Grade 7 Mathematics – Evidence Statements

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 7 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.	7.R.1a Base explanations and reasoning on a coordinate plane 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.	7.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. 7.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

7.RP Ratios and Proportional Relationships

7.RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

For example, if a person walks $\frac{1}{2}$ *mile in each* $\frac{1}{4}$ *hour, compute the unit rate as the complex fraction* $\frac{\frac{1}{2}}{\frac{1}{4}}$ *miles per hour, equivalently 2 miles per hour.*

Evidence Statements/Clarifications:

- Items have a real-world context.
- Items do not assess unit conversions.

Calculator Code: Yes

7.RP.A.2 Recognize and represent proportional relationships between quantities.

2a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

Evidence Statements/Clarifications:

- Items may have minimal or no context.
- Items are not limited to ratios of whole numbers. Items should be rigorous; operations should not distract from the intent of the standard.
- Items use only coordinates in the first quadrant, and use only a positive constant of proportionality.

Calculator Code: Yes

2b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

Evidence Statements/Clarifications:

- Items may or may not have a context.

- Items sample equally across the listed representations (graphs, equations, diagrams, and verbal descriptions).
- Items use only coordinates in the first quadrant, and use only a positive constant of proportionality.

Calculator Code: No

2c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as* $t = pn$.

Evidence Statements/Clarifications:

- Items may or may not have a context.
- Proportional relationships may be initially presented in any representation (i.e. graphs, diagrams, and verbal descriptions).
- Items use only coordinates in the first quadrant, and use only a positive constant of proportionality.

Calculator Code: No

2d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points *(0, 0)* and *(1, r)* where *r* is the unit rate.

Evidence Statements/Clarifications:

- Items can require students to interpret, as well as explain, a point (x, y) on the graph of a proportional relationship in terms of the situation.
- Items use only coordinates in the first quadrant, and use only a positive constant of proportionality.

Calculator Code: No

7.RP.A.3-1 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

3-1. Use proportional relationships to solve multistep ratio problems.

Evidence Statements/Clarifications:

- Items will include proportional relationships that only involve positive numbers.

Calculator Code: Yes

3-2. Use proportional relationships to solve multistep percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Evidence Statements/Clarifications:

- Items will include proportional relationships that only involve positive numbers.

Calculator Code: Yes

7.NS Number System

7.NS.A Apply and extend previous understandings of operations with fractions.

7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

1a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.

Evidence Statements/Clarifications:

- Items must have a context.
- Items are not limited to integers.

Calculator Code: No

1b-1. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses).

Evidence Statements/Clarifications:

- Items do not have a context.
- Items are not limited to integers.
- Items involve a number line.

Calculator Code: No

1b-2. Interpret sums of rational numbers by describing real-world contexts.

Evidence Statements/Clarifications:

- Items require students to produce or recognize real-world contexts that correspond to given sums of rational numbers.
- Items are not limited to integers.

Calculator Code: No

1c-1. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Apply this principle in real-world contexts.

Evidence Statements/Clarifications:

- Items may or may not have a context.
- Items are not limited to integers.
- Contextual items may require students to create or identify a situation described by an expression of the form ***p – q = p + (-q)***.
- Items may be computation or focus on the conceptual understanding of the standard. For example, given the difference $-\frac{1}{3}-\left(\frac{1}{5}+\frac{5}{8}\right)$, the student might be asked to recognize the equivalent expression $-\frac{1}{3}+-\left(\frac{1}{5}+\frac{5}{8}\right)$.

Calculator Code: No

1c-2. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

Evidence Statements/Clarifications:

- Items focus on the conceptual understanding of the standard.

Calculator Code: No

1d. Apply properties of operations as strategies to add and subtract rational numbers.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items are not limited to integers.
- Items may involve sums and differences of two or three rational numbers.
- Items require students to demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given sum or difference. For example, given the sum -8.1 + 7.4 , the student might be asked to recognize or produce the equivalent expression –(8.1 – 7.4).

Calculator Code: No

7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

2a-1. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1)=1$ and the rules for multiplying signed numbers.

Evidence Statements/Clarifications:

- Items do not have a context.

- Items require students to demonstrate conceptual understanding, for example by providing students with a numerical expression and requiring students to produce or recognize an equivalent expression using properties of operations. For example, given the expression $(-3)(6+-4+-3)$, the student might be asked to recognize that the given expression is equivalent to $(-3)(6+-4)+(-3)(-3)$.

Calculator Code: No

2a-2. Interpret products of rational numbers by describing real-world contexts.

Evidence Statements/Clarifications:

- N/A

Calculator Code: No

2b-1. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-\left(\frac{p}{q}\right)=\frac{(-p)}{q}=\frac{p}{(-q)}$

Evidence Statements/Clarifications:

- Items do not have a context.
- Items require students to demonstrate conceptual understanding for example, by providing students with a numerical expression and requiring students to produce or recognize an equivalent expression.

Calculator Code: No

2b-2. Interpret quotients of rational numbers by describing real-world contexts.

Evidence Statements/Clarifications:

- N/A

Calculator Code: No

2c. Apply properties of operations as strategies to multiply and divide rational numbers.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items are not limited to integers.
- Items may involve products and quotients of two or three rational numbers.

- Items require students to compute a product or quotient, or demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given expression.
  For example, given the expression $(-8)(6) \div (-3)$, the student might be asked to recognize or produce the equivalent expression $-\left(\frac{8}{3}\right)(-6)$.

Calculator Code: No

2d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Evidence Statements/Clarifications:

- Items should be rigorous, but not tedious.
- Items should keep the final answers within three decimal places, or no more than three decimal places to identify the repetend.

Calculator Code: No

7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Evidence Statements/Clarifications:

- Items are one-step word problems.
- Items involve at least one negative number, which could be the solution.
- Items are not limited to integers.

Calculator Code: No

7.EE Expressions and Equations

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

7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Evidence Statements/Clarifications:

- Items are not limited to integer coefficients.
- Items should assess the true intent of the standard, which is application of properties of operations as strategies.
- Items should not require students to identify or name properties.
- Tasks may involve issues of strategy, e.g., by providing a factored expression such as $y(3+x+k)$ and a fully expanded expression $3y+xy+ky$, and requiring students to produce or identify a new expression equivalent to both, such as $y(3+x)+yk$.

Calculator Code: No

7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by* 1.05."

Evidence Statements/Clarifications:

- Items focus on conceptual understanding of the standard.
- Items require students to determine equivalent forms of expressions.
- Items may involve equivalent forms of percent expressions, e.g. percent increase or percent decrease.
- Items have a context.
- Expressions may or may not contain a variable.

Calculator Code: No

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

7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a* 10% *raise, she will make an additional* $\frac{1}{10}$ *of her salary an hour, or* $2.50, *for a new salary of $27.50. If you*

want to place a towel bar $9\frac{3}{4}$ *inches long in the center of a door that is* $27\frac{1}{2}$ *inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation*.

Evidence Statements/Clarifications:

- Items are not limited to integers.
- Items can require students to solve problems in more than one way.
- Items may require interpretation of solution.

Calculator Code: Yes

7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

4a-1. Solve word problems leading to equations of the form $\boldsymbol{px+q=r}$ and $\boldsymbol{p(x+q)=r}$, where *p*, *q*, and *r* are specific rational numbers.

Evidence Statements/Clarifications:

- Comparison of an algebraic solution to an arithmetic solution is not assessed here.
- Items can require students to write, and solve, two-step equations from real-world context

Calculator Code: No

4a-2. Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where *p*, *q*, and *r* are specific rational numbers. **Solve equations of these forms fluently.** Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Evidence Statements/Clarifications:

- Comparison of an algebraic solution to an arithmetic solution is not assessed here.
- Items are non-contextual.
- Items focus on solving equations.

Calculator Code: No

4b. Solve word problems leading to inequalities of the form $px+q>r$ or $px+q<r$, where *p*, *q* and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least* $100. *Write an inequality for the number of sales you need to make, and describe the solutions*.

Evidence Statements/Clarifications:

- Items may involve $<$, $>$, $\leq$ or $\geq$
- Items may require students to write, and solve, inequalities in two steps from a real world context.
- Items may require interpretation of possible solutions to the inequality.
- In the inequalities, p, q and r are rational numbers.
- Careful consideration should be made when choosing the context of the word problems. Items should be written so that the inequality accurately and precisely represents the situation, especially when describing discrete quantities.
- Compound inequalities are taught and assessed in Algebra I and Algebra II, and are not appropriate for Grade 7.

Calculator Code: No

7.G Geometry

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

7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Evidence Statements/Clarifications:

- Items may or may not have context.

Calculator Code: Yes

7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Evidence Statements/Clarifications:

- Items do not have a context.
- Items may ask students to identify geometric shapes based on specific parameters.

Calculator Code: Yes

7.G.A.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Evidence Statements/Clarifications:

- Items may or may not have context.
- Slices are not limited to cross sections parallel or perpendicular to the base of the figure. Slices may be oblique.
- Items may ask students to identify geometric shapes based on specific parameters.

Calculator Code: Yes

7.G.B Solve real-life and mathematical problems involving angle measures, area, surface area, and volume.

7.G.B.4 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.

4-1. Know the formulas for the area an circumference of a circle and use them to solve problems.

Evidence Statements/Clarifications:

- Items may or may not have context.
- Items may require answers to be written in terms of π.

Calculator Code: Yes

4-2. Give an informal derivation of the relationship between the circumference and area of a circle.

Evidence Statements/Clarifications:

- Items require students to identify or produce a logical conclusion about the relationship between the circumference and the area of a circle.

Calculator Code: Yes

7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Evidence Statements/Clarifications:

- Items may or may not have context.
- Items involving writing or solving an equation should not go beyond the equation types described in 7.EE.B.4a.

Calculator Code: Yes

7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Evidence Statements/Clarifications:

- Items may or may not have context.
- Items should focus on volume and surface area.

Calculator Code: Yes

7.SP Statistics and Probability

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

7.SP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

7.SP.B Draw informal comparative inferences about two populations.

7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable*.

Evidence Statements/Clarifications:

- Items may use mean absolute deviation, range, or interquartile range as a measure of variability to compare multiple sets of data using a visual display.

Calculator Code: Yes

7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

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

7.SP.C.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Evidence Statements/Clarifications:

- Items may involve probabilities that are impossible (0) or certain (1), as well as probabilities that are between impossible and certain (0–1).

Calculator Code: Yes

7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times*.

Evidence Statements/Clarifications:

- Items require the student to make a prediction based on long-run relative frequency in data from a chance process.

Calculator Code: Yes

7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

7a. Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected*.

Evidence Statements/Clarifications:

- Items should be simple events only.
- Items should focus on development and use of the model, rather than emphasizing the term ‘uniform probability model’.

Calculator Code: Yes

7b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

Evidence Statements/Clarifications:

- Items should focus on development and use of the model, rather than emphasizing the term 'uniform probability model'.

Calculator Code: Yes

7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

8a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

8b. Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

8c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

Evidence Statements/Clarifications:

- N/A

Calculator Code: Yes

Reasoning Subclaim

All reasoning assessment items connect to both the Grade 7 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.

7.R.1 Reasoning with Ratios and Proportional Relationships

7.R.1a Evidence Statement:

- Base explanations and reasoning on a coordinate plane diagram.

Clarifications:

- Content Scope: 7.RP Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Items involving coordinate grids use only coordinates in the first quadrant.
- Items use only a positive constant of proportionality.

7.R.1b Evidence Statement:

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

Clarifications:

- Content Scope: 7.RP.A.2 Recognize and represent proportional relationships between quantities.
- Items involving coordinate grids use only coordinates in the first quadrant.
- Items use only a positive constant of proportionality.

7.R.1c Evidence Statement:

- Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision.
- Identify or describe errors in solutions to multi-step problems and present corrected solutions.

Clarifications:

- Content Scope: 7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems.
- Items involving coordinate grids use only coordinates in the first quadrant.
- Items use only a positive constant of proportionality.

7.R.2 Reasoning with Number Systems

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

- Base explanations and reasoning on the properties of operations.

Clarifications:

- Content Scope: 7.NS.A.1, 7.NS.A.2 **Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers;** represent addition and subtraction on a horizontal or vertical number line diagram. **Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.**
- Items should not require students to identify or name properties.

7.R.2b **Evidence Statement:**

- Base explanations and reasoning on the relationship between addition and subtraction or the relationship between multiplication and division.

Clarifications:

- Content Scope: 7.NS.A.1, 7.NS.A.2 **Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers;** represent addition and subtraction on a horizontal or vertical number line diagram. **Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.**

7.R.2c **Evidence Statement:**

- Base explanations and reasoning on a number line diagram.

Clarifications:

- Content Scope: 7.NS Apply and extend previous understandings of operations with fractions.
- Diagram may be provided in the prompt or constructed by the student.

7.R.2d **Evidence Statement:**

- Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision.
- Identify or describe errors in solutions to multi-step problems and present corrected solutions.

Clarifications:

- Content Scope: 7.NS.A.2d Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
- Items focus on demonstrating understanding that a number is rational.
- Items do not directly assess the ability to divide two whole numbers.

7.R.2e **Evidence Statement:**

- Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision.
- Identify or describe errors in solutions to multi-step problems and present corrected solutions.

Clarifications:

- Content Scope: 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.
- Items involve any or all of the four operations with rational numbers.
- Items should be multi-step.

7.R.3 Reasoning with Expressions and Equations

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

- Base explanations and reasoning on the properties of operations.

Clarifications:

- Content Scope: 7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- Items should not require students to identify or name properties.

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

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

Clarifications:

- Content Scope: 7.EE.B.4a Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

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

- Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision.
- Identify or describe errors in solutions to multi-step problems and present corrected solutions.

Clarifications:

- Content Scope: 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Modeling Subclaim

All modeling assessment items connect to both the Grade 7 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.

7.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.

7.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.

7.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.

7.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.

7.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.

7.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.