

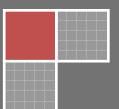
2008

Mathematics Curriculum Guide

Catholic Diocese of Wilmington, Delaware

Grade 2 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 responsibly.

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 TWO

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 using manipulatives and then writing numbers in standard form. They learn how to group numbers in hundreds, tens, and ones, which allows them to write numbers up to 1000. They count by ones, twos, fives, tens, and hundreds. They identify odd and even numbers and put numbers in order of size. They use the terms first, second, third, etc. Students also extend their knowledge of fractions, including learning how to compare the sizes of simple fractions.

Standard 2 — Computation

Mastering computational skills is vital. As students learn about the whole numbers up to 1000, 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 also learn to add and subtract using mental arithmetic.

Standard 3 — Algebra and Functions

Understanding patterns, rules, and symbols is the foundation of Algebra. Students at this level make simple patterns with numbers and continue these number patterns using addition and subtraction. They also relate word problems to number sentences such as $\square - 15 = 13$ and use rules for addition to check results. Students describe, represent, and analyze relationships among variable quantities.

Standard 4 — Geometry

Exploring shapes and developing spatial sense is the basis of Geometry. Students identify and describe simple shapes, such as circles, triangles, squares, rectangles, and cubes. Students construct simple two- and three-dimensional shapes and describe and sort them using their faces, edges, and vertices. They identify shapes that are congruent (i.e., the same shape and size). They also investigate how shapes are made from other shapes and recognize geometric shapes in the world around them. They identify shapes as congruent and/or symmetrical.

Standard 5 — Measurement

Using measurement is essential to everyday life. Students measure in order to compare objects' length, perimeter, area, weight, temperature, etc. They learn why we use standard units of length (inch, foot, yard, centimeter, and meter) and measure objects using these units. In a similar way, they learn how to measure weight, capacity, and temperature in standard units. They also learn about time (hours in a day, months in a year, etc.) and how to tell the time on a clock to the nearest five minutes. They learn about money: the values of the coins and the value of a collection of coins and dollars

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, explain their reasoning, and 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 1000. They understand that fractions may refer to parts of a set and parts of a whole.

- 2.1.1 Count by ones, twos, fives, tens, and hundreds to 1000.
Example: Count 274 pencils by groups of, hundreds, tens, and ones.
- 2.1.2 Identify the pattern of numbers in each group of ten, from tens through nineties.
Example: What pattern do you see on a hundreds chart for the numbers 12, 22, 32...
- 2.1.3 Identify numbers up to 1000 in various combinations of hundreds, tens and ones.
Example: $232 = 2 \text{ hundreds} + 3 \text{ tens} + 2 \text{ ones} = 20 \text{ tens} + 32 \text{ ones}$ OR $23 \text{ tens} + 2 \text{ ones}$
- 2.1.4 Name the number that is ten more or ten less than any number 10 through 100.
Example: Name the number that is ten more than 54.
- 2.1.5 Name the number that is 100 more or 100 less than any number 10 through 990.
Example: Name the number that is ten more than 540
- 2.1.6 Compare whole numbers up to 1000 and arrange them in numerical order.
Example: Put the numbers in order of size: 95, 28, 42, 31.
- 2.1.7 Match the ordinal numbers (first, second, third...) with an ordered set of up to 100 items.
Example: Identify the seventeenth letter of the alphabet.
- 2.1.8 Identify odd and even numbers up to 1000.
Example: Find the odd numbers in this set: 44, 31, 100, 57, 28, 501
- 2.1.9 Recognize fractions as parts of a whole or parts of a group (up to 12 parts).
Example: Divide a cardboard rectangle into 8 equal pieces. Shade 5 pieces and write the fraction for the shaded part.
- 2.1.10 Recognize, name, and compare the unit fractions: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$, and $\frac{1}{12}$.
Example: Which is larger, $\frac{1}{3}$ or $\frac{1}{6}$? Explain your answer.
- 2.1.11 Recognize that the number one can be written as a fraction.
Example: What is another way of saying six sixths? Explain your answer.
- 2.1.12 Connect repeated addition with multiplication for twos, fives, and tens.
Example: $2+2+2+2 = 8$ and $2 \times 4 = 8$

Standard 2

Computation

*Students solve simple problems involving addition and subtraction of numbers up to 1000.
Students explore the concept of equal groups in multiplication and division.*

2.2.1 Model addition of numbers less than 100 with objects and pictures.

Example: Use blocks to find the sum of 26 and 15.

2.2.2 Write and solve addition and subtraction problems in vertical and horizontal form.

$$\begin{array}{r} 14 \\ +23 \\ \hline \end{array} \quad 14 + 23 = \underline{\quad}$$

2.2.3 Add two whole numbers less than 1000, with and without regrouping.

Example: $362 + 456 = ?$.

2.2.4 Subtract two whole numbers less than 1000 with and without regrouping.

Example: $864 - 556 = ?$

2.2.5 Add three or more two digit addends with and without regrouping.

$$23 + 40 + 21 = ?$$

2.2.6 Add and multiply to find the total number of objects in equal groups.

Example: $3 \times 5 = 15$ and $5 + 5 + 5 = 15$

2.2.7 Identify the multiplication facts for the 2, 5, and 10 tables.

2.2.8 Using manipulatives, divide by finding the number of equal groups in a larger group.

Example: Divide 12 blocks into equal groups of 2.

2.2.9 Understand and use the inverse relationship between addition and subtraction.

Example: Understand that $89 - 17 = 72$ means that $72 + 17 = 89$.

2.2.10 Use estimation to decide whether answers are reasonable in addition problems.

Example: Your friend says that $13 + 24 = 57$. Without solving, explain why you think the answer is wrong.

2.2.11 Use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100.

Example: Use a spinner or roll two dice to create numbers and add them.

Standard 3

Algebra and Function

Students model, represent, and interpret number relationships to create and solve problems involving addition and subtraction.

- 2.3.1 Model word problems as number sentences/equations involving addition and subtraction using symbols, variables, or pictures.
Example: You have 13 pencils and your friend has 12 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. $13 + 12 = \square$
- 2.3.2 Use the commutative and associative, and identity properties for addition to simplify mental calculations and to check results.
Example: Add the numbers 5, 17, and 13 in this order. Now add them in the order 17, 13, and 5. Which was easier? Why?
Example: $7 + 0 = 7$
- 2.3.3 Recognize and extend a linear pattern by its rules.
Example: One horse has 4 legs, two horses have 8 legs, and so on. Continue the pattern to find how many legs five horses have.
- 2.3.4 Create, describe, and extend number patterns using addition and subtraction.
Example: What is the next number: 23, 21, 19, 17, ...? How did you find your answer?

Standard 4

Geometry

Students identify plane and solid figures and describe the attributes of common shapes and objects

- 2.4.1 Identify plane figures: circle, oval, square, triangle, rectangle; and solid figures: pyramid, cone, cylinder, cube, rectangular prism
- 2.4.2 Construct squares, rectangles, triangles, cubes, and rectangular prisms with appropriate materials.
Example: Use blocks to make a rectangular prism.
- 2.4.3 Describe, classify, and sort plane and solid geometric shapes (triangle, square, rectangle, cube, rectangular prism) according to the number and shape of sides, edges and/or corners.
Example: How many corners does a cube have?
- 2.4.4 Investigate and predict the result of putting together and taking apart two-dimensional and three-dimensional shapes.
Example: Use objects or a drawing program to find other shapes that can be made from

a rectangle and a triangle. Use sketches or a drawing program to show several ways that a rectangle can be divided into three triangles.

- 2.4.5 Identify congruent two-dimensional shapes in any position. Identify symmetrical figures.

Example: In a set of figures, find the two which are symmetrical.

Example: In a collection of rectangles, pick out those that are the same shape and size.

- 2.4.6 Recognize geometric shapes and structures in the environment and specify their locations.

Example: Look for combinations of shapes in the buildings around you.

- 2.4.7 Use concrete models to demonstrate how an object can slide, flip, or turn.

Example: Draw a mirror image of an object.

Standard 4

Measurement

Students understand how to measure length, temperature, capacity, weight, and time in standard units.

- 2.5.1 Measure and estimate length to the nearest inch, foot, yard, centimeter, and meter.
Example: Measure the length of your classroom to the nearest foot.

- 2.5.2 Describe the relationships among inch, foot, and yard. Describe the relationship between centimeter and meter.

Example: How many inches are in a yard?

- 2.5.3 Decide which unit of length is most appropriate in a given situation.

Example: Would you use yards or inches to measure the length of your school books? Explain your answer.

- 2.5.4 Estimate perimeter and use a given object to measure the perimeter of other objects.

Example: Make a class estimate of the number of crayons it would take to go around the edge of the top of a student's desk. Then measure the distance around the desk using crayons.

- 2.5.5 Estimate and measure capacity using cups, pints, quarts, gallons, and liters.

Example: Make a reasonable estimate of the number of pints a juice pitcher holds.

- 2.5.6 Estimate weight and use a given object to measure the weight of other objects.

Example: About how many jellybeans will you need to put on one side of a balance scale to balance with a box of chalk? Count out the number of jellybeans that you guessed would be needed and see whether your estimate was close. Explain the results of your estimation and weighing.

- 2.5.7 Recognize the need for a fixed unit of weight.
Example: Estimate the number of paperclips needed to balance with a box of chalk. Will it be the same as the number of jellybeans? Explain your answer.
- 2.5.8 Estimate temperature. Read a thermometer in Celsius and Fahrenheit to the nearest five degrees with ten degree intervals.
Example: What do you think the temperature is today? Look at the thermometer to check.
- 2.5.9 Using analog and digital clocks, tell time to the nearest quarter hour, be able to tell five-minute intervals, and know the difference between a.m. and p.m.
Example: What time is your snack break?
- 2.5.10 Know relationships of time: seconds in a minute; minutes in an hour; hours in a day; days in a week; and days, weeks, and months in a year.
Example: How many days are in a year?
- 2.5.11 Read a calendar. Give exact, month, day, and year. Give elapsed time to days within a month.
Example: How many days are there until Friday
- 2.5.12 Find the duration of intervals of time in hours.
Example: Your trip began at 9:00 a.m. and ended at 3:00 p.m. How long were you traveling?
- 2.5.13 Find the value of a collection of pennies, nickels, dimes, quarters, half-dollars, and dollars.
Example: You have 3 pennies, 4 nickels, and 2 dimes. How much money do you have? Explain your answer.

Standard 6

Data Analysis and Probability

Students will collect data by observing, measuring, surveying, and counting. They will create and interpret graphs to make inferences and predictions.

- 2.6.1 Collect and record numerical data in systematic ways
Example: Measure the hand span in whole centimeters of each student in your class.
- 2.6.2 Represent, compare, and interpret data using tables, tally charts, and bar graphs.
Example: Make a tally of your classmates' favorite colors and draw a bar graph. Name the color that is most popular and the color that is the favorite of the fewest people.
- 2.6.3 Explore by experimenting at the concrete level using manipulatives to predict and record outcomes of events that are not equally likely.
Example: Use a number cube, a spinner, or cards to make a prediction about numbers.

- 2.6.4 Interpret and compile data and display this data on different graphs; pictographs, horizontal or vertical bar graphs. Show that the data are the same for each graph.
Example: Make a horizontal bar graph and a pictograph representing the favorite colors of your classmates.

Standard 7

Problem Solving

Students make decisions about how to set up a problem.

- 2.7.1 Use manipulatives to model problems.
Example: “Count the number of squares on the surface of a cube. Put two cubes together and count the number of visible squares. Repeat this step with 3, 4, 5, ... , cubes in a line. Find a rule for the number of squares.” Use blocks to set up the problem.
- 2.7.2 Choose the approach, materials, and strategies to use in solving problems.
Example: Place blocks together. Each time you add a block, count the number of squares and record it.

Students solve problems and justify their reasoning.

- 2.7.3 Explain the reasoning used and justify the procedures selected in solving a problem.
Example: In the first example, notice that the number goes up by 4 each time a block is added. Observe that, as you add each cube, you gain 6 squares but lose 2 where the blocks are joined.
- 2.7.4 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 and counting the number of squares on each long side and then the two at the ends. See how this fits with your rule of adding 4 each time.
- 2.7.5 Understand and use connections between two problems.
Example: Use the method of the problem you have just solved to find what happens when the cubes are not all in a line.