



## **Assessment Development Guide**

### **Educator Resource**

### **Mathematics: Grade 5**

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 post-secondary readiness.

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

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

**Level 4:** A student at Level 4 shows an *excellent* ability to understand and use the skills and knowledge needed for post-secondary readiness.

Detailed descriptions of performance levels for grade 5 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:

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 5 Mathematics Test Summary**

Skills and Concepts		Percentage of Assessment	Depth of Knowledge
<i>Domains</i>	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		Percentage of Assessment	Depth of Knowledge
	Problem-Solving and Modeling	12%–25%	2, 3
	Communicating Reasoning		

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: 5.OA.A** Write and interpret numerical expressions.

**Standards:** 5.OA.1, 5.OA.2

**Grade Level Focus:** ● Additional

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student evaluates numerical expressions that contain parentheses.</li> <li>2. The student writes or identifies numerical expressions that record calculations represented with words.</li> <li>3. The student interprets numerical expressions in words without evaluating them.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to write and identify numerical expressions, written in words and containing no parentheses.	Students should be able to evaluate numerical expressions containing one set of parentheses; write and identify numerical expressions, written in words and containing one set of parentheses; and interpret numerical expressions, written in words and containing one set of parentheses.	Students should be able to evaluate numerical expressions containing two non-nested sets of parentheses; write and identify numerical expressions, written in words and containing two non-nested sets of parentheses; and interpret numerical expressions, written in words and containing two non-nested sets of parentheses.	Students should be able to evaluate numerical expressions containing any number of non-nested sets of parentheses; write and identify numerical expressions, written in words and containing any number of non-nested sets of parentheses; and interpret numerical expressions, written in words and containing any number of non-nested sets of parentheses.

**Cluster: 5.NBT.A** Understand the place value system.

**Standards:** 5.NBT.1, 5.NBT.2, 5.NBT.3, 5.NBT.4

**Grade Level Focus:** ► Major

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student compares digits in a multi-digit number based on place value.</li> <li>2. The student explains patterns in the number of zeros of the product when multiplying a number by powers of 10 and explains patterns in the placement of the decimal point when a decimal is multiplied or divided by powers of 10.</li> <li>3. The student uses whole-number exponents to denote powers of 10.</li> <li>4. The student reads and writes decimals to the thousandths using base-ten numerals, number names, expanded form, and unit form.</li> <li>5. The student compares two decimals to the thousandths, written in the same form or in different forms, using <math>&gt;</math>, <math>&lt;</math>, <math>=</math>, and <math>\neq</math> symbols.</li> <li>6. The student rounds decimals to the nearest whole number, tenth, or hundredth.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to read and write decimals to the thousandths using base-ten numerals, number names, expanded form, and unit form; and round decimals to the nearest hundredth.	Students should be able to compare digits in multi-digit numbers and recognize that a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left; compare decimals written in the same form; and round decimals to the next-largest place.	Students should be able to use whole-number exponents to denote powers of 10; explain patterns in the number of zeros of the product when multiplying by powers of 10 and explain patterns in the placement of the decimal point when multiplying or dividing by powers of 10; compare decimals written in different forms; and round decimals to any place.	Students should be able to apply strategies that involve multiplying by powers of 10, reading, writing, comparing, and rounding decimals to solve real-world and mathematical problems.

**Cluster: 5.NBT.B** Perform operations with multi-digit whole numbers and with decimals to hundredths.

**Standards:** 5.NBT.5, 5.NBT.6, 5.NBT.7

**Grade Level Focus:** ► Major

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student multiplies multi-digit whole numbers.</li> <li>2. The student determines whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies based on place value, properties of operations, and the relationship between multiplication and division.</li> <li>3. The student illustrates and explains division of whole numbers with up to four-digit dividends and two-digit divisors using equations, rectangular arrays, and area models.</li> <li>4. The student adds, subtracts, multiplies, and divides decimals to the hundredths using models and strategies based on place value, properties of operations, and the relationship between the operations and explain the reasoning used.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to multiply one- and two-digit whole numbers; divide whole numbers with two- and three-digit dividends and one-digit divisors; and perform the four operations on decimals to the tenths and a whole number.	Students should be able to multiply three- and four-digit whole numbers using strategies based on place value understanding; divide whole numbers with two- and three-digit dividends and two-digit divisors using strategies based on place value understanding; and perform the four operations on decimals to the hundredths and a whole number using strategies based on place value understanding.	Students should be able to fluently (efficiently, accurately, and flexibly) multiply multi-digit whole numbers using an efficient algorithm based on place value understanding and properties of operations; divide whole numbers with four-digit dividends and two-digit divisors using strategies based on place value understanding, properties of operations, and the relationship between multiplication and division; illustrate and explain division of	Students should be able to justify the reasoning and algorithms used to perform operations with decimals.

		whole numbers using equations, rectangular arrays, and area models; and perform the four operations on decimals to the hundredths using models and strategies based on place value understanding, properties of operations, and the relationships between the operations.	
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**Cluster: 5.NF.A** Use equivalent fractions as a strategy to add and subtract fractions.

**Standards:** 5.NF.1, 5.NF.2

**Grade Level Focus:** ► Major

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student adds and subtracts fractions and mixed numbers with unlike denominators in real-world and mathematical problems, including using equivalent fractions, visual fraction models, and equations to represent the problem.</li> <li>2. The student identifies and explains the use of equivalent fractions when adding and subtracting fractions and mixed numbers with unlike denominators.</li> <li>3. The student uses benchmark fractions to estimate and assess the reasonableness of answers.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to add and subtract two fractions with unlike denominators (denominators < 12) when one denominator is a factor of the other in mathematical problems.	Students should be able to add fractions and mixed numbers with unlike denominators (denominators ≤ 12) when one denominator is a factor of the other in mathematical problems; subtract a fraction or mixed number from a whole number (denominators ≤ 4); and use benchmark fractions $(\frac{1}{4}, \frac{1}{2})$ and number sense to estimate mentally and assess the reasonableness of answers (denominators ≤ 12).	Students should be able to add and subtract fractions and mixed numbers with unlike denominators in mathematical problems and use benchmark fractions and number sense to estimate mentally and assess the reasonableness of answers.	Students should be able to add and subtract fractions and mixed numbers with unlike denominators in real-world problems and use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

**Cluster: 5.NF.B** Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

**Standards:** 5.NF.3, 5.NF.4, 5.NF.5, 5.NF.6, 5.NF.7

**Grade Level Focus:** ► Major

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student interprets a fraction as division of the numerator by the denominator.</li> <li>2. The student divides whole numbers leading to quotients in the form of fractions or mixed numbers in real-world problems, including using visual fraction models and equations to represent the problem.</li> <li>3. The student multiplies fractions and mixed numbers in real-world and mathematical problems, including using visual fraction models and equations to represent the problem.</li> <li>4. The student multiplies fractional side lengths to find areas of rectangles, including representing the products as rectangular areas.</li> <li>5. The student compares and explains the size of a product to the size of one factor based on the size of the other factor, without performing the indicated multiplication.</li> <li>6. The student divides unit fractions by non-zero whole numbers and whole numbers by unit fractions in real-world and mathematical problems, including using visual fraction models and equations to represent the problem.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
<p>Students should be able to multiply a whole number by a fraction between 0 and 1; know the effect that multiplication has on the size of the product when the factors are a whole number and a fraction between 0 and 1; and interpret and perform division of a whole number by <math>\frac{1}{2}</math> or <math>\frac{1}{3}</math>.</p>	<p>Students should be able to demonstrate understanding that division of whole numbers can result in fractions; represent and solve word problems involving division of whole numbers leading to answers in the form of fractions; multiply a whole number by a fraction greater than 1 or by a mixed number; know the effect that multiplication has on the size of the product when the factors are a whole number and a fraction greater than 1 or a mixed number; and interpret and perform division of a whole number by any unit fraction.</p>	<p>Students should be able to represent and solve word problems involving division of whole numbers leading to answers in the form of mixed numbers; multiply a fraction or mixed number by a fraction or mixed number; know the effect that multiplication has on the size of the product when the factors are fractions and mixed numbers; and interpret and perform division of a unit fraction by a whole number.</p>	<p>Students should be able to solve problems involving the areas of rectangles with fractional or mixed-number side lengths; solve word problems involving multiplication of fractions and mixed numbers; and solve word problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.</p>



**Cluster: 5.MD.A** Convert like measurement units within a given measurement system.

**Standard:** 5.MD.1

**Grade Level Focus:** ◆ Supporting

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student converts units of linear measure within a single measurement system and uses these conversions in solving multi-step, real-world problems (km, m, cm, mm; mi, yd, ft, in.).</li> <li>2. The student converts units of weight/mass measure within a single measurement system and uses these conversions in solving multi-step, real-world problems (kg, g; ton, lb, oz).</li> <li>3. The student converts units of liquid volume measure within a single measurement system and uses these conversions in solving multi-step, real-world problems (L, mL; gal, qt, pt, cup, fl oz).</li> <li>4. The student converts units of time measure within a single measurement system and uses these conversions in solving multi-step, real-world problems (wk, day, hr, min, s).</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
No descriptor	Students should be able to convert a whole-number metric measurement to a different metric measurement resulting in a whole number; and convert a whole-number customary measurement to a different customary measurement resulting in a whole number.	Students should be able to convert a metric measurement to the tenths place to a different metric measurement; convert a customary measurement given to the one-fourth unit (fractions or mixed numbers) from a larger measurement unit to a smaller one; and use these conversions to solve real-world problems.	Students should be able to convert like measurements within a system using whole numbers, fractions (customary system), and decimals (metric system); and use these conversions to solve multi-step, real-world problems.

**Cluster: 5.MD.B** Represent and interpret data.

**Standard:** 5.MD.2

**Grade Level Focus:** ◆ Supporting

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student makes or identifies data displays (line plot, bar graph, pictograph) to represent data sets with measurements in fractions of a unit <math>(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16})</math>.</li> <li>2. The student uses information presented in data displays (line plot, bar graph, pictograph) to solve problems involving addition, subtraction, and multiplication of fractions.</li> <li>3. The student interprets information presented in data displays (line plot, bar graph, pictograph).</li> </ol>			
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 fractions of a unit.	Students should be able to use information presented in data displays to solve problems involving addition, subtraction, and multiplication of fractions.	Students should be able to interpret data displays representing data sets in fractions of a unit.

**Cluster: 5.MD.C** Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

**Standards:** 5.MD.3, 5.MD.4, 5.MD.5

**Grade Level Focus:** ► Major

Evidence Statements			
<ol style="list-style-type: none"> <li>1. The student determines the volume of right rectangular prisms with whole-number edge lengths by counting or packing unit cubes (cubic cm, cubic in., cubic ft, and non-standard cubic units).</li> <li>2. The student represents the volume of right rectangular prisms as whole-number products.</li> <li>3. The student determines the volume of right rectangular prisms with whole-number edge lengths by applying the volume formulas in real-world and mathematical problems.</li> <li>4. The student determines the volume of solid figures composed of at least two non-overlapping right rectangular prisms by applying the volume formulas.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to understand concepts of volume measurement and use unit cubes to determine the volume of right rectangular prisms.	Students should be able to recognize and represent the volume of right rectangular prisms packed with unit cubes is related to the edge lengths.	Students should be able to represent the volume of right rectangular prisms as whole-number products; apply the formulas to determine the volume of right rectangular prisms; and determine the volume of figures composed of two non-overlapping right rectangular prisms and apply this technique to solve real-world problems.	Students should be able to determine the volume of right rectangular prisms after multiplying the edge length of a side by a whole-number factor and compare it to the original.

**Cluster: 5.G.A** Graph points on the coordinate plane to solve real-world and mathematical problems.

**Standards:** 5.G.1, 5.G.2

**Grade Level Focus:** ● Additional

Evidence Statements			
<ol style="list-style-type: none"> <li>The student interprets coordinate values of points graphed on a coordinate grid (first quadrant of the coordinate plane) or in the context of a given situation.</li> <li>The student graphs and identifies coordinate points on a coordinate grid (first quadrant of the coordinate plane) in real-world and mathematical problems.</li> </ol>			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
Students should be able to graph and identify whole-number coordinate points on a coordinate grid with unit axis increments in mathematical problems.	Students should be able to graph and identify whole-number coordinate points on a coordinate grid with whole-number axis increments in mathematical problems.	Students should be able to interpret whole-number coordinate points on a coordinate grid with whole-number axis increments in real-world and mathematical problems.	Students should be able to graph coordinate points on a coordinate grid with fractional axis increments, where at least one term is a fraction; interpret coordinate points on a coordinate grid with fractional axis increments, where at least one term is a fraction, in real-world and mathematical problems.

**Cluster: 5.G.B** Classify two-dimensional figures into categories based on their properties.

**Standards:** 5.G.3, 5.G.4

**Grade Level Focus:** ● Additional

Evidence Statements			
1. The student classifies and compares two-dimensional figures based on attributes and properties. 2. The student classifies two-dimensional figures into subcategories in a hierarchy based on properties.			
Performance Level Descriptors (PLDs)			
Level 1	Level 2	Level 3	Level 4
No descriptor	Students should be able to classify two-dimensional figures into categories by their attributes and properties.	Students should be able to classify two-dimensional figures into subcategories in a hierarchy based on attributes and properties.	Students should be able to compare two-dimensional figures based on attributes and properties.