Assessment Development Guide
Educator Resource
Mathematics: Grade 4

This document is intended to describe how the Kansas assessments align to the Kansas standards. It illustrates how standards, evidence statements, performance level descriptors (PLDs), and depth of knowledge influence the Kansas summative assessment.

The 2017 Kansas mathematics standards serve as the foundation of the assessment. These standards are grouped into clusters, and the assessment mirrors these same groupings. By assessing at the cluster level, it is possible to highlight student mastery of the connected material contained in the standards. Emphasis on particular clusters captures the focus, coherence, and rigor of the standards. These content emphases guide the development of each assessment.

Suggested Uses

Educators can use this document to

- better understand the standards and the assessment.
- understand what is expected of students in order to achieve performance level 3.
- check the alignment of curriculum and learning activities.
- ensure that long-range instructional plans match the major emphases of the standards.
- apply standards at the level of rigor necessary to allow students to demonstrate success within a balanced assessment system.
- develop learning goals.
- build a greater understanding of student, grade-level, school, and district results and plan for future learning activities accordingly.
- provide professional development opportunities within a school or district, and for vertical team planning, grade-level planning, and professional learning communities.

Evidence Statements

Evidence statements are derived from the content standards and describe the knowledge and skills that an assessment item or task elicits from students.

Evidence statements are also designed to provide guidance for teachers in creating classroom learning opportunities that align with the expectations of the standards. Evidence statements should not be used as a checklist of student understanding, nor should they be used to limit instructional practices.

Performance Level Descriptors

To help educators and parents understand students' performance at each level, PLDs are available for each test. PLDs define the knowledge, skills, and processes that students likely demonstrate at different levels of proficiency within the reporting categories (1, 2, 3, 4). PLDs are not inclusive: they do not describe all possible skills students could demonstrate at each of the levels. PLDs should not be viewed as checklists of what students should know or be able to do.

These PLDs appear on Individual Student Reports and describe student performance on the assessment.

Level 1: A student at Level 1 shows a *limited* ability to understand and use the skills and knowledge needed for postsecondary readiness.

Level 2: A student at Level 2 shows a *basic* ability to understand and use the skills and knowledge needed for postsecondary readiness.

Level 3: A student at Level 3 shows an *effective* ability to understand and use the skills and knowledge needed for postsecondary readiness.

Level 4: A student at Level 4 shows an *excellen*t ability to understand and use the skills and knowledge needed for postsecondary readiness.

Detailed descriptions of performance levels for grade 4 mathematics are contained within this document.

Depth of Knowledge

The Kansas Assessment Program (KAP) uses Webb's Depth of Knowledge (DOK) framework to classify each assessment item based on the level of cognitive demand required by students. The four DOK levels **do not** directly correspond to the four performance levels of the KAP summative assessments.

DOK is a measure of cognitive complexity, not a measure of difficulty. Item difficulty is determined by the percentage of students who correctly respond to an item. It is possible for a DOK 2 item to be very difficult and for a DOK 3 item to be relatively easy.

Items within an assessment include a range of DOK levels and correspond to the levels of cognitive complexity required by the content standards. There are four DOK levels, as outlined below.

Level 1 Recall and Reproduction: Recall a fact, term, definition, principle, or concept; perform a simple procedure.

Level 2 Basic Application of Skills and Concepts: Apply conceptual knowledge; use provided information to select appropriate procedures for a task; perform two or more steps with decision points along the way; solve routine problems; organize or display data; interpret or use simple graphs.

Level 3 Strategic Thinking: Apply reasoning, using evidence, and developing a plan to approach or solve abstract, complex, or nonroutine problems; interpret information and provide justification when more than one approach is possible.

Level 4 Extended Thinking: Perform investigations or apply concepts and skills that require research and problem-solving across content areas or multiple sources.

Test Content Summary

The test summary provides general information related to the development and frequency of items on the summative assessment. The content emphases of the Kansas summative assessment reflect the instructional emphases outlined in the Kansas State Department of Education Grade Level Focus documents.

There are two groups of items that make up the summative assessment.

1. Skills and Concepts:
Items that assess Skills and Concepts align to one or more evidence statements within a single cluster and require students to perform operations, apply formulas, compare and classify information, and demonstrate conceptual understanding. These items involve applying knowledge of mathematical concepts and executing procedures to solve problems.

2. Strategic Thinking and Reasoning (STAR):
Items that assess Strategic Thinking and Reasoning align to one or more clusters and require students to use problem-solving and modeling strategies and to communicate their reasoning. These items involve analyzing complex mathematical and real-world problems, using problem-solving strategies and mathematical models to interpret and solve problems, constructing arguments to support the reasoning used, and critiquing the reasoning of others.

Table 1. Grade 4 Mathematics Test Summary

Skills and Concepts	Percentage of Assessment	Goal Depth of Knowledge
Operations and Algebraic Thinking	75%–88%	1, 2
Number and Operations in Base Ten		
Number and Operations—Fractions		
Measurement and Data		
Geometry		
Strategic Thinking and Reasoning (STAR)	**Percentage of Assessment**	**Goal Depth of Knowledge**
Problem-Solving and Modeling (PSM)	12%–25%	2, 3
Communicating Reasoning (CR)		

The remaining pages of this document are organized by cluster. The cluster descriptions include the cluster heading and a list of the standards within each cluster, as structured in the 2017 Kansas mathematics standards. Evidence statements and PLDs are shown below each cluster.

Cluster: 4.OA.A Use the four operations with whole numbers to solve problems.

Standards: 4.OA.1, 4.OA.2, 4.OA.3

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student represents and solves word problems involving multiplicative comparisons. 2. The student uses the four operations to solve multi-step word problems and assesses the reasonableness of answers. 3. The student represents multi-step word problems using situation and solution equations with a letter or symbol standing for the unknown quantity.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to use the four operations to represent and solve one-step word problems.	Students should be able to represent and solve multiplicative comparison problems; use the four operations to represent and solve two-step word problems.	Students should be able to use the four operations to solve multi-step word problems, including problems where the remainder must be interpreted; and represent multi-step word problems using situation and solution equations with a letter or symbol standing for the unknown quantity.	Students should be able to use mental computation and estimation strategies, including rounding, to assess the reasonableness of answers**.**

Cluster: 4.OA.B Gain familiarity with factors and multiples.

Standard: 4.OA.4

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student determines factors and factor pairs for a given whole number (from 1 to 100). 2. The student recognizes that a whole number (from 1 to 100) is a multiple of each of its factors. 3. The student determines whether a whole number (from 1 to 100) is a multiple of a given one-digit number. 4. The student determines whether a whole number (from 1 to 100) is prime or composite.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to recognize that a whole number is a multiple of each of its factors.	Students should be able to determine factors and factor pairs for whole numbers that are multiples of 2 or 5; and determine whether a whole number within 100 is a multiple of a given one-digit number.	Students should be able to determine all factor pairs for whole numbers within 100; and determine whether a whole number within 100 is prime or composite.	No descriptor

Cluster: 4.OA.C Generate and analyze patterns.

Standard: 4.OA.5

Grade Level Focus: Additional

Evidence Statements			
1. The student generates number patterns that follow a given rule. 2. The student generates shape patterns that follow a given rule. 3. The student analyzes number and shape patterns to identify and explain features that are not explicitly stated in the pattern rules.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to extend number and shape patterns that follow a given rule.	Students should be able to generate number and shape patterns that follow a given rule.	Students should be able to analyze number and shape patterns and identify features that are not explicitly stated in the pattern rules.	Students should be able to explain features of number and shape patterns that are not explicitly stated in the pattern rules.

Cluster: 4.NBT.A Generalize place value understanding for multi-digit whole numbers.

Standards: 4.NBT.1, 4.NBT.2, 4.NBT.3

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student compares digits in a multi-digit whole number based on place value. 2. The student reads and writes multi-digit whole numbers using base-ten numerals, number names, expanded form, and unit form. 3. The student compares two multi-digit whole numbers, written in the same form or in different forms, using >, <, =, and ≠ symbols. 4. The student rounds multi-digit whole numbers to any place.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to read and write whole numbers up to 1,000 in any form; compare whole numbers up to 1,000 and written in the same form; and round whole numbers up to 1,000 to any place.	Students should be able to read and write whole numbers up to 10,000 in any form; compare whole numbers up to 10,000 and written in the same form; and round whole numbers up to 10,000 to any place.	Students should be able to read and write whole numbers up to 100,000 in any form; compare whole numbers up to 100,000 and written in different forms; round whole numbers up to 100,000 to any place; and compare digits in a multi-digit number and recognize that a digit in one place represents 10 times as much as it represents in the place to its right.	Students should be able to read and write whole numbers up to 1,000,000 in any form; compare whole numbers up to 1,000,000 and written in different forms; and round whole numbers up to 1,000,000 to any place.

Cluster: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

Standards: 4.NBT.4, 4.NBT.5, 4.NBT.6

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student adds and subtracts multi-digit whole numbers. 2. The student multiplies whole numbers (up to four digits by one digit or two digits by two digits) using strategies based on place value understanding and properties of operations. 3. The student illustrates and explains multiplication and division calculations using equations, rectangular arrays, and area models. 4. The student finds whole numbers quotients and remainders (up to four-digit dividends and one-digit divisors) using strategies based on place value understanding, properties of operations, and the relationship between multiplication and division.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to add and subtract one- and two-digit whole numbers using strategies based on place value understanding; multiply two-digit whole numbers by one-digit whole numbers; and find whole-number quotients with no remainders with two-digit dividends and one-digit divisors.	Students should be able to add and subtract two- and three-digit whole numbers using any algorithm based on place value understanding; multiply three- and four-digit whole numbers by a one-digit whole number; find whole-number quotients and remainders with two-digit dividends and one-digit divisors; and illustrate multiplication and division by using equations, arrays, and area models.	Students should be able to fluently (efficiently, accurately, and flexibly) add and subtract multi-digit whole numbers using any algorithm based on place value understanding and properties of operations; multiply two-digit whole numbers by two-digit whole numbers using strategies based on place value understanding and properties of operations; and find whole-number quotients and remainders with three- and four-digit dividends and one-digit divisors using strategies based on place value understanding, properties of operations, and the relationship between multiplication and division.	Students should be able to explain multiplication and division using equations, rectangular arrays, and area models based on place value understanding, properties of operations, and the relationship between multiplication and division.

Cluster: 4.NF.A Extend understanding of fraction equivalence and ordering.

Standards: 4.NF.1, 4.NF.2

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student recognizes and explains when two or more fractions are equivalent by using visual fraction models. 2. The student generates equivalent fractions given an initial fraction or fraction model. 3. The student compares two fractions with different numerators and different denominators using >, <, =, and ≠ symbols, including using visual fraction models.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to recognize that fraction comparisons are valid only when the two fractions refer to the same whole.	Students should be able to recognize equivalent fractions using visual models; and compare two fractions with different numerators and different denominators by comparing to a benchmark fraction.	Students should be able to generate equivalent fractions using visual models; and compare two fractions with different numerators and different denominators by creating common denominators or numerators.	Students should be able to justify the comparison of two fractions with different numerators and different denominators.

Cluster: 4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Standards: 4.NF.3, 4.NF.4

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator. 2. The student adds and subtracts fractions and mixed numbers with like denominators in real-world and mathematical problems, including using visual fraction models and equations to represent the problem. 3. The student represents a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. 4. The student multiplies a fraction by a whole number in real-world and mathematical problems, including using visual fraction models and equations to represent the problem.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify fractions using visual models and understand that fraction $\frac{a}{b}$ with $a > 1$ is the sum of its unit fractional parts.	Students should be able to understand that a fraction $\frac{a}{b}$ is a multiple of $\frac{1}{b}$ by extending previous understanding of multiplication on whole numbers; decompose fractions with like denominators; represent and solve one-step mathematical problems involving addition and subtraction of fractions with like denominators.	Students should be able to identify and generate equivalent forms of fractions and mixed numbers with like denominators; represent and solve multi-step real-world and mathematical problems involving addition and subtraction of fractions and mixed numbers with like denominators; and represent and solve one-step real-world and mathematical problems involving multiplication of a fraction by a whole number.	Students should be able to solve multi-step real-world and mathematical problems involving multiplication of a fraction by a whole number.

Cluster: 4.NF.C Understand decimal notation for fractions, and compare decimal fractions.

Standards: 4.NF.5, 4.NF.6, 4.NF.7

Grade Level Focus: ▶ Major

Evidence Statements			
1. The student expresses a fraction with denominator 10 as an equivalent fraction with denominator 100. 2. The student adds two fractions with respective denominators 10 and 100. 3. The student uses decimal notation to represent fractions with denominators 10 or 100. 4. The student locates decimal numbers to the hundredths place on a number line. 5. The student compares two decimals to the hundredths place by reasoning about their size using >, <, =, and ≠ symbols and visual fraction models.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
No descriptor	Students should be able to express fractions with denominator 10 as equivalent fractions with denominator 100 and express those fractions as decimals.	Students should be able to add two fractions with respective denominators 10 and 100 by first converting to two fractions with like denominators; locate decimal numbers on a number line; and compare two decimals to the hundredths by using symbols and visual fraction models.	Students should be able to compare two decimals to the hundredths and justify the conclusions by using symbols and visual fraction models.

Cluster: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

Standards: 4.MD.1, 4.MD.2, 4.MD.3

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student converts measurements from larger units to smaller units within a single system of units (mi, yd, ft, in.; km, m, cm; lb, oz; kg, g; gal, qt, pt, cup; L, mL; and hr, min, s). 2. The student records measurement equivalents in a two-column table. 3. The student uses the four operations to solve real-world problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including using diagrams that represent measurement quantities. 4. The student recalls and applies the area and perimeter formulas for rectangles to solve real-world and mathematical problems.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to know relative sizes of measurement units within one system of units, including mi, yd, ft, in.; km, m, cm; lb, oz; kg, g; gal, qt, pt, cup; L, mL; and hr, min, s.	Students should be able to express measurements in a larger unit in terms of a smaller unit within a single system of measurement; record measurement equivalents in a two-column table; and determine the perimeter and area of rectangles in mathematical problems.	Students should be able to use the four operations to solve real-world problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including using diagrams that represent measurement quantities; and recall and apply the area and perimeter formulas for rectangles to determine a missing side length in mathematical problems.	Students should be able to recall and apply the area and perimeter formulas for rectangles to solve real-world problems.

Cluster: 4.MD.B Represent and interpret data.

Standard: 4.MD.4

Grade Level Focus: ◆ Supporting

Evidence Statements			
1. The student makes or identifies data displays (line plot, bar graph, pictograph) to represent data sets with measurements in fractions of a unit $\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right)$. 2. The student uses information presented in data displays (line plot, bar graph, pictograph) to solve problems involving addition and subtraction of fractions with like denominators. 3. The student interprets information presented in data displays (line plot, bar graph, pictograph).			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to identify information presented in data displays.	Students should be able to make data displays representing data sets in whole units and fractions of a unit.	Students should be able to use information presented in data displays to solve problems involving addition and subtraction of fractions with like denominators.	Students should be able to interpret data displays representing data sets in whole units and fractions of a unit.

Cluster: 4.G.A Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Standards: 4.G.1, 4.G.2, 4.G.3

Grade Level Focus: ● Additional

Evidence Statements			
1. The student draws points, lines, line segments, rays, and angles and identifies these in two-dimensional figures. 2. The student classifies two-dimensional figures based on the presence or absence of parallel or perpendicular lines and types of angles (right, acute, obtuse, straight, reflex). 3. The student categorizes triangles based on angles (right, acute, obtuse, equiangular,) and sides (scalene, isosceles, equilateral). 4. The student identifies and draws lines of symmetry in line-symmetric figures, and distinguishes line-symmetric figures from line-asymmetric figures.			
Performance Level Descriptors (PLDs)			
Level 1	**Level 2**	**Level 3**	**Level 4**
Students should be able to draw points, lines, line segments, rays, angles, and parallel and perpendicular lines.	Students should be able to identify points, lines, line segments, rays, angles, and parallel and perpendicular lines in two-dimensional figures.	Students should be able to classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines and the presence or absence of angles; and recognize lines of symmetry in two-dimensional figures.	Students should be able to categorize triangles based on angles and sides; and distinguish line-symmetric figures from line-asymmetric figures.