Kentucky Academic Standards for Mathematics (High School) Crosswalk Overview

ACT Math Standards	Corresponding KAS for Math Math Practices	Corresponding KAS Math Cross Cutting Concepts
Number and Quantity (N)	• Make Sense of Problems and Persevere in Solving Them • Reason Abstractly and Quantitatively • Model with Mathematics • Attend to Precision • Look For and Express Regularity in Repeated Reasoning	• Problem Solving • Data, Real-World Situations, and Solutions • Scale, Proportion, and Quantity
Algebra (A) and Functions (F)	• Reason Abstractly and Quantitatively • Construct Viable Arguments and Critique Reasoning • Model with Mathematics • Attend to Precision • Look For and Make Use of Structure	• Systems and System Models • Mathematical Connections
Geometry (G), Statistics and Probability (S)	• Make Sense of Problems and Persevere in Solving Them • Reason Abstractly and Quantitatively • Construct Viable Arguments and Critique Reasoning • Model with Mathematics • Attend to Precision	• Structure and Function • Patterns

Content of the ACT Mathematics Test

	Content Area	Possible Topics & Percentages	# Questions
#1	Pre-Algebra	Fractions, Percent, Proportion, Equations, Probability, Descriptive Stats (23%)	14
#2	Elementary Algebra	Polynomials, Quadratics, Systems (17%)	10
#3	Intermediate Algebra	Radical and Rational Operations, Matrices, Complex Numbers (15%)	9
#4	Coordinate Geometry	Conics, Distance, Perpendicular and Parallel Lines, Transformations (15%)	9
#5	Plane Geometry	Plane Figures, Circles, Proof (23%)	14
#6	Trigonometry	Functions, Identities, Equations (7%)	4

Math ACT—Benchmark Analysis

To receive the benchmark score of **19 (for Contemporary Math)**, at least **26** questions, benchmark score of **22 (for College Algebra)**, at least **31** questions, and score of 27 **(for Calculus)**, at least **44** questions must be answered correctly.

60 questions – 60 minutes

Key Ideas and Details: Number and Quantity (N)

ACT Mathematics: Number and Quantity (N) Scoring Range with Standards					
Approaching Benchmark		**Meets Benchmark**	**Exceeds Benchmark**		
13-15	16-19	20-23	24-27	28-32	33-36
N 201. Perform one-operation computation with whole numbers and decimals N 202. Recognize equivalent fractions and fractions in lowest terms N 203. Locate positive rational numbers (expressed as whole numbers, fractions, decimals, and mixed numbers) on the number line	N 301. Recognize one-digit factors of a number N 302. Identify a digit's place value N 303. Locate rational numbers on the number line *Note: A matrix as a representation of data is treated here as a basic table.*	**N 401. Exhibit knowledge of elementary number concepts such as rounding, the ordering of decimals, pattern identification, primes, and greatest common factor** **N 402. Write positive powers of 10 by using exponents** **N 403. Comprehend the concept of length on the number line, and find the distance between two points** **N 404. Understand absolute value in terms of distance** **N 405. Find the distance in the coordinate plane between two points with the same x-coordinate or y-coordinate** **N 406. Add two matrices that have whole number entries**	N 501. Order fractions N 502. Find and use the least common multiple N 503. Work with numerical factors N 504. Exhibit some knowledge of the complex numbers N 505. Add and subtract matrices that have integer entries	N 601. Apply number properties involving prime factorization N 602. Apply number properties involving even/odd numbers and factors/multiples N 603. Apply number properties involving positive/negative numbers N 604. Apply the facts that π is irrational and that the square root of an integer is rational only if that integer is a perfect square N 605. Apply properties of rational exponents N 606. Multiply two complex numbers N 607. Use relations involving addition, subtraction, and scalar multiplication of vectors and of matrices	N 701. Analyze and draw conclusions based on number concepts N 702. Apply properties of rational numbers and the rational number system N 703. Apply properties of real numbers and the real number system, including properties of irrational numbers N 704. Apply properties of complex numbers and the complex number system N 705. Multiply matrices N 706. Apply properties of matrices and properties of matrices as a number system

Key Ideas and Details: Algebra (A)

ACT Mathematics: Algebra (A) Scoring Range with Standards					
Approaching Benchmark		**Meets Benchmark**	**Exceeds Benchmark**		
13-15	16-19	20-23	24-27	28-32	33-36
AF 201. Solve problems in one or two steps using whole numbers and using decimals in the context of money A 201. Exhibit knowledge of basic expressions (e.g., identify an expression for a total as $b + g$) A 202. Solve equations in the form $x + a = b$, where a and b are whole numbers or decimals	AF 301. Solve routine one-step arithmetic problems using positive rational numbers, such as single-step percent AF 302. Solve some routine two-step arithmetic problems AF 303. Relate a graph to a situation described qualitatively in terms of familiar properties such as before and after, increasing and decreasing, higher and lower AF 304. Apply a definition of an operation for whole numbers (e.g., $a \text{ ▫ } b = 3a - b$) A 301. Substitute whole numbers for unknown quantities to evaluate expressions A 302. Solve one-step equations to get integer or decimal answers A 303. Combine like terms (e.g., $2x + 5x$)	**AF 401. Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and estimating by using a given average value in place of actual values** **AF 402. Perform straightforward word-to-symbol translations** **AF 403. Relate a graph to a situation described in terms of a starting value and an additional amount per unit (e.g., unit cost, weekly growth)** **A 401. Evaluate algebraic expressions by substituting integers for unknown quantities** **A 402. Add and subtract simple algebraic expressions** **A 403. Solve routine first-degree equations** **A 404. Multiply two binomials** **A 405. Match simple inequalities with their graphs on the number line (e.g., $x \geq -3 \ 5 \quad x \geq -35$)**	AF 501. Solve multistep arithmetic problems that involve planning or converting common derived units of measure (e.g., feet per second to miles per hour) AF 502. Build functions and write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions) AF 503. Match linear equations with their graphs in the coordinate plane A 501. Recognize that when numerical quantities are reported in real-world contexts, the numbers are often rounded A 502. Solve real-world problems by using first-degree equations A 503. Solve first-degree inequalities when the method does not involve reversing the inequality sign	AF 601. Solve word problems containing several rates, proportions, or percentages AF 602. Build functions and write expressions, equations, and inequalities for common algebra settings (e.g., distance to a point on a curve and profit for variable cost and demand) AF 603. Interpret and use information from graphs in the coordinate plane AF 604. Given an equation or function, find an equation or function whose graph is a translation by a specified amount up or down A 601. Manipulate expressions and equations A 602. Solve linear inequalities when the method involves reversing the inequality sign A 603. Match linear inequalities with their	AF 701. Solve complex arithmetic problems involving percent of increase or decrease or requiring integration of several concepts (e.g., using several ratios, comparing percentages, or comparing averages) AF 702. Build functions and write expressions, equations, and inequalities when the process requires planning and/or strategic manipulation AF 703. Analyze and draw conclusions based on properties of algebra and/or functions AF 704. Analyze and draw conclusions based on information from graphs in the coordinate plane AF 705. Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ AF 706. Given an equation or function, find an equation or function whose graph is a translation by specified

		A 406. Exhibit knowledge of slope	A 504. Match compound inequalities with their graphs on the number line (e.g., −10.5 < x ≤ 20.3)	graphs on the number line	amounts in the horizontal and vertical directions
			A 505. Add, subtract, and multiply polynomials	A 604. Solve systems of two linear equations	A 701. Solve simple absolute value inequalities
			A 506. Identify solutions to simple quadratic equations	A 605. Solve quadratic equations	A 702. Match simple quadratic inequalities with their graphs on the number line
			A 507. Solve quadratic equations in the form $(x + a)(x + b) = 0$, where a and b are numbers or variables	A 606. Solve absolute value equations	A 703. Apply the remainder theorem for polynomials, that $P(a)$ is the remainder when $P(x)$ is divided by $(x - a)$
			A 508. Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)		
			A 509. Work with squares and square roots of numbers		
			A 510. Work with cubes and cube roots of numbers		
			A 511. Work with scientific notation		
			A 512. Work problems involving positive integer exponents		
			A 513. Determine when an expression is undefined		
			A 514. Determine the slope of a line from an equation.		

Key Ideas and Details: Functions (F)

ACT Mathematics: Functions (F) Scoring Range with Standards					
Approaching Benchmark		**Meets Benchmark**	**Exceeds Benchmark**		
13-15	16-19	20-23	24-27	28-32	33-36
AF 201. Solve problems in one or two steps using whole numbers and using decimals in the context of money F 201. Extend a given pattern by a few terms for patterns that have a constant increase or decrease between terms	AF 301. Solve routine one-step arithmetic problems using positive rational numbers, such as single-step percent AF 302. Solve some routine two-step arithmetic problems AF 303. Relate a graph to a situation described qualitatively in terms of familiar properties such as before and after, increasing and decreasing, higher and lower AF 304. Apply a definition of an operation for whole numbers (e.g., $a \blacksquare b = 3a - b$) F 301. Extend a given pattern by a few terms for patterns that have a constant factor between terms	**AF 401. Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and estimating by using a given average value in place of actual values** **AF 402. Perform straightforward word-to-symbol translations** **AF 403. Relate a graph to a situation described in terms of a starting value and an additional amount per unit (e.g., unit cost, weekly growth)** **F 401. Evaluate linear and quadratic functions, expressed in function notation, at integer values**	AF 501. Solve multistep arithmetic problems that involve planning or converting common derived units of measure (e.g., feet per second to miles per hour) AF 502. Build functions and write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions) AF 503. Match linear equations with their graphs in the coordinate plane F 501. Evaluate polynomial functions, expressed in function notation, at integer values F 502. Find the next term in a sequence described recursively F 503. Build functions and use quantitative information to identify graphs for relations that are proportional or linear	AF 601. Solve word problems containing several rates, proportions, or percentages AF 602. Build functions and write expressions, equations, and inequalities for common algebra settings (e.g., distance to a point on a curve and profit for variable cost and demand) AF 603. Interpret and use information from graphs in the coordinate plane AF 604. Given an equation or function, find an equation or function whose graph is a translation by a specified amount up or down F 601. Relate a graph to a situation described qualitatively in terms of faster change or slower change F 602. Build functions for relations that are inversely proportional	AF 701. Solve complex arithmetic problems involving percent of increase or decrease or requiring integration of several concepts (e.g., using several ratios, comparing percentages, or comparing averages) AF 702. Build functions and write expressions, equations, and inequalities when the process requires planning and/or strategic manipulation AF 703. Analyze and draw conclusions based on properties of algebra and/or functions AF 704. Analyze and draw conclusions based on information from graphs in the coordinate plane AF 705. Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ AF 706. Given an equation or function, find an equation or function whose graph is a translation by specified

				F 504. Attend to the difference between a function modeling a situation and the reality of the situation	F 603. Find a recursive expression for the general term in a sequence described recursively	amounts in the horizontal and vertical directions
				F 505. Understand the concept of a function as having a well-defined output value at each valid input value	F 604. Evaluate composite functions at integer values	F 701. Compare actual values and the values of a modeling function to judge model fit and compare models
				F 506. Understand the concept of domain and range in terms of valid input and output, and in terms of function graphs		F 702. Build functions for relations that are exponential
				F 507. Interpret statements that use function notation in terms of their context		F 703. Exhibit knowledge of geometric sequences
				F 508. Find the domain of polynomial functions and rational functions		F 704. Exhibit knowledge of unit circle trigonometry
				F 509. Find the range of polynomial functions		F 705. Match graphs of basic trigonometric functions with their equations
				F 510. Find where a rational function's graph has a vertical asymptote		F 706. Use trigonometric concepts and basic identities to solve problems
				F 511. Use function notation for simple functions of two variables		F 707. Exhibit knowledge of logarithms
						F 708. Write an expression for the composite of two simple functions

Key Ideas and Details: Geometry (G)

ACT Mathematics: Geometry (G) Scoring Range with Standards					
Approaching Benchmark		Meets Benchmark	Exceeds Benchmark		
13-15	16-19	20-23	24-27	28-32	33-36
G 201. Estimate the length of a line segment based on other lengths in a geometric figure G 202. Calculate the length of a line segment based on the lengths of other line segments that go in the same direction (e.g., overlapping line segments and parallel sides of polygons with only right angles) G 203. Perform common conversions of money and of length, weight, mass, and time within a measurement system (e.g., dollars to dimes, inches to feet, and hours to minutes)	G 301. Exhibit some knowledge of the angles associated with parallel lines G 302. Compute the perimeter of polygons when all side lengths are given G 303. Compute the area of rectangles when whole number dimensions are given G 304. Locate points in the first quadrant	**G 401. Use properties of parallel lines to find the measure of an angle** **G 402. Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)** **G 403. Compute the area and perimeter of triangles and rectangles in simple problems** **G 404. Find the length of the hypotenuse of a right triangle when only very simple computation is involved (e.g., 3-4-5 and 6-8-10 triangles)** **G 405. Use geometric formulas when all necessary information is given** **G 406. Locate points in the coordinate plane** **G 407. Translate points up, down, left, and right in the coordinate plane**	G 501. Use several angle properties to find an unknown angle measure G 502. Count the number of lines of symmetry of a geometric figure G 503. Use symmetry of isosceles triangles to find unknown side lengths or angle measures G 504. Recognize that real-world measurements are typically imprecise and that an appropriate level of precision is related to the measuring device and procedure G 505. Compute the perimeter of simple composite geometric figures with unknown side lengths G 506. Compute the area of triangles and rectangles when one or more additional simple steps are required G 507. Compute the area and circumference of circles after identifying necessary information G 508. Given the length of two sides of a right triangle, find the third	G 601. Use relationships involving area, perimeter, and volume of geometric figures to compute another measure (e.g., surface area for a cube of a given volume and simple geometric probability) G 602. Use the Pythagorean theorem G 603. Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles G 604. Apply basic trigonometric ratios to solve right-triangle problems G 605. Use the distance formula G 606. Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point G 607. Find the coordinates of a point reflected across a vertical or horizontal line or across y = x G 608. Find the coordinates of a point rotated 90° about the origin G 609. Recognize special characteristics of parabolas	G 701. Use relationships among angles, arcs, and distances in a circle G 702. Compute the area of composite geometric figures when planning and/or visualization is required G 703. Use scale factors to determine the magnitude of a size change G 704. Analyze and draw conclusions based on a set of conditions G 705. Solve multistep geometry problems that involve integrating concepts, planning, and/or visualization

			when the lengths are Pythagorean triples G 509. Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths G 510. Determine the slope of a line from points or a graph G 511. Find the midpoint of a line segment G 512. Find the coordinates of a point rotated 180° around a given center point	and circles (e.g., the vertex of a parabola and the center or radius of a circle)	

Key Ideas and Details: Statistics and Probability (S)

ACT Mathematics: Statistics and Probability (S) Scoring Range with Standards					
Approaching Benchmark		**Meets Benchmark**	**Exceeds Benchmark**		
13-15	16-19	20-23	24-27	28-32	33-36
S 201. Calculate the average of a list of positive whole numbers S 202. Extract one relevant number from a basic table or chart, and use it in a single computation	S 301. Calculate the average of a list of numbers S 302. Calculate the average given the number of data values and the sum of the data values S 303. Read basic tables and charts S 304. Extract relevant data from a basic table or chart and use the data in a computation S 305. Use the relationship between the probability of an event and the probability of its complement	**S 401. Calculate the missing data value given the average and all data values but one** **S 402. Translate from one representation of data to another (e.g., a bar graph to a circle graph)** **S 403. Determine the probability of a simple event** **S 404. Describe events as combinations of other events (e.g., using *and*, *or*, and *not*)** **S 405. Exhibit knowledge of simple counting techniques**	S 501. Calculate the average given the frequency counts of all the data values S 502. Manipulate data from tables and charts S 503. Compute straightforward probabilities for common situations S 504. Use Venn diagrams in counting S 505. Recognize that when data summaries are reported in the real world, results are often rounded and must be interpreted as having appropriate precision S 506. Recognize that when a statistical model is used, model values typically differ from actual values	S 601. Calculate or use a weighted average S 602. Interpret and use information from tables and charts, including two-way frequency tables S 603. Apply counting techniques S 604. Compute a probability when the event and/or sample space are not given or obvious S 605. Recognize the concepts of conditional and joint probability expressed in real-world contexts S 606. Recognize the concept of independence expressed in real-world contexts	S 701. Distinguish between mean, median, and mode for a list of numbers S 702. Analyze and draw conclusions based on information from tables and charts, including two-way frequency tables S 703. Understand the role of randomization in surveys, experiments, and observational studies S 704. Exhibit knowledge of conditional and joint probability S 705. Recognize that part of the power of statistical modeling comes from looking at regularity in the differences between actual values and model values