K-12 Louisiana Student Standards for Mathematics:
Table of Contents

Updated December 21, 2017
(edited 5.MD.C.5b and 6.G.A.2 to use capital B)

Introduction

Development of K-12 Louisiana Student Standards for Mathematics

The Louisiana mathematics standards were created by over one hundred Louisiana educators with input by thousands of parents and teachers from across the state. Educators envisioned what mathematically proficient students should know and be able to do to compete in our society and focused their efforts on creating standards that would allow them to do so. The new standards provide appropriate content for all grades or courses, maintain high expectations, and create a logical connection of content across and within grades.

The Role of Standards in Establishing Key Student Skills and Mathematical Proficiency

Students in Louisiana are ready for college or a career if they are able to meet college and workplace expectations without needing remediation in mathematics skills and concepts. The standards define what Louisiana students should know, understand, and be able to do mathematically and represent the steps students must take along the way to be able to meet this goal.

For example, all students should be able to recall and use math skills and concepts on a daily basis. That is, a student should know certain math facts and concepts such as how to add, subtract, multiply, and divide basic numbers with ease, how to work with simple fractions and percentages, and how to apply basic algebra and geometry principles. Additionally, students need to be able to reason mathematically, communicate with others about math through speaking and writing, and problem solve in real-world situations to be prepared mathematically for post-secondary education or to pursue a career.

The K-12 mathematics standards lay the foundation that allows students to become mathematically proficient by focusing on conceptual understanding, procedural skill and fluency, and application.

- **Conceptual understanding** refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful. It also allows students to connect prior knowledge to new ideas and concepts.
- **Procedural Skill and Fluency** is the ability to apply procedures accurately, efficiently, and flexibly. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.
- **Application** provides a valuable context for learning and the opportunity to solve problems in a relevant and a meaningful way. It is through real-world application that students learn to select an efficient method to find a solution, determine whether the solution(s) makes sense by reasoning, and develop critical thinking skills.

Structure of the Standards

There are two types of standards in the Louisiana Mathematics Standards – mathematical practice and content. A summary of each type is provided below:

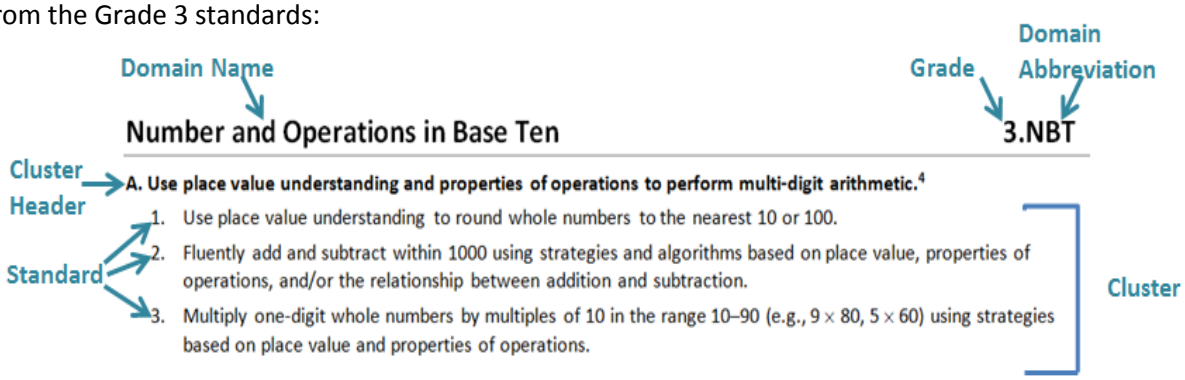
1. Standards for Mathematical Practice
   - Apply to all grade levels
   - Describe mathematically proficient students
2. Standards for Mathematical Content
   - K-8 standards presented by grade level
   - High school standards presented by high school course (Algebra I, Geometry, Algebra II), then organized by conceptual categories:
     - Number and Quantity
     - Algebra
     - Functions
     - Modeling
     - Geometry
     - Statistics and Probability

The following terms will assist in understanding how to read the content standards and their codes. Terms are defined in order from most specific to most general.

- **Standards -** Statements of what a student should know, understand, and be able to do.
- **Clusters -** Groups of **related** standards. Cluster headings may be considered as the big idea(s) that the group of standards they represent are addressing. Cluster headings are therefore useful as a quick summary of the progression of ideas that the standards in a domain are covering and can help teachers to determine the focus of the standards they are teaching.
- **Domains -** A **large** category of mathematics that the clusters and their respective content standards delineate and address. For example, *Number and Operations – Fractions* is a domain under which there are a number of clusters (the big ideas that will be addressed) along with their respective content standards, which give the specifics of what the student should know, understand, and be able to do when working with fractions.
- **Conceptual Categories –** The content standards, clusters, and domains in Algebra I, Geometry, and Algebra II are further organized under conceptual categories. These are very broad categories of mathematical thought and lend themselves to the organization of high school course work. For example, Algebra is a conceptual category in the high school standards under which are domains such as Seeing Structure in Expressions, Creating Equations, Arithmetic with Polynomials and Rational Expressions, etc.

Reading Standards and Interpreting their Codes in Grades K-8

Example from the Grade 3 standards:



There are four parts to the code for a mathematics standard in Kindergarten through Grade 8. The Cluster Headers are identified by an uppercase letter (A, B, C…). If a Domain has four clusters, then the letter A is assigned to the heading for the first cluster, B to the second, C to the third, and D to the fourth cluster. Each part of the code is separated by a period and has a specific meaning:

PART ONE	PART TWO	PART THREE	PART FOUR
Grade Level	Domain	Cluster	Standard #

Look at the example below. It is the code for the last Grade 3 standard in the above list.

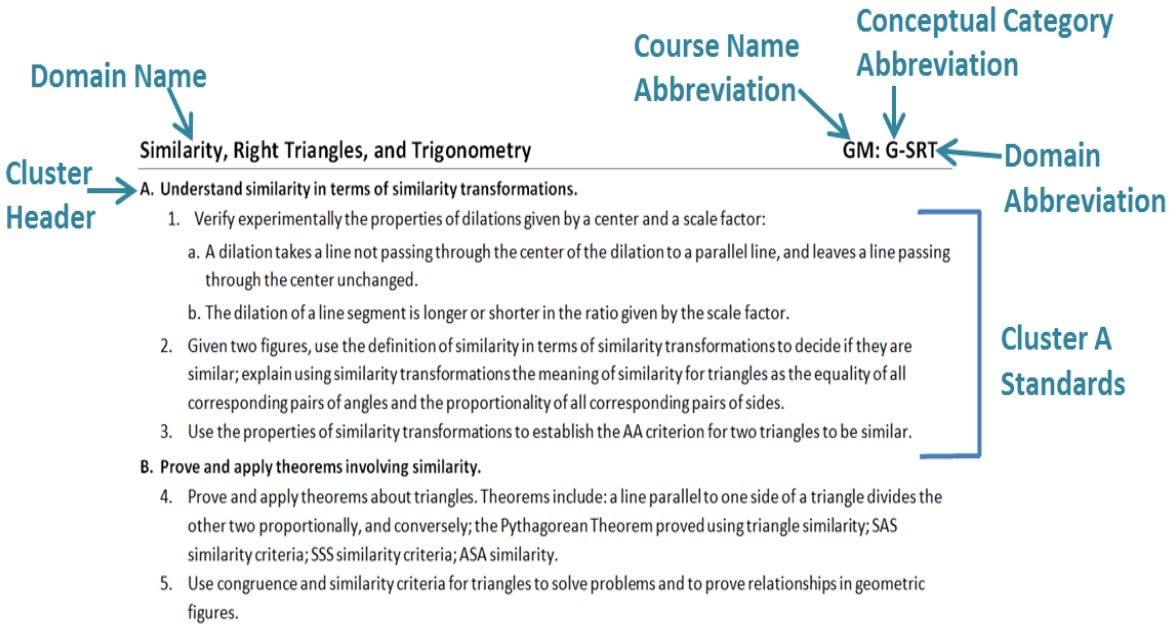
3.NBT.A.3

The grade level is 3, the domain code is NBT (Numbers and Operations in Base Ten), the cluster is A (first cluster), and the standard number is 3. The text of standard 3.NBT.A.3 is provided below.

> 3.NBT.A.3. *Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.*

Reading Standards and Interpreting their Codes in High School Courses

The codes for standards in high school math courses have five parts. An excerpt of the standards for the high school Geometry course as displayed in this document is shown below.



Similarity, Right Triangles, and Trigonometry — **GM: G-SRT**

A. Understand similarity in terms of similarity transformations.

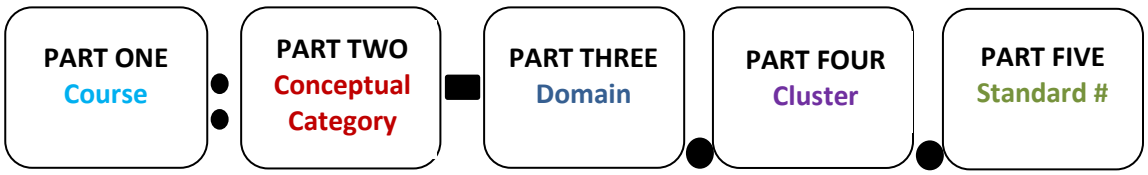
1. Verify experimentally the properties of dilations given by a center and a scale factor:
   a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
   b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

B. Prove and apply theorems involving similarity.

4. Prove and apply theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity; SAS similarity criteria; SSS similarity criteria; ASA similarity.
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

As indicated in the excerpt, the abbreviation used for the high school Geometry course is GM. The abbreviations used for Algebra I and Algebra II are A1 and A2, respectively. The course name abbreviation is followed by abbreviations for the Conceptual Category and the Domain, the letter of the Cluster Header, and then the standard number. High school Conceptual Categories and their abbreviations are located in the table of the next section (Progressions).

The code for standard 5 in the list above is **GM: G-SRT.B.5** with the meaning of each part noted in the graphic below.



Algebra I Example A1: N-Q.A.2

Quantities* — **A1: N-Q**

A. Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Algebra II Example A2: F-LE.B.4

Linear, Quadratic, and Exponential Models* **A2: F-LE**

A. Construct and compare linear, quadratic, and exponential models and solve problems.

2. Given a graph, a description of a relationship, or two input-output pairs (include reading these from a table), construct linear and exponential functions, including arithmetic and geometric sequences, to solve multi-step problems

4. For exponential models, express as a logarithm the solution to $a\,b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

B. Interpret expressions for functions in terms of the situation they model.

5. Interpret the parameters in a linear, quadratic, or exponential function in terms of a context.

Note: There is not an error in the Algebra II listing of standards above. Standards 1 and 3 in the Linear, Quadratic, and Exponential Models domain are in the Algebra I standard with codes of A1: F-LE.A.1 and A1:F-LE.A.3.

Companion Documents for Teachers

Companion documents for teachers are designed to assist educators in interpreting and implementing the new Louisiana Student Standards for Mathematics by providing descriptions and examples for each standard in a grade level or course. The companion documents are linked in the Resources section and the grade level listings of this document. Access the companion document for a specific grade or course by clicking an icon similar to the one to the right which links to the Grade 5 Teachers Companion document.

Progressions in the Math Standards

The standards for each grade should not be considered a checklist or taught in isolation. There is a flow or progression that creates coherence within a grade and from one grade to the next. The progressions are organized using domains in grades K -8 and conceptual categories in high school. The color-coded table shows the domains, categories, and their abbreviations, and identifies the five progressions present in the Louisiana Student Standards for Mathematics. Each of the progressions begins in Kindergarten and indicates a constant movement toward the high school standards. Progressions guarantee a steady, age-appropriate development of each topic and also ensure that gaps are not created in the mathematical education of Louisiana's students. The table is designed to allow teachers to see the coherence and connections among the mathematical topics in the standards.

<table>
<tr><th>Kindergarten</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>High School</th></tr>
<tr><td colspan="9">Domains and Abbreviations</td><td>Categories and Abbreviations</td></tr>
<tr><td colspan="2">Counting and Cardinality (CC)</td><td colspan="7"></td><td rowspan="4">Number and Quantity (N)</td></tr>
<tr><td colspan="6">Numbers and Operations in Base Ten (NBT)</td><td colspan="2">Ratios and Proportional Relationships (RP)</td></tr>
<tr><td colspan="3"></td><td colspan="3">Number and Operations – Fractions (NF)</td><td colspan="3">The Number System (NS)</td></tr>
<tr><td colspan="6" rowspan="2">Operations and Algebraic Thinking (OA)</td><td colspan="3">Expressions and Equations (EE)</td><td>Algebra (A)</td></tr>
<tr><td colspan="2"></td><td>Functions (F)</td><td>Functions (F)</td></tr>
<tr><td colspan="6">Geometry (G)</td><td colspan="3">Geometry (G)</td><td>Geometry (G)</td></tr>
<tr><td colspan="6">Measurement and Data (MD)</td><td colspan="3">Statistics and Probability (SP)</td><td>Statistics and Probability (S)</td></tr>
</table>

Mathematics | Standards for Mathematical Practice

Being successful in mathematics requires that development of approaches, practices, and habits of mind are implemented as one strives to develop mathematical fluency, procedural skills, and conceptual understanding. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

The Standards for Mathematical Practice are typically developed as students solve high-level mathematical tasks that support approaches, practices, and habits of mind which are called for within these standards.

The following are the eight Standards for Mathematical Practice and their descriptions.

1 **Make sense of problems and persevere in solving them.**
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 **Reason abstractly and quantitatively.**
Mathematically proficient students make sense of the quantities and their relationships in problem situations. Students bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3 **Construct viable arguments and critique the reasoning of others.**
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to

Mathematics | Kindergarten

GRADE K TEACHERS COMPANION DOCUMENT

Grade Level Overview

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in Kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Counting and Cardinality K.CC

A. Know number names and the count sequence.

1. Count to 100 by ones and by tens.
2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects).

B. Count to tell the number of objects.

4. Understand the relationship between numbers and quantities; connect counting to cardinality.
   a. When counting objects in standard order, say the number names as they relate to each object in the group, demonstrating one-to-one correspondence.
   b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
   c. Understand that each successive number name refers to a quantity that is one larger.
5. Count to answer “How many?” questions.
   a. Count objects up to 20, arranged in a line, a rectangular array, or a circle.
   b. Count objects up to 10 in a scattered configuration.
   c. When given a number from 1-20, count out that many objects.

C. Compare numbers.

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.[1]
7. Compare two numbers between 1 and 10 presented as written numerals.

[1] Include groups with up to ten objects.

Operations and Algebraic Thinking K.OA

A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

1. Represent addition and subtraction with objects, fingers, mental images, drawings[2], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).
4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.
5. Fluently add and subtract within 5.

Number and Operations in Base Ten K.NBT

A. Work with numbers 11–19 to gain foundations for place value.

1. Gain understanding of place value.
   a. Understand that the numbers 11–19 are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.
   b. Compose and decompose numbers 11 to 19 using place value (e.g., by using objects or drawings).
   c. Record each composition or decomposition using a drawing or equation (e.g., 18 is one ten and eight ones, 18 = 1 ten + 8 ones, 18 = 10 + 8).

Measurement and Data K.MD

A. Describe and compare measurable attributes.

1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

B. Classify objects and count the number of objects in each category.

3. Classify objects into given categories based on their attributes; count the numbers of objects in each category and sort the categories by count.[3]

C. Work with money.

4. Recognize pennies, nickels, dimes, and quarters by name and value (e.g., This is a nickel and it is worth 5 cents.)

[2] Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)
[3] Limit category counts to be less than or equal to 10.

Geometry K.G

A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.
2. Correctly name shapes regardless of their orientations or overall size.
3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

B. Analyze, compare, create, and compose shapes.

4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).
5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?*