Overview of the Maryland Comprehensive Assessment Program (MCAP)

The MCAP includes a coherent set of summative mathematics assessments aligned to the Maryland College and Career Ready Standards for Mathematics (MCCRSM). Students are required to take an MCAP mathematics assessment at the end of grades 3 – 8 and at the end of Algebra I. Students may also take an MCAP mathematics assessment at the end of Geometry and Algebra II.

The MCAP mathematics assessment development process is based on Evidence-Centered Design. The ECD process begins by establishing the answer to "What skills and understandings should be assessed?". The MCCRSM describes the skills and understandings that the MCAP mathematics assessments assess. Assessments are then designed to gather evidence that allows inferences to be made. Assessments can be designed to allow inferences of various grain sizes. The MCAP mathematics assessments are summative assessments and are therefore designed to provide evidence that allows only general inferences about a student's mathematical skills and understandings. The MCAP Mathematics Claims Structure describes the grain size of the evidence that the MCAP mathematics assessments will yield. Assessment items are designed to elicit evidence of a student's level of proficiency for each claim.

MCAP MATHEMATICS CLAIMS STRUCTURE

Master Claim

The student is college and career ready or is on track to being college and career ready in mathematics.

Subclaims

Content - The student solves problems related to all content of the grade/course related to the Standards for Mathematical Practice.

Reasoning - The student expresses grade/course level appropriate mathematical reasoning.

Modeling - The student solves real-world problems with a degree of difficulty appropriate to the grade/course.

MCAP MATHEMATICS ASSESSMENT ITEM TYPES

Item Type	Description	Subclaim	Scoring Method	Number of Operational Items per Form
Type I	Type I items will assess conceptual understanding, procedural skills, reasoning, and the ability to use mathematics to solve real-world problems.	• Content • Reasoning • Modeling	Machine scored	**31**
Type II	Type II items assess a student's ability to reason mathematically. Items may require students to provide arguments or justifications, critique the reasoning of others, and to use precision when explaining their thinking related to mathematics.	• Reasoning	Human scored	**2**
Type III	Type III items assess a student's ability to apply their understanding of mathematics when solving real-world contextual problems.	• Modeling	Human scored	**2**
			Total	**35**

Overview of the MCAP Mathematics Evidence Statements

MCAP Mathematics Evidence Statements help teachers, curriculum developers, and administrators understand how the MCCRSM will be assessed. Assessment items are designed to elicit the evidence described in the Evidence Statements.

The MCAP Mathematics Evidence Statements for the Content Sub-Claim are organized using the same structure as the MCCRSM. The Domains, Clusters, and then Standards organize the Grade 8 Evidence Statements.

Evidence Statements

Evidence statements are provided for each standard to describe the type of evidence that a task addressing the standard should elicit. In some cases, the standard clearly describes the type of evidence that an aligned task should elicit. The Evidence Statement for such standards will read “As stated in the standard”. In cases where the wording of a standard does not adequately describe the type of evidence that should be elicited, the Evidence Statement will attempt to better describe the type of evidence items should elicit. In cases where a standard is taught in both Algebra I and Algebra II, the Evidence Statement and/or Item Specification will seek to describe how the items might differ between the two courses.

CODING OF CONTENT EVIDENCE STATEMENTS

Explanation of Coding	Example of the Evidence Statement
Assessing the Entire Standard • The evidence statement code is the same as the MCCRSM. • The exact language and intent of the entire standard is assessed, which includes examples and "e.g." parts of the standard.	6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." and "For every vote candidate A received, candidate C received nearly three votes."*
Assessing Portions of a Standard with Multiple Operations • The evidence statement code is the same as the MCCRSM with an addition of a dash and a sequential number, e.g. -1, -2, -3, … • The portion of the standard that is assessed will appear in bold font.	6.NS.B.3-1 **Fluently add,** subtract, multiply, and divide **multi-digit decimals using the standard algorithm for each operation.** 6.NS.B.3-2 Fluently add, subtract, multiply, and divide **multi-digit decimals using the standard algorithm for each operation**.

Explanation of Coding	Example of the Evidence Statement
Assessing Portions of a Standard with Two or More Concepts • The evidence statement code is the same as the MCCRSM with an addition of a dash and a sequential number, e.g. -1, -2, -3, … • The portion of the standard that is being assessed will appear in bold font.	7.G.B.4-1 **Know the formulas for the area and circumference of a circle and use them to solve problems**; give an informal derivation of the relationship between the circumference and area of a circle. 7.G.B.4-2 Know the formulas for the area and circumference of a circle and use them to solve problems; **give an informal derivation of the relationship between the circumference and area of a circle.**

CODING FOR REASONING EVIDENCE STATEMENTS

Explanation of Coding	Example of the Evidence Statement
• The evidence statement code begins with the corresponding grade level. • The letter "R" appears after the grade level in the code to indicate Reasoning. • Following the letter "R," a sequential number appears and refers to a domain of the MCCRSM. • The lower case letter at the end of the evidence statement code refers to a specific reasoning evidence statement.	8.R.1a Base reasoning on the principle that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. lane diagram.

CODING FOR MODELING EVIDENCE STATEMENTS

Explanation of Coding	Example of the Statement
• The evidence statement code begins with the corresponding grade level. • After the grade level, M.1 with a sequential letter, e.g. a, b, c, … appears to indicate the specific modeling evidence statement.	8.M.1 Choose and produce appropriate mathematics to model quantities and mathematical relationships in order to analyze situations, make predictions, solve multi-step problems, and draw conclusions. 8.M.1a Given a real-world situation, identify the problem that needs to be solved, make necessary assumptions, and identify important information.

Standards for Mathematical Practice

The Standards for Mathematical Practice describe the varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These practice rest on important “processes and proficiencies” with longstanding importance in mathematics education.

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

Definitions

Defined below are some common terms used in the Evidence Statements.

- **Context:** The situation or setting for a word problem. The situations influence the solution path.
- **Thin Context:** A sentence or phrase that provides meaning for the quantity/quantities in a problem. For example, “The fractions represent lengths of a string.”
- **No context:** The item has no situation or setting. There are only numbers, symbols, and/or visual models in the item.
- **Visual models:** Drawn or pictorial examples that are representations of the mathematics.

Content Subclaim

8.NS Number System

8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items may require students to write a fraction $\frac{a}{b}$ a repeating decimal, or write a repeating decimal as a fraction.
- For items involving writing a repeating decimal as a fraction and items involving writing a fraction as a repeating decimal, the decimal should include no more than two repeating digits following no more than two non-repeating digits (i.e. $2.16\overline{6}$; $0.23\overline{23}$).

Calculator Code: No

8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations*.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items may require students to approximate irrational numbers up to 3 decimal places.

Calculator Code: No

8.EE Expressions and Equations

8.EE.A Work with radicals and integer exponents.

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$.

Evidence Statements/Clarifications:

- Items may or may not have context. Contextual items are limited to items involving area and volume.
- Items focus on the properties and equivalence, not on simplification.
- Items involve one to three properties.
- Items should involve a single common base or a potential common base, such as, a item that includes 3, 9 and 27.

Calculator Code: No

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

Evidence Statements/Clarifications:

- Items may or may not have a context.
- Simplifying radicals is not included.
- Students are required to express the square roots of the perfect squares from 1 to 81, and the perfect cubes from 1 to 64.
- Items may include fractions with perfect squares and cubes, i.e. $\frac{1}{16}$; $x^2 = \frac{4}{9}$.

Calculator Code: No

8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times* 10^8 *and the population of the world as 7 times* 10^9, *and determine that the world population is more than 20 times larger*.

Evidence Statements/Clarifications:

- Items have minimal context.

Calculator Code: No

8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

4-1. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Rules and conventions for significant figures are not assessed.
- Items may involve both decimal and scientific notation.
- Coefficients of the scientific notation expressions should be terminating decimals.

Calculator Code: No

4.2. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Evidence Statements/Clarifications:

- Items have minimal context.
- Items may require students to recognize calculator outputs such as $3.7E-2$ as 3.7×10^{-2}.

Calculator Code: Item Specific

8.EE.B Understand the connections between proportional relationships, lines, and linear equations.

8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

5-1. Graph proportional relationships, interpreting the unit rate as the slope of the graph.

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: Yes

5-2. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: Yes

8.EE.B.6 Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*.

6-1. Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane

Evidence Statements/Clarifications:

- Items do not have context.
- Items focus on explanations using similar triangles, where the focus is on the ratios of the legs.
- Given a non-vertical line in the coordinate plane, items might, for example, require students to choose two pairs of points and record the **rise, run, and slope relative to each pair and verify that they are the same**.
- Items may assess simple graphing of lines from a linear equation in slope-intercept form.

Calculator Code: Yes

6-2. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*.

Evidence Statements/Clarifications:

- Items may have minimal or no context.
- Items may assess simple graphing of lines from a linear equation in slope-intercept form.
- Items may include:
  - Given an equation, identify the slope and y-intercept.
  - Given a graph, derive the equation.
- Given a linear equation, identify the graph.

Calculator Code: Yes

8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.

8.EE.C.7 Solve linear equations in one variable.

7a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$ or $a = b$ results (where a and b are different numbers).

Evidence Statements/Clarifications:

- Items may have minimal or no context.

Calculator Code: No

7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Evidence Statements/Clarifications:

- Items do not have a context.
- Solving linear inequalities in one variable is not assessed in Grade 8. However, to build coherence and prepare students for Algebra I, it may be appropriate to build solving linear inequalities in one variable into classroom instruction (as time permits).

Calculator Code: No

8.EE.C.8 Analyze and solve pairs of simultaneous linear equations.

8a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items assess understanding the solution satisfies both equations simultaneously.
- Items focus connecting the solution to the system of equations, and not on solving the system.

Calculator Code: No

8b-1. Solve systems of two linear equations in two variables algebraically

Evidence Statements/Clarifications:

- Coefficients, constants, and solutions may be rational, including zero.
- Items may or may not have a context.
- Students may solve the system using substitution or elimination (combination) methods.

Calculator Code: Yes

8b-2. Estimate solutions by graphing the equations.

Evidence Statements/Clarifications:

- Coefficients, constants, and solutions may be rational, including zero.
- Items may or may not have a context.

Calculator Code: Yes

8b-3. Solve simple cases by inspection. ***For example,*** $3x + 2y = 5$ ***and*** $3x + 2y = 6$ ***have no solution because*** $3x + 2y$ ***cannot simultaneously be 5 and 6.***

Evidence Statements/Clarifications:

- Items have whole number or integer coefficients, which could be zero.
- Items may involve:
  - inconsistent systems, where the inconsistency is plausibly visible by inspection as in the italicized example
  - degenerate systems (infinitely many solutions), where the degeneracy is plausibly visible by inspection, *e.g.* $3\boldsymbol{x} + 3\boldsymbol{y} = 1$, $6\boldsymbol{x} + 6\boldsymbol{y} = 2$
- systems with a unique solution and one coefficient zero, where the solution is plausibly visible by inspection, *e.g.* $y = 1$, $3x + y = 1$.

Calculator Code: Yes

8c. Solve real-world and mathematical problems leading to two linear equations in two variables; *for example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair*.

Evidence Statements/Clarifications:

- Items may require students to write the system of equations and/or write equivalent equations.

Calculator Code: Yes

8.F Functions

8.F.A Define, evaluate, and compare functions.

8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

1-1. Understand that a function is a rule that assigns to each input exactly one output.

Evidence Statements/Clarifications:

- Items do not involve the coordinate plane or the “vertical line test”.
- Some of the functions in items are non-numerical.
- Items should involve clearly defined inputs and outputs
- Items assess the understanding of what makes a relation a function.

Calculator Code: No

1-2. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output

Evidence Statements/Clarifications:

- Functions are limited to those with inputs and outputs in the real numbers.
- Items include:
    - Graphing functions in the coordinate plane
    - Reading inputs and outputs from the graph of a function in the coordinate plane.
    - Identifying when a set of points in the plane represents a function.
- Items should involve clearly defined inputs and outputs.

Calculator Code: No

8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change*.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Equations can be presented in slope intercept form, standard form, or other such forms.

Calculator Code: Yes

8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points* (1, 1), (2, 4), and (3, 9), *which are not on a straight line*.

3-1. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Equations can be presented in slope intercept form, standard form, or other such forms.

Calculator Code: No

3-2. Give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points* (1, 1), (2, 4), and (3, 9), *which are not on a straight line*.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Items may require students to give examples of equations that are nonlinear or pairs of points to show a function is non-linear.

Calculator Code: No

8.F.B Use functions to model relationships between quantities.

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: Yes

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

5-1. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: No

5-2. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: No

8.G Geometry

8.G.A Understand congruence and similarity using physical models, transparencies, or geometry software.

8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations.

1a. Lines are taken to lines, and line segments to line segments of the same length.

Evidence Statements/Clarifications:

- Items do not have a context.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- Symbols for parallel lines (//) and perpendicular lines (⊥) may be used in assessment items.

Calculator Code: No

1b. Angles are taken to angles of the same measure.

Evidence Statements/Clarifications:

- Items do not have a context.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- Symbols for angles (∠) and congruency (≅) may be used in assessment items.

Calculator Code: No

1c. Parallel lines are taken to parallel lines.

Evidence Statements/Clarifications:

- Items do not have a context.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- The symbol for parallel lines (//) may be used in assessment items.

Calculator Code: No

8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Evidence Statements/Clarifications:

- Items do not have a context.
- Figures may be in the coordinate plane, but do not include use of coordinates.
- Items require students to make connections between congruence and transformations.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- Symbols for congruency (≅) and similarity (~) may be used in assessment items.

Calculator Code: No

8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Items require the use of coordinates in the coordinate plane.
- Items must state the center of dilation.
- Centers of dilation can be the origin, the center of the original shape or the vertices of the original shape.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- Algebraic notation for transformations may be used in assessment items.
- Symbols for congruency (≅) and similarity (~) may be used in assessment items.

Calculator Code: No

8.G.A.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Evidence Statements/Clarifications:

- Items have no context.
- Figures drawn in the coordinate plane do not include the use of coordinates.
- Items require students to make connections between similarity and transformations.
- Rotations are limited to 90°, 180°, and 270° angles of rotation about the origin.
- Reflection are limited to reflections across the *x*- and *y*- axes.
- Symbols for congruency ($\cong$) and similarity ($\sim$) may be used in assessment items.

Calculator Code: No

8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*.

Evidence Statements/Clarifications:

- Items have no context.
- Items may use precise vocabulary to refer to angles cut by a transversal (i.e. corresponding angles, alternate interior angles, etc.)
- Symbols for angles ($\angle$) , triangles (Δ) , parallel lines (/ /), perpendicular lines ($\perp$) congruency ($\cong$) and similarity ($\sim$) may be used in assessment items.

Calculator Code: No

8.G.B Understand and apply the Pythagorean Theorem.

8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Proofs are informal, pictorial, and/or algebraic in nature.

- Algebraic manipulations and explanations of proof should not go beyond Grade 8 evidence statements.
- Refer to p. 12 of 7-HS Progression on Geometry, for informal proof examples.

Calculator Code: Yes

8.G.B.7 **Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two** and three dimensions.

Evidence Statements/Clarifications:

- Items have minimal or no context.
- Items require the answer to be given as a whole number or as an irrational number written to approximately three decimal places.
- Items may include recognition of the common Pythagorean Triples (i.e. 3, 4,5 and 5, 12, 13).
- Connections to and reasoning about specific triangle types may be made (i.e. isosceles right triangle).
- Side lengths may be represented by exact values using square root notation.
- Items may involve application of the converse of the Pythagorean Theorem.

Calculator Code: Yes

8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system

Evidence Statements/Clarifications:

- Items may involve application of the converse of the Pythagorean Theorem.

Calculator Code: Yes

8.G.C Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

8.SP Statistics and Probability

8.SP.A Investigate patterns of association in bivariate data.

8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

Evidence Statements/Clarifications:

- Items may have context.
- Descriptions of patterns may include ‘weak’ and ‘strong’, i.e. The data appear to have a weak, negative association; the data appear to have a strong, positive association.

Calculator Code: No

8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Evidence Statements/Clarifications:

- Items may have context.
- Items have students find the “line of best fit” as opposed to the “trend line’. Linear regression is an Algebra 1 topic, and not appropriate for Grade 8.

Calculator Code: No

8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height*.

Evidence Statements/Clarifications:

- When dealing with slope, items should include interpretation of slope, and not just calculation of slope.
- Items connect to the level of understanding detailed in 8.EE.B.6.

Calculator Code: Yes

8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

Evidence Statements/Clarifications:

- An equal number of items require students to:
  - Answer basic comprehension questions about a two-way table.
  - To compute marginal sums or marginal percentages.
- To interpret patterns or association.

Calculator Code: Yes

Reasoning Subclaim

All reasoning assessment items connect to both the Grade 8 reasoning evidence statements and the content evidence statements. Students must provide evidence of their ability to reason mathematically by responding to Type I and Type II items.

Type I

- Items are machine scored.
- Items are 1 point per item.
- Items align to the Ratios and Proportional Relationships (RP) domain, the Number Systems (NS) domain, and the Expressions and Equations (EE) domain.
- Calculators are allowed on all reasoning items.
- Four items from this grouping will appear on each assessment.

Type II

- Items are human scored constructed response.
- Items are 3 or 4 points per item.
- Items align to the Ratios and Proportional Relationships (RP) domain, the Number Systems (NS) domain, and the Expressions and Equations (EE) domain.
- Calculators are allowed on all reasoning items.
- Two items from this grouping will appear on each assessment.

The following pages provide the reasoning evidence statements and specific clarifications.

8.R.1 Reasoning with Expressions and Equations

8.R.1a **Evidence Statement:**

- Base reasoning on the principle that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

Clarifications:

- Content scope: 8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
- Items require students to derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intersecting the vertical axis at b.

8.R.1b **Evidence Statement:**

- Base reasoning on the principle that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

Clarifications:

- Content Scope: 8.EE.C.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously.

8.R.1c **Evidence Statement:**

- Given an equation or system of equations, present the solution steps as a logical argument that concludes with the set of solutions, if any.

Clarifications:

- Content Scope: 8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.

8.R.1d **Evidence Statement:**

- Present or validate solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision.

Clarifications:

- Content Scope: 8.EE.C.8c Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

8.R.1e **Evidence Statement:**

- Apply geometric reasoning in a coordinate setting and use coordinates to draw geometric conclusions.
- Demonstrate reasoning and understanding regarding the necessary conditions under which two segments have the same slope.

Clarifications:

- Content Scope: 8.EE.B.6 **Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane**; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

8.R.2 Reasoning with Functions

8.R.2a **Evidence Statement:**

- Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.

Clarifications:

- Content Scope: 8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1, 1), (2, 4), and (3, 9), which are not on a straight line*.
- Items require students to justify whether a given function is linear or nonlinear.

8.R.3 Reasoning with Geometry

8.R.3a **Evidence Statement:**

- Form **chains of reasoning** that will justify or refute propositions or conjectures.

Clarifications:

- Content Scope: 8.G.A.2, 8.G.A.4 Understand that a two-dimensional figure is congruent or similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and/or dilations; given two congruent or similar figures, describe a sequence that exhibits the congruence or similarity between them.

8.R.3b **Evidence Statement:**

- Form chains of reasoning that will justify or refute propositions or conjectures.

Clarifications:

- Content Scope: 8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

8.R.3c **Evidence Statement:**

- Apply **geometric reasoning** in a coordinate setting and use coordinates to draw geometric conclusions.

Clarifications:

- Content Scope: 8.G.A.2, 8.G.A.4 Understand that a two-dimensional figure is congruent or similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and/or dilations; given two congruent or similar figures, describe a sequence that exhibits the congruence or similarity between them.

8.R.3d **Evidence Statement:**

- Apply geometric reasoning in a coordinate setting and use coordinates to draw geometric conclusions.

Clarifications:

- Content Scope: 8.G.B Understand and apply the Pythagorean Theorem.
- Some of items require students to use the converse of the Pythagorean Theorem.

Modeling Subclaim

All modeling assessment items connect to both the Grade 8 modeling evidence statements and the content evidence statements. Students must provide evidence of their ability to apply one or more steps of the modeling cycle by responding to Type I and Type III items.

Type I

- Items are machine scored.
- Items are 1 point per item.
- Items can be aligned to any of the content standards.
- Calculators are allowed on all modeling items.
- Four items from this grouping will appear on each assessment.

Type III

- Items are human scored constructed response.
- Items are 3 points or 4 points per item.
- Items can be aligned to any of the content standards.
- Calculators are allowed on all modeling items.
- Two items from this grouping will appear on each assessment.

The following pages provide the modeling evidence statements and specific clarifications.

8.M.1 Evidence Statement:

- Choose and produce appropriate mathematics to model quantities and mathematical relationships in order to analyze situations, make predictions, solve multi-step problems, and draw conclusions.

Clarifications:

- Items require students to implement the modeling cycle.
- Items require application of knowledge and skills articulated in any/all of the Content Domains.
- Items allow for flexibility in mathematical representations and solution methods.

8.M.1a Evidence Statement:

- Given a real-world situation, identify the problem that needs to be solved, make necessary assumptions, and identify important information.

Clarifications:

- Items may require students to identify and describe the problem that needs to be solved in their own words or that could be asked based on the problem situation.
- Items may require students to justify the problem that needs to be solved by identifying information from the problem.
- Items may include charts and/or graphs that could be analyzed for information about the problem.
- Items may prompt students to identify the information that is needed to solve the problem.
- Items may have information that is essential to solving the problem, but is not given, and prompt students to make assumptions.
- Items do not require a solution.

8.M.1b Evidence Statement:

- Given a real-world situation, formulate a mathematical representation of the problem.

Clarifications:

- Items allow for students to represent the given problem using mathematical models, e.g. words, equations, functions, geometric figures, statistical models, etc.
- Responses should be mathematically correct and precise.
- Items do not require a solution.

8.M.1c **Evidence Statement:**

- Given a real-world situation, use mathematical models to compute and draw conclusions.

Clarifications:

- Items may prompt the students to identify the mathematics or mathematical model needed to solve the problem.
- Items require the students to use a model to compute a solution and draw conclusions.
- Responses should be mathematically correct and precise.

8.M.1d **Evidence Statement:**

- Given a real-world situation, interpret what a solution means within the context of the situation.

Clarifications:

- Items involve students interpreting and concluding what a particular solution means within the context of a problem.
- Items may require the students to provide the final solution to the problem.

8.M.1e **Evidence Statement:**

- Given a real-world situation, evaluate and/or validate a partial or complete solution.

Clarifications:

- Items require students to analyze a given solution path (partial or complete) to determine if it is a mathematically correct solution path for the given real-world situation, and to consider whether the solution reasonably answers the question.
- Items may ask students to improve or refine a solution path at any point in the modeling cycle.
- Items may require the students to provide the final solution to the problem.