Alabama Comprehensive Assessment Program (ACAP)

Summative

Item Specifications

Mathematics

Grade 8

Alabama Item Specifications
Grade 8 Mathematics
Alabama Comprehensive Assessment Program (ACAP)
Summative

The *Alabama Comprehensive Assessment Program* (ACAP) *Summative* item specifications are based on the development of summative assessments that measure the Alabama Course of Study Standards. The item specifications define the purpose of the *ACAP Summative* and provide important information regarding the content to be measured. The item specifications also serve as a road map to guide Alabama educators in the development and subsequent review of items that best measure the Course of Study Standards for a given grade and subject area. Each item specification is aligned to the given Alabama content area, cluster, and standard and includes the following key information:

- Evidence statements
- Content limits/constraints
- Recommended Webb's Depth of Knowledge (DOK) or cognitive levels
- Calculator usage
- Item types for measuring a given standard
- Information regarding whether or not context is allowable
- Sample item stem information

The appendix to this document includes sample test items, along with information about the item, including item type, page reference, alignment, depth of knowledge, and answer key. These sample items are provided to be an additional resource for educators to help guide instruction and assessment-building in the classroom. Teachers can use the sample items as models when leading classroom discussion as well as creating items for classroom tests or quizzes. In each sample item, the level of rigor needed in the item in order to align with the content standard is evident.

Definitions

Course of Study Standards: The Course of Study Standards are a set of content curriculum statements that define what students should know and be able to do at a given grade level. The goal is to prepare students for future opportunities and options in the workplace and for everyday life. Through the implementation of the Alabama Course of Study for Mathematics, students will be well equipped for the workforce upon graduation or ready to pursue higher levels of education in Alabama's colleges and universities.

Alabama Content Areas: Alabama content areas are large groups of related clusters and content standards. Because mathematics is a connected subject, standards from different Alabama content areas may sometimes be closely related.

Clusters: Clusters are groups of related content standards. Because mathematics is a connected subject, standards from different clusters may sometimes be closely related.

Standards: Standards define what students should understand (know) and be able to do at the conclusion of a course or grade. The standard text in the item specification is preceded by a standard identifier (e.g., 4.OA.1) to indicate the student grade level as fourth (4), the Alabama content area as Operations and Algebraic Thinking (OA), and the standard number as one (1).

Evidence Statements: Evidence statements are closely aligned to the standard and do not deviate from the requirements of the standard. Standards that are substantial in content do provide for a better opportunity to "unpack the standard," which is the case for many of the Alabama Course of Study Standards. The evidence statements serve that purpose.

Assessment Limits/Content Constraints: Assessment limits and/or content constraints define the range of content knowledge and the degree of difficulty allowable when items are written to measure a given standard.

Depth of Knowledge (DOK): Depth of knowledge involves the cognitive complexity or the nature of thinking required for a given item. Most recently, Webb's Depth of Knowledge levels are used in the development of items for cognitive demand. Therefore, when developing items for depth of knowledge, the item should be as demanding cognitively as what the actual standard expects. Webb's Depth of Knowledge includes four levels, from the lowest (basic recall) to the highest (extended thinking). The mathematics *ACAP Summative* assessment items are written to one of three cognitive levels of complexity:

- Level 1: Recall
- Level 2: Application of a Skill/Concept
- Level 3: Strategic Thinking

Item Types: The *ACAP Summative* assessments are composed of various item types. These item types are described in the following section.

Context: Context provides information regarding the types of stimulus materials that can be used in the items. If a context is allowable, it means that the item may have context. If context is required, then the item measuring the given standard must have context. If no context is noted, then the items measuring the given standard should not have context.

Sample Stem Information: This statement explains what students are expected to do when they respond to a given item.

Item Types

The *Alabama Comprehensive Assessment Program* (ACAP) *Summative* assessments are composed of various item types. These item types are described below.

Multiple-Choice (MC) Items: MC items have four answer choices, including three distractors and one correct answer. Distractors for mathematics represent common misconceptions, incorrect logic, incorrect application of an algorithm, computational errors, etc. A correct response to an MC item is worth one score point in the mathematics *ACAP Summative*.

Multiple-Select (MS) Items: MS items are similar in structure to MC items. However, unlike an MC item, an MS item has more than four options and more than one correct answer. In other words, multiple responses are required for a given item. For mathematics, there are two types of MS configurations. One has five answer options, two of which are correct, and the other has six answer options, two or three of which are correct. Directions for the number of options to select are provided with each item. A correct response to an MS item is worth one score point in the mathematics *ACAP Summative*.

Short-Answer (SA) Items: SA items are constructed-response items that require a keyed response from the student. The number of characters is limited to a relatively small number in order to facilitate autoscoring. The types of characters allowed can also be limited to text only, numbers only, or a mix. In the mathematics *ACAP Summative*, this item type is autoscored using scoring guidelines for the correct answer. A correct response to an SA item is worth one score point in the mathematics *ACAP Summative*.

Technology-Enhanced (TE) Items: TE items share the same functional structure as traditional paper-and-pencil test items; however, the expansive features and functions of a computer-based medium allow for the incorporation of technical enhancements into traditional elements of a test item, such as the stem, the stimulus (if any), the response area, or a combination of all three. These items require the use of one or more tools. A correct response to a TE item is worth one score point in the mathematics *ACAP Summative*. Mathematics TE items include, but are not limited to, the following:

- **Angle Draw Input:** These TE items provide a student with a given ray, and then the student completes the angle by drawing a second ray.
- **Drag-and-Drop Input**: These TE items provide a student with draggable entities that can be configured to be used once or multiple times.
- **Drop-Down List Input:** These TE items allow a student to select elements in drop-down lists that can be embedded within text or tables.
- **Hot Spot:** These TE items allow for an image to be highlighted or replaced with another image when selected by the student.
- **Line Plot Input:** These TE items provide another way for a student to graphically represent data when the structure is provided. Certain labeling on the line plot can be done by the student.
- **Matching:** These TE items allow for the use of text or graphics as the matching objects. The student selects one object and then selects a second object to connect them.
- **Matching Table:** These TE items include a table with multiple rows and columns, and the student makes matches between the given elements in the rows and columns. The table can be customized to allow for only a single selection in a row or column or for multiple selections within each.
- **Number Line Input:** These TE items allow a student to create a number line graph that might involve plotting points only or points and lines. Both closed and open points are available, as well as line segments and rays.

Standards for Mathematical Practice

The Standards for Mathematical Practice are based on important "processes and proficiencies" that have longstanding importance in mathematics education. The first of these are the National Council of Teachers of Mathematics (NCTM) process standards of problem-solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up: Helping Children Learn Mathematics*. These proficiencies include adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations, and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently, and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy). Because these practices are an important part of the curriculum, they will be assessed throughout the mathematics *ACAP Summative*. The eight Standards for Mathematical Practice are listed below, but more detail is provided in the Alabama Course of Study for Mathematics.

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Mathematics Reference Sheets

An online reference sheet is available as a pop-up window in certain grades.

Grade	Conversions	Formulas
2	No	No
3	No	No
4	Yes	Yes
5	Yes	Yes
6	Yes	Yes
7	Yes	Yes
8	Yes	Yes

Item Specifications for Mathematics

Item specifications are one of the key requirements for a high-quality, legally defensible, standards-based assessment. Item specifications help define important characteristics of the items (i.e., test questions) developed for each standard. These item specifications provide guidelines to help clarify the focus of what is to be assessed, what items may include, and what items may not include (i.e., assessment limits). Item specifications are used by item writers, item editors, and item reviewers as a common reference throughout the item-development process, from initial writing to final approval. These item specifications are based on the 2019 Alabama Course of Study Standards for Mathematics.

Content Area	NSO: Number Systems and Operations
Cluster	Understand that the real number system is composed of rational and irrational numbers.
Standard (2019 AL COS)	8.NSO.1a: Define the real number system as composed of rational and irrational numbers. a. Explain that every number has a decimal expansion; for rational numbers, the decimal expansion repeats or terminates.
Evidence Statements	The student will explain that every number has a decimal expansion; for rational numbers, the decimal expansion repeats or terminates.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given a number or list of numbers, classify the number(s) as rational or irrational.

Content Area	NSO: Number Systems and Operations
Cluster	Understand that the real number system is composed of rational and irrational numbers.
Standard (2019 AL COS)	8.NSO.1b: Define the real number system as composed of rational and irrational numbers. b. Convert a decimal expansion that repeats into a rational number.
Evidence Statements	The student will convert a decimal expansion that repeats into a rational number.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	

Content Area	NSO: Number Systems and Operations
Cluster	Understand that the real number system is composed of rational and irrational numbers.
Standard (2019 AL COS)	8.NSO.2: Locate rational approximations of irrational numbers on a number line, compare their sizes, and estimate the values of the irrational numbers.
Evidence Statements	The student will locate rational approximations of irrational numbers on a number line, compare their sizes, and estimate the values of the irrational numbers.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given comparisons involving irrational numbers, identify which comparison is correct. Given an irrational number, identify its approximate place on the number line. Given an irrational number, identify or generate a range of numbers that the given number is within. Given an expression involving irrational numbers, estimate the value. Given a point on a number line, identify the rational approximation. Given an estimated value, identify which expression most closely approximates the estimated value.

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.3: Develop and apply properties of integer exponents to generate equivalent numerical and algebraic expressions.
Evidence Statements	The student will develop and apply properties of integer exponents to generate equivalent numerical and algebraic expressions.
Assessment Limits / Content Constraints	Tasks do not have a context. Tasks focus on properties and equivalence, not on simplification. Tasks should involve a single common base or a potential common base.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given an exponential expression, number, or exponential computation, generate or identify its equivalent in another form.

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.4a: Use square root and cube root symbols to represent solutions to equations. a. Evaluate square roots of perfect squares (less than or equal to 225) and cube roots of perfect cubes (less than or equal to 1000).
Evidence Statements	The student will evaluate square roots of perfect squares (less than or equal to 225) and cube roots of perfect cubes (less than or equal to 1000).
Assessment Limits / Content Constraints	Tasks may or may not have a context. Students are not required to simplify expressions such as $\sqrt{8}$ to $2\sqrt{2}$.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a simple quadratic or cubic equation, determine or identify the number of solutions for that equation. Given a simple quadratic or cubic equation, generate or identify the solution to the equation. Given a number in square or cubic root notation, generate or identify the root.

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.4b: Use square root and cube root symbols to represent solutions to equations. b. Explain that the square root of a non-perfect square is irrational.
Evidence Statements	The student will explain that the square root of a non-perfect square is irrational.
Assessment Limits / Content Constraints	Tasks may or may not have a context.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.5: Estimate and compare very large or very small numbers in scientific notation.
Evidence Statements	The student will estimate and compare very large or very small numbers in scientific notation.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a situation with at least two numbers expressed in scientific notation, determine how many times as much as the other number one of the numbers is. Given one number expressed in scientific notation along with a comparative value (e.g., 10 times as much), determine the other number expressed in scientific notation.

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.6a: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. a. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
Evidence Statements	The student will use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
Assessment Limits / Content Constraints	Tasks have “thin context” or no context. Rules or conventions for significant figures are not assessed. Tasks may involve both decimal and scientific notation.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Apply concepts of integer exponents and radicals.
Standard (2019 AL COS)	8.AF.6b: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. b. Interpret scientific notation that has been generated by technology.
Evidence Statements	The student will interpret scientific notation that has been generated by technology.
Assessment Limits / Content Constraints	Tasks have “thin context” or no context. Rules or conventions for significant figures are not assessed. Tasks may involve both decimal and scientific notation. Tasks may require students to recognize 4.5E–2 (or 4.5e–2) from technology as 4.5×10^{-2}.
DOK(s)	1, 2, or 3
Calculator	NO – a calculator will not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.7: Determine whether a relationship between two variables is proportional or non-proportional.
Evidence Statements	The student will determine whether a relationship between two variables is proportional or non-proportional.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.8a: Graph proportional relationships. a. Interpret the unit rate of a proportional relationship, describing the constant of proportionality as the slope of the graph which goes through the origin and has the equation $y = mx$ where m is the slope.
Evidence Statements	The student will graph proportional relationships. The student will interpret the unit rate of a proportional relationship, describing the constant of proportionality as the slope of the graph which goes through the origin and has the equation $y = mx$ where m is the slope.
Assessment Limits / Content Constraints	Tasks may or may not contain context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a scenario presenting proportional relationships in a variety of methods, interpret the unit rate. Given a scenario presenting proportional relationships in a variety of methods, compare between the relationships.

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.9a: Interpret $y = mx + b$ as defining a linear equation whose graph is a line with m as the slope and b as the y-intercept. a. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in a coordinate plane.
Evidence Statements	The student will use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in a coordinate plane.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given a coordinate plane, use similar triangles to determine key features about the slopes of the triangles.

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.9b: Interpret $y = mx + b$ as defining a linear equation whose graph is a line with m as the slope and b as the y-intercept. b. Given two distinct points in a coordinate plane, find the slope of the line containing the two points and explain why it will be the same for any two distinct points on the line.
Evidence Statements	The student will find the slope of the line containing two distinct points in a coordinate plane and explain why it will be the same for any two distinct points on the line.
Assessment Limits / Content Constraints	Tasks do not have a context. Tasks may require students, when given a non-vertical line in the coordinate plane, to choose two pairs of points and record the rise, run, and slope relative to each pair and verify that they are the same.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.9c: Interpret $y = mx + b$ as defining a linear equation whose graph is a line with m as the slope and b as the y-intercept. c. Graph linear relationships, interpreting the slope as the rate of change of the graph and the y-intercept as the initial value.
Evidence Statements	The student will graph linear relationships, interpreting the slope as the rate of change of the graph and the y-intercept as the initial value.
Assessment Limits / Content Constraints	Tasks may or may not have a context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.9d: Interpret $y = mx + b$ as defining a linear equation whose graph is a line with m as the slope and b as the y-intercept. d. Given that the slopes for two different sets of points are equal, demonstrate that the linear equations that include those two sets of points may have different y-intercepts.
Evidence Statements	The student will demonstrate that the linear equations for two different sets of points that have equal slopes may have different y-intercepts.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze the relationship between proportional and non-proportional situations.
Standard (2019 AL COS)	8.AF.10: Compare proportional and non-proportional linear relationships represented in different ways (algebraically, graphically, numerically in tables, or by verbal descriptions) to solve real-world problems.
Evidence Statements	The student will compare proportional and non-proportional linear relationships represented in different ways (algebraically, graphically, numerically in tables, or by verbal descriptions) to solve real-world problems.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze and solve linear equations and systems of two linear equations.
Standard (2019 AL COS)	8.AF.11a: Solve multi-step linear equations in one variable, including rational number coefficients, and equations that require using the distributive property and combining like terms. a. Determine whether linear equations in one variable have one solution, no solution, or infinitely many solutions of the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers).
Evidence Statements	The student will determine whether linear equations in one variable have one solution, no solution, or infinitely many solutions of the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers).
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given a linear situation where only one unknown is present, solve for that unknown. Given an equation in one variable, determine whether the equation has one solution, infinitely many solutions, or no solution. Solve linear equations that require the distributive property and/or collecting like terms.

Content Area	AF: Algebra and Functions
Cluster	Analyze and solve linear equations and systems of two linear equations.
Standard (2019 AL COS)	8.AF.11b: Solve multi-step linear equations in one variable, including rational number coefficients, and equations that require using the distributive property and combining like terms. b. Represent and solve real-world and mathematical problems with equations and interpret each solution in the context of the problem.
Evidence Statements	The student will represent and solve real-world and mathematical problems with equations and interpret each solution in the context of the problem.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Analyze and solve linear equations and systems of two linear equations.
Standard (2019 AL COS)	8.AF.12a: Solve systems of two linear equations in two variables by graphing and substitution. a. Explain that the solution(s) of systems of two linear equations in two variables corresponds to points of intersection on their graphs because points of intersection satisfy both equations simultaneously.
Evidence Statements	The student will explain that the solution(s) of systems of two linear equations in two variables corresponds to points of intersection on their graphs because points of intersection satisfy both equations simultaneously.
Assessment Limits / Content Constraints	Tasks do not have a context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given a situation where a system of linear equations is given graphically, determine the point of intersection. Given a coordinate pair, identify the graph of a linear system that has the coordinate pair as a solution.

Content Area	AF: Algebra and Functions
Cluster	Analyze and solve linear equations and systems of two linear equations.
Standard (2019 AL COS)	8.AF.12b: Solve systems of two linear equations in two variables by graphing and substitution. b. Interpret and justify the results of systems of two linear equations in two variables (one solution, no solution, or infinitely many solutions) when applied to real-world and mathematical problems.
Evidence Statements	The student will interpret and justify the results of systems of two linear equations in two variables (one solution, no solution, or infinitely many solutions) when applied to real-world and mathematical problems.
Assessment Limits / Content Constraints	Tasks have whole-number or integer coefficients, with one coefficient in either or both equations possibly being zero. Tasks may assess solving by inspection.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a system of linear equations, identify the solution of the system of equations. Given the graph of a system of linear equations, identify the solution of the system of equations. Given a context-based problem that can be modeled by a system of linear equations, determine the solution.

Content Area	AF: Algebra and Functions
Cluster	Explain, evaluate, and compare functions.
Standard (2019 AL COS)	8.AF.13: Determine whether a relation is a function, defining a function as a rule that assigns to each input (independent value) exactly one output (dependent value), and given a graph, table, mapping, or set of ordered pairs.
Evidence Statements	The student will determine whether a relation is a function, defining a function as a rule that assigns to each input (independent value) exactly one output (dependent value), and given a graph, table, mapping, or set of ordered pairs.
Assessment Limits / Content Constraints	Tasks do not involve the "vertical line test." Some of the functions in tasks are nonnumerical. Tasks should involve clearly defined inputs and outputs. Functions are limited to those with real number inputs and outputs. Tasks may require students to graph functions in the coordinate plane or read inputs and outputs from the graph of a function in the coordinate plane. Tasks may require students to tell whether a set of points in the plane represents a function. *Note: Function notation is not required in Grade 8.*
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a relation in a variety of representations, determine whether the relation is a function.

Content Area	AF: Algebra and Functions
Cluster	Explain, evaluate, and compare functions.
Standard (2019 AL COS)	8.AF.14: Evaluate functions defined by a rule or an equation, given values for the independent variable.
Evidence Statements	The student will evaluate functions defined by a rule or an equation, given values for the independent variable.
Assessment Limits / Content Constraints	*Note: Function notation is not required in Grade 8.*
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	AF: Algebra and Functions
Cluster	Explain, evaluate, and compare functions.
Standard (2019 AL COS)	8.AF.15a: Compare properties of functions represented algebraically, graphically, numerically in tables, or by verbal descriptions. a. Distinguish between linear and non-linear functions.
Evidence Statements	The student will compare properties of functions represented algebraically, graphically, numerically in tables, or by verbal descriptions. The student will distinguish between linear and non-linear functions.
Assessment Limits / Content Constraints	Tasks have “thin context” or no context. Equations can be presented in forms other than $y = mx + b$. Tasks may require students to give examples of equations that are nonlinear or pairs of points to show a function is nonlinear. *Note: Function notation is not required in Grade 8.*
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given two different linear functions presented in different ways, make a comparison of one or more properties of the two functions. Given a relation presented in verbal form, with a graph, by an equation, or by a set of ordered pairs, determine whether the relation is a linear function. Given a set of functions, identify the function that is or is not linear.

Content Area	AF: Algebra and Functions
Cluster	Use functions to model relationships between quantities.
Standard (2019 AL COS)	8.AF.16a: Construct a function to model a linear relationship between two variables. a. Interpret the rate of change (slope) and initial value of the linear function from a description of a relationship or from two points in a table or graph.
Evidence Statements	The student will construct a function to model a linear relationship between two variables. The student will interpret the rate of change (slope) and initial value of the linear function from a description of a relationship or from two points in a table or graph.
Assessment Limits / Content Constraints	Tasks may or may not have a context. *Note: Function notation is not required in Grade 8.*
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a unit rate of change in a situation, determine the corresponding equation and vice versa. Given a linear relationship presented in a variety of methods, determine or analyze or identify different attributes related to the function.

Content Area	AF: Algebra and Functions
Cluster	Use functions to model relationships between quantities.
Standard (2019 AL COS)	8.AF.17: Analyze the relationship (increasing or decreasing, linear or non-linear) between two quantities represented in a graph.
Evidence Statements	The student will analyze the relationship (increasing or decreasing, linear or non-linear) between two quantities represented in a graph.
Assessment Limits / Content Constraints	Tasks may or may not have a context. *Note: Function notation is not required in Grade 8.*
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given the graph of a relationship, identify key features of the relationship. Given a situation in verbal form, interpret the information and identify its corresponding graph.

Content Area	DSP: Data Analysis, Statistics, and Probability
Cluster	Investigate patterns of association in bivariate data.
Standard (2019 AL COS)	8.DSP.18: Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities, describing patterns in terms of positive, negative, or no association, linear and non-linear association, clustering, and outliers.
Evidence Statements	The student will construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities, describing patterns in terms of positive, negative, or no association, linear and non-linear association, clustering, and outliers.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a scatter plot for bivariate data, describe patterns of association using a variety of methods.

Content Area	DSP: Data Analysis, Statistics, and Probability
Cluster	Investigate patterns of association in bivariate data.
Standard (2019 AL COS)	8.DSP.19: Given a scatter plot that suggests a linear association, informally draw a line to fit the data, and assess the model fit by judging the closeness of the data points to the line.
Evidence Statements	The student will informally draw a line to fit the data, and assess the model fit by judging the closeness of the data points to the line given a scatter plot that suggests a linear association.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a scatter plot for bivariate data, suggest or describe or investigate a linear association between the two quantities. Given a scatter plot for bivariate data, informally fit a straight line to the data and assess the closeness of the data to the points on the line.

Content Area	DSP: Data Analysis, Statistics, and Probability
Cluster	Investigate patterns of association in bivariate data.
Standard (2019 AL COS)	8.DSP.20a: Use a linear model of a real-world situation to solve problems and make predictions. a. Describe the rate of change and *y*-intercept in the context of a problem using a linear model of a real-world situation.
Evidence Statements	The student will use a linear model of a real-world situation to solve problems and make predictions. The student will describe the rate of change and *y*-intercept in the context of a problem using a linear model of a real-world situation.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a situation of bivariate data dealing with a linear model, interpret key features of the linear model.

Content Area	DSP: Data Analysis, Statistics, and Probability
Cluster	Investigate patterns of association in bivariate data.
Standard (2019 AL COS)	8.DSP.21: Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects, using relative frequencies calculated for rows or columns to describe possible associations between the two variables.
Evidence Statements	The student will construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects, using relative frequencies calculated for rows or columns to describe possible associations between the two variables.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a two-way table, interpret the data in the table. Given a partially completed two-way table, complete the table and draw conclusions.

Content Area	GM: Geometry and Measurement
Cluster	Understand congruence and similarity using physical models or technology.
Standard (2019 AL COS)	8.GM.22a: Verify experimentally the properties of rigid motions (rotations, reflections, and translations): lines are taken to lines, and line segments are taken to line segments of the same length; angles are taken to angles of the same measure; and parallel lines are taken to parallel lines. a. Given a pair of two-dimensional figures, determine if a series of rigid motions maps one figure onto the other, recognizing that if such a sequence exists the figures are congruent; describe the transformation sequence that verifies a congruence relationship.
Evidence Statements	The student will verify experimentally the properties of rigid motions (rotations, reflections, and translations): lines are taken to lines, and line segments are taken to line segments of the same length; angles are taken to angles of the same measure; and parallel lines are taken to parallel lines. The student will determine if a series of rigid motions maps one figure onto the other given a pair of two-dimensional figures, recognizing that if such a sequence exists the figures are congruent. The student will describe the transformation sequence that verifies a congruence relationship.
Assessment Limits / Content Constraints	Tasks do not have a context. Figures may be drawn in the coordinate plane but do not include the use of coordinates. Tasks require students to make connections between congruence and transformations.
DOK(s)	1, 2, or 3
Calculator	NEUTRAL – a calculator may or may not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given a congruence transformation, identify the effect of that transformation on a line or line segment. Given a congruence transformation, identify the effect of that transformation on an angle. Given a congruence transformation, identify the effect of that transformation on a set of parallel lines. Given two congruent figures on a coordinate grid, determine which single transformation or two transformations were used to obtain the resulting image. Given a pair of congruent figures, determine a series of transformations that shows congruence between the two given figures.

Content Area	GM: Geometry and Measurement
Cluster	Understand congruence and similarity using physical models or technology.
Standard (2019 AL COS)	8.GM.23: Use coordinates to describe the effect of transformations (dilations, translations, rotations, and reflections) on two-dimensional figures.
Evidence Statements	The student will use coordinates to describe the effect of transformations (dilations, translations, rotations, and reflections) on two-dimensional figures.
Assessment Limits / Content Constraints	Tasks have “thin context” or no context. Tasks require the use of coordinates in the coordinate plane. For items involving dilations, tasks must state the center of dilation. The center of dilation can be the origin, the center of the original shape, or a vertex of the original shape.
DOK(s)	1, 2, or 3
Calculator	NEUTRAL – a calculator may or may not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a figure on a coordinate grid, the student will perform a single transformation or two transformations to describe the effects or to describe a key attribute of the resulting image.

Content Area	GM: Geometry and Measurement
Cluster	Understand congruence and similarity using physical models or technology.
Standard (2019 AL COS)	8.GM.24: Given a pair of two-dimensional figures, determine if a series of dilations and rigid motions maps one figure onto the other, recognizing that if such a sequence exists the figures are similar; describe the transformation sequence that exhibits the similarity between them.
Evidence Statements	The student will determine if a series of dilations and rigid motions maps one figure onto the other given a pair of two-dimensional figures, recognizing that if such a sequence exists the figures are similar. The student will describe the transformation sequence that exhibits the similarity between the given pair of two-dimensional figures.
Assessment Limits / Content Constraints	Tasks do not have a context. Figures may be drawn in the coordinate plane but do not include the use of coordinates. Tasks require students to make connections between similarity and transformations.
DOK(s)	1, 2, or 3
Calculator	NEUTRAL – a calculator may or may not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Not Allowable
Sample Stem Information (as applicable)	Given two similar figures on a coordinate grid, determine which single transformation or two transformations were used to obtain the resulting image. Given a pair of similar figures, determine a series of transformations that shows similarity between the two given figures.

Content Area	GM: Geometry and Measurement
Cluster	Analyze parallel lines cut by a transversal.
Standard (2019 AL COS)	8.GM.25a: Analyze and apply properties of parallel lines cut by a transversal to determine missing angle measures. a. Use informal arguments to establish that the sum of the interior angles of a triangle is 180 degrees.
Evidence Statements	The student will analyze and apply properties of parallel lines cut by a transversal to determine missing angle measures. The student will use informal arguments to establish that the sum of the interior angles of a triangle is 180 degrees.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	NEUTRAL – a calculator may or may not be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a triangle or information about a triangle, determine facts about either interior or exterior angles. Given a diagram created by or consisting of parallel lines and transversals, determine an angle relationship.

Content Area	GM: Geometry and Measurement
Cluster	Understand and apply the Pythagorean Theorem.
Standard (2019 AL COS)	8.GM.26: Informally justify the Pythagorean Theorem and its converse.
Evidence Statements	The student will informally justify the Pythagorean Theorem and its converse.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a right triangle, determine a true relationship of the right triangle. Given a right triangle, explain a proof of the Pythagorean Theorem and its converse.

Content Area	GM: Geometry and Measurement
Cluster	Understand and apply the Pythagorean Theorem.
Standard (2019 AL COS)	8.GM.27: Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.
Evidence Statements	The student will apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given two points on a coordinate grid, determine the distance between the two points.

Content Area	GM: Geometry and Measurement
Cluster	Understand and apply the Pythagorean Theorem.
Standard (2019 AL COS)	8.GM.28: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles, including real-world applications
Evidence Statements	The student will apply the Pythagorean Theorem to determine unknown side lengths of right triangles, including real-world applications.
Assessment Limits / Content Constraints	Tasks have “thin context” or no context.
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a verbal description of a right triangle, apply the Pythagorean Theorem to determine an unknown side length. Given a right triangle, apply the Pythagorean Theorem to determine an unknown side length. Given a real-world situation, apply the Pythagorean Theorem to solve a problem.

Content Area	GM: Geometry and Measurement
Cluster	Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
Standard (2019 AL COS)	8.GM.29: Informally derive the formulas for the volume of cones and spheres by experimentally comparing the volumes of cones and spheres with the same radius and height to a cylinder with the same dimensions.
Evidence Statements	The student will informally derive the formulas for the volume of cones and spheres by experimentally comparing the volumes of cones and spheres with the same radius and height to a cylinder with the same dimensions.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	

Content Area	GM: Geometry and Measurement
Cluster	Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
Standard (2019 AL COS)	8.GM.30: Use formulas to calculate the volumes of three-dimensional figures (cylinders, cones, and spheres) to solve real-world problems.
Evidence Statements	The student will use formulas to calculate the volumes of three-dimensional figures (cylinders, cones, and spheres) to solve real-world problems.
Assessment Limits / Content Constraints	
DOK(s)	1, 2, or 3
Calculator	YES – a calculator will be available for items
Item Type(s)	MC, MS, SA, TE
Context	Allowable
Sample Stem Information (as applicable)	Given a three-dimensional figure (cone, cylinder, or sphere), find the volume of the figure.

Appendix A: Sample Items

Sample Items

Appendix A: Sample Items

Sample Item 1

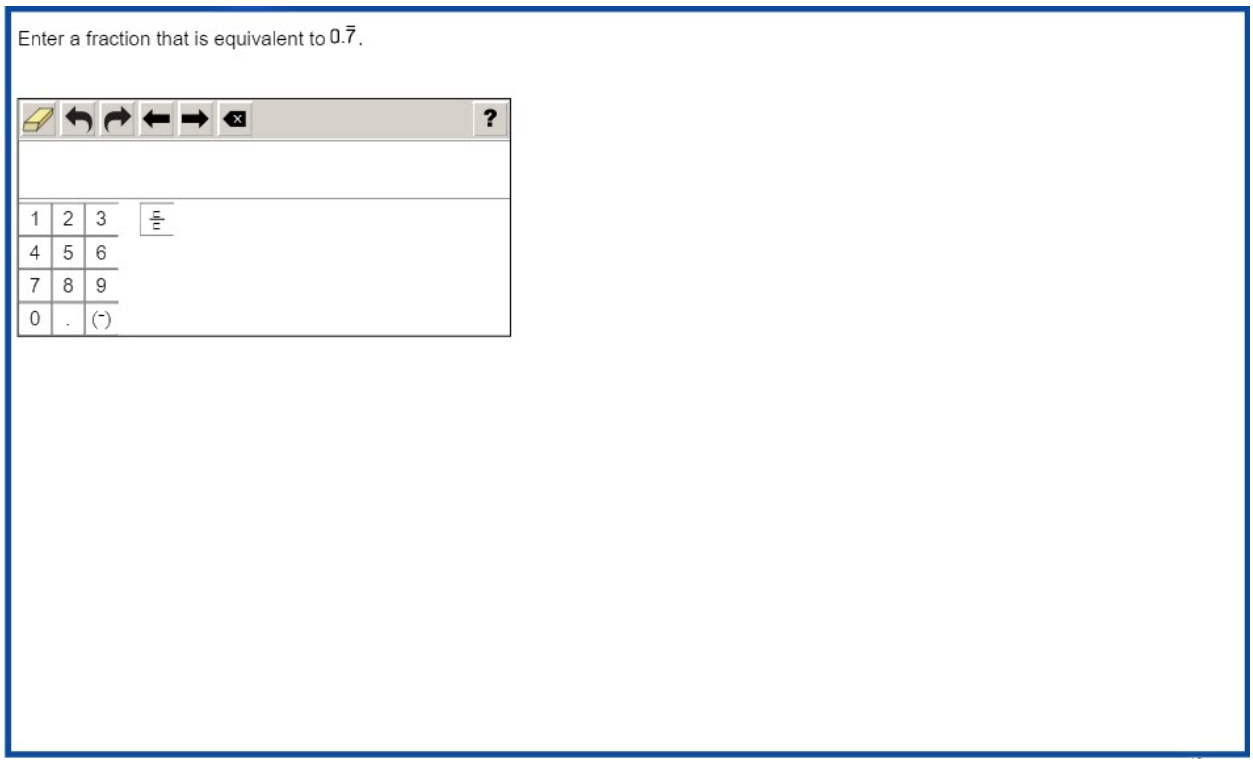
Item Information	
Item Type	Multiple Select
Page Reference	9
Alignment	8.NSO.1a
Depth of Knowledge	2
Answer Key	A, D

Option Annotations

A. Correct
B. The student selects a common decimal approximation of pi.
C. The student selects an incorrect approximation of pi.
D. Correct
E. The student selects a fraction.

Appendix A: Sample Items

Sample Item 2

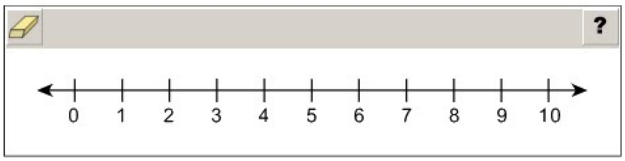


Item Information		Answer Key(s) Description
Item Type	Short Answer	$\frac{7}{9}$ (or equivalent fraction)
Page Reference	10	
Alignment	8.NSO.1b	
Depth of Knowledge	2	
Answer Key	(see description)	

Appendix A: Sample Items

Sample Item 3

Select the unit interval on the number line that contains $\sqrt{31}$.



Item Information		Answer Key(s) Description
Item Type	Technology Enhanced	The interval between 5 and 6 is selected.
Page Reference	11	
Alignment	8.NSO.2	
Depth of Knowledge	1	
Answer Key	(see description)	

Appendix A: Sample Items

Sample Item 4

A square pot holder has an area of 64 square inches. What is the length, in inches, of each side of the square pot holder?

(a) $\sqrt{8}$

(b) $\sqrt{64}$

(c) 16

(d) 32

Item Information		Option Annotations
Item Type	Multiple Choice	A. The student finds the square root of 64 but does not realize the radical symbol needs to be removed. B. Correct C. The student divides 64 by 4. D. The student divides 64 by 2.
Page Reference	13	
Alignment	8.AF.4a	
Depth of Knowledge	2	
Answer Key	B	

Appendix A: Sample Items

Sample Item 5

A company makes about 2.5×10^7 tablets in a year. The company spends about $20 to make each tablet. About how much money, in dollars, does the company spend making tablets each year?

(a) 4.5×10^8

(b) 5×10^7

(c) 5×10^8

(d) 22.5×10^7

Item Information	
Item Type	Multiple Choice
Page Reference	16
Alignment	8.AF.6a
Depth of Knowledge	1
Answer Key	C

Option Annotations

A. The student uses 2×10^1 for 20, adds 2 and 2.5, and then adds the exponents of 7 and 1.
B. The student multiplies 2 and 2.5 and does not account for the change in the power of 10.
C. Correct
D. The student adds 2.5 and 20 and keeps the same power of 10.

Appendix A: Sample Items

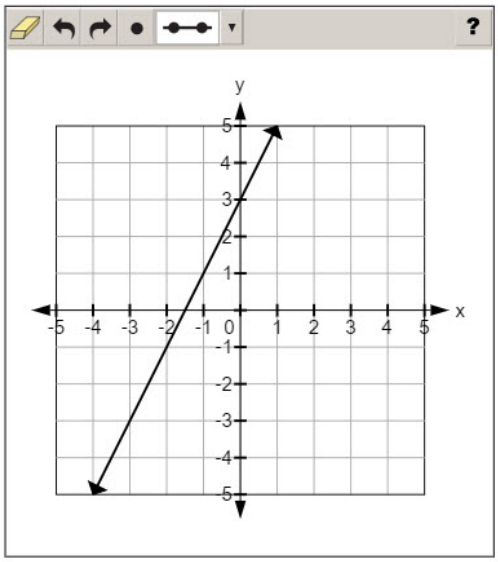
Sample Item 6

A system of two linear equations is shown.

$y = 2x + 3$

$y = \frac{2}{3}x - 1$

The graph of the first equation is shown on the coordinate plane. Graph the second equation and then enter the coordinates of the point that represents the solution of the system.

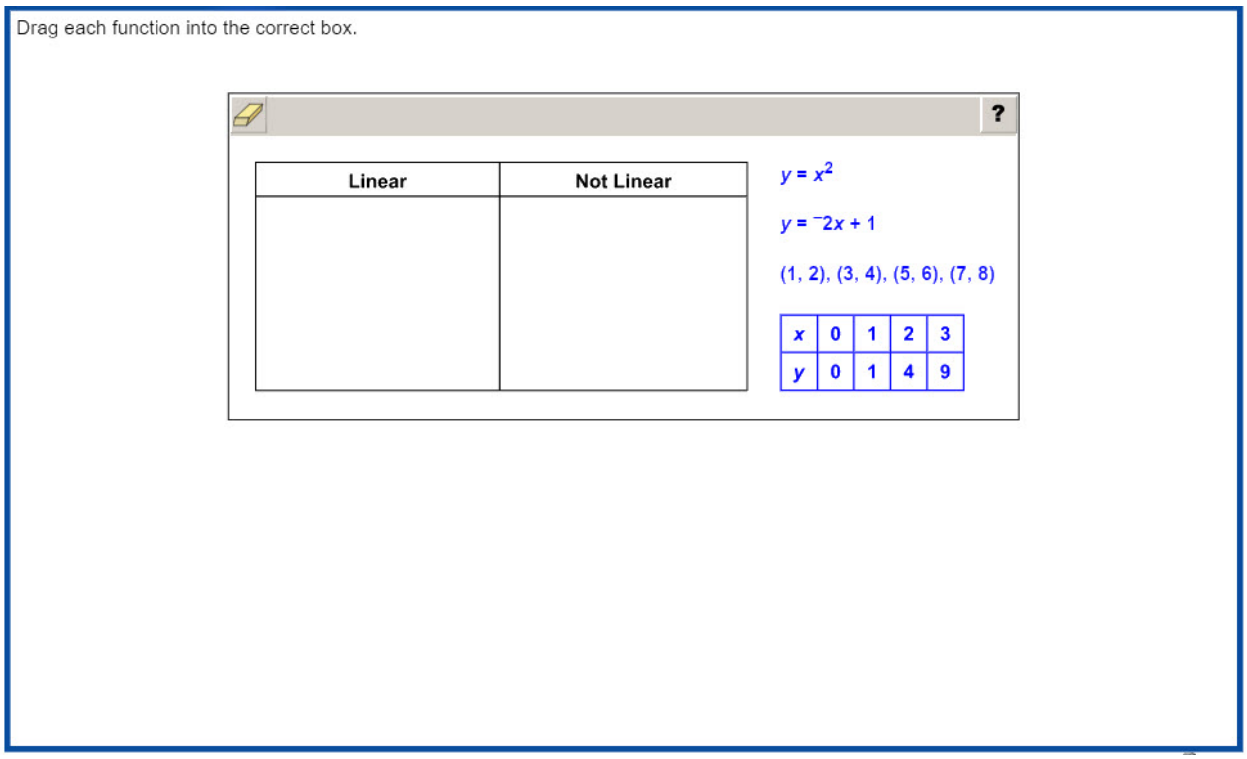


Solution: (,)

Item Information		Answer Key(s) Description
Item Type	Technology Enhanced	A graphed line with a slope of $\frac{2}{3}$, and a *y*-intercept of −1, that meets the given line at the point (−3, −3). Solution: (−3, −3)
Page Reference	28	
Alignment	8.AF.12b	
Depth of Knowledge	3	
Answer Key	(see description)	

Appendix A: Sample Items

Sample Item 7



Item Information		Answer Key(s) Description
Item Type	Technology Enhanced	**Linear:** $y = -2x + 1$ (1, 2), (3, 4), (5, 6), (7, 8) **Not Linear:** $y = x^2$ x 0 1 2 3 y 0 1 4 9
Page Reference	31	
Alignment	8.AF.15a	
Depth of Knowledge	2	
Answer Key	(see description)	

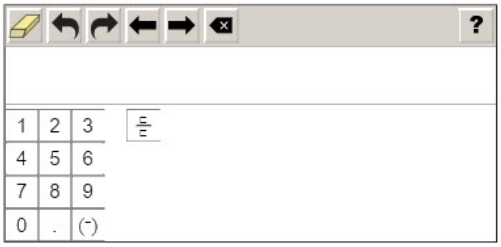
Appendix A: Sample Items

Sample Item 8

On a recent trip to a local amusement park, Sadie kept track of how much money she had remaining after paying to go on rides. Some of her data are shown in the table.

Number of Rides Paid For	Money Remaining ($)
0	50
5	40
10	30
15	20
20	10

What is the rate of change of Sadie's money remaining per ride paid for?

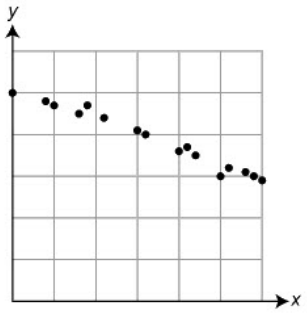


Item Information		Answer Key(s) Description
Item Type	Short Answer	–2 (or equivalent) OR 2 (or equivalent)
Page Reference	32	
Alignment	8.AF.16a	
Depth of Knowledge	1	
Answer Key	(see description)	

Appendix A: Sample Items

Sample Item 9

A scatterplot is shown.



Which statement **best** describes the relationship between x and y in the scatterplot?

(a) The relationship is positive and linear.

(b) The relationship is positive and nonlinear.

(c) The relationship is negative and linear.

(d) The relationship is negative and nonlinear.

Item Information	
Item Type	Multiple Choice
Page Reference	34
Alignment	8.DSP.18
Depth of Knowledge	1
Answer Key	C

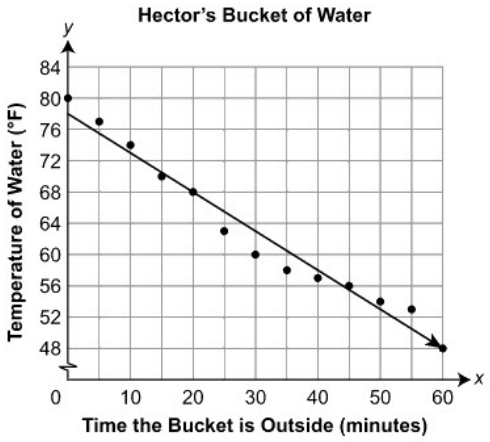
Option Annotations

A. The student does not recognize that this is a relationship with a negative slope.
B. The student does not recognize that this is a linear relationship with a negative slope.
C. Correct
D. The student does not recognize that this is a linear relationship.

Appendix A: Sample Items

Sample Item 10

Hector puts a bucket of warm water outside on a very cold day. He records the temperature, in degrees Fahrenheit (°F), of the water every 5 minutes for an hour. He plots his data and a line to fit his data on the coordinate plane.



Hector determines the equation of his line to be $y = -\frac{1}{2}x + 78$.

Based on Hector's line, how many minutes after he puts the bucket outside will the temperature of the water reach 40°F?

Item Information		Answer Key(s) Description
Item Type	Short Answer	76 (or equivalent)
Page Reference	36	
Alignment	8.DSP.20a	
Depth of Knowledge	2	
Answer Key	(see description)	

Appendix A: Sample Items

Sample Item 11

Courtney asked each of her classmates the following two questions:

- Do you own a dog?
- How many outdoor walks do you take each week?

Courtney displayed the results in a table.

	0–3 Walks	4–5 Walks	6–7 Walks	Total
Own a Dog	3	5	10	18
Do Not Own a Dog	11	8	3	22
Total	14	13	13	40

Based on the table, which statement about the association between owning a dog and the frequency of taking outdoor walks is true?

(a) Students who own dogs tend to take outdoor walks with the same frequency as students who do not own dogs.

(b) Students who own dogs tend to take outdoor walks more frequently than students who do not own dogs.

(c) Students who own dogs tend to take outdoor walks less frequently than students who do not own dogs.

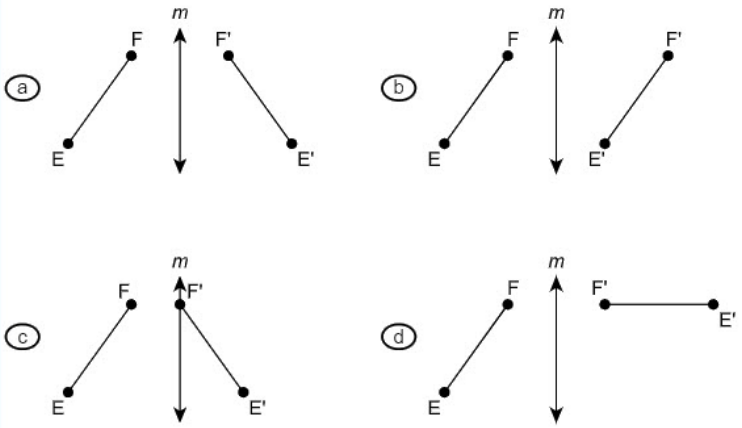
(d) There is no association between dog ownership and the frequency of taking outdoor walks.

Item Information		Option Annotations
Item Type	Multiple Choice	A. The student incorrectly interprets the table and the association between the variables. B. Correct C. The student incorrectly interprets the association between the variables. D. The student incorrectly interprets the table and the association between the variables.
Page Reference	37	
Alignment	8.DSP.21	
Depth of Knowledge	2	
Answer Key	B	

Appendix A: Sample Items

Sample Item 12

Which figure shows a reflection of line segment EF over line *m*?



Item Information		Option Annotations
Item Type	Multiple Choice	A. Correct B. The student identifies a translation. C. The student identifies a reflection that is not over line *m*. D. The student identifies a rotation.
Page Reference	38	
Alignment	8.GM.22	
Depth of Knowledge	1	
Answer Key	A	

Appendix A: Sample Items

Sample Item 13

The vertices of triangle ABC are located at (0, 3), (2, 3), and (0, 1). Triangle ABC is translated 3 units to the left and 2 units down to create triangle FGH. Select the **three** points that represent the vertices of triangle FGH.

a. $(^{-}3, ^{-}2)$

b. $(^{-}3, ^{-}1)$

c. $(^{-}3, 1)$

d. $(^{-}1, 1)$

e. (2, 5)

f. (3, 1)

Item Information	
Item Type	Multiple Select
Page Reference	39
Alignment	8.GM.23
Depth of Knowledge	1
Answer Key	B, C, D

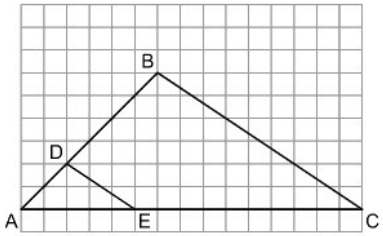
Option Annotations

A. The student chooses a point that represents the two transformations.
B. Correct
C. Correct
D. Correct
E. The student translates point C to the right 2 units and up 4 units.
F. The student translates point A to the right 3 units and down 2 units.

Appendix A: Sample Items

Sample Item 14

Triangle ADE and triangle ABC are shown.



Which single transformation maps triangle ADE to triangle ABC?

(a) a translation of triangle ADE right 10 units

(b) a translation of triangle ADE right 4 units and up 4 units

(c) a dilation of triangle ADE using center point A and a scale factor of 3

(d) a dilation of triangle ADE using center point A and a scale factor of 10

Item Information		Option Annotations
Item Type	Multiple Choice	A. The student finds the translation for only vertex E to vertex C, instead of the entire triangle. B. The student finds the translation for only vertex D to vertex B, instead of the entire triangle. C. Correct D. The student attempts to use dilation to map vertex E to vertex C only.
Page Reference	40	
Alignment	8.GM.24	
Depth of Knowledge	2	
Answer Key	C	