Table 3. Mathematical Content Areas for the Proposed Quantitative Literacy Framework from Roohr et al. (2014)

Content area	Brief description	Focus of assessment
(a) Number & operations	Real numbers, order properties, and physical quantities	• Understand fundamental types of real numbers, including positive and negative numbers, integers, fractions and decimals, even and odd integers, prime numbers, rational and irrational numbers • Understand the order properties of real numbers and the number line • Understand physical quantities as real numbers with units, such as time money, weight, temperature, distance, area, and volume
	Arithmetic operations on real numbers	• Add, subtract, multiply, and divide real numbers, as well as exponentiate and take roots • Understand the properties of arithmetic operations (i.e., commutative, distributive) as well as the role the operations have in defining fractions, decimals, factors, multiples, and remainders • Understand relationships between arithmetic operations and the ordering of real numbers (e.g., the product of two negative numbers is a positive number)
	Estimation	• Use estimation to approximate answers • Use estimation to judge reasonableness of answers
	Proportional reasoning	• Compute and interpret percents and percent change • Compute and interpret rates, ratios, and proportions
(b) Algebra	Variables, algebraic expressions, and their use in representing quantities	• Use variables to represent varying quantities • Use arithmetic operations on variables to form algebraic expressions • Manipulate and simplify algebraic expressions
	Functions, their types and properties, and their use in solving problems	• Understand the concept of a function, including domain and range, use function notation, and evaluate functions • Know various types of elementary functions, including linear, quadratic, polynomial, and exponential • Understand properties of various types of functions • Represent and interpret functions graphically in a coordinate plane • Use functions to model varying quantities in order to solve problems

Content area	Brief description	Focus of assessment
	Equations, inequalities, and their use in solving problems	• Understand equations and inequalities as conditions that must be satisfied by varying quantities • Solve problems using algebraic representations by setting up equations or inequalities involving functions or algebraic expressions • Graph equations and inequalities in a coordinate plane • Solve equations or inequalities algebraically, graphically, or by ad hoc methods, such as inspection or repeated substitution • Interpret solutions of equations or inequalities to solve problems
(c) Geometry & measurement	Geometric figures in one, two, and three dimensions	• Interpret Understand lines and angles in a plane, including parallel and perpendicular lines • Know two-dimensional and three-dimensional geometric figures, such as triangles, circles, polygons, rectangular solids, cylinders, and spheres • Understand transformations, congruence, and similarity of two-dimensional figures • Graph geometric figures in a coordinate plane
	Units and systems of measurement	• Understand units of measurement (e.g., time, money, weight, temperature, distance, area, volume) and when to apply them • Make conversions within a system of measurement (e.g., inches to feet, meters to kilometers) • Convert from one system of measurement to another (e.g., U.S. customary units to metric system, Fahrenheit to Celsius)
(d) Statistics & probability	Data interpretation and representation	• Read and interpret data in graphical or tabular form to solve problems • Determine appropriateness of a table or graph used to represent a set of data (e.g., line graphs vs. bar graphs) • Compare alternative displays of the same data set or displays across multiple data sets (e.g., bar graphs and pie graphs) for similarities and differences • Create a table to organize frequency data, proportional quantities, or the relationship between two variables • Represent the frequency distribution of data using a dotplot, histogram, boxplot, or stem-and-leaf plot • Plot proportional quantities using a pie or bar graph

Content area	Brief description	Focus of assessment
		• Create line charts or scatterplots to represent the relationship between two variables
	Descriptive statistics	• Interpret and calculate measures of central tendency (e.g., mean, median, mode) for a distribution of data • Interpret and calculate measures of dispersion or spread (e.g., standard deviation, range, interquartile range) for a distribution of data
	Basic probability	○ Understand random sampling with and without replacement, and equal probability for all outcomes ○ Calculate the probability of a single event using fractions and proportions (e.g., the probability of selecting an ace in a deck of cards) ○ Calculate the probability of two (or more) independent events (e.g., probability of a coin coming up tails after two coin tosses) ○ Understand and calculate conditional probability (e.g., probability of selecting an ace on the second draw after selecting an ace on the first draw)