



AzMERIT

Arizona's Statewide Achievement Assessment
for English Language Arts and Mathematics

Math Item Specifications

HIGH SCHOOL

Table of Contents

Introduction	3
Item Development Process	3
Test Construction Guidelines	5
Math Practices	5
Blueprint	9
Depth of Knowledge (DOK)	9
Calculators	10
Item Formats	11
Arizona’s College and Career Ready Standards (AzCCRS) - Algebra	14
High School Math Item Specifications - Algebra	15
Arithmetic with Polynomials & Rational Expressions	15
Creating Equations	20
Reasoning with Equations and Inequalities	24
Seeing Structure in Expressions	35
Arizona’s College and Career Ready Standards (AzCCRS) - Functions	42
High School Math Item Specifications - Functions	43
Building Functions	43
Interpreting Functions	47
Linear, Quadratic & Exponential Models	59
Trigonometric Functions	64
Arizona’s College and Career Ready Standards (AzCCRS) - Geometry	68
High School Math Item Specifications - Geometry	69
Standards for Circles	69
Congruence	73
Geometric Measurement and Dimensions	86
Expressing Geometric Properties with Equations	89
Modeling with Geometry	95
Similarity, Right Triangles, and Trigonometry	98
Arizona’s College and Career Ready Standards (AzCCRS) – Number and Quantity	107
High School Math Item Specifications - Number and Quantity	108
The Complex Number System	108

Quantities.....	111
The Real Number System.....	114
Arizona’s College and Career Ready Standards (AzCCRS) – Statistics and Probability	117
High School Math Item Specifications - Statistics and Probability	118
Conditional Probability & the Rules of Probability	118
Making Inferences & Justifying Conclusions.....	125
Interpreting Categorical & Quantitative Data.....	131

Introduction

The Arizona Statewide Achievement Assessment for English Language Arts and Mathematics (AzMERIT) is Arizona’s statewide achievement test. AzMERIT assesses the Arizona College and Career Ready Standards (AzCCRS) adopted by the Arizona State Board of Education in 2010. AzMERIT will inform students, teachers, and parents about preparedness for college and careers upon graduating from high school. AzMERIT tests are computer-based, meaning that they can better assess students’ critical thinking skills and provide them with opportunities to demonstrate a deeper understanding of the materials. Computer-based testing also allows for the use of a variety of innovative items types.

During the item-development process, all AzMERIT items are written in accordance with the Item Specifications and are reviewed and approved by a committee of Arizona educators to confirm alignment and appropriateness for inclusion in the test. AzMERIT items are generally representative of Arizona’s geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities. Arizona community members also have an opportunity to review items for issues of potential concern to members of the community at large. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Arizona, and then to determine whether the subject matter will be acceptable to Arizona students, families, and other members of Arizona communities.

This *AzMERIT Item Specifications* is a resource document that defines the content and format of the test and test items for item writers and reviewers. Each *Item Specifications* document indicates the alignment of items with the AzCCRS. It also serves to provide all stakeholders with information about the scope and function of assessment items. This document can also serve to assist educators to understand how assessment items are developed in alignment with the standards for English language arts and math. These item specifications for AzMERIT are intended to provide information regarding standards, item formats and response types. The descriptions of math practices, blueprints, and depth of knowledge in this document are meant to provide an overview of the test. Item specifications are meant for the purposes of assessment, not instruction. They are not intended to be tools for instruction or the basis for curricula. AzMERIT has a test blueprint that was developed by Arizona and is different from any other state or consortium test blueprint.

For the math portion of AzMERIT, all of the test questions are aligned to the mathematic content standards for these subject areas. Similarly, each item assesses a single domain and aligns to one or more of the eight Math Practices. Any item specifications that are absent for standards listed in this document may be under development. This document does not endorse the exclusion of the instruction of any grade-level content standards. The test will ask questions that check a student’s conceptual understanding of math as well as their procedural skills. These items have been written to be free from bias and sensitivity, and widely vary in their degree of difficulty.

Item Development Process

AzMERIT items go through a rigorous review before they are operational. When an item is “operational” it means it is used to determine a student’s score on the assessment. This is a description of the process every item must go through before it is operational on AzMERIT.



Sample tests are available online for the math portion of AzMERIT. For more information view the Guide to the Sample Tests at <http://azmeritportal.org/>.

Test Construction Guidelines

The construction of the AzMERIT assessment is guided by the depth and rigor of the Arizona College and Career Ready Standards. Items are created to address key components of the standards and assess a range of important skills. The AzMERIT Blueprint provides an overview of the distribution of items on the AzMERIT according to the standards. The standards for Math Practices are embedded within all AzMERIT items. Further, the AzMERIT blueprint outlines the Depth of Knowledge distribution of items.

Math Practices

The standards for Mathematical Practice highlight the knowledge, skills and abilities that should be developed in students at all grades. The Mathematical Practices are a part of each course description for Grades 3 through 8, Algebra I, Geometry, and Algebra 2. These practices are a vital part of the curriculum. These skills are often difficult to measure, and as a result, every item created for AzMERIT aligns to one or more of the following eight Mathematical Practices.

Math Practice (MP)	Description
Math Practice 1	<p>Make sense of problems and persevere in solving them.</p> <p>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.</p>

Math Practice (MP)	Description
<p style="text-align: center;">Math Practice 2</p>	<p>Reason abstractly and quantitatively.</p> <p>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</p>
<p style="text-align: center;">Math Practice 3</p>	<p>Construct viable arguments and critique the reasoning of others.</p> <p>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</p>

Math Practice (MP)	Description
<p style="text-align: center;">Math Practice 4</p>	<p>Model with mathematics.</p> <p>Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.</p>
<p style="text-align: center;">Math Practice 5</p>	<p>Use appropriate tools strategically.</p> <p>Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.</p>

Math Practice (MP)	Description
<p style="text-align: center;">Math Practice 6</p>	<p>Attend to precision.</p> <p>Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</p>
<p style="text-align: center;">Math Practice 7</p>	<p>Look for and make use of structure.</p> <p>Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.</p>
<p style="text-align: center;">Math Practice 8</p>	<p>Look for and express regularity in repeated reasoning.</p> <p>Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.</p>

Blueprint

The AzMERIT blueprints detail specific information in regard to the domains tested at each grade level. The blueprint outlines the percentage of points aligned to each domain.

Algebra 1	Domain	Minimum	Maximum
	Algebra	40%	44%
	Functions	36%	40%
	Statistics	17%	21%

Approximately 70% of the assessment for High School will be on major content.

Geometry	Domain	Minimum	Maximum
	Congruence	23%	27%
	Similarity, Right Triangles, And Trigonometry	27%	31%
	Circles, Geometric Measurement and Dimensions	23%	27%
	Modeling with Geometry	17%	21%

Approximately 70% of the assessment for High School will be on major content.

Algebra 2	Domain	Minimum	Maximum
	Algebra	34%	38%
	Functions	32%	36%
	Statistics	27%	31%

Approximately 70% of the assessment for High School will be on major content.

Depth of Knowledge (DOK)

DOK refers to the level of rigor or sophistication of the task in a given item, designed to reflect the complexity of the AzCCRS. Items at DOK level 1 focus on the recall of information, such as definitions, terms, and simple procedures. Items at DOK 2 require students to make decisions, solve problems, or recognize patterns; in general, they require a greater degree of engagement and cognitive processing than items at DOK 1. Items at DOK 3 feature higher-order cognitive tasks that assess students' capacities to approach abstract or complex problems.

Percentage of Points by Depth of Knowledge (DOK) Level			
High School	DOK Level 1	DOK Level 2	DOK Level 3
	10% - 20%	60% - 70%	12% - 30%

For more information on DOK go to www.azed.gov/AzMERIT.

Calculators

Calculators are permitted for both the paper-based and computer-based assessment for High School Math.

Item Formats

The AzMERIT Assessments are composed of item formats that include traditional multiple-choice response items and technology-enhanced response items (TEI). TEIs are computer-delivered response items that require students to interact with test content to select, construct, and/or support their responses. TEIs are better able to assess a deeper level of understanding.

Currently, there are nine types of TEIs that may appear on the High School Math computer based assessment for AzMERIT:

- Editing Tasks (ET)
 - Editing Task Choice (ETC)
 - Equation Editor (EQ)
 - Graphic Response Item Display (GRID)
 - Hot Text (HT)
 - Selectable Hot Text
 - Drag-and-Drop Hot Text
- Matching Item (MI)
- Multi-Select (MS)
- Open Response
- Table Item (TI)

For paper based assessments (including those for students with an IEP or 504 plan that specifies a paper based accommodation), TEIs will be modified so that they can be scanned and scored electronically or hand-scored.

See the table below for a description of each TEI. In addition, for examples of each response item format described, see the AzMERIT Training Tests at <http://azmeritportal.org/>.

Item Format	Description
Editing Task (ET)	The student clicks on a highlighted word or phrase that may be incorrect, which reveals a text box. The directions in the text box direct the student to replace the highlighted word or phrase with the correct word or phrase. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Editing Task Choice (ETC)	The student clicks a highlighted word or phrase, which reveals a drop-down menu containing options for correcting an error as well as the highlighted word or phrase as it is shown in the sentence to indicate that no correction is needed. The student then selects the correct word or phrase from the drop-down menu. For paper-based assessments, the item is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct word or phrase.

Item Format	Description
Equation Editor (EQ)	The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. Responses may be in the form of a number, variable, expression, or equation, as appropriate to the test item. For paper-based assessments, this item type may be replaced with a modified version of the item that can be scanned and scored electronically or replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Graphic Response Item Display (GRID)	The student selects numbers, words, phrases, or images and uses the drag-and-drop feature to place them into a graphic. This item type may also require the student to use the point, line, or arrow tools to create a response on a graph. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Hot Text (HT)	Selectable Hot Text - Excerpted sentences from the text are presented in this item type. When the student hovers over certain words, phrases, or sentences, the options highlight. This indicates that the text is selectable (“hot”). The student can then click on an option to select it. For paper-based assessments, a “selectable” hot text item is modified so that it can be scanned and scored electronically. In this version, the student fills in a circle to indicate a selection.
	Drag-and-Drop Hot Text - Certain numbers, words, phrases, or sentences may be designated “draggable” in this item type. When the student hovers over these areas, the text highlights. The student can then click on the option, hold down the mouse button, and drag it to a graphic or other format. For paper-based assessments, drag-and-drop hot text items will be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Matching Item (MI)	The student checks a box to indicate if information from a column header matches information from a row. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Multi-Select (MS)	The student is directed to select all of the correct answers from among a number of options. These items are different from multiple-choice items, which allow the student to select only one correct answer. These items appear in the online and paper-based assessments.
Open Response	The student uses the keyboard to enter a response into a text field. These items can usually be answered in a sentence or two. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

Item Format	Description
Table Item (TI)	<p>The student types numeric values into a given table. The student may complete the entire table or portions of the table depending on what is being asked. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.</p>

Arizona's College and Career Ready Standards (AzCCRS) - Algebra

Arithmetic with Polynomials & Rational Expressions (A-APR)

HS.A-APR.A – Perform arithmetic operations on polynomials.

HS.A-APR.B – Understand the relationship between zeros and factors of polynomials.

HS.A-APR.C – Use polynomials identities to solve problems.

HS.A-APR.D – Rewrite rational expressions.

Creating Equations (A-CED)

HS.A-CED.A – Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities (A-REI)

HS.A-REI.A – Understand solving equations as a process of reasoning and explain the reasoning.

HS.A-REI.B – Solve equations and inequalities in one variable.

HS.A-REI.C – Solve systems of equations.

HS.A-REI.D – Represent and solve equations and inequalities graphically.

Seeing Structure in Expressions (A-SSE)

HS.A-SSE.A – Interpret the structure of expressions.

HS.A-SSE.B – Write expressions in equivalent forms to solve problems.

High School Math Item Specifications - Algebra

Arithmetic with Polynomials & Rational Expressions

Content Standards	AzCCRS.Math.Content.A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to calculate the sum, difference or product of polynomials.		<ul style="list-style-type: none"> Multiple Choice Response 	8

Content Standards	AzCCRS.Math.Content.A-APR.B.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 $p(x)$.		
Explanations	The Remainder theorem says that if a polynomial $p(x)$ is divided by $x - a$, then the remainder is the constant $p(a)$. That is, So if $p(a) = 0$ then $p(x) = q(x)(x-a)$.		
Content Limits	This standard is aligned to Algebra II only. Focus should be polynomials beyond quadratics.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given a zero of a polynomial, identify a factor, or vice versa.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	2, 3

Content Standards	AzCCRS.Math.Content.A-APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.		
Explanations	None		
Content Limits	Algebra I: Quadratic and cubic polynomials in which linear and quadratic factors are available Algebra II: Quadratic, cubic, and quartic polynomials for which factors are not provided		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the zeroes of a polynomial.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	4, 5
Students will be required to given a polynomial, determine its graph.			2, 4, 5

Content Standards	AzCCRS.Math.Content.A-APR.C.4 Prove polynomial identities and use them to describe numerical relationships.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify an expression or statement used to prove the polynomial identity.		<ul style="list-style-type: none">• Equation Response• HotText Response• Multiple Choice Response• Proposition Response	7, 8
Students will be required to show ways in which a polynomial identity can relate numerical values.			7, 8
Students will be required to construct a proof of polynomial identities.			7, 8

Content Standards	AzCCRS.Math.Content.A-APR.D.6 Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, 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.		
Explanations	The polynomial $q(x)$ is called the quotient and the polynomial $r(x)$ is called the remainder. Expressing a rational expression in this form allows one to see different properties of the graph, such as horizontal asymptotes.		
Content Limits	This standard is aligned to Algebra II only. Rational expressions with linear and quadratic denominators		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given a simple rational expression, identify the expression in a different form.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Multi-Select Response	2, 7
Students will be required to create or identify the quotient in the form of $q(x) + r(x)/b(x)$, or just $q(x)$ or $r(x)/b(x)$.			2, 7

Creating Equations

Content Standards	AzCCRS.Math.Content.A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems.		
Explanations	Equations can represent real world and mathematical problems. Include equations and inequalities that arise when comparing the values of two different functions, such as one describing linear growth and one describing exponential growth.		
Content Limits	Algebra I: Linear, quadratic, and exponential equations at integer inputs. (Lin, Quad, Eint) Algebra II: Exponential and rational equations (Exp, Poly, Rat, Rad)		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is subject to task demand.	Math Practices	2, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the solution for a given equation or inequality. Context is not allowed.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	2, 4, 5
Students will be required to construct an equation or inequality to model a context. Context is required.			2, 4, 5

Content Standards	AzCCRS.Math.Content.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Students must be required to construct an equation and/or graph given equations.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is subject to task demand.	Math Practices	2, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the solution for an equation. Context is not allowed.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	2, 4, 5
Students will be required to construct a graphical representation of an equation. Context is not allowed.			2, 4, 5
Students will be required to construct an equation to represent a context. Context is required.			2, 4, 5
Students will be required to construct an equation and identify a solution. Context is required.			2, 4, 5

Content Standards	AzCCRS.Math.Content.A-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	2, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given a constraint or set of constraints, identify possible solutions.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Multi-Select Response	2, 5
Students will be required to construct a graphical representation of a constraint or set of constraints.			2, 4, 5
Students will be required to create or identify a constraint or set of constraints given a context.			2, 5

Content Standards	AzCCRS.Math.Content.A-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. The student must be provided an equation. Generally, if the equation to be created is very complex, consider using multiple choice response rather than equation response.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given an equation, identify or create a form of that equation solved for a specific variable.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	2, 4, 5, 7
Students will be required to given an equation, describe how one quantity changes when another changes (ex. Given $V = IR$, how does I change if R is doubled and V remains constant?).			2, 4, 5, 7

Reasoning with Equations and Inequalities

Content Standards	AzCCRS.Math.Content.A-REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.		
Explanations	Properties of operations can be used to change expressions on either side of the equation to equivalent expressions. In addition, adding the same term to both sides of an equation or multiplying both sides by a non-zero constant produces an equation with the same solutions. Other operations, such as squaring both sides, may produce equations that have extraneous solutions.		
Content Limits	Algebra I: Linear and quadratic equations. Algebra II: Simple rational or radical equations		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to justify a next step in a solution process (i.e., “commutative property”, etc.).		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	2, 7
Students will be required to identify a correct next step in a solution process.			2, 7
Students will be required to given a series of steps in an attempt to solve an equation identify the error(s) and the correct solution.			2, 3, 7

Content Standards	AzCCRS.Math.Content.A-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Radical and rational equations.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given an equation and its solution(s), identify which solutions(s) are extraneous.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	2, 7
Students will be required to solve simple equations from context or no context.			2, 7
Students will be required to using abstract symbols, identify when an equation will have extraneous solutions.			2, 3, 7

Content Standards	AzCCRS.Math.Content.A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Equations must be given to the student.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve equations or inequalities from context or no context.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	2, 7, 8
Students will be required to graph the solution of an inequality on a number line.			2, 7, 8
Students will be required to analyze and solve equations or inequalities with unknown constant coefficients.			2, 7, 8

Content Standards	<p>AzCCRS.Math.Content.A-REI.B.4 Solve quadratic equations in one variable.</p> <p>AzCCRS.Math.Content.A-REI.B.4a Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.</p>		
Explanations	<p>Students should solve by factoring, completing the square, and using the quadratic formula. The zero product property is used to explain why the factors are set equal to zero. Students should relate the value of the discriminant to the type of root to expect. A natural extension would be to relate the type of solutions to $ax^2 + bx + c = 0$ to the behavior of the graph of $y = ax^2 + bx + c$.</p>		
Content Limits	<p>This standard is aligned to Algebra I only.</p> <p>Quadratics with real solutions.</p>		
Common Item Formats	<p>The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</p>		
Context	Context is allowed.	Math Practices	2, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
<p>Students will be required to create equivalent quadratic equations in the form $(x-p)^2=q$.</p>		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	2, 7, 8

Content Standards	AzCCRS.Math.Content.A-REI.B.4 Solve quadratic equations in one variable. AzCCRS.Math.Content.A-REI.B.4b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions		
Explanations	Students should solve by factoring, completing the square, and using the quadratic formula. The zero product property is used to explain why the factors are set equal to zero. Students should relate the value of the discriminant to the type of root to expect. A natural extension would be to relate the type of solutions to $ax^2 + bx + c = 0$ to the behavior of the graph of $y = ax^2 + bx + c$.		
Content Limits	Algebra I: Quadratic with real solutions. Algebra II: Quadratic with complex solutions.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify which equations have complex solutions (Alg II only).		<ul style="list-style-type: none">Equation ResponseMultiple Choice ResponseMulti-Select Response	2, 7, 8
Students will be required to solve quadratic equations.			2, 7, 8

Content Standards	AzCCRS.Math.Content.A-REI.C.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Linear systems		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given a system of equations, identify another system that has the same solutions (based on the process described in the standard).		<ul style="list-style-type: none"> Multiple Choice Response 	2, 3

Content Standards	AzCCRS.Math.Content.A-REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		
Explanations	The system solution methods can include but are not limited to graphical, elimination/linear combination, substitution, and modeling. Systems can be written algebraically or can be represented in context.		
Content Limits	Algebra I: Linear systems with exact solutions and limited calculations. Algebra II: Linear systems with approximate solutions and extensive calculations. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution)		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given the graph of a system of equations, identify a possible solution.		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	2, 4, 5, 7, 8
Students will be required to solve a system of equations.			2, 5, 6, 7, 8
Students will be required to graph a system of equations and identify an approximate solution.			2, 4, 5, 7, 8

Content Standards	AzCCRS.Math.Content.A-REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given the graph of a system of equations, identify a possible solution.		• Multiple Choice Response	2, 4, 5, 7, 8
Students will be required to solve a system of equations.			2, 5, 6, 7, 8

Content Standards	AzCCRS.Math.Content.A-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Linear and exponential equations.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify coordinates of points that lie on the graph of a given equation.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Multi-Select Response	2, 4
Students will be required to plot points that are solutions to a given equation.			2, 4
Students will be required to identify other possible solutions to a given equation, type of equation, and/or the graph of a solution to the equation.			2, 4

Content Standards	AzCCRS.Math.Content.A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, 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, polynomial, rational, absolute value, exponential, and logarithmic functions.		
Explanations	Students need to understand that numerical solution methods (data in a table used to approximate an algebraic function) and graphical solution methods may produce approximate solutions, and algebraic solution methods produce precise solutions that can be represented graphically or numerically.		
Content Limits	Algebra I: Linear, Quadratic or exponential (Lin, Exp) Algebra II: polynomial, rational, radical, piece-wise, logarithmic, trigonometric (Quad, Poly, Rat, Rad, PW, Log, Trig) Note that this standard is not about systems, but about the solution(s) to $f(x) = g(x)$; thus, solutions should be values of x.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the solution(s) to $f(x) = g(x)$, given the graph of the two functions.		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMulti-Select ResponseProposition Response	2, 4, 5, 6
Students will be required to identify the solutions to $f(x) = g(x)$.			2, 4, 5, 6
Students will be required to identify a possible $g(x)$, given $f(x)$ and the value(s) of x where $f(x) = g(x)$.			2, 4, 5, 6

Content Standards	AzCCRS.Math.Content.A-REI.D.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to select the solution region for a system of inequalities.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	4, 5
Students will be required to graph the boundary for a non-strict inequality and drag a symbol to show the solution set.			4, 5
Students will be required to graph the boundaries for a system of non-strict inequalities and drag a symbol to show the solution set.			4, 5
Students will be required to identify the graph and solution set for a system of non-strict inequalities.			4, 5

Seeing Structure in Expressions

Content Standards	AzCCRS.Math.Content.A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context. AzCCRS.Math.Content.A-SSE.A.1a Interpret parts of an expression, such as terms, factors, and coefficients.		
Explanations	Students should understand the vocabulary for the parts that make up the whole expression and be able to identify those parts and interpret their meaning in terms of a context.		
Content Limits	This standard is aligned to Algebra I only. Focus on factors and coefficients of simpler expressions.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	1, 2, 4, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to select the meaning for part of a given expression.		• Multiple Choice Response	2, 4, 7
Students will be required to identify what part of a given expression has a given meaning.			1, 2, 4, 7

Content Standards	AzCCRS.Math.Content.A-SSE.A.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.		
Explanations	Students should understand the vocabulary for the parts that make up the whole expression and be able to identify those parts and interpret their meaning in terms of a context.		
Content Limits	This standard is aligned to Algebra I only. Focus on terms of complicated expressions.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	1, 2, 4, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to select the meaning for part of a given expression.		• Multiple Choice Response	2, 4, 7
Students will be required to identify what part of a given expression has a given meaning.			1, 2, 4, 7

Content Standards	AzCCRS.Math.Content.A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it.		
Explanations	Students should extract the greatest common factor (whether a constant, a variable, or a combination of each). If the remaining expression is quadratic, students should factor the expression further.		
Content Limits	Algebra I: Numerical expressions and polynomial expression in one variable Algebra II: Polynomial, rational, and exponential expressions (Poly, Rat) The given expression must be in a form that allows students to use the structure to identify an equivalent expression - not simply using properties of operations.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify an equivalent expression.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	2, 7
Students will be required to construct a new equivalent expression from a given expression.			2, 7

Content Standards	AzCCRS.Math.Content.A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. AzCCRS.Math.Content.A-SSE.B.3a Factor a quadratic expression to reveal the zeros of the function it defines.		
Explanations	Students will use the properties of operations to create equivalent expressions.		
Content Limits	This standard is aligned to Algebra I only. Quadratic expressions The item must require factoring as the solution method.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 4
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the zeros of a function given in factored form.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	1, 2, 4
Students will be required to identify the factored form of a quadratic expression.			1, 2, 4
Students will be required to identify the factored form of a quadratic expression and the zeroes of the function it defines.			1, 2, 4

Content Standards	AzCCRS.Math.Content.A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. AzCCRS.Math.Content.A-SSE.B.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.		
Explanations	Students will use the properties of operations to create equivalent expressions.		
Content Limits	This standard is aligned to Algebra I only. Quadratic expressions The item must require completing the square as a solution method.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the maximum or minimum of a quadratic expression in vertex form.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	1, 2, 7
Students will be required to identify the vertex form of a quadratic expression.			1, 2, 7
Students will be required to identify the vertex form of a quadratic expression and the max/min of the function it defines.			1, 2, 7

Content Standards	AzCCRS.Math.Content.A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. AzCCRS.Math.Content.A-SSE.B.3c Use the properties of exponents to transform expressions for exponential functions.		
Explanations	Students will use the properties of operations to create equivalent expressions.		
Content Limits	Algebra I: Exponential expressions with integer exponents Algebra II: Exponential expressions with rational or real exponents		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify forms of exponential expressions suitable for a given purpose.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	1, 2
Students will be required to identify equivalent expressions.			1, 2

Content Standards	AzCCRS.Math.Content.A-SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Finite geometric series		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 4, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to calculate the sum of a finite geometric series in context.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Proposition Response	4, 7
Students will be required to derive the formula for a finite geometric series.			3, 4, 7

Arizona's College and Career Ready Standards (AzCCRS) - Functions

Building Functions (F-BF)

HS.F-BF.A – Build a function that models a relationship between two quantities.

HS.F-BF.B – Build new functions from existing functions.

Interpreting Functions (F-IF)

HS.F-IF.A – Understand the concept of a function and use function notation.

HS.F-IF.B – Interpret functions that arise in applications in terms of the context.

HS.F-IF.C – Analyze functions using different representations.

Linear, Quadratic & Exponential Models (F-LE)

HS.F-LE.A – Construct and compare linear, quadratic, and exponential models and solve problems.

HS.F-LE.B – Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions (F-TF)

HS.F-TF.A – Extend the domain of trigonometric functions using the unit circle.

HS.F-TF.B – Model periodic phenomena with trigonometric functions.

HS.F-TF.C – Prove and apply trigonometric identities.

High School Math Item Specifications - Functions

Building Functions

Content Standards	AzCCRS.Math.Content.F-BF.A.1 Write a function that describes a relationship between two quantities. AzCCRS.Math.Content.F-BF.A.1b Combine standard function types using arithmetic operations.		
Explanations	Students will analyze a given problem to determine the function expressed by identifying patterns in the function’s rate of change. They will specify intervals of increase, decrease, constancy, and, if possible, relate them to the function’s description in words or graphically.		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to perform arithmetic operations to write one function that models a context for another.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	1, 2, 4, 5, 7, 8
Students will be required to create a multi-faceted function to model a context.			1, 2, 3, 4, 5, 6, 7, 8

Content Standards	AzCCRS.Math.Content.F-BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.		
Explanations	An explicit rule for the n th term of a sequence gives a_n as an expression in the term's position n ; a recursive rule gives the first term of a sequence, and a recursive equation relates a_n to the preceding term(s). Both methods of presenting a sequence describe a_n as a function of n .		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify a formula that models a geometric or arithmetic pattern.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	4, 5, 8
Students will be required to translate a recursive function to an explicit formula.			4, 5, 8
Students will be required to create a recursive function to model a geometric pattern described verbally.			4, 5, 8

Content Standards	AzCCRS.Math.Content.F-BF.B.3 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. Experiment with cases and illustrate an explanation of the effects on the graph using technology.		
Explanations	Students will apply transformations to functions and recognize functions as even and odd.		
Content Limits	Algebra I: Linear, quadratic, square and cube root, piece-wise (Lin, Quad, Exp, PW) Algebra II: Polynomial, rational, radical, exponential, logarithmic, trigonometric (Poly, Rat, Rad, Log, Trig)		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to show the effects of a transformation by translating a graph.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	4, 5, 7
Students will be required to determine the value of k from two related functions or graphs.			4, 5, 7
Students will be required to create a function to model a transformation of a given graph.			4, 5, 7
Students will be required to describe the effects of k on a transformation of a function.			4, 5, 7

Content Standards	AzCCRS.Math.Content.F-BF.B.4 Find inverse functions. AzCCRS.Math.Content.F-BF.B.4a 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.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is missing.	Math Practices	2, 4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to create a function to model the inverse of a given function.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	2, 4, 5, 7
Students will be required to select which function(s) does or does not have an inverse.			2, 4, 5, 7
Students will be required to graph the inverse of a function.			2, 4, 5, 7

Interpreting Functions

Content Standards	AzCCRS.Math.Content.F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.		
Explanations	The domain of a function given by an algebraic expression, unless otherwise specified, is the largest possible domain.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to recognize functions.		<ul style="list-style-type: none">• Multiple Choice Response• Matching Item Response• Multi-Select Response• Proposition Response• Table Response	2
Students will be required to create or complete examples of functions and nonfunctions.			2
Students will be required to explain why a relation is or is not a function.			2

Content Standards	AzCCRS.Math.Content.F-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.		
Explanations	The domain of a function given by an algebraic expression, unless otherwise specified, is the largest possible domain.		
Content Limits	This standard is aligned to Algebra I only. Linear, quadratic, and exponential functions		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to recognize and identify input or output values from the table of a function.		<ul style="list-style-type: none">• Equation Response• Graphic Response• HotText Response• Multiple Choice Response• Table Response	2
Students will be required to recognize correct uses of function notation.			2
Students will be required to complete a table of input and output values for a given function.			2
Students will be required to interpret statements that use function notation in terms of a context.			2

Content Standards	AzCCRS.Math.Content.F-IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.		
Explanations	None		
Content Limits	Algebra I: Linear or exponential Algebra II: Quadratic Limit sequence representations to rational values		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct a function to model a sequence.		<ul style="list-style-type: none"> Equation Response 	8

Content Standards	AzCCRS.Math.Content.F-IF.B.4 For a 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.		
Explanations	Students may be given graphs to interpret or produce graphs given an expression or table for the function, by hand or using technology.		
Content Limits	Algebra I: Linear, quadratic, exponential (with domains in the inegers), square and cube roots, piece-wise (Lin, Quad, Exp) Algebra II: Polynomial, exponential, logarithmic, trigonometric (Poly, Rat, Rad, PW, Log, Trig) Key features may also include domain and range		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify an interval on a graph where the function is increasing or decreasing.		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	2, 4, 5
Students will be required to identify intercepts of a function.			2, 4, 5
Students will be required to construct the graph of a linear function with a given verbal description for the intercept and/or slope.			2, 4, 5
Students will be required to identify key features, such as relative maximums and minimums, symmetries, and end behavior, of graphs and tables in terms of the quantities.			2, 4, 5
Students will be required to create a linear function with the same slope but different y-intercept (Algebra I only).			2, 4, 5, 6
Students will be required to create an exponential function that grows at a different rate than a given one.			2, 4, 5, 6
Students will be required to describe the meaning of key features of a function.			2, 4, 5, 6

Content Standards	AzCCRS.Math.Content.F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.		
Explanations	Students may explain orally, or in written format, the existing relationships.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to create a graph with a given domain.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	2, 4
Students will be required to determine the domain of the given graph of a function.			2, 4, 6
Students will be required to determine the domain of a given function based on context.			2, 4, 6

Content Standards	AzCCRS.Math.Content.F-IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.		
Explanations	The average rate of change of a function $y = f(x)$ over an interval $[a,b]$ is $\Delta y/\Delta x=(f(b)-f(a))/(b-a)$ In addition to finding average rates of change from functions given symbolically, graphically, or in a table, Students may collect data from experiments or simulations (ex. falling ball, velocity of a car, etc.) and find average rates of change for the function modeling the situation.		
Content Limits	Algebra I: Linear, quadratic, exponential (with domains in the integers), square and cube root, piece-wise (Lin, Quad, Exp) Algebra II: Polynomial, exponentialradical, logarithmic, trigonometric (Poly, Rat, Rad, PW, Log, Trig)		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to estimate the average rate of change of the graph of a given function over a given interval.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	2, 4, 5
Students will be required to calculate the average rate of change of a function expressed symbolically or as a table over a given interval.			2, 4, 5
Students will be required to interpret the rate of change in context.			2, 5

Content Standards	AzCCRS.Math.Content.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. AzCCRS.Math.Content.F-IF.C.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.		
Explanations	Key characteristics include but are not limited to maxima, minima, intercepts, symmetry, end behavior, and asymptotes.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct the graph of a function.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	5, 6
Students will be required to identify intercepts, maxima, and minima of a function from a graph.			5, 6

Content Standards	<p>AzCCRS.Math.Content.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <p>AzCCRS.Math.Content.F-IF.C.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</p>		
Explanations	Key characteristics include but are not limited to maxima, minima, intercepts, symmetry, end behavior, and asymptotes.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct the graph of a function.		<ul style="list-style-type: none"> • Graphic Response • Multiple Choice Response 	5, 6

Content Standards	AzCCRS.Math.Content.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. AzCCRS.Math.Content.F-IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.		
Explanations	Key characteristics include but are not limited to maxima, minima, intercepts, symmetry, end behavior, and asymptotes.		
Content Limits	This standard is aligned to Algebra II only. Choices to selected response items should be differentiated with different zeros, max/mins, and/or end behavior		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct the graph of a function.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	5, 6
Students will be required to identify end behavior from the graph of a function.			5, 6

Content Standards	AzCCRS.Math.Content.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. AzCCRS.Math.Content.F-IF.C.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.		
Explanations	Key characteristics include but are not limited to maxima, minima, intercepts, symmetry, end behavior, and asymptotes.		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct the graph of a function.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	5, 6
Students will be required to identify end behavior or intercepts from the graph of a function.			5, 6
Students will be required to identify or show period, midline, and amplitude.			5, 6

Content Standards	AzCCRS.Math.Content.F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. AzCCRS.Math.Content.F-IF.C.8a Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. AzCCRS.Math.Content.F-IF.C.8b Use the properties of exponents to interpret expressions for exponential functions.		
Explanations	None		
Content Limits	HSF-IF.C.8a is aligned to Algebra I only. Functions in one form must be given to students, who are then expected to write these functions in different forms HSF-IF.C.8b is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to create an equivalent function in a specific form that reveals characteristics of the function defined by that expression.		<ul style="list-style-type: none">Equation ResponseMultiple Choice ResponseProposition Response	2, 7
Students will be required to interpret parameters of a function in terms of the context.			2, 7

Content Standards	AzCCRS.Math.Content.F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).		
Explanations	None		
Content Limits	Algebra I: Linear, quadratic, square and cube root, piece-wise, exponential (with domains in the integers) (Lin, Quad, Exp) Algebra II: Polynomial, exponential, logarithmic, trigonometric (Poly, Rat, Rad, Log, Trig)		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to compare numeric values representing properties of two functions.		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	6, 7
Students will be required to compare two functions qualitatively.			6, 7
Students will be required to construct a graph of a function for which a given comparison with another function is true.			6, 7

Linear, Quadratic & Exponential Models

Content Standards	AzCCRS.Math.Content.F-LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.		
	AzCCRS.Math.Content.F-LE.A.1a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.		
	AzCCRS.Math.Content.F-LE.A.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.		
	AzCCRS.Math.Content.F-LE.A.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.		
Explanations	Students can investigate functions and graphs modeling different situations involving simple and compound interest. Students can compare interest rates with different periods of compounding (monthly, daily) and compare them with the corresponding annual percentage rate. Spreadsheets and applets can be used to explore and model different interest rates and loan terms.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 4, 5, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to create a value or expression to show how a function grows over equal intervals.		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	4, 5, 7, 8
Students will be required to identify situations that represent linear growth.			3, 5, 7, 8
Students will be required to identify situations that represent exponential growth.			3, 5, 7, 8

Content Standards	AzCCRS.Math.Content.F-LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).		
Explanations	None		
Content Limits	Algebra I: Constructing linear and exponential functions in simple context (not multi-step) Algebra II: Solving multi-step problems by constructing linear and exponential functions		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to create an equation of a linear function passing through two given points.		• Equation Response	4, 8
Students will be required to create an equation of a linear function given a graph of that function.			4, 8
Students will be required to create an equation of a linear function given a description of that function.			4, 8

Content Standards	AzCCRS.Math.Content.F-LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to compare two or more functions for values over various intervals given graphs or other representations of the functions.		<ul style="list-style-type: none">Equation ResponseMulti-Select Response	2
Students will be required to solve problems based on the fact that exponential functions grow/decay faster than linear or quadratic functions.			2

Content Standards	AzCCRS.Math.Content.F-LE.A.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a , c , and d are numbers and the base b is 2, 10, or e ; evaluate the logarithm using technology.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to evaluate a logarithm.		• Equation Response	7
Students will be required to create an exponential equation equivalent to a logarithmic equation.			7
Students will be required to create a logarithmic equation equivalent to an exponential equation.			7

Content Standards	AzCCRS.Math.Content.F-LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.		
Explanations	None		
Content Limits	Algebra I: exponential functions limited to those with domains in the integers Algebra II: Exponential functions with domains not limited to integers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to interpret the meaning of a parameter of a function.		• Multi-Select Response	2, 4
Students will be required to interpret the meaning of a parameter in a function that combines linear and exponential terms.			2, 4

Trigonometric Functions

Content Standards	AzCCRS.Math.Content.F-TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Positive angles, all four quadrants of the coordinate plane		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to determine the radian measure of an angle.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Proposition Response	
Students will be required to construct an angle with a given radian measure.			
Students will be required to explain the relationship of the central angle to the arc.			

Content Standards	AzCCRS.Math.Content.F-TF.A.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.		
Explanations	Students may explain (orally or in written format) their understanding.		
Content Limits	This standard is aligned to Algebra II only. Sine and cosine, common angles		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to evaluate trigonometric functions for common angles and their co-terminal angles.		<ul style="list-style-type: none">• Equation Response• Graphic Response	2
Students will be required to place a point on the unit circle to show trigonometric values with given radian measures.			2

Content Standards	AzCCRS.Math.Content.F-TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Sine and cosine functions are used for modeling simple harmonic motion		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to determine the amplitude of a given sine or cosine function.		• Equation Response	4, 5, 7
Students will be required to create the trigonometric function with given numeric values for amplitude, midline, and frequency.			4, 5, 7
Students will be required to create a trigonometric function given a verbal description.			4, 5, 7

Content Standards	AzCCRS.Math.Content.F-TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to determine the value of a trigonometric function using the Pythagorean identity.		<ul style="list-style-type: none">Equation ResponseHot Text Response	3
Students will be required to order steps in a proof of the Pythagorean identity.			3

Arizona's College and Career Ready Standards (AzCCRS) - Geometry

Geometry

Circles (G-C)

HS.G-C.A – Understand and apply theorems about circles.

HS.G-C.B – Find arc lengths and areas of sectors of circles.

Congruence (G-CO)

HS.G-CO.A – Experiment with transformations in the plane.

HS.G-CO.B – Understand congruence in terms of rigid motions.

HS.G-CO.C – Prove geometric theorems.

HS.G-CO.D – Make geometric constructions.

Geometric Measurement and Dimensions (G-GMD)

HS.G-GMD.A – Explain volume formulas and use them to solve problems.

HS.G-GMD.B – Visualize relationships between two-dimensional and three-dimensional objects.

Expressing Geometric Properties with Equations (G-GPE)

HS.G-GPE.A – Translate between the geometric description and the equation for a conic section.

HS.G-GPE.B – Use coordinates to prove simple geometric theorems algebraically.

Modeling with Geometry (G-MG)

HS.G-MG.A – Apply geometric concepts in modeling situations.

Similarity, Right Triangles, and Trigonometry (G-SRT)

HS.G-SRT.A – Understand similarity in terms of similarity transformations.

HS.G-SRT.B – Prove theorems involving similarity.

HS.G-SRT.C – Define trigonometric ratios and solve problems involving right triangles.

HS.G-SRT.D – Apply trigonometry to general triangles.

High School Math Item Specifications - Geometry

Standards for Circles

Content Standards	AzCCRS.Math.Content.G-C.A.1 Prove that all circles are similar.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Aside from items that ask the student to find the ratio of dilation between circles, items should focus on the fact that any circle can be obtained by a translation and dilation of any other circle - thus, they are similar (this is related to many of the		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to use transformations between two or more circles to show similarity.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Matching Item Response	5
Students will be required to show that the ratios of the circumference to the diameter of any circle are the same.			3, 5
Students will be required to graph the resulting circle from a transformed circle.			5

Content Standards	AzCCRS.Math.Content.G-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to describe the relationship between inscribed angles, radius, and chords of a circle.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Proposition Response	3, 5
Students will be required to find measures of central, inscribed and circumscribed angles.			3, 5

Content Standards	AzCCRS.Math.Content.G-C.A.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct an inscribed/circumscribed circle of a triangle.		<ul style="list-style-type: none">• Graphic Response• Hot Text Response• Multiple Choice Response• Proposition Response	5
Students will be required to explain the validity of proofs using properties of angles for a quadrilateral inscribed in a circle.			3, 5
Students will be required to complete a two-column proof proving properties of angles for a quadrilateral inscribed in a circle.			3, 5

Content Standards	AzCCRS.Math.Content.G-C.B.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Emphasize the similarity of all circles. Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to Use radian measures for all angles		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to understand that sectors with different arcs have arc lengths that are proportional.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	2, 3
Students will be required to understand that sectors with the same arc of two different circles are proportional.			2, 3

Congruence

Content Standards	AzCCRS.Math.Content.G-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Item writers should take care that the key does not stand out compared to the distractor options.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to select a definition for a geometric object.		• Multiple Choice Response	6

Content Standards	AzCCRS.Math.Content-G.CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify a correct transformation given a starting shape and an ending shape.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	5
Students will be required to construct a transformation given a starting shape and a sequence of steps.			5
Students will be required to explain the difference between two transformations or a transformation and a stretch in terms of preservation of properties.			5
Students will be required to given a transformation, describe a rule that maps the coordinates of a starting shape to an ending shape.			5

Content Standards	AzCCRS.Math.Content.G-CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygons, describe the rotations and reflections that carry it onto itself.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Shapes should be given on a coordinate grid		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to describe rotations and/or reflections that carry a figure onto itself.		<ul style="list-style-type: none"> Multiple Choice Response Multi-Select Response 	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.		
Explanations	Students may observe patterns and develop definitions of rotations, reflections, and translations.		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Items should focus on formal definitions of these concepts, i.e. what makes a definition complete or incomplete. Simply recognizing a description of a rotation compared with ones for reflections or rotations is a middle-school skill.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to describe definitions for a given transformation.		<ul style="list-style-type: none"> Multiple Choice Response 	6, 7

Content Standards	AzCCRS.Math.Content.G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Two-dimensional figures		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to recognize and identify transformations of a given figure.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	5, 7
Students will be required to construct a transformation of a figure from given information.			3, 5, 7

Content Standards	AzCCRS.Math.Content.G-CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.		
Explanations	A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures.		
Content Limits	This standard is aligned to Geometry only. Two-dimensional figures		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to describe rigid motions involved in a given transformation in terms of size and orientation.		<ul style="list-style-type: none">• Multiple Choice Response• Multi-Select Response	5, 7
Students will be required to describe how rigid motions can be used to show congruence.			3, 5, 7

Content Standards	AzCCRS.Math.Content.G-CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.		
Explanations	A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures. Two triangles are said to be congruent if one can be exactly superimposed on the other by a rigid motion, and the congruence theorems specify the conditions under which this can occur.		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to show/explain that if two triangles are congruent, their corresponding sides and angles are congruent.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	3
Students will be required to show/explain that if two triangles' corresponding sides and angles are congruent, then the figures are congruent.			3

Content Standards	AzCCRS.Math.Content.G-CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to explain how, given that rigid motions preserve congruence, the criteria ASA, SAS, and/or SSS are true.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3

Content Standards	AzCCRS.Math.Content.G-CO.C.9 Prove theorems about lines and angles.		
Explanations	None		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Theorems are not limited to only those in the “include” list, however they must be about lines and angles.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to complete a proof.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.C.10 Prove theorems about triangles.		
Explanations	None		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Theorems are not limited to only those in the “include” list, however they must be about triangles</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to complete a proof.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.C.11 Prove theorems about parallelograms.		
Explanations	None		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Theorems are not limited to only those in the “include” list, however they must be about parallelograms</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to complete a proof.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to draw a shape within a construction framework (item must require or at least refer student to use common construction techniques).		<ul style="list-style-type: none"> • Graphic Response • Hot Text Response • Multiple Choice Response 	5, 6

Content Standards	AzCCRS.Math.Content.G-CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct a figure or show the vertices of the figure inscribed in a circle.		<ul style="list-style-type: none">• Graphic Response• Multiple Choice Response	5, 6
Students will be required to explain the reason(s) points on a circle are vertices of a figure.			5, 6

Geometric Measurement and Dimensions

Content Standards	AzCCRS.Math.Content.G-GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.		
Explanations	Cavalieri's principle is if two solids have the same height and the same cross-sectional area at every level, then they have the same volume.		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to complete an informal argument.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3, 4, 5

Content Standards	AzCCRS.Math.Content.G-GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.		
Explanations	Missing measures can include but are not limited to slant height, altitude, height, diagonal of a prism, edge length, and radius.		
Content Limits	This standard is aligned to Geometry only. Focus should be on solving problems, not simply finding the volume of given figures.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve problems based on the volume of cylinders, pyramids, cones, or spheres.		• Equation Response	1, 2
Students will be required to solve problems based on the volumes of compositions or parts of cylinders, pyramids, cones, or spheres.			1, 2

Content Standards	AzCCRS.Math.Content.G-GMD.B.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.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. The focus for the first part of the standard should be on diagonal (not horizontal or vertical) cross-sections.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify cross-sections of three-dimensional objects to two-dimensional shapes.		<ul style="list-style-type: none">• Multiple Choice Response• Matching Item Response	4, 5
Students will be required to identify the three-dimensional object generated by a rotation of a given two-dimensional object.			4, 5

Expressing Geometric Properties with Equations

Content Standards	AzCCRS.Math.Content.G-GPE.A.1 Derive 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.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. All four quadrants of the coordinate plane, whole number coordinates, and a perfect square radius.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct an equation of a circle given information about the center and radius.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	7, 8
Students will be required to find the center and/or radius of a circle given an equation not in standard form.			7, 8

Content Standards	AzCCRS.Math.Content.G-GPE.A.2 Derive the equation of a parabola given a focus and directrix.		
Explanations	None		
Content Limits	<p>This standard is aligned to Algebra II only.</p> <p>The directrix should be parallel to a coordinate axis.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct an equation of a parabola given its focus and directrix.		<ul style="list-style-type: none"> Equation Response 	7, 8

Content Standards	AzCCRS.Math.Content.G-GPE.B.4 Use coordinates to prove simple geometric theorems algebraically.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. All four quadrants, may use radical values		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to rearrange statements to form a proof.		<ul style="list-style-type: none"> • Equation Response • Hot Text Response • Multiple Choice Response 	3

Content Standards	AzCCRS.Math.Content.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).		
Explanations	Lines can be horizontal, vertical, or neither.		
Content Limits	This standard is aligned to Geometry only. All four quadrants of the coordinate plane; coordinates are restricted to whole numbers.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct an equation of a line parallel or perpendicular to another line and containing a specific point.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Proposition Response	8
Students will be required to solve a problem using slope criteria for parallel and perpendicular lines.			8
Students will be required to describe aspects of why parallel lines have the same slope and why perpendicular lines have slopes that are negative reciprocals.			3, 8

Content Standards	AzCCRS.Math.Content.G-GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Rational numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the ratio a point divides a line segment into.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	2, 8
Students will be required to identify points on a line segment that partition it based on a given ratio.			2, 8

Content Standards	AzCCRS.Math.Content.G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. At least part of the computation must require the distance formula. Coordinates of all points must be given.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the perimeter of a polygon.		• Equation Response	2, 6
Students will be required to identify the area of a triangle or rectangle.			2, 3, 6

Modeling with Geometry

Content Standards	AzCCRS.Math.Content.G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to explain how a real-life object can be modeled by three-dimensional geometric objects.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	4, 5, 7
Students will be required to construct an equation that models an object and can be used to find its unknown measure (i.e., the object's volume, area).			4, 5, 7

Content Standards	AzCCRS.Math.Content.G-MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Only some of these items should deal with density of an object, etc. Others should deal with broader applications of the word density, like wolves per square mile.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to calculate a density.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	5, 7
Students will be required to draw conclusions based on a density.			4, 5, 7

Content Standards	AzCCRS.Math.Content.G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	1, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to satisfy a constraint given parameters in a geometric context.		<ul style="list-style-type: none"> Equation Response 	1, 4, 5

Similarity, Right Triangles, and Trigonometry

Content Standards	AzCCRS.Math.Content.G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: AzCCRS.Math.Content.G-SRT.A.1a Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.		
Explanations	Dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. Students may observe patterns and verify experimentally the properties of dilations.		
Content Limits	This standard is aligned to Geometry only. Limited to polygons with an emphasis on line segments and right triangles Items should include centers of dilation on a line segment, and not just in the middle of a figure		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the slope of a given side of a dilation, based on the slope of the corresponding side of the original figure.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	2, 5
Students will be required to understand a given scale factor and construct a dilation.			2, 5
Students will be required to describe and relate properties of dilations.			2, 5

Content Standards	AzCCRS.Math.Content.G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: AzCCRS.Math.Content.G-SRT.A.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.		
Explanations	Dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. Students may observe patterns and verify experimentally the properties of dilations.		
Content Limits	This standard is aligned to Geometry only. Limit figures to points, triangles, or rectangles		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to find the length of one side of a dilated figure, given the original figure and a scale factor.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	2, 5
Students will be required to describe how a scale factor relates to side lengths, and use this relationship to solve problems.			2, 5

Content Standards	AzCCRS.Math.Content.G-SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.		
Explanations	A similarity transformation is a rigid motion followed by dilation.		
Content Limits	This standard is aligned to Geometry only. Figures should be given on a coordinate plane Items for task demand 3 should assess knowledge of this line of reasoning - “Two shapes are similar if one can be obtained using reflections, rotations, translations, and/or dilations on the other. All of these transformations maintain angle measure and ratios of side lengths. Therefore, similar figures have equal corresponding angle measures and corresponding pairs of sides are proportional.”		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify similar figures.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	5, 7
Students will be required to identify a transformation or series of transformations, including dilations (including scale factors of dilations), that show that two figures are similar.			5, 7
Students will be required to describe the connection between similarity and transformations.			3, 5, 7

Content Standards	AzCCRS.Math.Content.G-SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify similar triangles based on AA.		• Multiple Choice Response	3
Students will be required to informally describe why the AA criterion is true.			3

Content Standards	AzCCRS.Math.Content.G-SRT.B.4 Prove theorems about triangles.		
Explanations	None		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Theorems about triangles are restricted to the following:</p> <p>Prove that a line constructed parallel to one side of a triangle intersecting the other two sides of the triangle divides the intersected side proportionally.</p> <p>Prove that a line that divides two sides of a triangle proportionally is parallel to the third side.</p> <p>Prove that if three sides of one triangle are proportional to the corresponding sides of another triangle, the triangles are similar.</p> <p>Prove the Pythagorean Theorem using similarity.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to complete a proof.		<ul style="list-style-type: none"> • Hot Text Response • Multiple Choice Response • Proposition Response 	3, 5

Content Standards	AzCCRS.Math.Content.G-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.		
Explanations	Similarity postulates include SSS, SAS, and AA. Congruence postulates include SSS, SAS, ASA, AAS, and H-L.		
Content Limits	This standard is aligned to Geometry only. Items use SSS, SAS, ASA, and/or AAS for congruence Items use AA, SAS (ratios) and/or SSS (ratios) for similarity		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve a problem that uses congruence and/or similarity criteria.		<ul style="list-style-type: none">Equation ResponseHot Text ResponseMultiple Choice Response	5
Students will be required to construct, analyze, and/or critique a proof that uses congruence and/or similarity criteria to shows a relationship between two figures.			3, 5

Content Standards	AzCCRS.Math.Content.G-SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. The trigonometric ratios are limited to sine, cosine, and tangent.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	6, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to define the trigonometric ratios: sine, cosine, and tangent.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Matching Item Response	8
Students will be required to identify the sine, cosine, and/or tangent ratio of a given triangle.			6, 8
Students will be required to use the trigonometric ratios to find the length of an unknown side.			6, 8

Content Standards	AzCCRS.Math.Content.G-SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify the relationship between the sine and cosine of acute angles in a right triangle: the sine of an angle is equal to the cosine of its complement and vice versa.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	3
Students will be required to use the sine and cosine functions to find the measure of an unknown angle given the measure of its complementary angle.			3

Content Standards	AzCCRS.Math.Content.G-SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		
Explanations	None		
Content Limits	<p>This standard is aligned to Geometry only.</p> <p>Items at this standard must require the student to solve real-life problems (e.g., use Pythagorean to find distance traveled on a map), and not simply find side lengths or angles of given triangles</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to use the Pythagorean Theorem and/or trigonometric ratios to solve problems involving right triangles.		<ul style="list-style-type: none"> Equation Response Graphic Response 	1, 4, 5

Arizona's College and Career Ready Standards (AzCCRS) – Number and Quantity

The Complex Number System (N-CN)

HS.N-CN.A – Perform arithmetic operations with complex numbers.

HS.N-CN.B – Represent complex numbers and their operations on the complex plane.

HS.N-CN.C – Use complex numbers in polynomial identities and equations.

Quantities (N-Q)

HS.N-Q.A – Reason quantitatively and use units to solve problems.

The Real Number System (N-RN)

HS.N-RN.A – Extend the properties of exponents to rational exponents.

HS.N-RN.B – Use properties of rational and irrational numbers.

Vector & Matrix Quantities (N-VM)

HS.N-VM.A – Represent and model with vector quantities.

HS.N-VM.B – Perform operations on vectors.

HS.N-VM.C – Perform operations on matrices and use matrices in applications.

High School Math Item Specifications - Number and Quantity

The Complex Number System

Content Standards	AzCCRS.Math.Content.N-CN.A.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.		
Explanations	None		
Content Limits	<p>This standard is aligned to Algebra II only.</p> <p>The exponent for i should be no greater than 2.</p> <p>The arithmetic performed under this standard should serve to clarify the form of a single complex number (differentiating between complex numbers that are real, complex numbers with imaginary and real components, and pure-imaginary numbers).</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is not allowed.	Math Practices	2, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to match square roots of negative numbers with complex numbers.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Matching Item Response	2, 6
Students will be required to create equivalent numbers in standard $a + bi$ form.			2, 6

Content Standards	AzCCRS.Math.Content.N-CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve problems using algebraic properties (commutative, associative, and distributive) with multiple complex numbers.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	2, 7

Content Standards	AzCCRS.Math.Content.N-CN.C.7 Solve quadratic equations with real coefficients that have complex solutions.		
Explanations	None		
Content Limits	<p>This standard is aligned to Algebra II only.</p> <p>Include real and complex solutions as options, but keys should be complex solutions</p> <p>Equation response items for this standard are not ideal, in that there is no “+-” button, and many solutions derived from the quadratic equation are cumbersome to input. Therefore, EQ items at this standard should ask for one solution, and that solution should be simple to input.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	6, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve a quadratic equation.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	6, 8

Quantities

Content Standards	AzCCRS.Math.Content.N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.		
Explanations	This standard is aligned to Algebra I only. Include word problems where quantities are given in different units, which must be converted to make sense of the problem. Graphical representations and data displays include, but are not limited to: line graphs, circle graphs, histograms, multi-line graphs, scatterplots, and multi-bar graphs.		
Content Limits	Rational numbers Linear equations and graph Exponential equations and graphs Customary and metric units of measure		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to solve problems that focus on an incorrect selection of units given the context.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	5, 6
Students will be required to identify/modify vertical and horizontal scales of a graph, including breaks, to fit a given situation.			4, 5, 6

Content Standards	AzCCRS.Math.Content.N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.		
Explanations	None		
Content Limits	Algebra I: Linear and exponential models Algebra II: Quadratic and rational models		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to use units appropriate to the context to solve problems.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	4, 6

Content Standards	AzCCRS.Math.Content.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.		
Explanations	The margin of error and tolerance limit varies according to the measure, tool used, and context.		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to explain, justify, and/or defend someone's level of accuracy needed to perform a given calculation between two quantities of different measurements.		<ul style="list-style-type: none"> Multiple Choice Response 	5, 6

The Real Number System

Content Standards	AzCCRS.Math.Content.N-RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.		
Explanations	Students may explain orally or in written format.		
Content Limits	This standard is aligned to Algebra II only. Rational exponents and bases		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify correct notation for radicals.		• Multiple Choice Response	2
Students will be required to explain the meaning of rational exponents. Context is required.			2, 3

Content Standards	AzCCRS.Math.Content.N-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given an expression, create/identify an equivalent expression.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	7

Content Standards	AzCCRS.Math.Content. N-RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.		
Explanations	Since every difference is a sum and every quotient is a product, this includes differences and quotients as well. Explaining why the four operations on rational numbers produce rational numbers can be a review of students understanding of fractions and negative numbers. Explaining why the sum of a rational and an irrational number is irrational, or why the product is irrational, includes reasoning about the inverse relationship between addition and subtraction (or between multiplication and addition).		
Content Limits	This standard is aligned to Algebra I only. For products, can include [irrational number] x 0 as rational.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to given sums/products of numbers, identify which are rational and which are irrational.		<ul style="list-style-type: none">Multiple Choice ResponseMulti-Select Response	2, 3
Students will be required to justify why the sums/products of two rational numbers, two irrational numbers, and one irrational and one rational numbers are necessarily rational or irrational.			2, 3

Arizona's College and Career Ready Standards (AzCCRS) – Statistics and Probability

Conditional Probability & the Rules of Probability (S-CP)

HS.S-CP.A – Understand independence and conditional probability and use them to interpret data.

HS.S-CP.B – Use the rules of probability to compute probabilities of compound events.

Making Inferences & Justifying Conclusions (S-IC)

HS.S-IC.A – Understand and evaluate random processes underlying statistical experiments.

HSS-IC.B – Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Interpreting Categorical & Quantitative Data (S-ID)

HS.S-ID.A – Summarize, represent, and interpret data on a single count of measurement variable.

HS.S-ID.B – Summarize, represent and interpret data on two categorical and quantitative variables.

HS.S-ID.C – Interpret linear models.

Using Probability to Make Decisions (S-MD)

HS.S-MD.A – Calculate expected values and use them to solve problems.

HS.S-MD.B – Use probability to evaluate outcomes of decisions.

High School Math Item Specifications - Statistics and Probability

Conditional Probability & the Rules of Probability

Content Standards	AzCCRS.Math.Content.S-CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").		
Explanations	<p>Intersection: The intersection of two sets A and B is the set of elements that are common to both set A and set B. It is denoted by $A \cap B$ and is read 'A intersection B.'</p> <p>Union: The union of two sets A and B is the set of elements, which are in A or in B or in both. It is denoted by $A \cup B$ and is read 'A union B.'</p> <p>Complement: The complement of the set $A \cup B$ is the set of elements that are members of the universal set U but are not in $A \cup B$. It is denoted by $(A \cup B)'$</p>		
Content Limits	This standard is aligned to Algebra II only. Positive rational numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify events as outcomes of a trial.		<ul style="list-style-type: none">Multiple Choice ResponseMulti-Select Response	2, 6, 7
Students will be required to identify multiple events as subsets of the sample space, including unions, intersections, and complements.			2, 4, 6, 7

Content Standards	AzCCRS.Math.Content.S-CP.A.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Positive rational numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify independent events given their probabilities.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	2, 6, 7
Students will be required to determine the probability of the other event given that two events are independent and the probability of one event.			2, 6, 7
Students will be required to interpret two events in terms of independence given the probabilities of the two events.			2, 4, 6, 7

Content Standards	AzCCRS.Math.Content.S-CP.A.3 Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Rational positive numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 4, 6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to compute conditional probabilities.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	2, 6, 7
Students will be required to identify independent events given their probabilities and one conditional probability.			2, 6, 7
Students will be required to determine the conditional probability (or vice versa) given that two events are independent and the probability of one event.			2, 6, 7
Students will be required to interpret the events in terms of independence given the probability of an event and the conditional probability of that event with another event.			2, 4, 6, 7

Content Standards	AzCCRS.Math.Content.S-CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to determine independence of events or conditional probabilities given a two-way table.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Table Response	1, 2, 4, 5, 7, 8
Students will be required to complete a two-way table to satisfy criteria related to independence or conditional probability.			1, 2, 3, 4, 5, 6, 7, 8

Content Standards	AzCCRS.Math.Content.S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Rational positive numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 4, 6, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify examples of independence and conditional probability given a scenario.		• Multiple Choice Response	1, 8
Students will be required to interpret this in terms of the context given that two events are independent or a conditional probability.			1, 4, 6, 8

Content Standards	AzCCRS.Math.Content.S-CP.B.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Data is given by raw data and not probabilities		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to compute a conditional probability.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	1, 5, 7
Students will be required to find pieces of raw data given a conditional probability and some other raw data.			1, 4, 5, 7
Students will be required to interpret the meaning of the conditional probability given data and a conditional probability.			1, 4, 5, 7

Content Standards	AzCCRS.Math.Content.S-CP.B.7 Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5, 6, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to compute the probability of the union of two events.		<ul style="list-style-type: none">• Equation Response• Proposition Response	4, 5, 6, 7
Students will be required to find a missing probability using the Addition Rule given the probability of the union of two events and other probabilities.			4, 5, 6, 7
Students will be required to interpret the meaning of the union given a context and the probability of the union of two events.			4, 5, 6, 7

Making Inferences & Justifying Conclusions

Content Standards	AzCCRS.Math.Content.S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. Quantities should be simple and realistic to the context so as to allow the student to show knowledge of the concept rather than computational skills.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to order steps in a statistical process or select a sample that represents a given population.		<ul style="list-style-type: none">• Hot Text Response• Multiple Choice Response	4, 6
Students will be required to describe flaws in a statistical process (i.e., not random) or recommend a correct course of action.			4, 6

Content Standards	AzCCRS.Math.Content.S-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.		
Explanations	<p>Possible data-generating processes include (but are not limited to): flipping coins, spinning spinners, rolling a number cube, and simulations using the random number generators.</p> <p>The law of large numbers states that as the sample size increases, the experimental probability will approach the theoretical probability. Comparison of data from repetitions of the same experiment is part of the model building verification process.</p>		
Content Limits	<p>This standard is aligned to Algebra II only.</p> <p>Quantities should be simple and realistic to the context so as to allow the student to show knowledge of the concept rather than computational skills.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to predict the most likely results of a simulation given a probability model.		<ul style="list-style-type: none">Equation ResponseMultiple Choice Response	1, 2, 4, 5, 7, 8
Students will be required to select the best probability model given the results of a simulation.			1, 2, 3, 4, 5, 6, 7, 8

Content Standards	AzCCRS.Math.Content.S-IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.		
Explanations	<p>Students should be able to explain techniques/applications for randomly selecting study subjects from a population and how those techniques/applications differ from those used to randomly assign existing subjects to control groups or experimental groups in a statistical experiment.</p> <p>In statistics, an observational study draws inferences about the possible effect of a treatment on subjects, where the assignment of subjects into a treated group versus a control group is outside the control of the investigator (for example, observing data on academic achievement and socio-economic status to see if there is a relationship between them). This is in contrast to controlled experiments, such as randomized controlled trials, where each subject is randomly assigned to a treated group or a control group before the start of the treatment.</p>		
Content Limits	This standard is aligned to Algebra II only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	3, 4, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify a given activity as a survey sample, experiment, or observational study		• Multiple Choice Response	3, 6
Students will be required to identify a substantive difference between the three types of activities, or the most appropriate activity for a given research question.			3, 6
Students will be required to design a study that correctly applies randomization given specific criteria.			3, 4, 6

Content Standards	AzCCRS.Math.Content.S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. The student should not be required to compute a margin of error, but identify what factors lead to larger or smaller margins of error		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to provide a sample mean given raw data.		<ul style="list-style-type: none">Equation ResponseProposition ResponseSimulator Response	1, 4, 5
Students will be required to relate margin of error to the characteristics of the sample population and the survey methodology.			1, 4, 5

Content Standards	AzCCRS.Math.Content.S-IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.		
Explanations	Treatment is a term used in the context of an experimental design to refer to any prescribed combination of values of explanatory variables. For example, one wants to determine the effectiveness of weed killer. Two equal parcels of land in a neighborhood are treated; one with a placebo and one with weed killer to determine whether there is a significant difference in effectiveness in eliminating weeds.		
Content Limits	This standard is aligned to Algebra II only. Items should give students two populations (people given a medication, people not given a medication) and data on those two populations (sample mean of recovery).		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 4, 5, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to give a quantitative likelihood that two treatments are significantly different		<ul style="list-style-type: none">• Equation Response• Proposition Response• Simulator Response	1, 4, 5, 8
Students will be required to describe to what degree the results of a particular randomized experiment answer a given research question.			1, 4, 5, 8
Students will be required to reach conclusions about the effectiveness of a treatment based on given data.			1, 4, 5, 8

Content Standards	AzCCRS.Math.Content.S-IC.B.6 Evaluate reports based on data.		
Explanations	<p>Explanations can include but are not limited to sample size, biased survey sample, interval scale, unlabeled scale, uneven scale, and outliers that distort the line-of-best-fit. In a pictogram the symbol scale used can also be a source of distortion.</p> <p>As a strategy, collect reports published in the media and ask students to consider the source of the data, the design of the study, and the way the data are analyzed and displayed.</p>		
Content Limits	<p>This standard is aligned to Algebra II only.</p> <p>If approximations using the normal curve are to be used by the student, a standard normal table or equivalent should be provided.</p> <p>Student must be given data and a conclusion to evaluate.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to evaluate the validity of a claim derived from the results of a randomized experiment.		<ul style="list-style-type: none"> Equation Response Multiple Choice Response 	1, 2, 3, 4, 5, 6, 7, 8

Interpreting Categorical & Quantitative Data

Content Standards	AzCCRS.Math.Content.S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. The amount of data to be plotted should be reasonable.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	4, 5
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct a data display.		<ul style="list-style-type: none"> • Graphic Response • Multiple Choice Response 	4, 5

Content Standards	AzCCRS.Math.Content.S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. AzCCRS.Math.Content.S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	2, 3, 4, 5, 7
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify data distributions that share commonalities (i.e., same spread, interquartile range, median, and mean) through inspection.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response• Multi-Select Response	2, 4, 5, 7
Students will be required to distinguish between different spreads to compare the mean and medians of the data set.			2, 4, 5, 7
Students will be required to construct a graph given information about the shape, center, and spread.			2, 4, 5, 7
Students will be required to compare different distributions in order to draw conclusions about the effects of an extreme outlier on different spreads			2, 3, 4, 5, 7
Students will be required to make inferences about the spread of distributions to draw conclusions about the given context. (i.e., what does a skewed distribution of test scores tell us about the test questions).			2, 3, 4, 5, 7

Content Standards	AzCCRS.Math.Content.S-ID.A.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.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. If a student is required to estimate a population percentage not associated with 1, 2, or 3 standard deviations from the mean, a normal table or some equivalent mechanism must be provided. Items should state that the data are approximately normally distri		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 6, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to identify a population percentage or area under a curve within 1, 2, or 3 standard deviations.		<ul style="list-style-type: none">• Equation Response• Graphic Response• Multiple Choice Response	1, 2, 4, 5, 6, 7, 8
Students will be required to identify a population percentage for standard deviations other than 1, 2, or 3.			1, 2, 4, 5, 6, 7, 8
Students will be required to explain why a data set should or should not be modeled with a normal distribution.			1, 2, 3, 4, 5, 6, 7, 8

Content Standards	AzCCRS.Math.Content.S-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Bivariate data Positive rational numbers		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	Math Practices	1, 2, 3, 4, 5, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to construct a contingency table in order to show the relationships between variables.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Table Response	1, 2, 4, 5, 8
Students will be required to interpret tables to calculate marginal and joint frequencies within the context.			1, 2, 4, 5, 8
Students will be required to identify patterns in a distribution in order to answer questions pertaining to the data set and context.			1, 2, 3, 4, 5, 8

Content Standards	AzCCRS.Math.Content.S-ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.		
	AzCCRS.Math.Content.S-ID.B.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data.		
	AzCCRS.Math.Content.S-ID.B.6b Informally assess the fit of a function by plotting and analyzing residuals.		
	AzCCRS.Math.Content.S-ID.B.6c Fit a linear function for a scatter plot that suggests a linear association.		
Explanations	The residual in a regression model is the difference between the observed and the predicted y for some x (y the dependent variable and x the independent variable). So if we have a model $y = ax + b$ and a data point (xi, yi), the residual is for this point is $r_i = y_i - (ax_i + b)$. Students may use spreadsheets, graphing calculators, and statistical software to represent data, describe how the variables are related, fit functions to data, perform regressions, and calculate residuals.		
Content Limits	This standard is aligned to Algebra I. Only S-ID.B.6a is aligned to Algebra II (fitting functions for Algebra I and using functions for Algebra II). Rational numbers; Bivariate data; Linear, quadratic, and exponential models for 6a		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is not allowed.	Math Practices	2, 3, 4, 5, 7, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to select a function that best represents the data given a set of data. (a)		<ul style="list-style-type: none">Equation ResponseGraphic ResponseMultiple Choice Response	2, 4, 5, 7, 8
Students will be required to plot and analyze residuals on a number line. (b)			2, 4, 5, 7, 8
Students will be required to create a linear function that best represents the data given a scatter plot. (c)			2, 3, 4, 5, 7, 8

Content Standards	AzCCRS.Math.Content.S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. A linear model should be provided The model should not fit exactly a set of data, if given		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	1, 2, 4, 5, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to interpret the rate of change and/or constant term of a linear model to identify valid conclusions.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response• Multi-Select Response	1, 2, 4, 5
Students will be required to identify the value in a linear model that represents a given interpretation.			1, 2, 4, 5, 6

Content Standards	AzCCRS.Math.Content.S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.		
Explanations	None		
Content Limits	This standard is aligned to Algebra I only. Items should focus on interpreting a given correlation coefficient		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	4, 5, 8
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to interpret the correlation coefficient of a linear fit.		<ul style="list-style-type: none">• Equation Response• Multiple Choice Response	4, 5, 8
Students will be required to identify another correlation coefficient that satisfies a given condition given a correlation coefficient (i.e., a coefficient that shows a better positive correlation than 0.7).			4, 5, 8

Content Standards	AzCCRS.Math.Content.S-ID.C.9 Distinguish between correlation and causation.		
Explanations	Some data leads observers to believe that there is a cause and effect relationship when a strong relationship is observed. Students should be careful not to assume that correlation implies causation. The determination that one thing causes another requires a controlled randomized experiment.		
Content Limits	<p>This standard is aligned to Algebra I only.</p> <p>Bivariate, linear data</p> <p>Items should focus on the fact that causation cannot be determined from correlation, rather than asking the student to decide which relationships are causal and which are not.</p>		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	Math Practices	3, 4, 6
Sample Task Demands		Common Item Formats	Recommended Math Practices
Students will be required to distinguish information that a correlation coefficient provides (fit, trend) to information it does not (causation).		<ul style="list-style-type: none"> Multiple Choice Response Multi-Select Response 	3, 4, 6