



**Informational Guide**  
**to**  
**Mathematics III Summative**  
**Assessments**

# Overview

The PARCC assessment system is a cohesive set of tests that students will take during the school year that include summative (performance-based and end-of-year assessments) and non-summative components (diagnostic and mid-year assessments). This guide has been prepared to provide specific information about the PARCC Summative Assessments. The PARCC Assessments are based upon Evidence-Centered Design (ECD). Evidence-Centered Design is a systematic approach to test development. The design work begins with developing **claims** (the inferences we want to draw about what students know and can do). Next, **evidence statements** are developed to describe the tangible things we could point to, highlight or underline in a student work product that would help us prove our claims. Then, **tasks** are designed to elicit this tangible evidence.

This guide provides information on the following for the Mathematics III Summative Assessments:

- PARCC Claims Structure
- PARCC Task Types
- PARCC Test Blueprint
- PARCC Evidence Statements and Tables<sup>◇</sup>
- PARCC Assessment Policies

<sup>◇</sup>The Evidence Tables in this document are formatted to assist educators in understanding the content of each summative assessment. Evidence Statements are grouped to indicate those assessable on the PBA only, both the PBA and EOY, and the EOY only.

# Claims Structure: Mathematics III

**Master Claim:** On-Track for college and career readiness. The degree to which a student is college and career ready (or “on-track” to being ready) in mathematics. The student solves grade-level /course-level problems in mathematics as set forth in the Standards for Mathematical Content with connections to the Standards for Mathematical Practice.

**Sub-Claim A: Major Content<sup>1</sup> with Connections to Practices**

The student solves problems involving the Major Content<sup>1</sup> for her grade/course with connections to the Standards for Mathematical Practice.

35 points

**Sub-Claim B: Additional & Supporting Content<sup>2</sup> with Connections to Practices**

The student solves problems involving the Additional and Supporting Content<sup>2</sup> for her grade/course with connections to the Standards for Mathematical Practice.

24 points

**Sub-Claim C: Highlighted Practices MP.3,6 with Connections to Content (expressing mathematical reasoning)**

The student expresses grade/course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and/or attending to precision when making mathematical statements.

18 points<sup>3</sup>

**Sub-Claim D: Highlighted Practice MP.4 with Connections to Content (modeling/application)**

The student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), *engaging particularly in the Modeling practice*, and where helpful making sense of problems and persevering to solve them (MP. 1), reasoning abstractly and quantitatively (MP. 2), using appropriate tools strategically (MP.5), looking for and making use of structure (MP.7), and/or looking for and expressing regularity in repeated reasoning (MP.8).

24 points<sup>3</sup>

**Total Exam :**

**107 points<sup>4</sup>**

<sup>1</sup> For the purposes of the PARCC Mathematics assessments, the Major Content in a grade/course is determined by that grade level’s Major Clusters as identified in the *PARCC Model Content Frameworks v.3.0* for Mathematics. Note that tasks on PARCC assessments providing evidence for this claim will sometimes require the student to apply the knowledge, skills, and understandings from across several Major Clusters.

<sup>2</sup> The Additional and Supporting Content in a grade/course is determined by that grade level’s Additional and Supporting Clusters as identified in the *PARCC Model Content Frameworks v.3.0* for Mathematics.

<sup>3</sup> Mathematics III has an additional reasoning and modeling task to provide more information about the student’s college and career readiness.

<sup>4</sup> There are an additional 6 points from integrated tasks that will be reported in the Master Claim.

# Overview of PARCC Mathematics Task Types

Task Type	Description	Reporting Categories	Scoring Method	Mathematical Practice(s)	Summative Assessment
Type I	conceptual understanding, fluency, and application	<b>Sub-Claim A:</b> Solve problems involving the <u>major content</u> for the grade level <b>Sub-Claim B:</b> Solve problems involving the <u>additional and supporting content</u> for the grade level	computer-scored only	can involve any or all practices	EOY and PBA
Type II	written arguments/justifications, critique of reasoning, or precision in mathematical statements	<b>Sub-Claim C:</b> Express mathematical <u>reasoning</u> by constructing mathematical arguments and critiques	computer- and hand-scored tasks	primarily MP.3 and MP.6, but may also involve any of the other practices	PBA only
Type III	modeling/application in a real-world context or scenario	<b>Sub-Claim D:</b> solve real-world problems engaging particularly in the <u>modeling</u> practice	computer- and hand-scored tasks	primarily MP.4, but may also involve any of the other practices	PBA only

# Mathematics III High Level Blueprints

Performance-Based Summative Assessment (PBA)			
	Task Type/ Point Value	Number of Tasks	Total Points
Number and Point Values for each Task Type	Type I 1 Point	10	10
	Type I 2 Point	0	0
	Type II 3 Point	2	6
	Type II 4 Point	3	12
	Type III 3 Point	2	6
	Type III 6 Point	3	18
	<b>Total</b>	<b>20</b>	<b>52</b>
Percentage of Assessment Points by Task Type	Type I	(10/52) 19%	
	Type II	(18/52) 35%	
	Type III	(24/52) 46%	

End-of-Year Summative Assessment (EOY)			
Task Type/ Point Value	Number of Tasks	Total Points	Percent of Test
Type I 1 Point	19	19	35%
Type I 2 Point	14	28	51%
Type I 4 points	2	8	14%
<b>Total</b>	<b>35</b>	<b>55</b>	<b>100%</b>

# Evidence Statement Keys

Evidence statements describe the knowledge and skills that an assessment item/task elicits from students. These are derived directly from the Common Core State Standards for Mathematics (the standards), and they highlight the advances of the standards, especially around their focused coherent nature. The evidence statement keys for grades 3 through 8 will begin with the grade number. High school evidence statement keys will begin with “HS” or with the label for a conceptual category. Together, the five different types of evidence statements described below provide the foundation for ensuring that PARCC assesses the full range and depth of the standards which can be downloaded from <http://www.corestandards.org/Math/>.

An Evidence Statement might:

**1. Use exact standard language** – For example:

- 8.EE.1 - Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,  $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$ .* This example uses the exact language as standard 8.EE.1

**2. Be derived by focusing on specific parts of a standard** – For example: 8.F.5-1 and 8.F.5-2 were derived from splitting standard 8.F.5:

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

Together these two evidence statements are standard 8.F.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.

**3. Be integrative (Int)** – Integrative evidence statements allow for the testing of more than one of the standards on a single item/task without going beyond the standards to create new requirements. An integrative evidence statement might be integrated across all content within a grade/course, all standards in a high school conceptual category, all standards in a domain, or all standards in a cluster. For example:

- Grade/Course** – 4.Int.2<sup>s</sup> (Integrated across Grade 4)
- Conceptual Category** – F.Int.1<sup>s</sup> (Integrated across the Functions Conceptual Category)
- Domain** – 4.NBT.Int.1<sup>s</sup> (Integrated across the Number and Operations in Base Ten Domain)
- Cluster** – 3.NF.A.Int.1<sup>s</sup> (Integrated across the Number and Operations – Fractions Domain, Cluster A )

**4. Focus on mathematical reasoning**– A reasoning evidence statement (keyed with C) will state the type of reasoning that an item/task will require and the content scope from the standard that the item/task will require the student to reason about. For example:

- 3.C.2<sup>§</sup> -- Base explanations/reasoning on the relationship between addition and subtraction or the relationship between multiplication and division.
  - Content Scope: Knowledge and skills are articulated in 3.OA.6
- 7.C.6.1<sup>§</sup> – Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.
  - Content Scope: Knowledge and skills are articulated in 7.RP.2

**Note:** When the focus of the evidence statement is on reasoning, the evidence statement may also require the student to reason about securely held knowledge from a previous grade.

**5. Focus on mathematical modeling** – A modeling evidence statement (keyed with D) will state the type of modeling that an item/task will require and the content scope from the standard that the item/task will require the student to model about. For example:

- 4.D.2<sup>§</sup> – Solve multi-step contextual problems with degree of difficulty appropriate to Grade 4 requiring application of knowledge and skills articulated in 3.OA.A, 3.OA.8, 3.NBT, and/or 3.MD.

**Note:** The example 4.D.2 is of an evidence statement in which an item/task aligned to the evidence statement will require the student to model on grade level, using securely held knowledge from a previous grade.

- HS.D.5<sup>§</sup> - Given an equation or system of equations, reason about the number or nature of the solutions.
  - Content scope: A-REI.11, involving any of the function types measured in the standards.

<sup>§</sup> The numbers at the end of the integrated, modeling and reasoning Evidence Statement keys are added for assessment clarification and tracking purposes. For example, 4.Int.2 is the second integrated Evidence Statement in Grade 4.

## Mathematics III Evidence Statements

### Listing by PBA only, PBA and EOY, and EOY Only

The PARCC Evidence Statements for Mathematics III are provided starting on the next page. The list has been organized to indicate whether items designed to align with an Evidence Statement may be used on the Performance-Based Assessment (PBA), the End-of-Year (EOY) Assessment, or on both the PBA and EOY.

Evidence Statements are presented in the order shown below and are color coded:

**Lavender** – Evidence Statement is applicable to the PBA only.

**Peach** – Evidence Statement is applicable to both the PBA and EOY.

**Aqua** – Evidence Statement is applicable to the EOY only.



**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
C	HS.C.4.1	Derive and use a formula. Content Scope: A-SSE.4	PBA -	MP.3, MP.6	Y
C	HS.C.5.4	Given an equation or system of equations, reason about the number or nature of the solutions. Content Scope: A-REI.2.	PBA i) Simple rational equations are limited to numerators and denominators that have degree at most 2.	MP.3	Y
C	HS.C.5.11	Given an equation or system of equations, reason about the number or nature of the solutions. Content Scope: A-REI.11, involving any of the function types measured in the standards.	PBA i) <i>For example, students might be asked how many positive solutions there are to the equation <math>e^x = x+2</math> or the equation <math>e^x = x+1</math>, explaining how they know. The student might use technology strategically to plot both sides of the equation without prompting.</i>	MP.3	Y
C	HS.C.6.2	Base explanations/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. Content Scope: A-REI.D	PBA -	MP.3	Y
C	HS.C.6.4	Base explanations/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. Content Scope: G-GPE.2	PBA -	MP.3	Y
C	HS.C.7.1	Base explanations/reasoning on the relationship between zeros and factors of polynomials. Content Scope: A-APR.B	PBA -	MP.3	Y
C	HS.C.8.2	Construct, autonomously, chains of reasoning that will justify or refute algebraic propositions or conjectures. Content Scope: A-APR.4	PBA -	MP.3	Y
C	HS.C.8.3	Construct, autonomously, chains of reasoning that will justify or refute algebraic propositions or conjectures. Content Scope: A-APR	PBA -	MP.3	Y

**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
C	HS.C.9.2	Express reasoning about transformations of functions. Content Scope: F-BF.3, which may involve polynomial, exponential, logarithmic or trigonometric functions. Tasks also may involve even and odd functions.	PBA -	MP.3	Y
C	HS.C.11.1	Express reasoning about trigonometric functions and the unit circle. Content Scope: F-TF.2, F-TF.8	PBA i) For example, students might explain why the angles $\frac{151\pi}{3}$ and $\frac{\pi}{3}$ have the same cosine value; or use the unit circle to prove that $\sin^2(\frac{3\pi}{4}) + \cos^2(\frac{3\pi}{4}) = 1$ ; or compute the tangent of the angle in the first quadrant having sine equal to $\frac{1}{3}$ .	MP.3	Y
C	HS.C.13.1	Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: G-GPE.6, G-GPE.7	PBA -	MP.3	Y
C	HS.C.13.2	Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: G-GPE.4	PBA -	MP.3	Y
C	HS.C.13.3	Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: G-GPE.5	PBA -	MP.3	Y
C	HS.C.14.3	Construct, autonomously, chains of reasoning that will justify or refute geometric propositions or conjectures. Content Scope: G-CO.D	PBA -	MP.3	Y
C	HS.C.16.3	Given an equation or system of equations, present the solution steps as a logical argument that concludes with the set of solutions (if any). Task are limited to simple rational or radical equations. Content Scope: A-REI.1	PBA i) Simple rational equations are limited to numerators and denominators that have degree at most 2.	MP.3, MP.6	Y

**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
C	HS.C.17.2	Make inferences and justify conclusions from data. Content Scope: S-IC.	<b>PBA</b> i) For tasks that address simple random sample: A simple random sample requires that every possible group of the given sample size has an equal chance of being selected, not that every unit in the population has an equal chance of being selected. ii) For tasks that address comparing two data distributions: Comparisons of center, shape, and spread are required.	MP.2, MP.3, MP.4	Y
C	HS.C.17.3	Make inferences and justify conclusions from data. Content Scope: S-IC.3	<b>PBA</b> i) For tasks that address simple random sample: A simple random sample requires that every possible group of the given sample size has an equal chance of being selected, not that every unit in the population has an equal chance of being selected.	MP.2, MP.3, MP.5	Y
C	HS.C.17.4	Make inferences and justify conclusions from data. Content Scope: S-IC.5	<b>PBA</b> i) For tasks that address comparing two data distributions: Comparisons of center, shape, and spread are required.	MP.2, MP.3, MP.6	Y
C	HS.C.17.5	Make inferences and justify conclusions from data. Content Scope: S-IC.6	<b>PBA</b> i) Reports should be based on content from S-IC. ii) For tasks that address simple random sample: A simple random sample requires that every possible group of the given sample size has an equal chance of being selected, not that every unit in the population has an equal chance of being selected. iii) For tasks that address comparing two data distributions: Comparisons of center, shape, and spread are required.	MP.2, MP.3, MP.7	Y
C	HS.C.18.4	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures about polynomials, rational expressions, or rational exponents. Content Scope: N-RN.3, A-APR.(2, 3, 4, 6).	<b>PBA</b> -	MP.3 MP.6	Y

**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
C	HS.C.CCR	Solve multi-step mathematical problems requiring extended chains of reasoning and drawing on a synthesis of the knowledge and skills articulated across: 7-RP.A.3, 7-NS.A.3, 7-EE.B.3, 8-EE.C.7B, 8-EE.C.8c, N-RN.A.2, A-SSE.A.1b, A-REI.A.1, A-REI.B.3, A-REI.B.4b, F-IF.A.2, F-IF.C.7a, F-IF.C.7e, G-SRT.B.5 and G-SRT.C.7.	<b>PBA</b> i) Tasks will draw on securely held content from previous grades and courses, including down to Grade 7, but that are at the Algebra II/Mathematics III level of rigor. ii) Tasks will synthesize multiple aspects of the content listed in the evidence statement text, but need not be comprehensive. iii) Tasks should address at least A-SSE.A.1b, A-REI.A.1, and F-IF.A.2 and either F-IF.C.7a or F-IF.C.7e (excluding trigonometric and logarithmic functions). Tasks should also draw upon additional content listed for grades 7 and 8 and from the remaining standards in the Evidence Statement Text.	MP.1 MP.2 MP.3 MP.6 MP.7	Y
D	HS.D.2-4	Solve multi-step contextual problems with degree of difficulty appropriate to the course that require writing an expression for an inverse function, as articulated in F.BF.4a	<b>PBA</b> i) Refer to F-B.4a for some of the content knowledge relevant to these tasks.	MP.4	Y
D	HS.D.2-7	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in A-CED, N-Q.2, A-SSE.3, A-REI.6, A-REI.7, A-REI.12, A-REI.11-2	<b>PBA</b> i) A-CED is the primary content; other listed content elements may be involved in tasks as well.	MP.2 MP.4	Y
D	HS.D.2-10	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-BF.A, F-BF.3, F-IF.3, A-CED.1, A-SSE.3, F-IF.B, F-IF.7	<b>PBA</b> i) F-BF.A is the primary content; other listed content elements may be involved in tasks as well.	MP.2 MP.4	Y

**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
D	HS.D.2-13	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in S-ID and S-IC,	<p style="text-align: center;"><b>PBA</b></p> <ul style="list-style-type: none"> <li>i) If the content is only S-ID, the task must include Algebra 2 / Math 3 content (S-ID.4 or S-ID.6).</li> <li>ii) Longer tasks may require some or all of the steps of the modeling cycle found on CCSSM, pp.72-73.</li> <li>iii) Predictions should not extrapolate far beyond the set of data provided.</li> <li>iv) Line of best fit is always based on the equation of the least squares regression line either provided or calculated through the use of technology.</li> <li>v) To investigate associations, students may be asked to evaluate scatter plots that may be provided or created using technology. Evaluation includes shape, direction, strength, presence of outliers, and gaps.</li> <li>vi) Analysis of residuals may include the identification of a pattern in a residual plot as an indication of a poor fit.</li> <li>vii) Models may assess key features of the graph of the fitted model.</li> <li>viii) Tasks that involve S-IC.2 might ask the students to look at the results of a simulation and decide how plausible the observed value is with respect to the simulation. For an example, see question 7 on the calculator section of the online practice test (<a href="http://practice.parcctestnav.com/#">http://practice.parcctestnav.com/#</a>).</li> <li>ix) Tasks that involve S-ID.4, may require finding the area associated with a z-score using technology. Use of a z-score table will not be required.</li> <li>x) Tasks may involve finding a value at a given percentile based on a normal distribution.</li> </ul>	MP.1 MP.2 MP.4 MP.5 MP.6	Y
D	HS.D.3-5b	Decisions from data: Identify relevant data in a data source, analyze it, and draw reasonable conclusions from it.  Content Scope: Knowledge and skills articulated in Math 3.	<p style="text-align: center;"><b>PBA</b></p> <ul style="list-style-type: none"> <li>i) Tasks may result in an evaluation or recommendation.</li> <li>ii) The purpose of tasks is not to provide a setting for the student to demonstrate breadth in data analysis skills (such as box-and-whisker plots and the like). Rather, the purpose is for the student to draw conclusions in a realistic setting using elementary techniques.</li> </ul>	MP.4, may involve MP.1, MP. 2 MP. 5 MP.7	Y

**Mathematics III Evidence Statements**  
**PBA Only      PBA and EOY      EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
D	HS.D.3-6	<p>Full models: Identify variables in a situation, select those that represent essential features, formulate a mathematical representation of the situation using those variables, analyze the representation and perform operations to obtain a result, interpret the result in terms of the original situation, validate the result by comparing it to the situation, and either improve the model or briefly report the conclusions.</p> <p>Content Scope: Knowledge and skills articulated in the Standards in grades 6-8, Algebra 1 and Math 1 (excluding statistics)</p>	<p align="center"><b>PBA</b></p> <p>i) See CCSSM, pp. 72, 73 for more information on the modeling cycle.</p> <p>ii) Task prompts describe a scenario using everyday language. Mathematical language such as "function," "equation," etc. is not used.</p> <p>iii) Tasks require the student to make simplifying assumptions autonomously in order to formulate a mathematical model. For example, the student might autonomously make a simplifying assumption that every tree in a forest has the same trunk diameter, or that water temperature is a linear function of ocean depth.</p> <p>iv) Tasks may require the student to create a quantity of interest in the situation being described (N-Q.2). For example, in a situation involving population and land area, the student might decide autonomously that population density is a key variable, and then choose to work with persons per square mile. In a situation involving data, the student might autonomously decide that a measure of center is a key variable in a situation, and then choose to work with the mean.</p> <p>v) Tasks may involve choosing a level of accuracy appropriate to limitations of measurement or limitations of data when reporting quantities (N-Q.3, first introduced in AI/M1).</p>	MP 4, may involve MP.1, MP.2, MP.5, MP.7	Y
D	HS.D.CCR	<p>Solve problems using modeling: Identify variables in a situation, select those that represent essential features, formulate a mathematical representation of the situation using those variables, analyze the representation and perform operations to obtain a result, interpret the result in terms of the original situation, validate the result by comparing it to the situation, and either improve the model or briefly report the conclusions.</p> <p>Content Scope: Knowledge and skills articulated in the Standards as described in previous courses and grades, with a particular emphasis on 7- RP, 8 – EE, 8 – F, N-Q, A-CED, A-REI, F-BF, G-MG, Modeling, and S-ID</p>	<p align="center"><b>PBA</b></p> <p>i) Tasks will draw on securely held content from previous grades and courses, include down to Grade 7, but that are at the Algebra II/Mathematics III level of rigor.</p> <p>ii) Task prompts describe a scenario using everyday language. Mathematical language such as "function," "equation," etc. is not used.</p> <p>iii) Tasks require the student to make simplifying assumptions autonomously in order to formulate a mathematical model. For example, the student might make a simplifying assumption autonomously that every tree in a forest has the same trunk diameter, or that water temperature is a linear function of ocean depth.</p> <p>iv) Tasks may require the student to create a quantity of interest in the situation being described.</p>	MP 4; may involve MP.1, MP.2, MP.5, MP.6, MP.7	Y

\*Calculator Key:

Y – Yes; Assessed on Calculator Sections

N – No; Assessed on Non-Calculator Sections

X – Calculator is Specific to Item

Z – Calculator Neutral (Could Be on Calculator or Non-Calculator Sections)

**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
A	A-REI.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	<b>PBA/EOY</b> i) Simple rational equations are limited to numerators and denominators that have degree at most 2.	MP.3 MP.6	N
A	A-REI.11-2	Find the solutions of where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect, e.g. using technology to graph the functions, make tables of values or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, quadratic, polynomial, rational, absolute value, exponential, and/or logarithmic functions. ★	<b>PBA/EOY</b> i) The "explain" part of standard A-REI.11 is not assessed here.	MP.1 MP.5	X
A	A-SSE.2-3	Use the structure of polynomial, rational or exponential expressions to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$ .	<b>PBA/EOY</b> i) Additional examples: In the equation $x^2 + 2x + 1 + y^2 = 9$ , see an opportunity to rewrite the first three terms as $(x+1)^2$ . See $(x^2 + 4)/(x^2 + 3)$ as $((x^2+3) + 1)/(x^2+3)$ , thus recognizing an opportunity to write it as $1 + 1/(x^2 + 3)$ . ii) Tasks will not include sums and differences of cubes.	MP.7	Z
A	F-IF.6-5	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. ★	<b>PBA/EOY</b> i) Tasks have a real-world context. ii) Tasks may involve polynomial, logarithmic, and trigonometric functions iii) Tasks must include the interpret part of the evidence statement.	MP.1 MP.4 MP.5 MP.7	X
A	F-IF.6-10	.Estimate the rate of change from a graph. ★	<b>PBA/EOY</b> i) Tasks have a real-world context. ii) Tasks may involve polynomial, logarithmic, and trigonometric functions	MP.1 MP.4 MP.5 MP.7	X
B	F-IF.9-5	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>Function types are limited to polynomial, logarithmic and trigonometric functions.</i>	<b>PBA/EOY</b> i) Tasks may or may not have a real-world context.	MP.1 MP.2 MP.3 MP.5 MP.6 MP.8	X

## Mathematics III Evidence Statements

PBA Only
PBA and EOY
EOY Only

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
A	A.Int.1	Solve equations that require seeing structure in expressions.	<p style="text-align: center;">PBA/EOY</p> <p>i) Tasks do not have a context.</p> <p>ii) Equations simplify considerably after appropriate algebraic manipulations are performed. For example, <math>x^4 - 17x^2 + 16 = 0</math>, <math>23x = 7(22x) + 22x</math>, <math>x - \sqrt{x} = 3\sqrt{x}</math>.</p> <p>iii) Tasks should be course level appropriate.</p>	MP.1 MP.7	N

★Modeling standards appear throughout the CCSSM. Evidence statements addressing these modeling standards are indicated by a star symbol (★).

\*Calculator Key:

Y – Yes; Assessed on Calculator Sections

N – No; Assessed on Non-Calculator Sections

X – Calculator is Specific to Item

Z – Calculator Neutral (Could Be on Calculator or Non-Calculator Sections)



**Mathematics III Evidence Statements**  
**PBA Only**    **PBA and EOY**    **EOY Only**

Subclaim	Evidence Statement Key	Evidence Statement Text	Clarifications, limits, emphases, and other information intended to ensure appropriate variety in tasks	Relationship to MP	Calculator*
A	A-APR.2	Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number $a$ , the remainder on division by $x - a$ is $p(a)$ , so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$ .	EOY -	MP.6	N
A	A-APR.3-1	Identify zeros of quadratic and cubic polynomials in which linear and quadratic factors are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	EOY i) For example, find the zeros of $(x-2)(x^2-9)$ . ii) Sketching graphs is limited to quadratics. iii) For cubic polynomials at least one linear factor must be provided or one of the linear factors must be a GCF.	MP.7	N
B	A-APR.6	Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$ , where $a(x)$ , $b(x)$ , $q(x)$ , and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$ , using inspection, long division, or, for the more complicated examples, a computer algebra system	EOY i) Examples will be simple enough to allow inspection or long division. ii) Simple rational expressions are limited to numerators and denominators that have degree at most 2.	MP.1	Z
A	A-SSE.2-6	Use the structure of a polynomial, rational, or exponential expression to rewrite it, in a case where two or more rewriting steps are required.	EOY i) Factor completely: $6cx - 3cy - 2dx + dy$ . (A first iteration might give $3c(2x-y) + d(-2x+y)$ , which could be recognized as $3c(2x-y) - d(2x-y)$ on the way to factoring completely as $(3c-d)(2x-y)$ .) ii) Tasks do not have a context.	MP.1 MP.7	Z
A	A-SSE.4-2	Use the formula for the sum of a finite geometric series to solve multi-step contextual problems.	EOY -	MP.1 MP.7	Y
B	F-BF.3-2	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs, limiting the function types to polynomial, exponential, logarithmic, and trigonometric functions.	EOY i) Experimenting with cases and illustrating an explanation are not assessed here.	MP.5 MP.7	X
B	F-BF.3-3	Recognize even and odd functions from their graphs and algebraic expressions for them, limiting the function types to polynomial, exponential, logarithmic, and trigonometric functions.	EOY i) Experimenting with cases and illustrating an explanation are not assessed here.	MP.7	X

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B	F-BF.3-5	Identify the effect on the graph of a polynomial, exponential, logarithmic, or trigonometric function of replacing $f(x)$ by $f(x) + k$ , $kf(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	EOY i) Illustrating an explanation is not assessed here	MP.3 MP.5 MP.8	X
A	F-IF.4-5	For a polynomial, trigonometric, or logarithmic function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; end behavior; symmetries; and periodicity.</i> ★	EOY i) See illustrations for F-IF.4 at <a href="http://illustrativemathematics.org">http://illustrativemathematics.org</a> , e.g., <a href="http://illustrativemathematics.org/illustrations/649">http://illustrativemathematics.org/illustrations/649</a> , <a href="http://illustrativemathematics.org/illustrations/637">http://illustrativemathematics.org/illustrations/637</a> , <a href="http://illustrativemathematics.org/illustrations/639">http://illustrativemathematics.org/illustrations/639</a> ii) Key features may also include discontinuities.	MP.4 MP.6	X
B	F-IF.7c	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ c) Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	EOY -	MP.1 MP.5 MP.6	X
B	F-IF.7e-2	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ e) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	EOY i) About half of tasks involve logarithmic functions, while the other half involves trigonometric functions.	MP.1 MP.5 MP.6	X
B	F-TF.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	EOY -	MP.6	X

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B	F-TF.8-2	Use the Pythagorean identity $\sin^2\theta + \cos^2\theta = 1$ to find $\sin\theta$ , $\cos\theta$ , or $\tan\theta$ , given $\sin\theta$ , $\cos\theta$ , or $\tan\theta$ and the quadrant of the angle.	<p style="text-align: center;">EOY</p> <p>i) The "prove" part of standard F-TF.8 is not assessed here.</p>	MP.5 MP.7	X
B	G-C.2	Identify and describe relationships among inscribed angles, radii, and chords and apply these concepts in problem solving situations.	<p style="text-align: center;">EOY</p> <p>i) Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is a perpendicular to the tangent where the radius intersects the circle.</p> <p>ii) This does not include angles and segments relationships with tangents and secants.</p>	MP.1 MP.5	X
B	G-CO.D	Make and understand geometric constructions as detailed in G-CO.D.	<p style="text-align: center;">EOY</p> <p>i) Most tasks align to G.CO.12.</p> <p>ii) Tasks may include requiring students to justify steps and results of a given construction.</p>	MP.3 MP.5 MP.6	Z
B	G-C.B	Find arc lengths and areas of sectors of circles.	<p style="text-align: center;">EOY</p> <p>i) Tasks involve computing arc lengths or areas of sectors given the radius and the angle subtended; or vice versa.</p>	-	X
B	G-GMD.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	<p style="text-align: center;">EOY</p> <p>i) If the cross section is a conic section it will be limited to circles, ellipses, and parabolas. (It will not include hyperbolas.)</p>	MP.7	Z
B	G-GPE.1-1	Complete the square to find the center and radius of a circle given by an equation.	<p style="text-align: center;">EOY</p> <p>i) The "derive" part of standard G-GPE.1 is not assessed here.</p>	MP.6	Z

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B	G-GPE.1-2	Understand or complete a derivation of the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	EOY i) Tasks must go beyond simply finding the center and radius of a circle.	MP.6	Z
A	G-GPE.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	EOY -	MP.1 MP.5	X
B	S-IC.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. <i>For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?</i>	EOY i) Tasks might ask the students to look at the results of a simulation and decide how plausible the observed value is with respect to the simulation. For an example, see question 7 on the calculator section of the online practice test ( <a href="http://practice.parcctestnav.com/#">http://practice.parcctestnav.com/#</a> )	MP.2 MP.4	Z
A	S-IC.3-1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies.	EOY i) The "explain" part of standard S-IC.3 is not assessed here; ii) Purposes and distinctions are as follows: a. Survey: To estimate or make a decision about a characteristic of a population based on a random sample. b. Experiment: To estimate or compare the effects of different treatments based on randomized assignment of treatments to units for the purpose of establishing a cause and effect relationship. c. Observational study: To suggest patterns and/or associations among variables where treatments or conditions are inherent and not assigned to units.	MP.4	Y
B	S-ID.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	EOY i) Tasks may require finding the area associated with a z-score using technology. ii) Use of a z-score table will not be required. iii) Tasks may involve finding a value at a given percentile based on a normal distribution.	MP.2 MP.4	Y

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B	S-ID.6a-2	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in S-ID.6a, excluding normal distributions and limiting function fitting to trigonometric functions.	EOY -	MP.1 MP.2 MP.5 MP.6	Y
B	F-BF.Int.2	Find inverse functions to solve contextual problems. a. Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse. <i>For example, <math>f(x) = 2x^3</math> or <math>f(x) = \frac{x+1}{x-1}</math> for <math>x \neq 1</math>.</i>	EOY i) For example, see <a href="http://illustrativemathematics.org/illustrations/234">http://illustrativemathematics.org/illustrations/234</a> ii) As another example, given a function $C(L) = 750L^2$ for the cost $C(L)$ of planting seeds in a square field of edge length $L$ , write a function for the edge length $L(C)$ of a square field that can be planted for a given amount of money $C$ ; graph the function, labeling the axes. iii) This is an integrated evidence statement because it adds solving contextual problems to standard F-BF.4a.	MP.1 MP.6 MP.8	X
Ψ	F-Int.1-5	Given a verbal description of a rational, polynomial, trigonometric, or logarithmic functional dependence, write an expression for the function and demonstrate various knowledge and skills articulated in the Functions category in relation to this function.	EOY i) Given a verbal description of a functional dependence, the student would be required to write an expression for the function and then, e.g., identify a natural domain for the function given the situation; use a graphing tool to graph several input-output pairs; select applicable features of the function, such as linear, increasing, decreasing, quadratic, periodic, nonlinear; and find an input value leading to a given output value. - e.g., a functional dependence might be described as follows: "The area of a square is a function of the length of its diagonal." The student would be asked to create an expression such as $f(x) = (1/2)x^2$ for this function. The natural domain for the function would be the positive real numbers. The function is increasing and nonlinear. And so on. - e.g., a functional dependence might be described as follows: "The slope of the line passing through the points (1, 3) and (7, y) is a function of y." The student would be asked to create an expression such as $s(y) = (3-y)/(1-7)$ for this function. The natural domain for this function would be the real numbers. The function is increasing and linear. And so on.	MP.1 MP.2 MP.8	X
B	F-Int.3	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-TF.5, F-IF.B, F-IF.7, limited to trigonometric functions.	EOY i) F-TF.5 is the primary content and at least one of the other listed content elements will be involved in tasks as well.	MP.2 MP.4	Y

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A	G-Int.1	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in G-MG and G-GPE.7	<p style="text-align: center;"><b>EOY</b></p> <p>i) G-MG is the primary content</p> <p>ii) See examples at <a href="http://illustrativemathematics.org">http://illustrativemathematics.org</a> for G-MG.</p>	MP.1 MP. MP.4 MP.5 MP.6	X
B	HS-Int.3-3	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in F-LE, A-CED.1, A-SSE.3, F-IF.B, F-IF.7★	<p style="text-align: center;"><b>EOY</b></p> <p>i) F-LE.A, Construct and compare linear, quadratic, and exponential models and solve problems, is the primary content and at least one of the other listed content elements will be involved in tasks as well.</p>	MP.2 MP.4	Y
Ψ	S-IC.Int.1	Solve multi-step contextual word problems with degree of difficulty appropriate to the course, requiring application of course-level knowledge and skills articulated in S-IC.	<p style="text-align: center;"><b>EOY</b></p> <p>i) If the task addresses S-IC.4, the margin of error can be estimated as being 2 standard deviations of the sampling distribution of the statistic.</p>	MP.1 MP.2 MP.4 MP.5 MP.6	Y

★Modeling standards appear throughout the CCSSM. Evidence statements addressing these modeling standards are indicated by a star symbol (★).

Ψ - These integrated evidence statements will be reported in the Master Claim which is used to determine if a student is college or career ready.

\*Calculator Key:

Y – Yes; Assessed on Calculator Sections

N – No; Assessed on Non-Calculator Sections

X – Calculator is Specific to Item

Z – Calculator Neutral (Could Be on Calculator or Non-Calculator Sections)

# Mathematics III Assessment Policies

## Calculators:

- PARCC mathematics assessments allow a graphing calculator with functionalities consistent with TI -84 or similar models in Mathematics III.
- For students who meet the guidelines in the *PARCC Accessibility Features and Accommodations Manual* for a calculation device, this accommodation allows a calculation device to be used on the non- calculator section of any PARCC mathematics assessment. The student will need a hand-held calculator because an online calculator will not be available. If a student needs a specific calculator (e.g., large key, talking), the student can also bring his or her own, provided it is specified in his or her approved IEP or 504 Plan and meets the same guidelines.

Additionally, schools must adhere to the following additional guidance regarding calculators:

- No calculators with Computer Algebra System (CAS) features are allowed.
- No tablet, laptop (or PDA), or phone-based calculators are allowed during PARCC assessments.
- Students are not allowed to share calculators within a testing session.
- Test administrators must confirm that memory on all calculators has been cleared before and after the testing sessions.
- Calculators with “QWERTY” keyboards are **not** permitted.
- If schools or districts permit students to bring their own hand-held calculators for PARCC assessment purposes, test administrators must confirm that the calculators meet PARCC requirements as defined above.

## Scratch Paper and Graph Paper:

- Blank **scratch paper** (lined or un-lined paper) is **required** and is intended for use by students to take notes and work through items during testing. At least two pages per unit must be provided to each student. Any work on scratch paper will **not** be scored.
- **Graph paper** is **allowable** for the PARCC Mathematics III assessments and is considered scratch paper if used.

## Geometry Tools (allowable but not required):

- A ruler, a protractor, tracing paper, reflection tools, straight edge and compass are allowable materials for the Mathematics III assessments for both the paper-based and online assessments. These allowable tools must be provided by the school or students if used.
- If schools allow students to bring their own tools, they must be given to the school test coordinator or test administrator prior to testing to ensure that the tools are appropriate for testing (e.g., tools do not have any writing on them).
- Directions should be given to the test administrator to have the materials located in a pre-determined location in the testing room. Additional administration guidance will be given in the PARCC Test Administrator Manual.

## Mathematics Reference Sheet:

- For computer-based assessments, the mathematics reference sheets are provided on the computer-based delivery platform. If desired, schools may also make printed copies available to students during administration.
- For paper-based assessments, mathematics reference sheets are provided in the PARCC-provided materials during shipment.

### High School Assessment Reference Sheet

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilograms	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallons
		1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian = $\frac{180}{\pi}$ degrees
Degrees	1 degree = $\frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t-t_0)} + B_0$