Claim	Target	IAB	DOK	Standards	Item Types
1: **Concepts and Procedures**	**A:** Extend the properties of exponents to rational exponents.	No IAB	1, 2	**N.RN.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.	MC, MS, EQ, MA
				N.RN.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.	
	B: Use properties of rational and irrational numbers.	No IAB	1, 2, 3	**N.RN.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.	MS, MA, HS
	C: Reason quantitatively and use units to solve problems.	No IAB	1, 2	**N.Q.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.	MC, MS, DD, MA
	D: Interpret the structure of expressions.	No IAB	1, 2	**A.SSE.2:** Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.	MC, MA, DD

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Claim	Target	IAB	DOK	Standards	Item Types

1: **Concepts and Procedures**	**E:** Write expressions in equivalent forms to solve problems.	No IAB	1,2	**A.SSE.3:** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
				  A.SSE.3a: Factor a quadratic expression to reveal the zeros of the function it defines.
				  A.SSE.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
				  A.SSE.3c: Use the properties of exponents to transform expressions for exponential functions. For example, the expression $1.15t$ can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
					EQ, MC, HS

	F: Perform arithmetic operations on polynomials.	No IAB	2	**A.APR.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.	EQ, MC
	G: Create equations that describe numbers or relationships.	Algebra and Functions I Algebra and Functions II	1, 2	**A.CED.1:** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **A.CED.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	EQ, G
	H: Understand solving equations as a process of reasoning and explain the reasoning.	Algebra and Functions II	1, 2	**A.REI.2:** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	MC, EQ, MA

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Claim	Target	IAB	DOK	Standards	Item Types
1: Concepts and Procedures	**I:** Solve equations and inequalities in one variable.	Algebra and Functions I Algebra and Functions II	1, 2	**A.REI.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A.REI.4:** Solve quadratic equations in one variable. **A.REI.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. **A.REI.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 and write them as $a \pm bi$ for real numbers a and b.	MC, EQ, MA
	J: Represent and solve equations and inequalities graphically.	Algebra and Functions I Algebra and Functions II	1, 2	**A.REI.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). **A.REI.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. **A.REI.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.	MC, MS, HS, G, DD, MA, EQ

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Claim	Target	IAB	DOK	Standards	Item Types
1: Concepts and Procedures	**K:** Understand the concept of a function and use function notation.	No IAB	1, 2	**F.IF.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).	MC, MS, MA, G
				F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.	
	L: Interpret functions that arise in applications in terms of the context.	Algebra and Functions I Algebra and Functions II	1, 2	**F.IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	MA, MC, MS, EQ, HS, G
				F.IF.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.	
				F.IF.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.	

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Claim	Target	IAB	DOK	Standards	Item Types

1: **Concepts and Procedures**	**M:** Analyze functions using different representations.	Algebra and Functions I
		
		Algebra and Functions II
			1, 2	**F.IF.7:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
				  F.IF.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.
				  F.IF.7b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
				  F.IF.7c: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
				  F.IF.7e: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
					G, MA, HS, MS, EQ

				F.IF.8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
				  F.IF.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.
				  F.IF.8b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.10)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.	

				F.IF.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.	

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Claim	Target	IAB	DOK	Standards	Item Types
1: Concepts and Procedures	**N:** Build a function that models a relationship between two quantities.	Algebra and Functions I Algebra and Functions II	2	**F.BF.1:** Write a function that describes a relationship between two quantities. **F.BF.1a:** Determine an explicit expression, a recursive process, or steps for calculation from a context. **F.BF.2:** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	MC, EQ, MA, TI
	O: Define trigonometric ratios and solve problems involving right triangles.	Geometry and Right Triangle Trigonometry	1, 2	**G.SRT.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. **G.SRT.7:** Explain and use the relationship between the sine and cosine of complementary angles. **G.SRT.8:** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	MC, MS, EQ, MA
	P: Summarize, represent, and interpret data on a single count or measurement variable.	Statistics and Probability	1, 2	**S.ID.1:** Represent data with plots on the real number line (dot plots, histograms, and box plots). **S.ID.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. **S.ID.3:** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	MC, HS, MA, DD

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Claim	Target/DOK	IAB	Standards	Item Types

2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3)
	
	B: Select and use appropriate tools strategically. (1, 2)
	
	C: Interpret results in the context of a situation. (2)
	
	D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)
		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			N.Q.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.
			
			N.Q.2: Define appropriate quantities for the purpose of descriptive modeling.
			
			N.Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
			
			A.SSE.1: Interpret expressions that represent a quantity in terms of its context.
			    A.SSE.1a: Interpret parts of an expression, such as terms, factors, and coefficients.
			    A.SSE.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.
			
			A.SSE.2: Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
			
			A.SSE.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
			    A.SSE.3a: Factor a quadratic expression to reveal the zeros of the function it defines.
			    A.SSE.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
			    A.SSE.3c: Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
				MC, MS, EQ, DD, HS, G, MA, TI
				
				CR
				(PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3) **B:** Select and use appropriate tools strategically. (1, 2) **C:** Interpret results in the context of a situation. (2) **D:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**A.SSE.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. For example, calculate mortgage payments. **A.CED.1:** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **A.CED.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A.CED.3:** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. **A.CED.4:** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. **A.REI.2:** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **A.REI.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types

2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3)
	
	B: Select and use appropriate tools strategically. (1, 2)
	
	C: Interpret results in the context of a situation. (2)
	
	D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)
		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			A.REI.4: Solve quadratic equations in one variable.
			  A.REI.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.
			  A.REI.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 and write them as $a \pm bi$ for real numbers a and b.
			
			A.REI.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.
			
			A.REI.6: Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
			
			A.REI.7: Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = -3x and the circle $x^2 + y^2 = 3$.
				MC, MS, EQ, DD, HS, G, MA, TI
				
				CR
				(PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3) **B:** Select and use appropriate tools strategically. (1, 2) **C:** Interpret results in the context of a situation. (2) **D:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**A.REI.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).	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)
			A.REI.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.	
			A.REI.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.	
			F.IF.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).	
			F.IF.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	

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Claim	Target/DOK	IAB	Standards	Item Types
2: Problem Solving	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3) **B:** Select and use appropriate tools strategically. (1, 2) **C:** Interpret results in the context of a situation. (2) **D:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**F.IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)
			F.IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.	
			F.IF.5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.	
			F.IF.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.	

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Claim	Target/DOK	IAB	Standards	Item Types

2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3)
	
	B: Select and use appropriate tools strategically. (1, 2)
	
	C: Interpret results in the context of a situation. (2)
	
	D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)
		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			F.IF.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
			   F.IF.7a: Graph linear and quadratic functions and show intercepts, maxima, and minima.
			   F.IF.7b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
			   F.IF.7c: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
			   F.IF.7d: (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
			   F.IF.7e: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
			
			F.IF.8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
			   F.IF.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.
			   F.IF.8b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.
				MC, MS, EQ, DD, HS, G, MA, TI
				
				CR (PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3) **B:** Select and use appropriate tools strategically. (1, 2) **C:** Interpret results in the context of a situation. (2) **D:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**F.BF.1:** Write a function that describes a relationship between two quantities. **F.BF.1a:** Determine an explicit expression, a recursive process, or steps for calculation from a context. **F.BF.1b:** Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. **F.BF.1c:** (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. **F.BF.2:** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. **G.SRT.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. **G.SRT.7:** Explain and use the relationship between the sine and cosine of complementary angles. **G.SRT.8:** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. **S.ID.7:** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **S.ID.8:** Compute (using technology) and interpret the correlation coefficient of a linear fit.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
2: **Problem Solving**	**A:** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace. (1, 2, 3) **B:** Select and use appropriate tools strategically. (1, 2) **C:** Interpret results in the context of a situation. (2) **D:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**S.ID.9:** Distinguish between correlation and causation. **S.CP.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"). **S.CP.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. **S.CP.3:** Understand the conditional probability of A given B as P(A 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. **S.CP.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. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **S.CP.5:** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
3: Communicating Reasoning	**A:** Test propositions or conjectures with specific examples. (2) **B:** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. (3, 4) **C:** State logical assumptions being used. (2, 3) **D:** Use the technique of breaking an argument into cases. (2, 3) **E:** Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is. (2, 3, 4) **F:** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. (2, 3) **G:** At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) (3, 4)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**N.RN.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. **A.SSE.2:** Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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Claim	Target/DOK	IAB	Standards	Item Types
3: Communicating Reasoning	**A:** Test propositions or conjectures with specific examples. (2) **B:** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. (3, 4) **C:** State logical assumptions being used. (2, 3) **D:** Use the technique of breaking an argument into cases. (2, 3) **E:** Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is. (2, 3, 4) **F:** Base arguments on concrete referents such as objects, drawings, diagrams, and actions. (2, 3) **G:** At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) (3, 4)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**A.APR.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. **A.APR.4:** Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples. **A A.APR.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.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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4: **Modeling and Data Analysis**	**A:** Apply mathematics to solve problems arising in everyday life, society, and the workplace. (2, 3)
	
	B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. (2, 3, 4)
	
	C: State logical assumptions being used. (1, 2)
	
	D: Interpret results in the context of a situation. (2, 3)
	
	E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. (3, 4)
	
	F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)
	
	G: Identify, analyze and synthesize relevant external resources to pose or solve problems. (3, 4)
		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			N.Q.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.
			
			N.Q.2: Define appropriate quantities for the purpose of descriptive modeling.
			
			N.Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
			
			A.SSE.3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
			  A.SSE.3a: Factor a quadratic expression to reveal the zeros of the function it defines.
			  A.SSE.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
			  A.SSE.3c: Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.
			
			A.SSE.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. For example, calculate mortgage payments.
				MC, MS, EQ, DD, HS, G, MA, TI
				
				CR
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			A.REI.2: Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	
			A.REI.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	

			A.REI.4: Solve quadratic equations in one variable.
			  A.REI.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.
			  A.REI.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 and write them as $a \pm bi$ for real numbers a and b.	

			A.REI.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.	

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Claim	Target/DOK	IAB	Standards	Item Types

4: Modeling and Data Analysis	**A:** Apply mathematics to solve problems arising in everyday life, society, and the workplace. (2, 3)
	
	B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. (2, 3, 4)
	
	C: State logical assumptions being used. (1, 2)
	
	D: Interpret results in the context of a situation. (2, 3)
	
	E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. (3, 4)
	
	F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3)
	
	G: Identify, analyze and synthesize relevant external resources to pose or solve problems. (3, 4)
		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			F.IF.8: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
			  F.IF.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.
			  F.IF.8b: Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)t$, $y = (0.97)t$, $y = (1.01)12t$, $y = (1.2)t/10$, and classify them as representing exponential growth or decay.
			
			F.IF.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
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		Algebra and Functions I
		
		Algebra and Functions II
		
		Geometry and Right Triangle Trigonometry
		
		Statistics and Probability
		
		Performance Task
			F.BF.1: Write a function that describes a relationship between two quantities.
			  F.BF.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context.
			  F.BF.1b: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
			  F.BF.1c: (+) Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.
			
			F.BF.2: Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
			
			F.TF.5: Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
			
			S.ID.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).
			
			S-ID.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
			
			S-ID.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
				MC, MS, EQ, DD, HS, G, MA, TI
				
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4: Modeling and Data Analysis	**A:** Apply mathematics to solve problems arising in everyday life, society, and the workplace. (2, 3) **B:** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. (2, 3, 4) **C:** State logical assumptions being used. (1, 2) **D:** Interpret results in the context of a situation. (2, 3) **E:** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. (3, 4) **F:** Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (1, 2, 3) **G:** Identify, analyze and synthesize relevant external resources to pose or solve problems. (3, 4)	Algebra and Functions I Algebra and Functions II Geometry and Right Triangle Trigonometry Statistics and Probability Performance Task	**S.ID.4:** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. **S.ID.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. **S.ID.6:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. **S.ID.6a:** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. **S.ID.6b:** Informally assess the fit of a function by plotting and analyzing residuals. **S.ID.6c:** Fit a linear function for a scatter plot that suggests a linear association. **S.IC.1:** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **S.IC.3:** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	MC, MS, EQ, DD, HS, G, MA, TI CR (PT Only)

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