cognia™

Formative Assessments

Formative Item Sets Overview

Mathematics

Grades 3–8
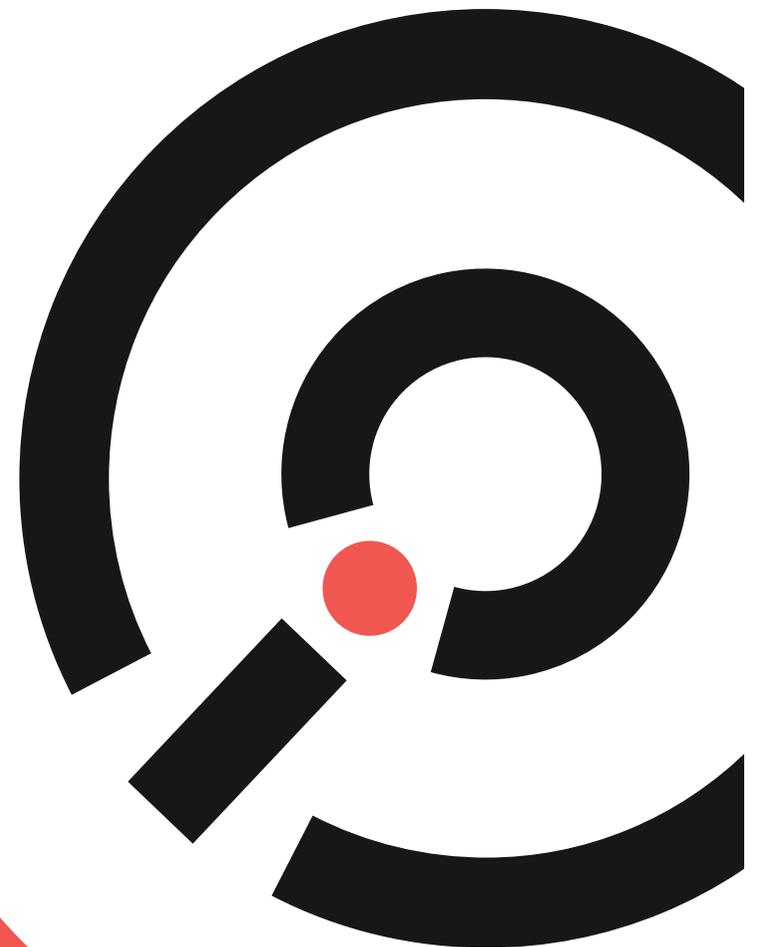
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Formative Item Sets—Mathematics

Purpose

Cognia formative item sets are designed to help teachers quickly gauge students' understanding of key concepts and skills that are emphasized by college and career readiness standards. The item sets support formative assessment practices and provide evidence of student understanding. Educators may administer the items as frequently as they like to engage students in the learning and quickly generate data that can be used to inform instruction.

Number of Item Sets per Grade Level							
Grade	3	4	5	6	7	8	Total
Sets	5	5	5	5	5	5	30

Item Set Components

Each formative item set includes the following three components:

- **Blueprints**—Outline the specifications of each item set and include the following elements for each item (question):
  - College and career readiness standard(s)
  - The domain, cluster, and mathematical standards
  - Learning targets, to clarify learning expectations for students
  - DOK (Depth of Knowledge) level for each item
  - Item type
  - Position of the item within the item set
- **Scoring Guide**—Materials for the teacher to score student responses. Elements of the scoring guide include:
  - Answer key
  - Distractor rationales that describe the misconception associated with the answer option.
  - Scoring rubric
  - Scoring notes
- **Student Item Set**—Printable forms that can be downloaded from the Formative Content Library for students to record their responses. Online forms are available in the Formative Assessments program within the online administration platform.

Design Specifications

Each mathematics item set aligns to a mathematics domain and is focused on one specific cluster within that domain. Clusters are standards that are grouped together to represent key concepts and skills emphasized within a domain. Mathematics item sets are designed to help educators integrate formative assessment into instruction while learning is still occurring.

Each mathematics item set assesses a range of cognitive complexities and encourages students to apply their understanding of key skills and concepts.

Each item set is aligned to a cluster of college and career readiness standards. Each item set consists of two parts to provide flexibility for instructional planning. Part A consists of four to eight multiple-choice, mutiple-select, and short-answer items, and Part B consists of one extended constructed-response item.

Items

Each mathematics item set consists of multiple-choice, multiple-select, short-answer, and constructed-response items. Educators can easily administer the items in a single class period, or administer each part separately in approximately 10 minutes.

Item Details

The following table provides the approximate administration time for each item type.

Item Type	Number of Points	Administration Time (minutes)
Multiple Choice (MC)	1	1–2
Multiple Select (MS)	1	1–2
Short Answer (SA)	1	2
Constructed Response (CR)	4	8–10

Depth of Knowledge

Each item is coded to a depth of knowledge level, from level 1 through level 4. A description of an example of the expectations at each level is provided below.

DOK	Description
Level 4	Using extended thinking to synthesize information or apply it to real-world applications.
Level 3	Employing strategic thinking through the use of reasoning or decision making.
Level 2	Conceptual knowledge, or the ability to put facts into context.
Level 1	The ability to recall facts.

Mathematics
Item Set Index

The following tables provide domain, cluster, number of items and item types, Depth of Knowledge and learning targets for each item set by grade level.

Grade 3 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
MD Area Unit Sq Decompose G3	Measurement and Data	Geometric measurement: understand concepts of area and relate area to multiplication and to addition	1	MC	1	I can find the area of a unit square.
			2	MC	1	I can measure area by counting unit squares.
			3	MC	2	I can find the area of a rectangle by multiplying the two side lengths.
			4	MC	1	I can understand area by relating counting unit squares to multiplication.
			5	MC	2	I can find the area of a shape by breaking it down into smaller rectangles and then adding those areas to find the total area.
			6	MC	2	I can use models to show that the area of a rectangle can be found by using the distributive property.
			7	CR	2	I can write equations to find the areas of rectangles.
MD Time Mass Volume G3	Measurement and Data	Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects	1	MC	2	I can solve word problems about telling time by reading a clock and adding and subtracting minutes.
			2	SA	2	I can solve word problems about telling time by adding and subtracting minutes.
			3	MC	2	I can use multiplication and division to solve word problems about mass.
			4	MC	2	I can use addition to solve word problems about mass shown on two scales.
			5	MC	2	I can use repeated addition or multiplication to solve word problems about volume.
			6	CR	2	I can show how to solve word problems about telling time by reading a clock and adding and subtracting minutes.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
NBT Place Value Operations G3	Numbers and Operations in Base Ten	Use place value understanding and properties of operations to perform multi-digit arithmetic	1	MC	1	I can use place value to help me round numbers to the nearest 10.
			2	MC	2	I can use place value to help me round numbers to the nearest 100.
			3	SA	1	I can use place value to add two two-digit numbers.
			4	SA	1	I can use place value to subtract a two-digit number from a three-digit number.
			5	SA	1	I can multiply a one-digit whole number by a multiple of 10.
			6	MC	2	I can identify different ways to multiply a whole number by a multiple of 10.
			7	CR	2	I can add a three-digit and two-digit number and find the missing number in a multiplication expression that equals the sum of the addition expression.
NF Number Line Equiv Frac G3	Number and Operations – Fractions	Develop understanding of fractions as numbers	1	MC	1	I can identify the fraction of a shape that is shaded.
			2	MC	1	I can identify the fraction of a shape that is shaded.
			3	MC	1	I can label a fraction on a number line.
			4	SA	1	I can label a fraction on a number line.
			5	MC	2	I can compare two fractions with the same numerator.
			6	SA	2	I can write equivalent fractions.
			7	MC	1	I can identify a fraction equivalent to a whole number.
			8	CR	2	I can find two equivalent fractions and compare them to a third fraction.
OA Multiply Divide Eqn G3	Operations and Algebraic Thinking	Understand properties of multiplication and the relationship between multiplication and division	1	MC	1	I can identify different ways to multiply three numbers.
			2	MC	1	I can find an equivalent expression when multiplying two numbers.
			3	MS	1	I can use properties to identify expressions that are equivalent to an expression multiplying two numbers.
			4	MC	2	I can find the answer to a division problem by thinking of the missing factor in a multiplication problem.
			5	MC	1	I can find a related multiplication equation to solve a division equation.
			6	MC	1	I can find a related multiplication equation to solve a division equation.
			7	CR	2	I can solve a word problem by using division and check the answer using multiplication.

Grade 4 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
G Lines Shapes Symmetry G4	Geometry	Draw and identify lines and angles, and classify shapes by properties of their lines and angles	1	MC	1	I can identify a ray.
			2	MC	1	I can identify parallel lines on a drawing.
			3	MC	1	I can identify perpendicular lines in a figure.
			4	MC	2	I can identify a figure based on its sides.
			5	MC	1	I can identify a right triangle.
			6	MC	1	I can identify a line of symmetry.
			7	MS	2	I can identify lines of symmetry.
			8	CR	3	I can explain why a statement about symmetry is true or false.
MD Angle Measures G4	Measurement and Data	Geometric measurement: understand concepts of angle and measure angles	1	MC	2	I can solve a word problem to find the number of degrees needed to complete a circle.
			2	MC	2	I can explain the measure of the angle formed by hands on a clock.
			3	MC	1	I can measure angles in whole-number degrees using a protractor.
			4	MC	2	I can add to find the sum of angles on a diagram.
			5	MC	2	I can identify the equation needed to find the unknown angle on a diagram.
			6	SA	2	I can add or subtract to find the unknown angle on a diagram.
			7	CR	3	I can add or subtract to find the unknown angle on a diagram.
NBT Value Compare Round G4	Numbers and Operations in Base Ten	Generalize place value understanding for multi-digit whole numbers	1	MC	2	I can relate the value of the same digit in two numbers.
			2	MC	2	I can relate the value of the same digit in two numbers.
			3	MC	1	I can identify the number form of a number given the expanded form.
			4	MC	1	I can identify the word form of a number given the number form.
			5	MC	1	I can identify a number that is less than the one given.
			6	MC	1	I can identify a number that is less than the one given.
			7	MC	1	I can round a four-digit number to the nearest hundred.
			8	MC	1	I can round a six-digit number to the nearest thousand.
			9	CR	3	I can write numbers in number form given the expanded and word forms. I can compare multi-digit whole numbers. I can relate the value of the same digit in two numbers.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
NF Fractions Decimals G4	Numbers and Operations – Fractions	Understand decimal notations for fractions, and compare decimal fractions	1	MC	1	I can identify an equivalent fraction with denominator 100 for a fraction with denominator 10.
			2	MC	1	I can identify an equivalent fraction with denominator 100 for a decimal.
			3	MC	1	I can identify an equivalent fraction with denominator 100 for a decimal.
			4	MC	1	I can identify the decimal represented by a point on a number line.
			5	MC	1	I can identify the equivalent decimal for a fraction with denominator 10.
			6	MC	1	I can compare two decimals.
			7	MC	2	I can identify a decimal that is greater than the one given.
			8	CR	2	I can add fractions with denominators 10 and 100. I can rewrite a fraction as an equivalent decimal.
OA Word Problems Equations G4	Operations and Algebraic Thinking	Use the four operations with whole numbers to solve problems	1	MC	2	I can identify the equation needed to solve a word problem involving multiplicative comparisons.
			2	MC	2	I can use multiplication to solve a word problem involving multiplicative comparisons.
			3	SA	2	I can use division to solve a word problem involving multiplicative comparisons.
			4	MC	2	I can identify the situation represented by a multiplication expression.
			5	MC	2	I can identify the equation needed to solve a multistep word problem.
			6	MC	2	I can use the four operations to solve a multistep word problem.
			7	CR	2	I can use the four operations to solve multistep word problems involving multiplicative comparisons.

Grade 5 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
G Coordinate Planes Quad1 G5	Geometry	Graph points on the coordinate plane to solve real-world and mathematical problems	1	MC	1	I can read and interpret a coordinate plane.
			2	MC	1	I can represent real-world and mathematical problems by graphing points in the first quadrant.
			3	MC	2	I can represent real-world and mathematical problems by graphing points in the first quadrant.
			4	MC	2	I can represent real-world and mathematical problems by graphing points in the first quadrant.
			5	CR	2	I can represent real-world and mathematical problems by graphing points in the first quadrant.
MD Line Plots Fractions G5	Measurement and Data	Represent and Interpret Data	1	MC	2	I can use data from a line plot, in fractions of a unit, to help solve a problem.
			2	MC	2	I can use data from a line plot, in fractions of a unit, to help solve a problem.
			3	MC	1	I can use a line plot to display a data set of measurements in fractions of a unit.
			4	MC	2	I can use operations on fractions to solve problems involving information presented in line plots.
			5	MC	2	I can use operations on fractions to solve problems involving information presented in line plots.
			6	CR	3	I can use a line plot to display a data set of measurements in fractions of a unit.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
NBT Mult Div Whole Dec G5	Number and Operations in Base 10	Perform operations with multi-digit whole numbers and with decimals to hundredths	1	SA	1	I can divide a three-digit number by a two-digit number.
			2	MC	1	I can divide a three-digit number by a one-digit number in a real-world situation.
			3	MC	2	I can divide a three-digit number by a two-digit number in a real-world situation.
			4	MC	2	I can identify which expression to use to find a quotient.
			5	MC	2	I can find whole number quotients of whole numbers with a four-digit dividend and one-digit divisor.
			6	MC	1	I can add decimals up to the hundredths.
			7	MC	2	I can subtract decimals up to the hundredths.
			8	MC	2	I can multiply decimals up to the hundredths to find the area.
			9	CR	3	I can add and multiply decimals in a real-world problem.
NF Mult Div Fractions G5	Number and Operations – Fractions	Apply and extend previous understandings of multiplication and division to multiply and divide fractions	1	MS	2	I can interpret a fraction as division of the numerator by the denominator and solve real-world problems with division of whole numbers resulting in a fraction.
			2	MC	2	I can multiply a fraction by a whole number.
			3	MC	1	I can use a model to write an equation for multiplying a whole number by a fraction.
			4	MC	2	I can compare the value of a product to the values of the factors, without performing the multiplication.
			5	MC	2	I can explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number.
			6	MC	2	I can solve real-world problems involving multiplication of a whole number and a mixed number.
			7	MC	1	I can solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.
			8	MC	2	I can divide a whole number by a unit fraction and use the quotient to solve a real-world problem.
			9	CR	2	I can interpret a fraction as division of the numerator by the denominator and solve real-world problems with division of whole numbers resulting in a fraction.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
OA Order Operations Exp G5	Operations and Algebraic Thinking	Write and interpret numerical expressions	1	MC	2	I can evaluate and write expressions using parentheses, brackets, or braces in numerical expressions.
			2	MS	2	I can write expressions using parentheses, brackets, or braces in numerical expressions.
			3	MC	2	I can evaluate expressions using parentheses, brackets, or braces in numerical expressions.
			4	SA	1	I can evaluate expressions using parentheses, brackets, or braces in numerical expressions.
			5	MC	1	I can write simple expressions without evaluating them.
			6	MC	1	I can write simple expressions without evaluating them.
			7	MC	2	I can write simple expressions without evaluating them.
			8	CR	2	I can write and evaluate expressions using parentheses, brackets, or braces in numerical expressions.

Grade 6 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
EE Variable Relationships G6	Expressions & Equations	Represent and analyze quantitative relationships between dependent and independent variables	1	MC	1	I can identify a relationship of a graph.
			2	MC	2	I can identify an equation that represents a relationship.
			3	MC	2	I can identify an equation that represents a relationship.
			4	MC	2	I can identify an equation that represents a relationship.
			5	MC	2	I can represent a relationship using a table.
			6	MC	2	I can find coordinate pairs on the graph of a line representing a relationship.
			7	CR	2	I can write an equation to represent a relationship, and use the equation to find a value.
G Area Surface Area Volume G6	Geometry	Solve real-world and mathematical problems involving area, surface area, and volume	1	MC	2	I can find the area of a composite figure.
			2	MC	2	I can find the volume of a rectangular prism, given the length, width, and height.
			3	MC	2	I can find the volume of a rectangular prism, using fractional unit cubes.
			4	MS	2	I can find the side lengths of a polygon graphed on the coordinate plane.
			5	MC	1	I can graph a polygon on a coordinate plane using coordinates and side lengths.
			6	MC	2	I can find the surface area of a solid by using a net.
			7	CR	2	I can use a net to name a figure and find the surface area of that solid figure.
NS Mult Divide Fractions G6	The Number System	Apply and extend previous understandings of multiplication and division to divide fractions by fractions	1	MC	2	I can divide fractions to solve a problem.
			2	MC	2	I can divide a whole number by a mixed number to solve a problem.
			3	MC	2	I can select the correct multiplication expression needed to solve a problem involving the division of mixed numbers.
			4	MC	2	I can divide a fraction by a whole number to solve a problem.
			5	MC	2	I can divide a whole number by a fraction to solve a problem.
			6	CR	2	I can multiply and divide fractions and mixed numbers to solve problems.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
RP Ratios Proportions G6	Ratios & Proportional Relationships	Understand ratio concepts and use ratio reasoning to solve problems	1	MC	1	I can identify a ratio relationship between two quantities.
			2	MC	1	I can use a ratio to solve a problem.
			3	MC	2	I can use a ratio to find a unit rate.
			4	MC	2	I can use a ratio to find a unit rate.
			5	MC	2	I can use a ratio to solve a problem.
			6	MC	1	I can find the percent of a whole.
			7	CR	2	I can find the percent of a whole, and use it to solve problems.
SP Summative Data G6	Statistics and Probability	Summarize and describe distributions	1	MC	2	I can use a dot plot to describe data displayed as a box plot.
			2	MC	2	I can identify a box plot that represents a data set.
			3	MC	1	I can choose labels for a line graph that represents a situation.
			4	MC	2	I can find the interquartile range of a data set.
			5	MC	2	I can describe how new data added to a set will affect the mean and the median of the original data set.
			6	CR	2	I can use a bar graph to answer questions about a data set.

Grade 7 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
EE Exp Equn Inq G7	Expressions and Equations	Solve real-life and mathematical problems using numerical and algebraic expressions and equations	1	MC	2	I can write and solve a two-step inequality represented in a word problem.
			2	MC	1	I can identify a two-step equation that represents a situation.
			3	MS	2	I can use the distributive property to identify equivalent equations.
			4	MC	2	I can identify a two-step inequality that represents a situation.
			5	MC	1	I can identify the solution to a two-step inequality that is graphed on a number line.
			6	CR	3	I can solve a multi-step problem that involves finding percent of decrease, sales tax and solving an inequality.
G Angles Areas Volume G7	Geometry	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume	1	MC	2	I can find the circumference of a cylinder given the dimensions in a model.
			2	MC	2	I can find the area of a circle given the radius.
			3	MC	3	I can find the circumference of a circle given the relationship to the area of a different circle.
			4	MC	2	I can find the measure of an angle given a model of angle relationships.
			5	MC	2	I can use vertical angles, right angles, and the sum of angles in a triangle to find an unknown angle measure.
			6	MC	2	I can find the volume of a rectangular prism and triangular prism given the measures.
			7	MC	2	I can find the area of an irregular figure when given the side lengths.
			8	CR	3	I can find side lengths of rectangular prisms that have the same volume and find volume given the surface area.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
G Scale Drawings G7	Geometry	Draw, construct, and describe geometrical figures and describe the relationship between them	1	MC	2	I can use ratios and a scale to find the height of an object.
			2	MC	2	I can use the scale of centimeters to feet to find the scale of a different scale drawing.
			3	MC	2	I can use a scale drawing of an object given in inches to find the actual area of the object given in feet.
			4	MC	1	I can identify the possible side lengths of a triangle.
			5	MC	2	I can identify an isosceles triangle and find the measures of two of its angles given the measure of two sides.
			6	MC	2	I can describe the two-dimensional shape that results from slicing a three-dimensional figure.
			7	CR	2	I can use a scale drawing and a scale factor to find actual lengths and widths. I can use scale measures and actual lengths and widths to find the scale factor.
NS Rational Numbers G7	The Number System	Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers	1	MC	2	I can identify situations in which quantities combine to make zero.
			2	MC	2	I can add and subtract rational numbers.
			3	MC	2	I can multiply rational numbers and compare products and factors of rational numbers.
			4	MC	1	I can identify equivalent expressions of rational numbers.
			5	MC	1	I can convert fractions to terminating and repeating decimals.
			6	MC	2	I can add positive and negative integers to find temperature change.
			7	MC	2	I can add and multiply rational numbers to find a total amount. I can solve multi-step problems with multiplication and addition.
			8	CR	3	I can multiply fractions and integers to find the total number of coins.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
RP Proportional Relationships G7	Ratio and Proportional Relationships	Analyze proportional relationships and use them to solve real-world and mathematical problems	1	MC	2	I can find a unit rate from a ratio of fractions for distance and time.
			2	MC	2	I can identify a proportional relationship and unit rate from a graph.
			3	MC	2	I can identify the rate of change from the graph of a proportional relationship.
			4	MC	2	I can identify an equation to represent a proportional relationship from a real-world problem.
			5	MC	2	I can calculate a discount and sales tax given the percent to find a total.
			6	MC	2	I can calculate a percent of decrease by subtracting a discounted price from an original price.
			7	CR	2	I can find the percent of a number or a total given the percent.

Grade 8 | Formative Item Sets

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
EE Linear Equations G8	Expressions and Equations	Understand the connections between proportional relationships, lines, and equations	1	MC	2	I can interpret a distance-time graph to calculate miles per hour.
			2	MC	2	I can compare the steepness of slopes from statements about proportional relationships.
			3	MC	2	I can identify the graph of a proportional relationship of cost per ounce.
			4	MC	1	I can find the unit rate from the graph of a proportional relationship.
			5	MC	2	I can find and compare unit rates from a table, description, equation, and graph.
			6	MC	2	I can identify the equation of a proportional relationship from a table.
			7	CR	3	I can compare the unit rate given in a statement to the slope from a graph.
EE Rad Integers Exponents G8	Expressions and Equations	Work with radicals and integer exponents	1	MC	2	I can apply the properties of integer exponents to generate equivalent expressions.
			2	MC	2	I can generate equivalent expressions from whole numbers and fractions using integer exponents.
			3	MC	2	I can use a formula to evaluate cube roots of perfect cubes to find side lengths.
			4	MC	2	I can apply the properties of integer exponents to generate equivalent expressions.
			5	MC	2	I can multiply whole numbers and numbers expressed in scientific notation.
			6	MC	1	I can convert numbers from standard form to scientific notation.
			7	CR	2	I can add numbers expressed in scientific form and make comparisons by finding percent.

Name/Item Set	Domain	Cluster	Item Position	Item Type	DOK	Learning Target
F Functions G8	Functions	Define, evaluate, and compare functions	1	MC	1	I can identify a relation as a function from a set of ordered pairs.
			2	MC	1	I can determine the equation of a line from a graph or a table and interpret the slope.
			3	MC	2	I can evaluate and compare two functions from a statement and equation.
			4	MC	2	I can calculate the rate of change from a table of values and make comparisons.
			5	MC	2	I can compare two rates given in a statement and a graph.
			6	MS	2	I can define a function from two points and compare slopes and *y*-intercepts.
			7	MC	2	I can identify a function that is not linear from a set of ordered pairs.
			8	CR	2	I can define a function from a table of values and compare rates of change.
G Pythagorean Theorem G8	Geometry	Understand and apply the Pythagorean Theorem	1	MC	2	I can identify a set of side lengths that form a right triangle.
			2	MC	2	I can use the Pythagorean Theorem to find the length of one leg of a right triangle.
			3	MC	1	I can identify the expression that represents the hypotenuse of a right triangle on a grid.
			4	MC	2	I can apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
			5	SA	2	I can find the difference between the length of hypotenuse and the sum of the lengths of the legs of a right triangle in a coordinate system.
			6	CR	3	I can apply the Pythagorean Theorem to determine unknown side lengths in right triangles.
SP Scatter Plots Tables G8	Statistics and Probability	Investigate patterns of association in bivariate data	1	MC	1	I can investigate patterns of association from a scatterplot.
			2	MC	2	I can interpret the line of best fit from a scatterplot of data to make a prediction.
			3	MC	1	I can interpret a scatterplot and find the line of best fit.
			4	MC	2	I can interpret the *y*-intercept of a linear model in the context of the problem.
			5	MC	2	I can interpret the slope of the equation of the best fitting line in the context of the problem.
			6	MC	2	I can read and interpret a two-way table of data to determine if an association exists.
			7	CR	2	I can interpret a two-way table of relative frequencies and determine possible associations.