# Assessment Development Guide
## Educator Resource
Mathematics: Grade 7

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 *excellen*t ability to understand and use the skills and knowledge needed for post-secondary readiness.

Detailed descriptions of performance levels for grade 7 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 7 Mathematics Test Summary**

| Skills and Concepts | | Percentage of Assessment | Depth of Knowledge |
|---|---|---|---|
| *Domains* | Ratios and Proportional Relationships | 75%–88% | 1, 2 |
| | The Number System | | |
| | Expressions and Equations | | |
| | Geometry | | |
| | Statistics and Probability | | |
| **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: 7.RP.A** Analyze proportional relationships and use them to solve real-world and mathematical problems.

**Standards**: 7.RP.1, 7.RP.2, 7.RP.3

**Grade Level Focus**: ▶ Major

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student computes unit rates of proportional relationships.<br>2. The student determines whether two quantities, represented in a variety of ways, are in a proportional relationship.<br>3. The student represents proportional relationships between quantities using equations.<br>4. The student interprets specific values from a proportional relationship based on the context of the situation.<br>5. The student solves multi-step ratio and percentage problems. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to identify proportional relationships represented verbally, graphically, or numerically in tables. | Students should be able to compute unit rates involving whole numbers and represent proportional relationships between two quantities using equations. | Students should be able to compute and use unit rates to solve problems involving rational numbers; identify, represent, and analyze proportional relationships represented in a variety of ways (verbally, graphically, numerically in tables, or algebraically); analyze graphs of proportional relationships to explain what the points ($x$, $y$) and (1, $r$) represent, where $r$ is the unit rate, and use this information to solve problems; and use proportional relationships to solve multi-step percentage problems. | Students should be able to solve real-world and mathematical problems involving proportional relationships represented verbally, graphically, numerically in tables, or algebraically, and identify connections between representations. |

**Cluster: 7.NS.A** Apply and extend previous understandings of operations with positive rational numbers to add, subtract, multiply, and divide all rational numbers.

**Standards**: 7.NS.1, 7.NS.2, 7.NS.3

**Grade Level Focus**: ▶ Major

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student interprets rational number values on a number line, including modeling addition and subtraction expressions.<br>2. The student applies properties of operations as strategies to add and subtract rational numbers.<br>3. The student applies properties of operations as strategies to multiply and divide rational numbers.<br>4. The student converts rational numbers in fraction form to decimal form.<br>5. The student solves and interprets real-world and mathematical problems involving the four operations with rational numbers. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to add, subtract, multiply, and divide rational numbers with a number line or other manipulative. | Students should be able to identify the absolute value of a rational number and show that a number and its opposite have a sum of 0; solve mathematical problems involving rational numbers using addition and subtraction; and convert from a familiar fraction to a decimal. | Students should be able to understand $p + q$ as a number located $\|q\|$ units from $p$ on a number line in either direction depending on the sign of $q$; extend previous understandings of subtraction to realize it is the same as adding the additive inverse; know, understand, and use the rules for multiplying and dividing signed numbers; convert from a fraction to a decimal; and solve real-world and mathematical problems involving rational numbers using the four operations. | Students should be able to solve and interpret real-world problems involving rational numbers using the four operations. |

**Cluster: 7.EE.A** Use properties of operations to generate equivalent expressions.

**Standards**: 7.EE.1, 7.EE.2

**Grade Level Focus**: ▶ Major

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student adds and subtracts linear expressions with rational coefficients.<br>2. The student factors linear expressions with integer coefficients.<br>3. The student expands linear expressions with rational coefficients.<br>4. The student generates equivalent linear expressions using a combination of addition and subtraction, factoring, and expansion. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to apply properties of operations as strategies to add and subtract linear expressions with whole-number coefficients. | Students should be able to apply properties of operations as strategies to add and subtract linear expressions with integer coefficients; factor linear expressions with whole-number coefficients; and expand linear expressions with integer coefficients. | Students should be able to apply properties of operations as strategies to add and subtract linear expressions with rational coefficients; factor linear expressions with integer coefficients; expand linear expressions with rational coefficients; and rewrite expressions to show how quantities are related in a problem-solving context. | No descriptor |

**Cluster: 7.EE.B** Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**Standards**: 7.EE.3, 7.EE.4

**Grade Level Focus**: ▶ Major

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student evaluates numerical expressions, including converting between different forms of rational numbers.<br>2. The student represents and solves real-world and mathematical problems leading to equations of the form $px + q = r$ or $p(x + q) = r$, where $p$, $q$, and $r$ are specific rational numbers.<br>3. The student represents and solves real-world and mathematical problems leading to one-step inequalities or inequalities of the form $px + q > r$ or $px + q < r$, where $p$, $q$, and $r$ are specific rational numbers.<br>4. The student graphs and interprets the solution set of an inequality on a number line based on the context of the situation. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to solve multi-step problems with integers or common fractions with denominators of 2 through 10, 25, 50, or 100 and decimals to the hundredths place; solve equations in the form of $px + q = r$, where $p$, $q$, and $r$ are integers; and distinguish between equations and inequalities with integer coefficients with or without a real-world context. | Students should be able to solve multi-step mathematical problems with rational numbers; represent and solve problems leading to equations in the form of $px + q = r$ and $p(x + q) = r$, where $p$, $q$, and $r$ are rational numbers; and represent and solve problems leading to one-step linear inequalities. | Students should be able to solve multi-step real-world problems with rational numbers; represent and solve problems leading to inequalities in the form of $px + q > r$ and $px + q < r$, where $p$, $q$, and $r$ are rational numbers; and graph solution sets to one-variable inequalities. | Students should be able to interpret the solution sets to one-variable inequalities. |

**Cluster: 7.G.A** Draw, construct, and describe geometrical figures and describe the relationships between them.

**Standards:** 7.G.1, 7.G.2, 7.G.3

**Grade Level Focus:** ● Additional

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student creates and identifies scale drawings.<br>2. The student uses proportional reasoning to solve problems involving scale drawings.<br>3. The student reproduces scale drawings at a different scale.<br>4. The student identifies three-dimensional objects generated by rotating a two-dimensional (rectangular or triangular) object around one edge.<br>5. The student describes the two-dimensional figures that result from slicing a three-dimensional figure by a plane. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| No descriptor | Students should be able to describe the relationship between a geometric figure and its scale drawing by finding the scale factor between them. | Students should be able to compute actual lengths and areas from a scale drawing; reproduce a scale drawing using a different scale; identify three-dimensional objects generated by rotating a two-dimensional object around one edge; describe the two-dimensional figures that result from slicing right rectangular prisms and cylinders by planes that are parallel to a face. | Students should be able to describe the two-dimensional figures that result from slicing cones, spheres, pyramids, or other three-dimensional figures by planes that are not parallel to a given face. |

**Cluster: 7.G.B** Solve real-life and mathematical problems involving area, surface area, and volume.

**Standards:** 7.G.4, 7.G.5, 7.G.6

**Grade Level Focus:** ● Additional

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student solves real-world and mathematical problems involving circumference and area of circles.<br>2. The student solves real-world and mathematical problems involving area of two-dimensional objects composed of polygons.<br>3. The student solves real-world and mathematical problems involving volume of three-dimensional objects composed of right prisms and cylinders.<br>4. The student solves real-world and mathematical problems involving surface area of three-dimensional objects composed of right prisms and cylinders. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to calculate the area of triangles and rectangles and the volume of cubes. | Students should be able to calculate the circumference of circles; calculate the area of circles, quadrilaterals, and polygons; and calculate the volume of right rectangular prisms and cylinders. | Students should be able to use formulas to explore the relationship between area and circumference of a circle; solve problems involving the area and circumference of circles; solve problems involving the area of polygons and the volume and surface area of three-dimensional objects (composed of triangles, quadrilaterals, cubes, right prisms, and cylinders). | Students should be able to solve real-world and mathematical problems involving volume and surface area of three-dimensional objects with polygonal faces; and generalize formulas for volume and surface area of right prisms and cylinders. |

**Cluster: 7.SP.A** Use random sampling to draw inferences about a population.

**Standards:** 7.SP.1, 7.SP.2

**Grade Level Focus:** ◆ Supporting

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student determines whether a sample is representative of a population.<br>2. The student draws inferences about a population using data from a random sample. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to describe what a representative sample entails and identify biased and unbiased samples of a population. | Students should be able to determine whether a sample is random; understand that random samples of an appropriate population are representative samples that support valid results; and use data from a random sample to draw obvious inferences about a population. | Students should be able to use data from a random sample to draw inferences about a population with an unknown characteristic of interest. | Students should be able to recognize multiple samples (or simulated samples) of the same size and gauge the variation to estimate or make predictions. |

**Cluster: 7.SP.B** Draw informal comparative inferences about two populations.

**Standards:** 7.SP.3, 7.SP.4

**Grade Level Focus:** ● Additional

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student uses measures of center (mean, median, and mode) and measures of variability (range, interquartile range, and mean absolute deviation) to make comparative inferences about two populations. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to use the mean to compare and make inferences about two populations. | Students should be able to use the range to compare and make inferences about two populations; and informally compare the visual overlap of two numerical data distributions with similar variability, by measuring the difference between the centers in any context. | Students should be able to use measures of variability, including mean absolute deviation, for numerical data from random samples to make comparative inferences about two populations. | No descriptor |

**Cluster: 7.SP.C** Investigate chance processes and develop, use, and evaluate probability models.

**Standards:** 7.SP.5, 7.SP.6, 7.SP.7, 7.SP.8

**Grade Level Focus:** ◆ Supporting

| **Evidence Statements** | | | |
|---|---|---|---|
| 1. The student determines the likelihood of an event.<br>2. The student determines the probability of a simple event.<br>3. The student predicts the approximate relative frequency given the probability.<br>4. The student compares the predicted probability to the observed frequency.<br>5. The student represents the sample space and determines the probability of a compound event. | | | |
| **Performance Level Descriptors (PLDs)** | | | |
| **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Students should be able to determine the probability of a simple event; and understand that probabilities are numbers between 0 (impossible) and 1 (always) and that a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely. | Students should be able to approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency; and predict the approximate relative frequency given the probability. | Students should be able to determine probability of a compound event using organized lists, tables, tree diagrams, and simulations; develop a probability model (which may not be uniform) and use it to compare probabilities of an event. | Students should be able to design, describe, and construct a simulation to generate frequencies for compound events; and explain what might account for differences between theoretical and experimental results and evaluate the associated probability model. |