CATHOLIC SCHOOLS

# Math

# 5th Grade

Communities of Faith, Knowledge and Service

Diocese of Alexandria ~ Catholic Schools

Where faith and knowledge grow

DIOCESE OF ALEXANDRIA

As the Diocese of Alexandria seeks to provide a comprehensive learning environment, we are charged to "Teach More" by showing how all learning flows from and relates to our Creator. In this way, we will give our teaching a deeper meaning and purpose than simply the content itself. With this as our goal, the Catholic Schools Office has intertwined our selected curricular standards with the Catholic Standards developed by the Cardinal Newman Society. Through the merging of these two curricula, English Language Arts, Mathematics, Science, and Social Studies, teachers will be provided a roadmap to guide student's understanding and recognition of the relationship between learning and the connection to our God.

Thomas E. Roque, Sr.<br>Superintendent of Catholic Schools

DIOCESE OF ALEXANDRIA

Through comprehensive review of curricula from high performing districts throughout the United States in combination with parochial schools and Newman Cardinal Standards, the Curriculum Team for the Diocese of Alexandria has generated curricula for English Language Arts, Mathematics, Science, and Social Studies. The development of this framework is designed to guide the instructional path of teachers as they focus on the formation of their students in the areas of faith, academic excellence, responsible citizenry, and effective communication and collaboration. This process is a continuous improvement process with no defined beginning or end.

Barbara Forest, M.A.
Courtney Gistorb, M.Ed.

Denese Carter, M.Ed.
Tracy Bock, Ed.S.

# Frameworks

THE DIOCESE of ALEXANDRIA

# HOW TO USE

The frameworks are guides to instruction. The frameworks assist teachers in planning and pacing instruction. Specific dates or weeks that may be included in this document are for reference. Each school and teacher must consider the make-up of their students, focusing on the needs and strengths of each child when pacing and planning instruction.

The cycles for the year help pace instruction and ensure students have consistent coverage of the content. The duration (the suggested amount of time to spend on each cycle) does not accommodate for the scheduling of special events, inclement weather or school events. Teachers, with principal guidance, should adjust pacing as needed to accommodate for these events.

## RESEARCH-BASED HIGH-YIELD PRACTICES FOR INSTRUCTION

These strategies have proven effective in affecting student learning and achievement gains. As you plan daily instruction, consider how and where to integrate these strategies into the instructional sequence. Effect size is in parentheses. Please refer to the works of John Hattie for a complete description of instructional effect size.

- Classroom Discussion/Discourse (.82)
- Teacher Clarity/making the learning visible with expectations for learning (.75)
- Reciprocal Teaching (.74)
- Feedback (.73)
- Metacognitive Strategies (.69)

# Student focusAreas

| Essential Questions | |
|---|---|

- *How does mathematics help us understand God's creation?*
- *How does the use of math help us to understand the importance of clarity, reality, and goodness?*
- *How do we solve addition and subtraction sentences to solve real world problems with and without concrete objects?*
- *What are the ethical, moral, and legal implications of Internet use?*
- *How does the study of mathematics enable us to understand, communicate, and live Gospel values?*

| Catholic School – Mathematics Standards (CS.GS) | |
|---|---|
| CS.M.K6.GS.1 | Demonstrate the mental habits of precise, determined, careful, and accurate questioning, inquiry, and reasoning. |
| CS.M.K6.GS.2 | Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false. |
| CS.M.K6.GS.3 | Recognize the power of the human mind as both a gift from God and a reflection of Him in whose image and likeness we were made. |
| CS.M.K6.GS.4 | Survey the truths about mathematical objects that are interesting in their own right and independent of human opinions. |

# Operations and Algebraic Thinking (DOA.5.OA)

| STANDARDS | | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Write and interpret numerical expressions** | | |
| DOA.5.OA.A.1 | Use parentheses or brackets in numerical expressions, and evaluate expressions with these symbols. | **Operations and Algebraic Thinking**<br>**Justification and Explanation**<br>**Modeling**<br>Operations & Number relationships<br>Whole Number Problem Solving |
| DOA.5.OA.A.2 | Write simple expressions that record calculations with whole numbers, fractions, and decimals, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 x (18,932 + 9.21) is three times as large as 18,932 + 9.21, without having to calculate the indicated sum or product.* | **Operations and Algebraic Thinking**<br>**Justification and Explanation**<br>**Modeling**<br>Operations & Number relationships<br>Whole Number Problem Solving<br>Decimal Problem Solving |
| **Analyze patterns and relationships** | | |
| DOA.5.OA.B.3 | Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* | **Operations and Algebraic Thinking**<br>**Justification and Explanation**<br>**Modeling**<br>Operations & Number relationships<br>Whole Number Problem Solving |

# Number and Operations in Base Ten (DOA.5.NBT)

| STANDARDS | | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Understand the place value system** | | |
| DOA.5.NBT.A.1 | Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $1/10$ of what it represents in the place to its left. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Whole Number Concepts |
| DOA.5.NBT.A.2 | Explain and apply patterns in the number of zeros of the product when multiplying a number by powers of 10. Explain and apply patterns in the values of the digits in the product or the quotient, when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *For example,* $10^0 = 1$, $10^1 = 10$ *... and* $2.1 \times 10^2 = 210$. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Whole Number Concepts |
| DOA.5.NBT.A.3 | Read, write, and compare decimals to thousandths. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Decimal Concepts |
| DOA.5.NBT.A.3a | Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$. | |
| DOA.5.NBT.A.3b | Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. | |
| DOA.5.NBT.A.4 | Use place value understanding to round decimals to any place. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Decimal Concepts |
| **Perform operations with multi-digit whole numbers and with decimals to hundredths** | | |
| DOA.5.NBT.B.5 | Fluently multiply multi-digit whole numbers using the standard algorithm. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Whole Number Operations |
| DOA.5.NBT.B.6 | Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, subtracting multiples of the divisor, and/or the relationship between multiplication and division. Illustrate and/or explain the calculation by using equations, rectangular arrays, area models, or other strategies based on place value. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Whole Number Operations |

# Number and Operations in Base Ten (DOA.5.NBT) continued…

| STANDARDS | | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Perform operations with multi-digit whole numbers and with decimals to hundredths** | | |
| DOA.5.NBT.B.7 | Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation. | **Number and Operations in Base Ten**<br>**Justification and Explanation**<br>**Modeling**<br>Decimal Operations |

# Number and Operations – Fractions (DOA.5.NF)

| STANDARDS | | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Use equivalent fractions as a strategy to add and subtract fractions** | | |
| DOA.5.NF.A.1 | Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,* $2/3 + 5/4 = 8/12 + 15/12 = 23/12$. *(In general,* $a/b + c/d = (ad + bc)/bd$.*)* | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |
| DOA.5.NF.A.2 | Solve word problems involving addition and subtraction of fractions. | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |
| DOA.5.NF.A.2a | Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. | |
| DOA.5.NF.A.2b | Use benchmark fractions and number sense of fractions to estimate mentally and justify the reasonableness of answers. *For example, recognize an incorrect result* $2/5 + 1/2 = 3/7$, *by observing that* $3/7 < 1/2$. | |
| **Apply and extend previous understandings of multiplication and division to multiply and divide fractions** | | |
| DOA.5.NF.B.3 | Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret* $3/4$ *as the result of dividing 3 by 4, noting that* $3/4$ *multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size* $3/4$. *If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |

## Number and Operations – Fractions (DOA.5.NF) continued…

| STANDARDS | | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Apply and extend previous understandings of multiplication and division to multiply and divide fractions** | | |
| DOA.5.NF.B.4 | Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |
| DOA.5.NF.B.4a | Interpret the product $(m/n) \times q$ as $m$ parts of a partition of $q$ into $n$ equal parts; equivalently, as the result of a sequence of operations, $m \times q \div n$. *For example, use a visual fraction model to show understanding, and create a story context for* $(m/n) \times q$. | |
| DOA.5.NF.B.4b | Construct a model to develop understanding of the concept of multiplying two fractions and create a story context for the equation. [In general, $(m/n) \times (c/d) = (mc)/(nd)$.] | |
| DOA.5.NF.B.4c | Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths and show that the area is the same as would be found by multiplying the side lengths. | |
| DOA.5.NF.B.4d | Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas. | |
| DOA.5.NF.B.5 | Interpret multiplication as scaling (resizing), by: | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |
| DOA.5.NF.B.5a | Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. | |
| DOA.5.NF.B.5b | Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case). | |
| DOA.5.NF.B.5c | Explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. | |
| DOA.5.NF.B.5d | Relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying $a/b$ by 1. | |
| DOA.5.NF.B.6 | Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. | **Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving |

# Number and Operations – Fractions (DOA.5.NF) continued…

<table>
<tr><th colspan="2">STANDARDS</th><th>ACT Reporting Category<br>*ACT Knowledge and Skills*</th></tr>
<tr><td colspan="3">**Apply and extend previous understandings of multiplication and division to multiply and divide fractions**</td></tr>
<tr><td>DOA.5.NF.B.7</td><td>Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.[1]</td><td rowspan="4">**Number and Operations Fractions**<br>**Justification and Explanation**<br>**Modeling**<br>Fraction Concepts<br>Fraction Problem Solving</td></tr>
<tr><td>DOA.5.NF.B.7a</td><td>Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) ×4 = 1/3.*</td></tr>
<tr><td>DOA.5.NF.B.7b</td><td>Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 ×(1/5) = 4.*</td></tr>
<tr><td>DOA.5.NF.B.7c</td><td>Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*</td></tr>
</table>

[1] Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.

## Measurement and Data (DOA.5.MD)

| STANDARDS | | ACT Reporting Category *ACT Knowledge and Skills* |
|---|---|---|
| **Convert like measurement units within a given measurement system** | | |
| DOA.5.MD.A.1 | Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real-world problems (e.g., convert 5 cm to 0.05 m; 9 ft to 108 in). | **Measurement and Data**<br>**Justification and Explanation**<br>**Modeling**<br>Unit Conversions |
| **Represent and interpret data** | | |
| DOA.5.MD.B.2 | Make a line plot to display a data set of measurements in fractions of a unit ($1/2$, $1/4$, $1/8$). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* | **Measurement and Data**<br>**Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Descriptive Statistics |
| **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition** | | |
| DOA.5.MD.C.3 | Recognize volume as an attribute of solid figures and understand concepts of volume measurement. | **Measurement and Data**<br>**Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Measurement of Figures |
| DOA.5.MD.C.3a | A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume. | |
| DOA.5.MD.C.3b | A solid figure that can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. | |
| DOA.5.MD.C.4 | Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. | |
| DOA.5.MD.C.5 | Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. | |
| DOA.5.MD.C.5a | Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. | |
| DOA.5.MD.C.5b | Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems. | |
| DOA.5.MD.C.5c | Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems. | |

## Geometry (DOA.5.G)

| | STANDARDS | ACT Reporting Category<br>*ACT Knowledge and Skills* |
|---|---|---|
| **Graph points on the coordinate plane to solve real-world and mathematical problems** | | |
| DOA.5.G.A.1 | Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number in the ordered pair indicates how far to travel from the origin in the direction of one axis, and the second number in the ordered pair indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). | **Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Coordinate Plane |
| DOA.5.G.A.2 | Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. | **Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Coordinate Plane |
| **Classify two-dimensional figures into categories based on their properties** | | |
| DOA.5.G.B.3 | Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* | **Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Figures and Their Properties |
| DOA.5.G.B.4 | Classify quadrilaterals in a hierarchy based on properties. (Students will define a trapezoid as a quadrilateral with at least one pair of parallel sides.) | **Geometry**<br>**Justification and Explanation**<br>**Modeling**<br>Figures and Their Properties |