Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS

K — GRADE

F — FOCUS

This focus document shows where students and teachers should spend the large majority of their time in order to meet the expectations of the Louisiana Student Standards for Mathematics.

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR KINDERGARTEN

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ☐ Supporting Clusters ○ Additional Clusters

K.CC.A	■	Know number names and the count sequence.
K.CC.B	■	Count to tell the number of objects.
K.CC.C	■	Compare numbers.
K.OA.A	■	Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
K.NBT.A	■	Work with numbers 11–19 to gain foundations for place value.
K.MD.A	○	Describe and compare measureable attributes.
K.MD.B	☐	Classify objects and count the number of objects in categories.
K.MD.C	☐	Work with money.
K.G.A	○	Identify and describe shapes.
K.G.B	☐	Analyze, compare, create, and compose shapes.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR KINDERGARTEN

K.OA.A.5	Add/subtract within 5

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.

2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES IN KINDERGARTEN

This section highlights some of the major steps in the progression of increasing knowledge and skill detailed in the kindergarten standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students where will be going in subsequent grades.

- Students orally count to 100, beginning from any given number within 100, to support their later ability to count higher, as well as to develop a pattern of tens as they become skilled with naming the next ten (e.g. "forty-nine, fifty").
- Students pair objects 1:1 with counting words, and they learn that the last number word tells the total number of objects in a collection (up to 20). This is called "cardinal counting," as opposed to "rote counting" (reciting the counting words in order).
- Students use their ability to subitize (recognize small quantities at a glance) to help them compose and decompose numbers. For example, when students are using objects to show the decompositions 5 = 2 + 3 or 5 = 4 + 1, it is helpful for them to be able to subitize two or three objects.
- Students anchor to 5, realizing that 6 is one more than 5 and 4 is one less.
- Students build the crucial basis for place-value understanding of teen numbers by learning to anchor to 10 and to compose or decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8). This is also a crucial prerequisite for the grade 1 adding-and-subtracting strategy of making a ten and for the meaningful learning of writing numbers from 1 to 20.
- Students compare the number of objects in one group versus the number of objects in another group to find which has more or less, and eventually compare written numerals 1–10 to find which number describes more or less than another number.
- Students understand addition as joining collections and adding to collections, and they understand subtraction as taking collections apart or taking from collections. They represent these operations in a variety of ways.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

This section highlights individual standards that set expectations for fluency or that represent culminating masteries. Fluency standards are highlighted to stress the need to provide sufficient supports and opportunities for practice to help students meet these expectations. Wherever the word "fluently" appears in a content standard, it is used to mean "quickly and accurately." A key aspect of fluency in this sense is that it does not happen all at once in a single grade, but requires attention to student understanding as they progress towards college/career readiness. It is important to ensure that sufficient practice and extra support are provided at each grade, to allow all students to meet the standards that call explicitly for fluency. Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend to one or more grades earlier in the standards than the grade when fluency is finally expected. Culminating standards are highlighted to help give a sense of critical foundations needed to maintain progressions from grade to grade.

K.CC.A.1 Count to 100 by tens and ones.

K.CC.A.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). It is recommended that, throughout the year, students work toward fluency in writing the numerals 0–10. Note that learning to write numerals is generally more difficult than learning to read them. It is common for students to reverse numbers at this stage (e.g., writing Ɛ for 3).[1]

K.CC.B.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.

K.CC.C.7 Compare two numbers between 1 and 10 presented as written numerals. If students are less than fluent in number comparisons by the end of kindergarten, then they may not have mastered early number concepts. Note that K.CC.C.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) is a precursor to K.CC.C.7 and portrays the kind of concrete work that students should be doing en route to mastering numeral-based comparisons.

K.OA.A.5 Fluently add and subtract within 5. Given an oral or written expression with any two numbers 0–5 with a sum less than or equal to 5 (e.g., "three and one" or 3 + 1), students can find the sum reasonably quickly, and say or write it. For subtractions involving numbers of the same sizes, and given an oral or written expression (e.g., "four, take away one" or 4 – 1), students can find the difference reasonably quickly and say or write it. Some students may still need to use fingers or make drawings. Students grow in fluency throughout the year as they work with addition and subtraction situations.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- Much of the learning in kindergarten—K.CC.C.6, all of K.OA and K.NBT, and K.MD.B.3—depends on the foundational ability to count to answer "how many?" (K.CC.B.5), which itself is grounded in K.CC.B.4.

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS, OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- In addition to laying the groundwork for place value in grade 1, working with numbers 11–19 (K.NBT.A.1) provides opportunities for cardinal counting beyond 10 (see K.CC.B.5) and for writing two-digit numbers (see K.CC.A.3). Ten frames, strips with ten ones and some loose ones, and math drawings can be helpful for this work.
- K.MD.B.3 provides opportunities for cardinal counting (see K.CC.B.5) and for comparing numbers (see K.CC.C.6). K.MD.B.3 also offers a context in which to decompose 10 in more than one way (see K.OA.A.3).
- K.G.A.2 and K.G.B.4 offer some opportunities for counting and comparing numbers.

1 Material adapted from National Research Council. Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity (Washington, DC: The National Academies Press, 2009), p. 138.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 1 — GRADE | F — FOCUS

This focus document shows where students and teachers should spend the large majority of their time in order to meet the expectations of the Louisiana Student Standards for Mathematics.

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice.

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 1

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▢ Supporting Clusters ○ Additional Clusters

1.OA.A	■	Represent and solve problems involving addition and subtraction.
1.OA.B	■	Understand and apply properties of operations and the relationship between addition and subtraction.
1.OA.C	■	Add and subtract within 20.
1.OA.D	■	Work with addition and subtraction equations.
1.NBT.A	■	Extending the counting sequence.
1.NBT.B	■	Understand place value.
1.NBT.C	■	Use place value understanding and properties of operations to add and subtract.
1.MD.A	■	Measure lengths indirectly and by iterating length units.
1.MD.B	○	Tell and write time.
1.MD.C	▢	Represent and interpret data.
1.MD.D	▢	Work with money.
1.G.A	○	Reason with shapes and their attributes.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 1

1.OA.C.6	Add/subtract within 10

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.

2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM KINDERGARTEN TO GRADE 1

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- Students gradually come to employ mental strategies (such as counting on and making ten) that make use of embedded concepts of number and the properties of addition and subtraction; by contrast, kindergarten students determine sums and differences primarily by representing problems with objects or drawings.
- Students read and write numbers through 120 and learn the early elements of place value, in particular being able to think of a ten as a unit and understanding that the digits of a two-digit number represent the number of tens in that number and the number of remaining ones.
- Students use their understanding of place value and the properties of operations to represent, explain, and perform addition and subtraction of two-digit numbers in specified cases.
- Students represent and solve a large variety of addition and subtraction problems—that is, word problems, and problems set in classroom discussions, that involve addition and subtraction situations such as adding to, taking from, putting together, taking apart, comparing, etc., with different unknown quantities in the problem.
- Students write equations for a variety of reasons, such as expressing a decomposition of a number (16 = 9 + 7), expressing a piece of reasoning about numbers (9 + 7 = 9 + 1 + 6, along the way to making ten), or representing a word problem with an unknown (9 + ? = 16). Students use the equal sign appropriately, evaluate the truth of an equation, and determine unknown numbers that will make an equation true. Students make connections among concrete objects, pictorial representations, and equations.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

This section highlights individual standards that set expectations for fluency or that represent culminating masteries. Fluency standards are highlighted to stress the need to provide sufficient supports and opportunities for practice to help students meet these expectations. Wherever the word "fluently" appears in a content standard, it is used to mean "quickly and accurately." A key aspect of fluency in this sense is that it does not happen all at once in a single grade, but requires attention to student understanding as they progress towards college/career readiness. It is important to ensure that sufficient practice and extra support are provided at each grade, to allow all students to meet the standards that call explicitly for fluency. Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend to one or more grades earlier in the standards than the grade when fluency is finally expected. Culminating standards are highlighted to help give a sense of critical foundations needed to maintain progressions from grade to grade.

1.OA.C.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). Fluency is demonstrated as that, given any two numbers 0–10 with a sum less than or equal to 20, students can say the sum reasonably quickly, and likewise, for related differences, given one number and a total that is 10 or less, they can reasonably quickly say the amount taken away or the unknown addend. Students grow in fluency throughout the year as they work with addition and subtraction situations.

1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true, and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2. This standard relates to fluency when the additions and subtractions in the equations fall within 10, as they do in the italicized examples accompanying the standard.

1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ☐ -3, 6 + 6 = ☐. A crucial aspect of understanding and solving such equations is knowing where the total is in addition equations (alone on one side) and in subtraction equations (before the minus sign). Also important is that students see varied equation forms, especially those with only one number on the left side of the equation.

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. Quickly finding 10 more or 10 less than a two-digit number is best thought of as an indicator of whether students have an understanding of place value for two-digit numbers.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- 1.OA.B.3 calls for students to "apply properties of operations" and gives the example "If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known." Similarly, knowing 13 – 3 gives a good starting place for figuring out 13 – 4. Use of properties lets students apply knowledge that they have to situations that they need to figure out.
- 1.NBT.B.2 describes the place-value foundations for 1.NBT.B.3 and 1.NBT.C.4. Comparing numbers (1.NBT.B.3) involves thinking about the sizes of tens and ones, and adding two-digit numbers (1.NBT.C.4) involves adding tens with tens and ones with ones, and sometimes composing a ten. These ideas and methods rest on an understanding of the place-value units and the use of visual models of these units in solving and explaining problems using these standards.

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS, OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- A thorough understanding of how place-value language and notation represent number (cluster 1. NBT.A) is needed for meaningful calculation (cluster 1.NBT.B) in many ways—not just pencil-and-paper calculation, but mental calculation as well. For purposes of calculation, it is valuable to use the tens and ones in two-digit numbers, single-digit knowledge, and properties of the operations (1.OA.B.4). In Grade 1, calculation ranges from simple mental adding, such as 40 + 20 (add the 4 tens and 2 tens) and 58 + 6 (6 gives 2 to 58 to make 60, then 60 plus the 4 left in 6 equals 64), to the more complex cases that require composing ten ones to make a ten, such as 37 + 56.
- The study of word problems in grade 1 (1.OA.A.1, 1.OA.A.2) can be coordinated with students' growing proficiency with addition and subtraction within 20 (1.OA.C.6) and their growing proficiency with multidigit addition and subtraction (1.NBT) and can involve easier and more accurate forward methods.
- Word problems can also be linked to students' growing understanding of properties of addition and the relationship between addition and subtraction. For example, put-together/take-apart problems with unknown addends can show subtraction as finding an unknown addend.
- Units are a connection between place value (1.NBT) and measurement (1.MD). Working with place value depends on having a sense of the sizes of the base-ten units and being able to see a larger unit as composed of smaller units within the system. As measurement develops through the grades, measurement also depends on having a sense of the sizes of units and being able to see a larger unit as composed of smaller units within the system. In later grades, unit thinking will become important throughout arithmetic, including in the development of multidigit multiplication and division algorithms and the development of fraction concepts and operations.
- Measurement standards 1.MD.A.1 and 1.MD.A.2 together support and provide a context for the 1.OA.A.1 goal of solving problems that involve comparing. To meet 1.MD.A.1, students compare the lengths of two objects by means of a third object, e.g., a length of string, that allows a "copy" of the length of an immovable object to be moved to another location to compare with the length of a movable object. When students cannot find the exact difference because of the magnitude of the numbers that arise from measurement—as may occur in comparing two students' heights—they may still compare the measurements to know which is greater (1.NBT.B.3). (Grade 2 standard 2.MD.B.6 formalizes this idea on a number-line diagram.)
- While students are dealing with the limited precision of only whole hours and half-hours, they must distinguish the position of the hour hand and connect it to the geometry standard 1.G.A.3, partitioning circles into halves and quarters.
- Composing shapes to create a new shape (1.G.A.2) is the spatial analogue of composing numbers to create new numbers. This concept is also connected to length measurement (1.MD.A.2) since students must visualize an object that is to be measured as being built up out of equal-sized units (see also 1.G.A.3). Though assembling two congruent right triangles into a rectangle does not use the same facts or reasoning that assembling two fives into a ten uses, the idea of looking at how objects in some domain (numbers or shapes) can be combined to make other objects in that domain, and looking for new true statements one can make about these combinations, is a big idea that is common across mathematics.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 2 — GRADE | F — FOCUS

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 2

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▢ Supporting Clusters ○ Additional Clusters

2.OA.A	■	Represent and solve problems involving addition and subtraction.
2.OA.B	■	Add and subtract within 20.
2.OA.C	▢	Work with equal groups of objects to gain foundations for multiplication.
2.NBT.A	■	Understand place value.
2.NBT.B	■	Use place value understanding and properties of operations to add and subtract.
2.MD.A	■	Measure and estimate lengths in standard units.
2.MD.B	■	Relate addition and subtraction to length.
2.MD.C	▢	Work with time and money.
2.MD.D	▢	Represent and interpret data.
2.G.A	○	Reason with shapes and their attributes.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 2

2.OA.B.2	Single-digit sums and differences (sums from memory by end of Grade 2)
2.NBT.B.5	Add/subtract within 100

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.
2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 1 TO GRADE 2

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- Students read and write numbers through 1,000, extending their use of place value to include units of hundreds.
- Students use their understanding of place value to add and subtract within 1,000 (e.g., 237 + 616 or 822 – 237). They can explain what they are doing as they add and subtract, and record their written method, using visual models to support calculating and explaining. They become fluent in addition and subtraction within 100.
- For word problems, students extend their ability by solving two-step problems using addition, subtraction, or both operations. They also master more advanced one-step addition and subtraction problems in this grade (such as take from with start unknown).
- Students use standard units of measure and appropriate measurement tools. They understand basic properties of linear measurement (e.g., length, distance), such as the fact that the smaller the unit, the more iterations will be needed to cover a given length.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

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2.OA.B.2 Fluently add and subtract within 20 using mental strategies. By end of grade 2, know from memory all sums of two one-digit numbers.

2.NBT.B.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Critical area 2 within the grade 2 Louisiana Student Standards for Mathematics introduction says "They solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations." As a result, students also use efficient, accurate, and generalizable methods for fluency within 100.

2.NBT.A.2 Count within 1000; skip-count by 5s, 10s, and 100s.

2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Fluency with these relationships is important for adding and subtracting within 1000.

2.NBT.B.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

2.MD.A.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. Students require sufficient practice to measure accurately and reasonably quickly.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- "Understand place value" (cluster 2.NBT.A) is the foundation for "Use place value understanding and the properties of operations to add and subtract" (cluster 2.NBT.B). (Mastery of the two clusters can grow over time, in tandem with each other.) Adding and subtracting within 1,000 (2.NBT.B.7) involves adding or subtracting hundreds with hundreds, tens with tens, and ones with ones, sometimes composing or decomposing tens or hundreds. These ideas and methods rest on an understanding of the place-value units (2.NBT.A.1, building on 1.NBT.A.2) and understanding these units deepens students' understanding of place value.
- Knowing single-digit sums from memory (2.OA.B.2) is the basis for adding and subtracting multidigit numbers fluently and efficiently in general (cluster 2.NBT.B).

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS, OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- Problems involving dollars, dimes, and pennies (2.MD.C.8) should be connected with the place- value learning of hundreds, tens, and ones (2.NBT.A.1), though the notation is different. A dollar is 100 cents, or a "bundle" of 10 dimes, each of which is a "bundle" of 10 pennies. Work with dollars, dimes, and pennies (without the notation) can support methods of whole-number addition (e.g., dimes are added to dimes). Addition that is appropriate with whole numbers can be explored in the new notation of money contexts (though fluency with that notation is not a standard at this grade).
- Students' work with addition and subtraction word problems (2.OA.A.1) can be coordinated with their growing skill in multidigit addition and subtraction (2.OA.B.2; cluster 2.NBT.B).
- Work with nickels (2.MD.C.8) and with telling time to the nearest five minutes on analog clocks (2.MD.C.7) should be taken together with counting by 5s (2.NBT.A.2) as contexts for gaining familiarity with repeating groups of 5 (2.OA.C.4). Recognizing time by seeing the minute hand at 3 and knowing that that signifies 15 minutes; recognizing three nickels as 15 cents; and seeing the 15-ness of a 3-by-5 rectangular array held in any position (including with neither base horizontal) will prepare for understanding, in grade 3, what the new operation of multiplication means.
- A number line (2.MD.B.6) connects numbers, lengths, and units. Number lines are first used in grade 2. A number line shows units of length; the numbers at the end points of the lengths tell how many lengths so far. Bar-graph scales (2.MD.D.10) and rulers (2.MD.A.1, 2, 3, 4) are number lines. Length units can be added and subtracted using rulers or number-line diagrams (2.MD.B.5,6); adding lengths is an extension of adding and subtracting numbers of things, which has been a focus in kindergarten and grade 1 and will be a focus in grade 2 OA and NBT standards. The purpose of number lines is to represent numbers, sums, and differences as lengths, rather than using lengths to solve all addition and subtraction problem.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 3 — GRADE | F — FOCUS

This focus document shows where students and teachers should spend the large majority of their time in order to meet the expectations of the Louisiana Student Standards for Mathematics.

Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 3

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▢ Supporting Clusters ○ Additional Clusters

3.OA.A	■	Represent and solve problems involving multiplication and division.
3.OA.B	■	Understand properties of multiplication and the relationship between multiplication and division.
3.OA.C	■	Multiply and divide within 100.
3.OA.D	■	Solve problems involving the four operations, and identify and explain patterns in arithmetic.
3.NBT.A	○	Use place value understanding and properties of operations to perform multi-digit arithmetic.
3.NF.A	■	Develop understanding of fractions as numbers.
3.MD.A	■	Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
3.MD.B	▢	Represent and interpret data.
3.MD.C	■	Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
3.MD.D	○	Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
3.MD.E	▢	Work with money.
3.G.A	▢	Reason with shapes and their attributes.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 3

3.OA.C.7	Single-digit products and quotients (Products from memory by end of Grade 3)
3.NBT.A.2	Add/subtract within 1000

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.

2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 2 TO GRADE 3

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- Students in grade 3 begin to enlarge their concept of number by developing an understanding of fractions as numbers. This work will continue in grades 3-6, preparing the way for work with the complete rational number system in grades 6 and 7.
- Students in grades K-2 worked on number; place value; and addition and subtraction concepts, skills and problem solving. Beginning in grade 3, students will learn concepts, skills, and problem solving for multiplication and division. This work will continue in grades 3, 4 and 5, preparing the way for work with ratios and proportions in grades 6 and 7.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

This section highlights individual standards that set expectations for fluency or that represent culminating masteries. Fluency standards are highlighted to stress the need to provide sufficient supports and opportunities for practice to help students meet these expectations. Wherever the word "fluently" appears in a content standard, it is used to mean "quickly and accurately." A key aspect of fluency in this sense is that it does not happen all at once in a single grade, but requires attention to student understanding as they progress towards college/career readiness. It is important to ensure that sufficient practice and extra support are provided at each grade, to allow all students to meet the standards that call explicitly for fluency. Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend to one or more grades earlier in the standards than the grade when fluency is finally expected. Culminating standards are highlighted to help give a sense of critical foundations needed to maintain progressions from grade to grade.

3.OA.C.7 Students fluently multiply and divide within 100. By the end of grade 3, they know all products of two one-digit numbers from memory.

3.NBT.A.2 Students fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (Although 3.OA.C.7 and 3.NBT.A.2 are both fluency standards, these two standards do not represent equal investments of time in grade 3. Note that students in grade 2 were already adding and subtracting within 1000, just not fluently. That makes 3.NBT.A.2 a relatively small and incremental expectation. By contrast, multiplication and division are new in grade 3, and meeting the multiplication and division fluency standard 3.OA.C.7 with understanding is a major portion of students' work in grade 3.)

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- Students must begin work with multiplication and division (3.OA) at or near the very start of the year to allow time for understanding and fluency to develop. Note that area models for products are an important part of this process (3.MD.C.7). Hence, work on concepts of area (3.MD.C.5–6) should likely begin at or near the start of the year as well.

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- Students' work with partitioning shapes (3.G.A.2) relates to visual fraction models (3.NF).
- Scaled picture graphs and scaled bar graphs (3.MD.B.3) can be a visually appealing context for solving multiplication and division problems.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 4 — GRADE | F — FOCUS

This focus document shows where students and teachers should spend the large majority of their time in order to meet the expectations of the Louisiana Student Standards for Mathematics.

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 4

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ☐ Supporting Clusters ○ Additional Clusters

4.OA.A	■	Use the four operations with whole numbers to solve problems.
4.OA.B	☐	Gain familiarity with factors and multiples.
4.OA.C	○	Generate and analyze patterns.
4.NBT.A	■	Generalize place value understanding for multi-digit whole numbers.
4.NBT.B	■	Use place value understanding and properties of operations to perform multi-digit arithmetic.
4.NF.A	■	Extend understanding of fraction equivalence and ordering.
4.NF.B	■	Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
4.NF.C	■	Understand decimal notation for fractions, and compare decimal fractions.
4.MD.A	☐	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
4.MD.B	☐	Represent and interpret data.
4.MD.C	○	Geometric measurement: understand concepts of angle and measure angles.
4.MD.D	☐	Relate area to operations of multiplication and addition.
4.G.A	○	Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 4

4.NBT.B.4	Add/subtract within 1,000,000

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.
2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 3 TO GRADE 4

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- In grade 3, students studied multiplication in terms of equal groups, arrays and area. In grade 4, students extend their concept of multiplication to make multiplicative comparisons (4.OA.A.1).[1]
- Students in grade 4 apply and extend their understanding of the meanings and properties of addition and subtraction of whole numbers to extend addition and subtraction to fractions (4.NF.B.3).[2]
- Fraction equivalence is an important theme within the standards that begins in grade 3. In grade 4, students extend their understanding of fraction equivalence to the general case, $a/b = {}^{(n \times a)}/_{(n \times b)}$ (3.NF.A.3 ⟶ 4.NF.A.1).[3] They apply this understanding to compare fractions in the general case (3.NF.A.3d ⟶ 4.NF.A.2).
- Students in grade 4 apply and extend their understanding of the meanings and properties of multiplication of whole numbers to multiply a fraction by a whole number (4.NF.B.4).
- Students in grade 4 begin using the four operations to solve word problems involving measurement quantities such as liquid volume, mass and time (4.MD.A.2).
- Students combine their understanding of the meanings and properties of multiplication and division with their understanding of base-ten units to begin to multiply and divide multidigit numbers (4.NBT.B.5–6; this builds on work done in grade 3, cf. 3.NBT.A.3).
- Students generalize their previous understanding of place value for multidigit whole numbers (4.NBT.A.1–3). This supports their work in multidigit multiplication and division, carrying forward into grade 5, when students will extend place value to decimals.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

This section highlights individual standards that set expectations for fluency or that represent culminating masteries. Fluency standards are highlighted to stress the need to provide sufficient supports and opportunities for practice to help students meet these expectations. Wherever the word "fluently" appears in a content standard, it is used to mean "quickly and accurately." A key aspect of fluency in this sense is that it does not happen all at once in a single grade, but requires attention to student understanding as they progress towards college/career readiness. It is important to ensure that sufficient practice and extra support are provided at each grade, to allow all students to meet the standards that call explicitly for fluency. Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend to one or more grades earlier in the standards than the grade when fluency is finally expected. Culminating standards are highlighted to help give a sense of critical foundations needed to maintain progressions from grade to grade.

4.NBT.B.4 Fluently add and subtract multi-digit whole numbers with sums less than or equal to 1,000,000, using the standard algorithm.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- Students' work with decimals (4.NF.C.5–7) depends to some extent on concepts of fraction equivalence and elements of fraction arithmetic. Students express fractions with a denominator of 10 as an equivalent fraction with a denominator of 100; comparisons of decimals require that students use similar reasoning to comparisons with fractions.
- Standard 4.MD.A.2 refers to using the four operations to solve word problems involving measurement quantities such as liquid volume, mass, time, and so on. Some parts of this standard could be met earlier in the year (such as using whole-number multiplication to express measurements given in a larger unit in terms of a smaller unit — see also 4.MD.A.1), while others might be met only by the end of the year (such as word problems involving addition and subtraction of fractions or multiplication of a fraction by a whole number — see also 4.NF.B.3d and 4.NF.B.4c).
- Standard 4.MD.C.7 refers to word problems involving unknown angle measures. Before this standard can be met, students must understand concepts of angle measure (4.MD.C.5) and, presumably, gain some experience measuring angles (4.MD.C.6). Before that can happen, students must have some familiarity with the geometric terms that are used to define angles as geometric shapes (4.G.A.1).

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- The work that students do with units of measure (4.MD.A.1–2) and with multiplication of a fraction by a whole number (4.NF.B.4) can be connected to the idea of "times as much" in multiplication (4.OA.A.1).
- Addition of fractions (4.NF.B.3) and concepts of angle measure (4.MD.C.5a, 4.MD.C.5b, and 4.MD.C.7) are connected in that a one-degree measure is a fraction of an entire rotation and that adding angle measures together is adding fractions with a denominator of 360.

1 In an additive comparison problem (grades 1–2), the underlying question is what amount would be added to one quantity to result in the other? In a multiplicative comparison problem, the underlying question is what factor would multiply one quantity to result in the other?

2 This work is limited to equal denominators in grade 4 to give students more time to build their understanding of fraction equivalence, before adding and subtracting unlike denominators in grade 5.

3 Students who can generate equivalent fractions can also develop strategies for adding fractions with different denominators, but this is not a requirement in grade 4.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 5 — GRADE | F — FOCUS

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 5

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▢ Supporting Clusters ○ Additional Clusters

5.OA.A	○	Write and interpret numerical expressions.
5.OA.B	○	Analyze patterns and relationships.
5.NBT.A	■	Understand the place value system.
5.NBT.B	■	Perform operations with multi-digit whole numbers and with decimals to hundredths.
5.NF.A	■	Use equivalent fractions as a strategy to add and subtract fractions.
5.NF.B	■	Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
5.MD.A	▢	Convert like measurement units within a given measurement system.
5.MD.B	▢	Represent and interpret data.
5.MD.C	■	Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.
5.G.A	○	Graph points on the coordinate plane to solve real-world and mathematical problems.
5.G.B	○	Classify two-dimensional figures into categories based on their properties.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 5

5.NBT.B.5	Multi-digit multiplication

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.

2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 4 TO GRADE 5

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- In grade 5, students will integrate decimal fractions more fully into the place value system (5.NBT.A.1–4). By thinking about decimals as sums of multiples of base-ten units, students begin to extend algorithms for multidigit operations to decimals (5.NBT.B.7).
- Students use their understanding of fraction equivalence and their skill in generating equivalent fractions as a strategy to add and subtract fractions, including fractions with unlike denominators.
- Students apply and extend their previous understanding of multiplication to multiply a fraction or whole number by a fraction (5.NF.B.4). They also learn the relationship between fractions and division, allowing them to divide any whole number by any nonzero whole number and express the answer in the form of a fraction or mixed number (5.NF.B.3). And they apply and extend their previous understanding of multiplication and division to divide a unit fraction by a whole number or a whole number by a unit fraction.[1]
- Students extend their grade 4 work in finding whole-number quotients and remainders to the case of two-digit divisors (5.NBT.B.6).
- Students continue their work in geometric measurement by working with volume as an attribute of solid figures and as a measurement quantity (5.MD.C.3–5).
- Students build on their previous work with number lines to use two perpendicular number lines to define a coordinate system (5.G.A.1–2).

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

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5.NBT.B.5 Students fluently multiply multidigit whole numbers using the standard algorithm.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

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- Understanding that in a multidigit number, a digit in one place represents $^1/_{10}$ of what it represents in the place to its left (5.NBT.A.1) is an example of multiplying a quantity by a fraction (5.NF.B.4).

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- The work that students do in multiplying fractions extends their understanding of the operation of multiplication. For example, to multiply $m/n \times q$ (where q is a whole number or a fraction), students can interpret $m/n \times q$ as meaning a parts of a partition of q into n equal parts (5.NF.B.4a). This interpretation of the product leads to a product that is less than, equal to or greater than q depending on whether $m/n < 1$, $m/n = 1$ or $m/n > 1$, respectively (5.NF.B.5).
- Conversions within the metric system represent an important practical application of the place value system. Students' work with these units (5.MD.A.1) can be connected to their work with place value (5.NBT.A.1).

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 the division of a fraction by a fraction is not a requirement in this grade.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 6 — GRADE | F — FOCUS

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 6

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▣ Supporting Clusters ○ Additional Clusters

6.RP.A	■	Understand ratio concepts and use ratio reasoning to solve problems.
6.NS.A	■	Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
6.NS.B	○	Compute fluently with multi-digit numbers and find common factors and multiples.
6.NS.C	■	Apply and extend previous understandings of numbers to the system of rational numbers.
6.EE.A	■	Apply and extend previous understandings of arithmetic to algebraic expressions.
6.EE.B	■	Reason about and solve one-variable equations and inequalities.
6.EE.C	■	Represent and analyze quantitative relationships between dependent and independent variables.
6.G.A	▣	Solve real-world and mathematical problems involving area, surface area, and volume.
6.SP.A	○	Develop understanding of statistical variability.
6.SP.B	○	Summarize and describe distributions.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

REQUIRED FLUENCIES FOR GRADE 6

6.NS.B.2	Multi-digit division
6.NS.B.2	Multi-digit decimal operations

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.
2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 5 TO GRADE 6

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- Students' prior understanding of and skill with multiplication, division, and fractions contribute to their study of ratios, proportional relationships and unit rates (6.RP).
- Students begin using properties of operations systematically to work with variables, variable expressions, and equations (6.EE).
- Students extend their work with the system of rational numbers to include using positive and negative numbers to describe quantities (6.NS.C.5), extending the number line and coordinate plane to represent rational numbers and ordered pairs (6.NS.C.6), and understanding ordering and absolute value of rational numbers (6.NS.C.7).
- Having worked with measurement data in previous grades, students begin to develop notions of statistical variability, summarizing and describing distributions (6.SP).

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

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6.NS.B.2 Students fluently divide multidigit numbers using the standard algorithm. This is the culminating standard for several years' worth of work with division of whole numbers.

6.NS.B.3 Students fluently add, subtract, multiply, and divide multidigit decimals using the standard algorithm for each operation. This is the culminating standard for several years' worth of work relating to the domains of Number and Operations in Base Ten, Operations and Algebraic Thinking, and Number and Operations — Fractions.

6.NS.A.1 Students interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. This completes the extension of operations to fractions.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

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- Equations of the form $px = q$ (6.EE.B.7) are unknown-factor problems; the solution will sometimes be the quotient of a fraction by a fraction (6.NS.A.1).
- Solving problems by writing and solving equations (6.EE.B.7) involves not only an appreciation of how variables are used (6.EE.B.6) and what it means to solve an equation (6.EE.B.5) but also some ability to write, read, and evaluate expressions in which letters stand for numbers (6.EE.A.2).
- Students must be able to place rational numbers on a number line (6.NS.C.7) before they can place ordered pairs of rational numbers on a coordinate plane (6.NS.C.8). The former standard about ordering rational numbers is much more fundamental.

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- Students' work with ratios and proportional relationships (6.RP) can be combined with their work in representing quantitative relationships between dependent and independent variables (6.EE.C.9).
- Plotting rational numbers in the coordinate plane (6.NS.C.8) is part of analyzing proportional relationships (6.RP.A.3a, 7.RP.A.2) and will become important for studying linear equations (8.EE.C.8) and graphs of functions (8.F).
- Students use their skill in recognizing common factors (6.NS.B.4) to rewrite expressions (6.EE.A.3).
- Writing, reading, evaluating, and transforming variable expressions (6.EE.A.1-4) and solving equations and inequalities (6.EE.B.7-8) can be combined with use of the volume formulas $V = lwh$ and $V = Bh$ (6.G.A.2).
- Working with data sets can connect to estimation and mental computation. For example, in a situation where there are 20 different numbers that are all between 8 and 10, one might quickly estimate the sum of the numbers as $9 \times 20 = 180$.

Louisiana STUDENT STANDARDS MATHEMATICS

MATH — MATHEMATICS | 7 — GRADE | F — FOCUS

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Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 7

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ▢ Supporting Clusters ○ Additional Clusters

7.RP.A	■	Analyze proportional relationships and use them to solve real-world and mathematical problems.
7.NS.A	■	Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.
7.EE.A	■	Use properties of operations to generate equivalent expressions.
7.EE.B	■	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
7.G.A	○	Draw, construct and describe geometrical figures and describe the relationships between them.
7.G.B	○	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
7.SP.A	▢	Use random sampling to draw inferences about a population.
7.SP.B	○	Draw informal comparative inferences about two populations.
7.SP.C	▢	Investigate chance processes and develop, use, and evaluate probability models.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

1 At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade.
2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 6 TO GRADE 7

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- In grade 6, students learned about negative numbers and the kinds of quantities they can be used to represent; they also learned about absolute value and ordering of rational numbers, including in real-world contexts. In grade 7, students will add, subtract, multiply, and divide within the system of rational numbers.
- Students grow in their ability to analyze proportional relationships. They decide whether two quantities are in a proportional relationship (7.RP.A.2a); they work with percents, including simple interest, percent increase and decrease, tax, markups and markdowns, gratuities and commission, and percent error (7.RP.A.3); they analyze proportional relationships and solve problems involving unit rates associated with ratios of fractions (e.g., if a person walks 1/2 mile in each 1/4 hour, the unit rate is the complex fraction ½ / ¼ miles per hour or 2 miles per hour) (7.RP.A.1); and they analyze proportional relationships in geometric figures (7.G.A.1).
- Students solve a variety of problems involving angle measure, area, surface area, and volume (7.G.B.4–6).

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

This section highlights individual standards that set expectations for fluency or that represent culminating masteries. Fluency standards are highlighted to stress the need to provide sufficient supports and opportunities for practice to help students meet these expectations. Wherever the word "fluently" appears in a content standard, it is used to mean "quickly and accurately." A key aspect of fluency in this sense is that it does not happen all at once in a single grade, but requires attention to student understanding as they progress towards college/career readiness. It is important to ensure that sufficient practice and extra support are provided at each grade, to allow all students to meet the standards that call explicitly for fluency. Fluency is not meant to come at the expense of understanding but is an outcome of a progression of learning and sufficient thoughtful practice. It is important to provide the conceptual building blocks that develop understanding in tandem with skill along the way to fluency; the roots of this conceptual understanding often extend to one or more grades earlier in the standards than the grade when fluency is finally expected. Culminating standards are highlighted to help give a sense of critical foundations needed to maintain progressions from grade to grade.

7.EE.B.3 Students solve multistep problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. This work is the culmination of many progressions of learning in arithmetic, problem solving and mathematical practices.

7.EE.B.4a In solving word problems leading to one-variable equations of the form px + q = r and p(x + q) = r, students solve the equations fluently. This will require fluency with rational number arithmetic (7.NS.A.1–3), as well as fluency to some extent with applying properties operations to rewrite linear expressions with rational coefficients (7.EE.A.1).

7.NS.A.1–2 Adding, subtracting, multiplying, and dividing rational numbers is the culmination of numerical work with the four basic operations. The number system will continue to develop in grade 8, expanding to become the real numbers by the introduction of irrational numbers, and will develop further in high school, expanding to become the complex numbers with the introduction of imaginary numbers. Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic (see below), fluency with rational number arithmetic should be the goal in grade 7.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

This section highlights cases in which a body of content within a given grade depends, conceptually or logically, upon another body of content within that same grade. Examples of within-grade dependencies are highlighted to stress the need to organize material coherently within the grade. (Because of space limitations, only examples of large-scale dependencies are described in this section, but coherence is important for dependencies that exist at finer grain sizes as well.)

- Meeting standard 7.EE.B.3 in its entirety will involve using rational number arithmetic (7.NS.A.1–3) and percents (7.RP.A.3). Work leading to meeting this standard could be organized as a recurring activity that tracks the students' ongoing acquisition of new skills in rational number arithmetic and percents.
- Because rational number arithmetic (7.NS.A.1–3) underlies the problem solving detailed in 7.EE.B.3 as well as the solution of linear expressions and equations (7.EE.A.1–2, 4), this work should likely begin at or near the start of the year.
- The work leading to meeting standards 7.EE.A.1–4 could be divided into two phases, one centered on addition and subtraction (e.g., solving $x + q = r$) in relation to rational number addition and subtraction (7.NS.A.1) and another centered on multiplication and division (e.g., solving $px + q = r$ and $p(x + q) = r$) in relation to rational number multiplication and division (7.NS.A.2).

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

This section highlights opportunities for connecting content in assessments, as well as in curriculum and instruction. Examples of connections are highlighted to stress the need to avoid approaching the standards as merely a checklist.

- Students use proportional reasoning when they analyze scale drawings (7.G.A.1).
- Students use proportional reasoning and percentages when they extrapolate from random samples and use probability (7.SP.C.6, 8).

Louisiana STUDENT STANDARDS MATHEMATICS

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MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 8

Emphases are given at the cluster level. Refer to the Louisiana Student Standards for Mathematics for the specific standards that fall within each cluster. Students should spend the large majority[1] of their time on the major work of the grade.[2]

■ Major Clusters ☐ Supporting Clusters ○ Additional Clusters

8.NS.A	☐	Know that there are numbers that are not rational, and approximate them by rational numbers.
8.EE.A	■	Work with radicals and integer exponents.
8.EE.B	■	Understand the connections between proportional relationships, lines, and linear equations.
8.EE.C	■	Analyze and solve linear equations and pairs of simultaneous linear equations.
8.F.A	■	Define, evaluate, and compare functions.
8.F.B	☐	Use functions to model relationships between quantities.
8.G.A	■	Understand congruence and similarity using physical models, transparencies, or geometry software.
8.G.B	■	Understand and apply the Pythagorean Theorem.
8.G.C	○	Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.
8.SP.A	☐	Investigate patterns of association in bivariate data.

HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
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6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
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2 Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

EXAMPLES OF KEY ADVANCES FROM GRADE 7 TO GRADE 8

This section highlights some of the major grade-to-grade steps in the progression of increasing knowledge and skill detailed in the standards. Each key advance in mathematical content also corresponds to a widening scope of problems that students can solve. Examples of key advances are highlighted to stress the need to treat topics in ways that take into account where students have been in previous grades and where they will be going in subsequent grades.

- Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation $y = mx + b$, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case $b = 0$). Students also formalize their previous work with linear relationships by working with functions — rules that assign to each input exactly one output.
- By working with equations such as $x^2 = 2$ and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals.

FLUENCY EXPECTATIONS OR EXAMPLES OF CULMINATING STANDARDS

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8.EE.C.7 Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers.

8.G.C.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.B.4–6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.B.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

EXAMPLES OF MAJOR WITHIN-GRADE DEPENDENCIES

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- An important development takes place in grade 8 when students make connections between proportional relationships, lines, and linear equations (8.EE, second cluster). Making these connections depends on prior grades' work, including 7.RP.A.2 and 6.EE.C.9. There is also a major dependency within grade 8 itself: The angle-angle criterion for triangle similarity underlies the fact that a nonvertical line in the coordinate plane has equation $y = mx + b$. Therefore, students must do work with congruence and similarity (8.G.A.1–5) before they are able to justify the connections among proportional relationships, lines, and linear equations. Hence the indicated geometry work should likely begin at or near the very start of the year.[1]
- Much of the work of grade 8 involves lines, linear equations, and linear functions (8.EE.B.5–8; 8.F.A.3–4; 8.SP.A.2–3). Irrational numbers, radicals, the Pythagorean theorem, and volume (8.NS.A.1–2; 8.EE.A.2; 8.G.B.6–9) are nonlinear in nature. Curriculum developers might choose to address linear and nonlinear bodies of content somewhat separately. An exception, however, might be that when addressing functions, pervasively treating linear functions as separate from nonlinear functions might obscure the concept of function *per se*. There should also be sufficient treatment of nonlinear functions to avoid giving students the misleading impression that all functional relationships are linear (see also 7.RP.A.2a).

EXAMPLES OF OPPORTUNITIES FOR CONNECTIONS AMONG STANDARDS, CLUSTERS OR DOMAINS

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- Students' work with proportional relationships, lines, linear equations, and linear functions can be enhanced by working with scatter plots and linear models of association in bivariate measurement data (8.SP.A.1–3).

1 Note that the Geometry cluster "Understand congruence and similarity using physical models, transparencies or geometry software" supports high school work with congruent triangles and congruent figures.