LOUISIANA EDUCATIONAL ASSESSMENT PROGRAM FOR THE 21ST CENTURY (LEAP 21)

ASSESSMENT FRAMEWORK
Grade 4

This section presents the assessment framework for state criterion-referenced testing at grade 4 in terms of strands/standards and benchmarks assessed. The section includes the text of each benchmark, followed by a list of abilities that students may be expected to demonstrate to give evidence of facility with the concepts or skills described in the benchmark statement. For ease of reference, a list of all benchmark statements for all grade clusters (K–4, 5–8, and 9–12) is provided in the appendix.

CONTENT LIMITS

Grade 4 test items will be subject to the following content limits. Depending on the particular benchmark assessed, items may involve:

- whole numbers through 10,000 (read the words or read/write standard notation)
- place value through ten thousands
- any of the four operations with whole numbers (See specific limits under Benchmark N.6.)
- calculating with monetary units up to $100.00
- fractions with denominators 2–12, but not computing with fractions
- decimal equivalents of tenths, fourths, and half
- decimal numbers through hundredths, but not computing with decimals except as expressed in dollars/cents
- percent equivalents of fourths

Calculating with monetary units (dollars and cents) and knowing monetary equivalents of coins (penny, nickel, dime, quarter, and half-dollar) and bills ($1, $5, $10, and $20) will be assessed under Number & Number Relations, rather than under the Measurement strand.

STRAND N: NUMBER AND NUMBER RELATIONS

N.1 Constructing number meaning and demonstrating that a number can be expressed in many different forms (e.g., standard notation, number words, number lines, geometrical representation, fractions, and decimals)

Assessment requires understanding and expressing numbers in various forms, including all examples in assessed benchmarks. The focus is on place value in whole numbers, factors and multiples of whole numbers, the concept of fractions, relative magnitude of fractions, decimals as written symbols for fractions for tenths, and the monetary value of U.S. coins and bills.

What students should know and be able to do includes:

- Read and write numbers up to 10,000 using standard notation (numerals)
- Understand the concept of ones, tens, hundreds, thousands, and ten thousands place, including using expanded notation to rename whole numbers by place value (e.g., 60 = 5 tens + 10 ones)
- Represent whole numbers in various ways, including number words, number lines, geometrical (e.g., illustrated sets of blocks) and numerical forms (e.g., 7 = 4 + 2 + 1)
- Recognize whether a number is divisible by 2, 3, 5, or 10, and recognize factors of composite numbers less than 50 (e.g., that 1, 2, 4, 5, 10, and 20 are factors of 20)
- Recognize multiples of natural numbers 2–12
- Read/write fractions with denominators 2–12, including relating a fraction to the shaded area of a geometrical figure or parts of an illustrated object
- Compare/order fractions using standard notation, geometric representation, or number line, and comparative terminology (e.g., more, less, greater, same, between, about, almost)
- Read and write decimal numbers to hundredths (two decimal places), particularly for expressions of dollars and cents
- Relate fractions for tenths to their decimal equivalents (e.g., .20 for 2/10)
- Identify the value of U.S. coins (penny, nickel, dime, quarter, half-dollar) and U.S. bills ($1, $5, $10, and $20), and know symbols for dollars ($) and cents (¢)
- Use ordinal numbers 1^{st} through 20^{th} in the context of real-world situations

N.2 Demonstrating number sense and estimation skills, giving particular attention to common equivalent reference points (i.e., 1/4 = 25% = .25; 1/2 = 50% = .5; $1 = 100%, etc.)

Items focus on using natural (counting) numbers to describe the real world in realistic terms or to estimate quantities for cases in which precise calculations cannot be made in the test setting. Questions are in the form: *"About how much," "About how many," "About how long,"* etc. Items may require estimating with whole or monetary values with rounding as needed or relating values to practical situations. Some items may require students to see and use the relationship between fractional and percentage parts of a whole.

What students should be able to do includes:

- Use whole numbers to describe real-world situations and physical reality involving counting (e.g., years of age; amounts of money; quantities such as 36 = 3 dozen; etc.)

  Note: Test items are restricted to applications of whole numbers involving "counting," to distinguish them from similar items involving units of measure (e.g., time, distance) under Benchmark M.1. Wrong answers are unrealistic, not close in magnitude to the correct answer, to differentiate "number sense" from "estimating."

- Use common reference points, including relating fractions for half and fourths to their decimal and percent equivalents (e.g., identify a value as "between 1/4 and 1/2" or "about 50%"; or recognize that 1/4 = 25%, 1/2 = .50, or 3/4 is between 50% and 100%)

- Identify equivalent relationships between U.S. coins and bills (e.g., 100 pennies = $1.00; 10 dimes = $1.00)

N.3 Reading, writing, representing, comparing, ordering, and using whole numbers in a variety of forms (e.g., standard notation, number line, and geometrical representation)

Test items focus on understanding the relative magnitude of whole numbers, rather than reading, writing, or representing numbers. Students are required to count, compare, or order whole numbers in a real-world context. Items do not require calculation. However, students should know the meaning of the terms "skip count," "count on," and "count back."

What students should be able to do includes:

- Compare or order whole numbers to 10,000 using standard notation, number line, or geometrical representation

- Use comparative terminology (e.g., more, less, greater, same, between, about, almost) to compare whole numbers

  Note: Understanding and using symbols for "greater/less" (>, <) is assessed under the Algebra strand.

- Use such strategies as counting on, counting back, or skip counting by 2's through 10's to demonstrate understanding of the numeration system in practical contexts

  Note: Understanding and using the concept of even and odd numbers is assessed under the Patterns, Relations, and Functions strand.

N.4 Demonstrating a conceptual understanding of the meaning of the basic arithmetic operations (add, subtract, multiply, and divide) and their relationships to each other

Items for this benchmark focus on *conceptual* understanding of the four basic operations. For example, students should understand that multiplication is repeated addition and division is repeated subtraction. They should also understand the commutative property for addition and multiplication ($a + b = b + a$, and $5 \times 3 = 3 \times 5$).

N.5 Selecting appropriate operation(s) (add, subtract, multiply, and divide) for a given situation

Test items for this benchmark will be similar to those for Benchmark N.6, except that students are not required to perform calculations. They are required to indicate the proper arithmetical operation(s) to solve a given problem and, in some cases, the values to be used in these operations. Problems may involve one or two steps. Where two steps are involved, students are required to know the correct order of operations.

A test item might take one of the following general forms:

- Which of these operations would you use to find the answer?
- What step(s) would you take to solve this problem?
- What step would you take first to solve this problem?

N.6 Applying a knowledge of basic math facts and arithmetic operations to real-life situations

Items for this benchmark focus mainly on addition, subtraction, multiplication, and division of whole numbers in practical problem-solving situations.

Items will be limited as follows:

- Addition: up to three three-digit numbers, with regrouping
- Subtraction: up to two four-digit numbers, with regrouping
- Multiplication: up to a three-digit number by a one-digit number, with regrouping
- Division: dividing a two-digit number by a one-digit number (with and without remainder)

What students should know and be able to do includes:

- Understand basic addition, subtraction, multiplication, and division facts and relate them to each other
- Apply computational skills in the context of word problems
- Count money and determine amount of change

N.9 Demonstrating the connection of number and number relations to the other strands and to real-life situations

This benchmark is eligible for assessment on Part B of the test.

NOTE: The following benchmarks are *not* directly assessed on the state test because it would not be possible to determine which method the student selected or used to answer a question (e.g., mental math or scratch paper).

N.7 Constructing, using, and explaining, procedures to compute and estimate with whole numbers (e.g., mental math strategies)

N.8 Selecting and using appropriate computational methods and tools for given situations involving whole numbers (e.g., estimation, mental arithmetic, calculator, or paper and pencil)

STRAND A: ALGEBRA

A.1 Demonstrating a conceptual understanding of variables, expressions, equations, and inequalities (e.g., use letters or boxes to represent values; understand =, ≠, <, and > symbols)

What students should know and be able to do includes:

- Understand the concept of the "unknown," using empty boxes or letters to represent unknown values
- Understand and use symbols (=, ≠, <, >) to express algebraic relationships
- Use number sentences or formulas containing a variable (letter) to represent real-world problems
- Given an algebraic sentence, write a related story problem (or choose the corresponding story problem), and explain their thinking

  Note: Algebraic sentences may involve addition, subtraction, multiplication, and division.

A.2 Modeling and developing strategies for solving equations and inequalities

What students should be able to do includes:

- Use numbers to replace unknowns
- Use letters as variables in mathematical statements to express and solve for real-world problems (i.e., 3 nickels = 15 cents, N = 5 cents, etc.)
- Identify and create true/false and open/closed number sentences
- Solve for a variable in a linear single-step equation

A.3 Recognizing the connection of algebra to the other strands and to real-life situations (e.g., number sentences or formulas to represent real-world problems)

This benchmark is eligible for testing on Part B of the test.

STRAND M: MEASUREMENT

Students should be able to estimate, measure, record, and communicate the dimensions of objects, understand the concepts of perimeter and area, and calculate the perimeter and area of rectangles, selecting and using standard units (customary and metric) as well as non-standard units of measurement. Test items require understanding and using units of linear measurement in a wide variety of practical contexts.

Note: Monetary measures (dollars/cents) are assessed under the Number & Number Relations strand.

M.1 Applying (measure or solve measurement problem) the concepts of length (inches, feet, yards, miles, millimeters, centimeters, decimeters, meters, kilometers), area, volume, capacity (cups, liquid pints and quarts, gallons, milliliters, liters), weight (ounces, pounds, tons, grams, kilograms), mass, time (seconds, minutes, hours, days, weeks, months, years), money, and temperature (Celsius and Fahrenheit) to real-world experiences

Test items focus on applications cited in the benchmark statement. Students should understand the concept of *volume*, but are not required to solve problems using standard units of volume (i.e., cubic inches, feet, yards, or centimeters). They also are not expected to use the concept of *rate* (e.g., miles per hour) in solving problems. Some items may require measuring with a ruler.

What students should know and be able to do includes:

- Understand the concepts of linear measure (length, perimeter), area (square units), capacity, and weight/mass
- Recognize the names of standard units of measure in the customary (English) and metric system, and related abbreviations (e.g., "cm" or "sq."), in the context of word problems
- Solve mathematical problems involving measurements in the customary and metric systems, including use of the following units:
  - Linear: inches, feet, yards, miles, millimeters, centimeters, meters, meters, kilometers
  - Capacity: cups, liquid pints and quarts, gallons, milliliters, liters
  - Weight/Mass: ounces, pounds, tons, grams, kilograms
  - Temperature: degrees on the Fahrenheit or Celsius scale
  - Time: seconds, minutes, hours, days, weeks, months, years

M.1 Continued . . .

- Measure length and read linear measurements accurately to the nearest centimeter or half inch, using a ruler demarcated in one or both systems
- Understand the concept of measuring time, including 1 hour = 60 minutes, 1 minute = 60 seconds, and using calendar dates to measure time
- Understand the Fahrenheit and Celsius scales as different approaches to measuring temperature, and recognize the practical range of each scale
- Use addition to find perimeter of a geometric shape, given lengths of sides in a labeled illustration or word problem (customary or metric units)
- Determine area of an illustrated square or rectangle by counting square units
- Use multiplication to find area of a rectangle, given lengths of one side (square) or two sides (other rectangles) in a labeled illustration or word problem

M.2 Selecting and using appropriate standard and non-standard units of measure (e.g., paper clips and Cuisenaire rods) and tools for measuring length, area, capacity, weight/mass, and time for a given situation by considering the purpose and precision required for the task

Items on the state test involve selecting appropriate *units* of measure for particular situations. Selecting appropriate tools is not assessed.

Specifically, students may be required to:

- Understand the concept of standard and non-standard (e.g., paper clips, hands) units of measure
- Select the best unit to measure length, area, capacity, weight/mass, and time for a given situation, considering purpose of measurement and precision required

M.3 Using estimation skills to describe, order, and compare measures of length, capacity, weight/mass, time, and temperature

Assessment focuses on (a) estimation skills involving measurements in the customary and metric systems, and (b) understanding relative magnitude of *units* or measurements within and between the customary and metric systems. Some test items may require students to estimate the size of a familiar object in the real world. Other items may require comparing or ordering *units* or measurements and distinguishing the difference (e.g., indicate which unit/measurement is greatest or smallest).

Specifically, students may be required to:

- Compare approximate relationships of units *across systems* in terms of intuitive reference points, not formal computation (e.g., a liter is about a quart; a meter is a little longer than a yard)
- Compare or order units or measurements *within the same system* (customary or metric), using any of the units cited below
- Estimate length in customary or metric units: inches, feet, yards, miles, millimeters, centimeters, meters, kilometers
- Estimate capacity in customary or metric units: cups, pints, quarts, gallons, milliliters, liters
- Estimate weight/mass in customary or metric units: ounces, pounds, tons, grams, kilograms
- Estimate elapsed time (or later point in time) using seconds, minutes, hours, days, weeks, months, years
- Estimate temperature in degrees Fahrenheit or Celsius, using common reference points (e.g., normal room and body temperature, freezing and boiling points of water, temperature of a “hot” vs. “cold” day)
- Estimate perimeter and area of a square or rectangular object (e.g., classroom door) in customary or metric units
- Estimate area of an irregular shape shown in terms of square units

M.4 Converting from one unit of measurement to another within the same system (customary and metric); comparisons between systems should be based on intuitive reference points, not formal computations (e.g., a meter is a little longer than a yard)

Note: Comparisons between systems should be based on intuitive reference points, not formal computations (e.g., a meter is a little longer than a yard).

Students should be able to:

- Make unit conversions within the same system (e.g., 12 inches = 1 foot, 100 centimeters = 1 meter, 1 pint = 2 cups) in practical contexts.
  Note: Test items will require two-step conversions (e.g., pints to gallons, inches to yards). A *Mathematics Reference Sheet* of unit conversions will be provided.

- Use intuitive reference points between the customary and metric systems to solve problems (e.g., a meter is slightly longer than a yard, a liter is slightly more than a liquid quart, a centimeter is less than an inch)

M.5 Demonstrating the connection of measurement to the other strands and to real-life situations

This benchmark is eligible for assessment on Part B of the test.

STRAND G: GEOMETRY

G.1 Determining the relationships among shapes

What students should be able to do includes:

- Manipulate common figures to analyze and produce new figures (e.g., create a figure from specified or given shapes)
- Identify views of three-dimensional objects (i.e., top, side, bottom, etc.)

G.2 Identifying, describing, comparing, constructing, and classifying two-dimensional and three-dimensional geometric shapes using a variety of materials

What students should know and be able to do includes:

- Sort objects or shapes according to two or more attributes (e.g., size, shape, color, pattern, function) or sort objects/shapes into given categories
- Sequence or position shapes according to a given attribute (e.g., size, sides)
- Identify (or draw/name) and describe by attributes two-dimensional figures, including circle, triangle, rectangles (including squares), and parallelograms (including rhombuses)
- Identify (or draw/name) and describe the properties of polygons (triangle, square, rectangle, pentagon, hexagon, octagon, etc.)
- Compare/contrast two-dimensional shapes according to their properties (number of sides, angles, etc.)
- Identify and name the following three-dimensional figures: cylinder, cube, cone, pyramid, sphere
- Understand concepts of congruence, similarity, and symmetry and apply these concepts to given shapes

Note: Understanding, estimating, and determining perimeter and area of a square or rectangle is tested under the Measurement strand.

G.3 Making predictions regarding combinations, subdivisions, and transformations (slides, flips, turns) of simple plane geometric shapes

What students should know and be able to do includes:

- Understand the terms "clockwise" and "counterclockwise"
- Visualize a given shape (e.g., outline of an upright "L" shape) when turned 90° or 180° in clockwise or counterclockwise direction or when turned upside down
- Visualize a given three-dimensional shape (e.g., a cylindrical can) when turned on its side or forward
- Visualize the shape formed by the joining of two other given shapes
- Visualize component shapes of a given geometrical shape (limit 6 components and 4 different common shapes); for example, say how many or what shapes they see

Note: "Slides" are not reflected on the state test because coordinate geometry concepts are not tested at grade 4.

G.5 Identifying and drawing lines and angles and describing their relationships to each other and to the real world

What students should know and be able to do includes:

- Understand the concept of a point, straight line, line segment, length of line segment, and plane
- Draw, identify, label a line segment, horizontal or vertical line, and intersecting lines in geometric figures and drawings (including maps)
- Draw, identify, and label parallel lines and perpendicular lines in real-world applications (e.g., labeling a figure drawing containing these elements)
- Understand properties of intersecting, parallel, and perpendicular lines
- Draw or identify angles and name right angles in geometric figures or drawings
  Note: At grade 4, students are not required to identify acute or obtuse angles or to know these terms.
- Order angles by size (> or < 90°)

G.6 Demonstrating the connection of geometry to the other strands and to real-life situations

This benchmark is eligible for testing on Part B of the test.

NOTE: The following benchmark is not directly assessed on the state test.

G.4 Drawing, constructing models, and comparing geometric shapes with special attention to developing spatial sense

Assessment of Benchmark G.4 at the classroom level could include observation of tasks involving visualization skills (e.g., drawing a map of the classroom as seen by a spider on the ceiling) or building with blocks.

STRAND D: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATH

D.1 Collecting, organizing, and describing data based on real-life situations

Items on the state test focus on "organizing" and "describing" data, not "collecting" data. At the classroom level, assessment of this benchmark could involve (a) collecting data using experiments, simulations, surveys or questionnaires; (b) writing a research report to describe findings; or (c) determining possible uses of long-term data collection.

Students may be expected to demonstrate such skills as:

- Analyze and describe data in terms of absolute or relative frequency of occurrence, range (highest/lowest), etc.
- Summarize information and relationships revealed by a graph
- Add new data to a given chart, graph, or set of organized data
- Extrapolate from obvious trends revealed by graphs in order to make predictions

D.2 Constructing, reading, and interpreting data in charts, graphs, tables, etc.

What students should be able to do includes:

- Obtain information from a bar graph, line graph, pictograph, chart/table (i.e., read a graph accurately to answer a question)
- Analyze, interpret, or draw conclusions based on data given in a bar graph, line graph, pictograph, chart/table
- Match a graph to a described situation
- Match a data set to a graph and vice versa (including matching data presented in a table/chart with a corresponding bar, line, or pictograph)
- Plot data onto a bar or line graph when the axes labels and scales have already been provided
- Draw a bar graph showing data given in a chart/table or words

D.3 Formulating and solving problems that involve the use of data

What students should be able to do includes:

- Generate questions that can be answered by collecting and analyzing data
- Use lists and tree diagrams to generate and record all possible combinations of a given set of objects; total number of combinations not to exceed 9 (3x3)
- Solve problems using data from a variety of sources (i.e., tables, graphs, maps, advertisements, etc.)
- Solve problems involving simple deductive reasoning (e.g., "Tom finished race after Sue but before John. In what order did they finish?")
- Use elementary logic involving sets ("and," "or," and "is/is not" statements) by solving logic problems that can be formulated in Venn diagrams (limit: 2 circles)

D.5 Predicting outcomes based on probability (e.g., make predictions of same chance, more likely, or less likely; determine fair and unfair games)

What students should know and be able to do includes:

- Understand and use the vocabulary of basic probability (chance, possible, impossible, likely, unlikely, certain, etc.)
- Make predictions of same chance or more or less likely from given information
- Determine fair and unfair (as in a game) based on probability
- Predict outcomes based on simple (single event) probability

D.6 Demonstrating the connection of data analysis, probability, and discrete math to other strands and real-life situations

This benchmark is eligible for testing on Part B of the test.

NOTE: The following benchmark is not directly assessed on the state test.

D.4 Exploring, formulating, and solving sequence-of-pattern problems involving selection and arrangement of objects/numerals

STRAND P: PATTERNS, RELATIONS, AND FUNCTIONS

Test items may require students to recognize, formulate, describe, or extend numbers, shapes, and patterns. Assessment may include multiplicative and additive patterns and sequences of transformations dealing with reflections.

P.1 Recognizing, describing, extending, and creating a wide variety of numerical (e.g., skip counting of whole numbers), geometrical, and statistical patterns

What students should know and be able to do includes:

- Understand and use the concept of *even and odd* numbers (e.g., repeat a pattern of even or odd numbers, or skip count by even or odd numbers)
  Note: Skip counting not involving even/odd numbers is tested under the Number & Number Relations strand.
- Identify missing element(s) *within* a number pattern, sequence or display, or continue a given sequence or pattern of numbers or geometrical shapes
- Describe the pattern evidenced by a sequence or display of numbers

P.2 Representing and describing mathematical relationships using tables, variables, open sentences, and graphs

What students should be able to do includes:

- Use "function (input/output) machines" to identify or continue numerical patterns, or to solve problems involving patterns
- Complete input/output tables relative to increasing patterns
- Relate function machines, function tables, and generalizing rules

Note: Traditional graph/table skills not involving *functions* are assessed under the Data Analysis, Probability, and Discrete Math strand (e.g., creating a conventional graph, reading/interpreting data in a table or graph, matching a graph to a described situation).

P.3 Recognizing the use of patterns, relations, and functions in other strands and in real-life situations

This benchmark is eligible for assessment on Part B of the test.