long was the movie?

Standard 6

Data Analysis and Probability

Students collect, display, analyze, compare, and interpret data sets. They use the results of probability experiments to predict future events.

5.6.1 Introduce and use stem and leaf plots for a set of data.

Example: Construct a stem and leaf plot for heights in the class.

5.6.2 Explain which types of displays are appropriate for various sets of data.

Example: Conduct a survey to find the favorite movies of the students in your class. Decide whether to use a bar, line, or picture graph to display the data. Explain your decision.

5.6.3 Find and interpret the mean, median, mode, and range of a set of data.

Example: Find and interpret the mean, median, and mode of a set of race times.

5.6.4 Understand that probability can take any value between 0 and 1; events that are not going to occur have probability 0, events certain to occur have probability 1, and more likely events have a higher probability than less likely events.

Example: What is the probability of rolling a 7 with a number cube?

5.6.5 Explore the possible outcomes of an experimental situation and state the probability verbally and/or numerically (e.g., 3 out of 4, $\frac{3}{4}$).

Example: What is the probability of rolling an odd number with a number cube?

Standard 7

Problem Solving

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

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

Example: Solve the problem: "On October, 8th, 2007, there were 3,223 people at the high school football game. There were 1,800 adults at the game and they must pay $3 to attend the game, while children must pay $1 to attend the game. Programs cost an extra $2. How much did the school take in for profit from ticket sales?"

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

Example: In the first example, organize the facts of the situation into similar units.

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

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

Example: In the first example, identify how many children attended the game.

5.7.4 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, make a chart to organize the data.

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

Example: In the first example, use estimation to determine a reasonable answer.

5.7.6 Know and apply appropriate methods for estimating results of rational-number computations.

Example: In the first example, estimate how many hot dogs would be needed for the game and explain your answer.

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

Example: In the first example, check your solution and verify your results mathematically.

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

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

Example: In the first example, make sure the total amount of adult spectators and child spectators adds up to the given total.

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

Example: In the first example, estimate how many spectators might purchase cotton candy.