Florida Department of Education
Adult General Education
Curriculum Frameworks

GED® MATHEMATICAL REASONING	
Program Title	GED® Preparation
Program Number	9900130
Course Title	GED® Mathematical Reasoning
Course Number	9900134
CIP Number	1532020207
Grade Equivalent	9.0-12.9
Grade Level	30, 31
Program Length	Varies (See Program Length Section)

PURPOSE

Adult General Education Program: The Florida Department of Education administers the Adult General Education Program under the authority of s. Florida Statute 1004.93, F.S., and the Workforce Investment and Opportunity Act (WIOA), 2014. The AGE Program has multiple purposes. Primarily, it provides instruction in reading and language and mathematics to students seeking to obtain a high school diploma or its recognized equivalent. Another purpose is to support parents to become full partners in the educational development of their children and to improve the economic opportunities of their family. Finally, the AGE Program helps learners transition to postsecondary education and training and obtain employment.

GED® Preparation Program: The purpose of the GED® Preparation Program is to prepare students to pass the four subtests of the official GED® Test: Reasoning through Language Arts, Mathematical Reasoning, Science, and Social Studies.

GED® Mathematical Reasoning course: The purpose of the Mathematical Reasoning course of the GED® course is to prepare students to pass the GED® Mathematical Reasoning subtest. This test focuses on quantitative problem solving and algebraic problem solving. Students acquire a deeper conceptual understanding, procedural skill and fluency, and the ability to apply these fundamentals in context.

STUDENTS
Students eligible to enroll in the GED® Mathematical Reasoning Course are those who:

- Are beyond compulsory school age (16 years)
- Are no longer enrolled in a K-12 school
- Score at or above the National Reporting System (NRS) Educational Functioning Level (EFL) 5 and the Grade Equivalent 9.0 – 9.9 as measured by FDOE-approved assessments.

* See s. Florida Statute 1003.435(4), F.S., "A candidate for a high school equivalency diploma shall be at least 18 years of age on the date of the examination, except that in extraordinary circumstances, as provided for in rules of the district school board, a candidate may take the examination after reaching the age of 16."

EDUCATIONAL FUNCTIONING LEVELS
The Workforce Investment and Opportunity Act defines the term Educational Functioning Level as "the ABE, ASE and ESL literacy levels, as provided in the NRS Guidelines, that describe a set of skills and competencies that students demonstrate in the skill areas of the National Reporting System." (Code of Federal Regulations Title 34 Subtitle B Chapter IV Part 462).

Table 1 shows the NRS EFLs of the GED® Mathematical Reasoning course, as provided in the NRS Guidelines. It also shows the corresponding Grade Equivalent levels.

Table 1: NRS EFLs and Grade Equivalents for the GED® Mathematical Reasoning course

Course Title	NRS Educational Functioning Levels	Grade Equivalent
GED® Mathematical Reasoning	ABE Level 5	9.0 – 10.9
GED® Mathematical Reasoning	ABE Level 6	11.0 – 12.9

PROGRAM LENGTH
Table 2 illustrates the recommended maximum number of instructional hours for each level. It is understood, however, that each student learns at their individual pace and there will be students who successfully complete the program or attain their educational goals in fewer (or more) than the recommended maximum hours noted.

Table 2: Recommended Maximum Number of Hours by Educational Functioning Level

Course Title	NRS Educational Functioning Levels	Recommended Maximum Hours
GED® Mathematical Reasoning	ABE Level 5	250
GED® Mathematical Reasoning	ABE Level 6	250

CURRICULUM AND INSTRUCTION
The GED® Mathematical Reasoning curriculum framework provides instructors with the anchor standards in Mathematics that the adult learner needs. With "framework" being the operative term, it is the basis for designing curriculum, assisting programs and teachers with selecting or creating instructional materials, techniques, and ongoing assessment. Additional information on the GED® test standards is available at the website GED® Testing Service Assessment Guide for Educators.

The Florida DOE provides the GED® Mathematical Reasoning curriculum framework to local programs across the state in order that local program personnel can design a curriculum that will serve the unique needs of their students and instructors. With "framework" being the operative term, it is the basis for designing curriculum, assisting programs and teachers with selecting or creating instructional materials, techniques, and ongoing assessment. A fully developed curriculum at the local program will include the following elements, at a minimum. Program staff may contact the Florida DOE Bureau of Adult Education for additional information on developing an in-house curriculum.

- A description of educational outcomes that students will be expected to have achieved upon completion of the course
- A set of core instructional materials (print and digital) aligned to the educational outcomes that students will be expected to have achieved upon completion of the course
- A series of needs assessment tools for teachers that helps them prioritize which standards are most relevant to the learning needs and educational goals of their students
- Pacing guides and matrices that display the scope and sequence of the curriculum
- A list of recommended websites, films, dictionaries available for teachers to select from
- A description of learning activities that may be used on a regular basis for reinforcement

Note: Instructors are not required to progress through the standards sequentially. The unique needs of each cohort of students can drive instruction and instructors may modify the sequence of teaching the standards.

ASSESSMENT

Local programs are required to use assessments that have been approved by the Florida DOE and USDOE to place the student into the GED® Mathematical Reasoning course. The following tests have been approved for use in the GED® Mathematical Reasoning course: TABE 11/2 Math and CASAS GOALS Math Series. See State Board Rule 6A-6.014, FAC and the Florida DOE Assessment Technical Assessment Paper for more information regarding approved tests, state policies on testing, and recommended and required testing procedures.

Pre-testing and Placement: Programs are required to pre-test students within the first 12 contact hours of enrollment activity. Students enrolling for the first time in the GED® Mathematical Reasoning course are required to score at NRS ABE Level 5 or 6 in math. The local program reports the student's initial EFL to the Florida DOE.

Students who pre-test lower than NRS level 5 in math should be enrolled in the ABE Math course.

Post-testing and Determining EFL Completion: Local programs are not required to report the EFLs completed by students in the GED® Mathematical Reasoning course. Therefore, students are not required to post-test for purposes of determining EFL completion. The local program may administer performance assessments to measure progress in the course and to guide instruction, but the results of these assessments are not reported to the Florida DOE.

Course Completion: Students complete the GED® Mathematical Reasoning course when they pass the GED® Mathematical Reasoning subtest. Upon passing all tests of the GED® Preparation Program, the local program will provide an exit date that reflects the diploma date. Local programs are required to report all courses completed by students to the Florida DOE.

ASSESSMENT
The Florida DOE has approved the following tests for pre-testing students for enrollment into the GED® Mathematical Reasoning course and for post-testing students to measure progress and completion of the course:

- CASAS GOALS Math 900 Series
- TABE 11&12 Math

References for Assessment and Reporting: For complete information regarding assessment procedures and policies, see the Florida DOE Assessment Technical Assistance Paper. For guidelines on the procedures for reporting data related to student test results, see the Florida DOE Division of Career and Adult Education (DCAE) Office of Research and Evaluation.

Pre-testing: Federal and state policies require local adult education agencies to pre-test all new students within the first 12 hours of enrollment activity. The Florida DOE defines a new student as one who is not found as having been enrolled at the local agency at any point during the current program year and/or the previous program year. All new GED® Mathematical Reasoning students are required to pre-test in math, and obtain a score at or above NRS EFL 5. The agency shall report the pre-test results to the Florida DOE per the guidelines of the DCAE Office of Research and Evaluation.

Post-testing: Agencies are not required to post-test students enrolled in the GED® Mathematical Reasoning course for NRS reporting purposes, however, students will benefit from a variety of assessments to gauge their knowledge and skills. The GED® Ready test is an appropriate tool for determining when the student is likely to be able to pass the GED® test.

Course Completion: Students complete the GED® Mathematical Reasoning course when they pass the GED® Mathematical Reasoning subtest.

2014 GED® Assessment: For complete information on the GED® 2014 Assessment and the performance targets and content topics, see the GED® Testing Service Assessment Guide for Educators.

In addition to the content-based indicators listed with each performance target, the GED® Mathematical Reasoning subtest will also focus on reasoning skills, as embodied by the GED® Mathematical Practices.

The following specifications guide the GED® Mathematical Reasoning subtest:
- Approximately 45 percent of the test focuses on quantitative problem solving and approximately 55 percent emphasizes algebraic problem solving.
- The test includes items that test procedural skill and fluency as well as problem solving
- Both academic and workforce contexts are used for items that measure problem solving skills.
- Approximately 50 percent of the items are written to a Depth of Knowledge cognitive complexity level of 2
- Approximately 30 percent of the items are aligned to a Mathematical Practice Standard in addition to a content indicator.
- Candidates are provided with an on-screen scientific calculator for use on most of the items on the GED® Mathematical Reasoning subtest.

Webb's Depth of Knowledge (DOK) Model
The GED Testing Service® is using Webb's Depth of Knowledge model to guide test item development for the GED® 2014 assessment. Unlike the Bloom's Taxonomy system that was used for the GED®2002 Test Series, the DOK levels are not a taxonomical tool that uses verbs to classify the level of each cognitive demand. The DOK is the cognitive demand required to correctly answer test questions. The DOK level describes the kind of thinking involved in the task. A greater DOK level requires greater conceptual understanding and cognitive processing by the students. The DOK model includes 4 levels: (1) recall, (2) basic application of skill/concept, (3) strategic thinking, and (4) extended thinking. Roughly 80 percent of the items across all four tests will be written to DOK levels two and three, and roughly 20 percent will require test-takers to engage level one DOK skills. Level four entails skills required to successfully complete long-term research projects. Therefore, DOK level four is beyond the scope of this assessment.

ACCOMMODATIONS
Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify, provide documentation, and request such services. Students with disabilities may need accommodations in areas such as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology, and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

ADULT EDUCATION INSTRUCTOR CERTIFICATION REQUIREMENTS
As per s. Florida Statute 1012.39 (1)(b), F.S., each school district shall establish the minimal qualifications for part-time and full-time teachers in adult education programs.

INTEGRATED EDUCATION AND TRAINING (IET)
The Florida DOE Division of Career and Adult Education (DCAE) promotes the planning, development, and implementation of an integrated education and training (IET) service approach that provides concurrent and contextualized adult education and literacy activities in combination with workforce preparation activities and workforce training for a specific occupation or occupational cluster for the purpose of educational and career advancement.

The IET service approach provides all levels of adult education students the opportunity to acquire the skills needed to:

- Transition to and complete postsecondary education and training programs

- Obtain and advance in employment leading to economic self-sufficiency
- Exercise the rights and responsibilities of citizenship

All IET programs must include the following three components:

- Adult education and literacy activities (§463.30)
- Workforce preparation activities (§463.34)
- Workforce training for a specific occupation or occupation cluster which can be any one of the training services defined in section 134(c)(3)(D), of WIOA

In order to meet the "integrated" requirement of IET, all services must include the following:

- Adult education and literacy activities run concurrently and contextually with workforce preparation activities and workforce training for a specific occupation or occupational cluster for the purpose of educational and career advancement
- Activities are of sufficient intensity and quality, and based on the most rigorous research available, particularly with respect to improving reading, writing, mathematics, and English proficiency of eligible individuals
- Occur simultaneously
- Use occupational relevant instructional materials

The integrated education and training program must have a single set of learning objectives that identifies specific adult education content, workforce preparation activities, and workforce training competencies, and the program activities function cooperatively.

GED® MATHEMATICAL REASONING STANDARDS

The Mathematical Reasoning subtest focuses on the fundamentals of mathematics in two major content areas: quantitative problem solving and algebraic problem solving. Students acquire a deeper conceptual understanding, procedural skill and fluency, and the ability to apply these fundamentals in realistic situations.

The standards in this framework are based on the knowledge and skills that will be measured on the GED® Mathematical Reasoning subtest. In addition to the content-based indicators listed with each performance target, the GED® Mathematical Reasoning subtest will also focus on reasoning skills, as embodied by the GED® Mathematical Practices. 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. See Chapter 2 in the GED® Testing Service Assessment Guide for Educators for more information on Mathematical Practices.

Range of Depth of Knowledge (DOK)	Mathematical Practices
1-2 1-3 2-3 1-2 1-3	**MP.1 Building Solution Pathways and Lines of Reasoning** a. Search for and recognize entry points for solving a problem. b. Plan a solution pathway or outline a line of reasoning. c. Select the best solution pathway, according to given criteria. d. Recognize and identify missing information that is required to solve a problem. e. Select the appropriate mathematical technique(s) to use in solving a problem or a line of reasoning.

	MP2. Abstracting Problems
1-2	a. Represent real world problems algebraically.
1-2	b. Represent real world problems visually.
2-3	c. Recognize the important and salient attributes of a problem.
	MP.3 Furthering Lines of Reasoning
1-3	a. Build steps of a line reasoning or solution pathway, based on previous step or givens.
1-3	b. Complete the lines of reasoning of others.
2-3	c. Improve or correct a flawed line of reasoning.
	MP.4 Mathematical Fluency
1-2	a. Manipulate and solve arithmetic expressions.
1-2	b. Transform and solve algebraic expressions.
1-2	c. Display data or algebraic expressions graphically.
	MP.5 Evaluating Reasoning and Solution Pathways
2-3	a. Recognize flaws in others' reasoning.
2-3	b. Recognize and use counterexamples.
2-3	c. Identify the information required to evaluate a line of reasoning.

Quantitative Problem Solving Standards and Content Indicators	
Q.1	**Apply number sense concepts, including ordering rational numbers, absolute value, multiples, factors, and exponents**
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.1.c	Apply rules of exponents in numerical expressions with rational exponents to write equivalent expressions with rational exponents.
Q.1.d	Identify absolute value or a rational number as its distance from zero 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	**Add, subtract, multiply, divide, and use exponents and roots of rational, fraction, and decimal numbers**
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 rational numbers.
Q.2.c	Perform computations and write numerical expressions with cubes and cube roots of rational numbers.
Q.2.d	Determine when a numerical expression is undefined.
Q.2.e	Solve single-step or multistep real-world arithmetic problems involving the four operations with rational numbers, including those involving scientific notation.
Q.3	**Calculate and use ratios, percent, and scale factors**
Q.3.a	Compute unit rates. Examples include but are not limited to: unit pricing, constant speed, persons per square mile, BTUs (British thermal units) 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, real-world arithmetic problems using ratios or proportions including those that require converting units of measure.
Q.3.d	Solve two-step, real-world arithmetic problems involving percentages. Examples include but are not limited

	to: simple interest, tax, markups and markdowns, gratuities and commissions, percent increase and decrease.
Q.4	**Calculate dimensions, perimeter, circumference, and area of two-dimensional figures**
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.4.e	Use the Pythagorean theorem to determine unknown side lengths in a right triangle.
Q.5	**Calculate dimensions, surface area, and volume of three-dimensional figures**
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 areas.
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	Use geometric formulas to 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.
Q.5.e	When given geometric formulas, compute volume and surface area of spheres. Solve for radius or diameter when given the surface area.
Q.5.f	Compute surface area and volume of composite 3-D geometric figures, given geometric formulas as needed.
Q.6	**Interpret and create data displays**
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 grants.
Q.7	**Calculate and use mean, median, mode, and weighted average**
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.
Q.8	**Utilize counting techniques and determine probabilities**
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.
Algebraic Problem Solving Standards and Content Indicators	
A.1	**Write, evaluate, and compute with expressions and polynomials**
A.1.a	Add, subtract, factor, multiply, and expand linear expressions with rational coefficients.
A.1.b	Evaluate linear expressions by substituting integers for unknown quantities.
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.e	Evaluate polynomial expressions by substituting integers for unknown quantities.
A.1.f	Factor polynomial expressions.
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.i	Evaluate rational expressions by substituting integers for unknown quantities.
A.1.j	Write rational expressions as part of word-to-symbol translations or to represent common settings.
A.2	**Write, manipulate, solve, and graph linear equations**
A.2.a	Solve one-variable linear equations with rational number coefficients, including equations for which 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.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.3	**Write, manipulate, solve, and graph linear inequalities**
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.4	**Write, manipulate, and solve quadratic 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, and inspection).
A.4.b	Write one-variable quadratic equations to represent context.
A.5	**Connect and interpret graphs and functions**
A.5.a	Locate points in the coordinate plane.
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.
A.6	**Connect coordinates, lines, and equations**
A.6.a	Write the equation of a line with a given slope through a given point.
A.6.b	Write the equation of a line passing through two given distinct points.
A.6.c	Use slope to identify parallel and perpendicular lines and to solve geometric problems.
A.7	**Compare, represent, and evaluate functions**

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.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).
A.7.c.	Evaluate linear and quadratic functions for values in their domain when represented using function notation.
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.