The GED® Test
A Content Comparison

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Mathematical Reasoning: Similarities between 2002 and 2014 Tests:

Note: Codes in **bold** in the 2014 column refer to the 2014 GED® Assessment Targets and Indicators as outlined in the body of Chapter 2 of the *Assessment Guide for Educators*. The codes may not appear in numerical order, as the goal of the table below is to show areas of correspondence between the 2002 content and the 2014 content.

Mathematical Reasoning: Content Specifications	
2002	**2014**
Represent and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific) in real-world and mathematical problem situations.	**Q.1.a** Order fractions and decimals, including on a number line. **Q.1.c** Apply rules of exponents in numerical expressions with rational exponents to write equivalent expressions with rational exponents. **Q.3.d** Solve two-step, arithmetic, real world problems involving percents. Examples include but are not limited to: simple interest, tax, markups and markdowns, gratuities and commissions, percent increase and decrease.
Represent, analyze, and apply whole numbers, decimals, fractions, percents, ratios, proportions, exponents, roots, and scientific notation in a wide variety of situations.	**Q.1.a** Order fractions and decimals, including on a number line. **Q.1.b** Apply number properties involving multiples and factors, such as using the least common multiple, greatest common factor, or distributive property to rewrite numeric expressions. **Q.2.a** Perform addition, subtraction, multiplication, and division on rational numbers. **Q.2.b** Perform computations and write numerical expressions with squares and square roots of positive, rational numbers. **Q.2.c** Perform computations and write numerical expressions with cubes and cube roots of positive, rational numbers. **Q.2.e** Solve one-step or multi-step arithmetic, real world problems involving the four operations with rational numbers, including those involving scientific notation. **Q.3.c** Solve multistep, arithmetic, real-world problems using ratios or proportions including those that require converting units of measure. **Q.3.d** Solve two-step, arithmetic, real world problems involving percents. Examples include but are not limited to: simple interest, tax, markups and markdowns, gratuities and commissions, percent increase and decrease.
Recognize equivalencies and order relations for whole numbers, fractions, decimals, integers, and rational numbers.	**Q.1.a** Order fractions and decimals, including on a number line.
Select the appropriate operations to solve problems (for example, When should I divide?).	[Not assessed on the 2014 test]
Relate basic arithmetic operations to one another.	[Not assessed on the 2014 test]
Calculate mentally, with pencil and paper, and with a scientific calculator using whole numbers, fractions, decimals, and integers.	**Q.2.a** Perform addition, subtraction, multiplication, and division on rational numbers.

Mathematical Reasoning: Content Specifications (continued)	
2002	**2014**
Use estimation to solve problems and assess the reasonableness of an answer.	[Not assessed on the 2014 test]
Model and solve problems using the concepts of perpendicularity, parallelism, congruence, and similarity of geometric figures.	[Not assessed on the 2014 test]
Use spatial visualization skills to describe and analyze geometric figures and translations/rotations/dilations of geometric figures.	[Not assessed on the 2014 test]
Use the Pythagorean theorem to model and solve problems.	**Q.4.e** Use the Pythagorean theorem to determine unknown side lengths in a right triangle.
Find, use, and interpret the slope of a line, the y-intercept of a line, and the intersection of two lines.	**A.5.b** Determine the slope of a line from a graph, equation, or table. **A.5.c** Interpret unit rate as the slope in a proportional relationship. **A.5.d** Graph two-variable linear equations. **A.5.e** For a function that models a linear or nonlinear relationship between two quantities, interpret key features of graphs and tables in terms of quantities, and sketch graphs showing key features of graphs and tables in terms of 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.
Find, use, and interpret the slope of a line, the y-intercept of a line, and the intersection of two lines (continued from previous page).	**A.6.a** Write the equation of a line with a given slope through a given point. **A.6.c** Use slope to identify parallel and perpendicular lines and to solve geometric problems.
Use coordinates to design and describe geometric figures.	**A.5.a** Locate points in the coordinate plane.
Identify and select appropriate units of metric and customary measures.	[Not assessed on the 2014 test]
Convert and estimate units of metric and customary measure (all conversions within systems).	**Q.3.c** Solve multistep, arithmetic, real-world problems using ratios or proportions including those that require converting units of measure. **Q.4.a** Compute the area and perimeter of triangles and rectangles. Determine side lengths of triangles and rectangles when given area or perimeter. **Q.4.b** Compute the area and circumference of circles. Determine the radius or diameter when given area or circumference. **Q.4.c** Compute the perimeter of a polygon. Given a geometric formula, compute the area of a polygon. Determine side lengths of the figure when given the perimeter or area. **Q.4.d** Compute perimeter and area of 2-D composite geometric figures, which could include circles, given geometric formulas as needed. **Q.5.a** When given geometric formulas, compute volume and surface area of rectangular prisms. Solve for side lengths or height, when given volume or surface area. **Q.5.b** When given geometric formulas, compute volume and surface area of cylinders. Solve for height, radius, or diameter when given volume or surface area. **Q.5.c** When given geometric formulas, compute volume and surface area of right prisms. Solve for side lengths or height, when given volume or surface area. **Q.5.d** When given geometric formulas, compute volume and surface area of right pyramids and cones. Solve for side lengths, height, radius, or diameter when given volume or surface area.

Mathematical Reasoning: Content Specifications (continued)	
2002	**2014**
Convert and estimate units of metric and customary measure (all conversions within systems). (Continued)	**Q.5.e** When given geometric formulas, compute volume and surface area of spheres. Solve for radius or diameter when given the surface area.
Solve and estimate solutions to problems involving length, perimeter, area, surface area, volume, angle measurement, capacity, weight, and mass.	**Q.5.f** Compute surface area and volume of composite 3-D geometric figures, given geometric formulas as needed.
Use uniform rates (e.g., miles per hour, bushels per acre) in problem situations.	**Q.2.e** Solve one-step or multi-step arithmetic, real world problems involving the four operations with rational numbers, including those involving scientific notation. **Q.3.a** Compute unit rates. Examples include but are not limited to: unit pricing, constant speed, persons per square mile, BTUs per cubic foot. **Q.3.b** Use scale factors to determine the magnitude of a size change. Convert between actual drawings and scale drawings. **Q.3.c** Solve multistep, arithmetic, real-world problems using ratios or proportions including those that require converting units of measure.
Read and interpret scales, meters, and gauges	[Not assessed on the 2014 test]
Predict the impact of changes in linear dimension on the perimeter, area, and volume of figures.	[Not assessed on the 2014 test]
Construct, interpret, and draw inferences from tables, charts, and graphs. Make inferences and convincing arguments based on data analysis. Represent data graphically in ways that make sense and are appropriate to the context. Use an informal line of best fit to make predictions from data.	**Q.6.a** Represent, display, and interpret categorical data in bar graphs or circle graphs. **Q.6.b** Represent, display, and interpret data involving one variable plots on the real number line including dot plots, histograms, and box plots. **Q.6.c** Represent, display, and interpret data involving two variables in tables and the coordinate plane including scatter plots and graphs.
Evaluate arguments based on data analysis, including distinguishing between correlation and causation.	[Not assessed on the 2014 test]
Apply measures of central tendency (mean, median, mode) and analyze the effect of changes in data on these measures.	**Q.7.a** Calculate the mean, median, mode and range. Calculate a missing data value, given the average and all the missing data values but one, as well as calculating the average, given the frequency counts of all the data values, and calculating a weighted average.
Apply and recognize sampling and bias in statistical claims.	[Not assessed on the 2014 test]
Make predictions based on experimental or theoretical probabilities, including listing possible outcomes.	**Q.8.a** Use counting techniques to solve problems and determine combinations and permutations. **Q.8.b** Determine the probability of simple and compound events.
Compare and contrast different sets of data on the basis of measures of central tendency and dispersion (range, standard deviation).	[Not assessed on the 2014 test]

Mathematical Reasoning: Content Specifications (continued)	
2002	**2014**
Analyze and represent situations involving variable quantities with tables, graphs, verbal descriptions, and equations.	**A.2.b** Solve real-world problems involving linear equations. **A.5.d** Graph two-variable linear equations. **A.5.e** For a function that models a linear or nonlinear relationship between two quantities, interpret key features of graphs and tables in terms of quantities, and sketch graphs showing key features of graphs and tables in terms of 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. **A.7.a** Compare two different proportional relationships represented in different ways. Examples include but are not limited to: compare a distance-time graph to a distance-time equation to determine which of two moving objects has a greater speed. **A.7.d** Compare properties of two linear or quadratic functions each represented in a different way (algebraically, numerically in tables, graphically or by verbal descriptions). Examples include but are not limited to: given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
Recognize that a variety of problem situations may be modeled by the same function or type of function (e.g., $y = mx + b$, $y = ax^2$, $y = ax$, $y = 1/x$).	**A.2.c** Write one-variable and multi-variable linear equations to represent context. **A.4.b** Write one-variable quadratic equations to represent context.
Convert between different representations, such as tables, graphs, verbal descriptions, and equations.	**A.2.c** Write one-variable and multi-variable linear equations to represent context. **A.4.b** Write one-variable quadratic equations to represent context. **A.5.d** Graph two-variable linear equations.
Create and use algebraic expressions and equations to model situations and solve problems.	**A.1.a** Add, subtract, factor, multiply and expand linear expressions with rational coefficients. **A.1.c** Write linear expressions as part of word-to-symbol translations or to represent common settings. **A.1.d** Add, subtract, multiply polynomials, including multiplying two binomials, or divide factorable polynomials. **A.1.g** Write polynomial expressions as part of word-to-symbol translations or to represent common settings. **A.1.h** Add, subtract, multiply and divide rational expressions. **A.1.j** Write rational expressions as part of word-to-symbol translations or to represent common settings. **A.2.b** Solve real-world problems involving linear equations. **A.2.c** Write one-variable and multi-variable linear equations to represent context. **A.2.d** Solve a system of two simultaneous linear equations by graphing, substitution, or linear combination. Solve real-world problems leading to a system of linear equations. **A.4.a** Solve quadratic equations in one variable with rational coefficients and real solutions, using appropriate methods. (e.g., quadratic formula, completing the square, factoring, inspection). **A.4.b** Write one-variable quadratic equations to represent context.

Mathematical Reasoning: Content Specifications (continued)	
2002	**2014**
Convert between different representations, such as tables, graphs, verbal descriptions, and equations.	**A.2.c** Write one-variable and multi-variable linear equations to represent context. **A.4.b** Write one-variable quadratic equations to represent context. **A.5.d** Graph two-variable linear equations.
Evaluate formulas.	**A.1.b** Evaluate linear expressions by substituting integers for unknown quantities. **A.1.e** Evaluate polynomial expressions by substituting integers for unknown quantities. **A.1.i** Evaluate rational expressions by substituting integers for unknown quantities. **A.7.c** Evaluate linear and quadratic functions for values in their domain when represented using function notation.
Solve equations, including first degree, quadratic, power, and systems of linear equations.	**A.2.a** Solve one-variable linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms or equations with coefficients represented by letters. **A.2.b** Solve real-world problems involving linear equations. **A.2.d** Solve a system of two simultaneous linear equations by graphing, substitution, or linear combination. Solve real-world problems leading to a system of linear equations. **A.4.a** Solve quadratic equations in one variable with rational coefficients and real solutions, using appropriate methods. (e.g., quadratic formula, completing the square, factoring, inspection). **A.4.b** Write one-variable quadratic equations to represent context.
Recognize and use direct and indirect variation.	[Not assessed on the 2014 test]
Analyze tables and graphs to identify and generalize patterns and relationships.	**A.2.b** Solve real-world problems involving linear equations. **A.5.d** Graph two-variable linear equations.
Analyze and use functional relationships to explain how a change in one quantity results in a change in another quantity, including linear, quadratic, and exponential functions.	[Not assessed on the 2014 test]

What's new on the 2014 Mathematical Reasoning Test?

As shown in the tables above, one of the major differences between the content of the 2002 Series Mathematics Test and the 2014 Mathematical Reasoning Test is the clarity with which each skill is articulated. Breaking each of these skills down into greater detail than the 2002 Series content framework provided is intended to give greater guidance and specificity to test developers, instructional materials developers, and educators.

Note that there are **some skills tested on the 2002 Series GED® Test that *will not appear* on the 2014 test.** The elimination of certain skills is generally **NOT** due to the fact that those skills are no longer important, but, rather, it is sometimes because those skills are foundational to other skills that ***are*** being assessed on the 2014 test. In other instances, because of the 2014 test's focus on ***deep mastery*** of core foundational skills, some more advanced mathematics have been moved out of the scope of the test. In addition, in the particular case of many statistics-based skills, those skills appear on the 2014 test in the Science and Social Studies tests, as opposed to the Mathematical Reasoning test.

In addition to all the skills that align with what has been previously measured, the 2014 test includes items that test the following skills:

- **Q.1.d** Identify absolute value of a rational number as its distance from 0 on the number line and determine the distance between two rational numbers on the number line, including using the absolute value of their difference.
- **Q.2.d** Determine when a numerical expression is undefined.
- **A.1.f** Factor polynomial expressions.
- **A.3.a** Solve linear inequalities in one variable with rational number coefficients.
- **A.3.b** Identify or graph the solution to a one variable linear inequality on a number line.
- **A.3.c** Solve real-world problems involving inequalities.
- **A.3.d** Write linear inequalities in one variable to represent context.

- **A.7.b** Represent or identify a function in a table or graph as having exactly one output (one element in the range) for each input (each element in the domain).

This more granular approach to describing the mathematical content is not the only improvement upon the 2002 Series test. In addition, the 2014 test includes items that measure the Mathematical Practices. These practices are skills that are drawn both from the Common Core State Standards for Mathematical Practice and from the Principles and Standards for School Mathematics developed by the National Council of Teachers of Mathematics.

The content indicators and Mathematical Practices found in the GED® Mathematical Reasoning Assessment Targets, though related, cover different aspects of item content considerations. The content indicators focus on mathematical content and they describe very specific knowledge and skills. In contrast, the mathematical practices focus more on mathematical reasoning skills and modes of thinking mathematically. Most of the Mathematical Practices are not specific to any one particular area of mathematics content, meaning that a mathematical practice indicator could be applied to test items that cover a variety of content domains (e.g., algebra, data analysis, number sense).

The Mathematical Practices provide specifications for assessing real-world problem-solving skills in a mathematical context rather than requiring students only to memorize, recognize and apply a long list of mathematical algorithms. Each practice falls into one of the five following categories.

- MP.1 Building Solution Pathways and Lines of Reasoning
- MP.2 Abstracting Problems
- MP.3 Furthering Lines of Reasoning
- MP.4 Mathematical Fluency
- MP.5 Evaluating Reasoning and Solution Pathways

For more information on the mathematical practices, see the Mathematical Reasoning Assessment Targets in the body of Chapter 2 of the *Assessment Guide for Educators*.