Georgia Assessments for the Certification of Educators®

TEST DESIGN AND FRAMEWORK

TEST DESIGN

Special Education: Mathematics and Science

The **Special Education: Mathematics and Science** assessment consists of **one test**. The test contains a section with selected-response questions and a section with constructed-response assignments. Each section counts for a percentage of your total test score. The areas of content assessed by the test, the approximate number of selected-response questions and constructed-response assignments in each content area, and the percentage of your total test score derived from each test section are shown in the table below. Further information regarding the content included in each subarea can be found in the test framework.

▪ Special Education: Mathematics and Science (Test Code 088)

Subareas:	Objectives	Approximate Number of Selected-Response Questions	Constructed-Response Assignments
➢ Mathematics	0012–0016	33	1
➢ Science	0017–0020	27	1
	TOTAL	**60**	**2**
	Percentage of Test Score	**80%**	**20%**

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TEST FRAMEWORK

Special Education: Mathematics and Science

MATHEMATICS

0012 Understand concepts and skills related to numbers and mathematical operations.

For example:

- analyzing the structure of number systems (e.g., number bases, place value)
- demonstrating knowledge of number theory and the characteristics of whole numbers (e.g., prime and composite numbers, prime factorizations, multiples, factors)
- identifying and analyzing a variety of models for representing numbers (e.g., fraction strips, diagrams, number lines)
- demonstrating knowledge of equivalency among different representations of numbers (e.g., fractions, decimals, percents, roots, scientific notation)
- comparing, ordering, and rounding different representations of numbers
- demonstrating knowledge of the relationships among mathematical operations and the properties of number operations (e.g., commutative, associative)
- applying knowledge of mathematical operations to problems involving fractions, decimals, and integers

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0013 Understand principles and applications of measurement and geometry.

For example:

- identifying appropriate measurement procedures, tools, and units to solve a variety of measurement problems (e.g., involving length, area, volume, angles, weight, temperature, time, or rates of change)
- converting measurements within and between the customary and metric systems
- applying knowledge of similarity, scale factors, and proportional reasoning to solve measurement problems
- analyzing and applying properties of points, lines (e.g., parallel, perpendicular), planes, angles (e.g., complementary, supplementary), lengths, and distances (e.g., Pythagorean theorem)
- demonstrating knowledge of the properties of similarity and congruence
- analyzing and applying properties of plane and solid geometric figures (e.g., triangles, quadrilaterals, spheres, cones) to solve problems
- representing basic geometric figures in the coordinate plane
- identifying and applying concepts of symmetry and transformations (e.g., translations, rotations, reflections) to figures in the coordinate plane

0014 Understand concepts and skills related to algebra.

For example:

- analyzing, extending, and describing a variety of patterns (e.g., numerical, pictorial) using rules and algebraic expressions
- translating verbal descriptions into algebraic expressions that model problem situations
- applying the methods of algebra to solve equations and inequalities
- simplifying, evaluating, and performing operations (e.g., factoring, grouping) on polynomials and other algebraic expressions
- analyzing the relationship between a linear equation and its graph
- describing and using various representations (e.g., verbal, tabular, graphical, algebraic) of linear functions

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0015 Understand concepts and skills related to data analysis and principles of probability.

For example:

- demonstrating knowledge of the nature of sampling, the collection of data through surveys, the significance of sample size, and random sampling
- applying knowledge of methods for organizing and interpreting data in a variety of formats (e.g., tables, frequency distributions, line graphs, circle graphs, histograms, box-and-whisker plots)
- determining and analyzing measures of central tendency (i.e., mean, median, mode) and dispersion (e.g., range, standard deviation)
- drawing valid conclusions based on data
- applying addition and multiplication counting principles to determine the number of outcomes related to an event
- determining probabilities of simple and compound events (e.g., dependent, independent, mutually exclusive, conditional)
- using different graphical representations (e.g., Venn diagrams, tree diagrams) to calculate and interpret probabilities

0016 Understand processes and approaches for exploring mathematics and solving problems.

For example:

- communicating mathematical ideas using a variety of representations (e.g., numeric, tabular, graphical, pictorial, symbolic)
- translating between various representations of mathematical ideas (e.g., algebraic, graphical, symbolic, diagrammatic) and everyday language
- identifying effective strategies (e.g., determining relevant information, simplifying, estimating) for solving problems in mathematical and other contexts
- demonstrating knowledge of strategies for evaluating the reasonableness of a solution to a problem
- recognizing connections among different concepts and areas of mathematics (e.g., algebra and geometry) and using them to solve problems
- applying correct mathematical reasoning to draw valid conclusions and evaluate mathematical arguments and proofs
- applying mathematical concepts and strategies across the curriculum and in everyday contexts to model and solve problems
- demonstrating knowledge of the analysis of problem-solving steps to determine areas of weakness or misunderstanding

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SCIENCE

0017 Understand concepts and principles of earth science.

For example:

- recognizing and comparing characteristics of objects in the solar system and universe (e.g., stars, planets)
- describing the effects of the motions, orientations, and relative positions of the earth, moon, and sun (e.g., seasons, phases of the moon, tides)
- demonstrating knowledge of the structure, composition, and processes of the earth's geosphere (e.g., rock cycle, plate tectonics, soil formation)
- demonstrating knowledge of the structure, composition, and processes of the earth's hydrosphere (e.g., water cycle, ocean currents, waves)
- demonstrating knowledge of the structure and processes of the atmosphere and the characteristics of weather phenomena
- demonstrating knowledge of strategies and tools for observing, describing, and predicting weather
- identifying types, characteristics, and uses of renewable and nonrenewable resources and the effects of human activities on the earth's natural resources

0018 Understand the concepts and principles of physical science.

For example:

- demonstrating knowledge of the structure and properties of matter (e.g., atoms, molecules, density)
- distinguishing between physical and chemical changes in matter
- applying the concepts of conservation of energy and conservation of matter to physical systems
- demonstrating knowledge of different forms of energy (e.g., light, heat, sound) and the processes by which energy is transferred (i.e., conduction, radiation, convection)
- demonstrating knowledge of the effects of balanced and unbalanced forces on objects
- identifying types, characteristics, and uses of simple machines (e.g., pulleys, levers)
- recognizing the properties and characteristics of waves, sound, and light (e.g., propagation through different media, wavelength, reflection, refraction)
- demonstrating knowledge of the characteristics of electricity and magnetism and applications of electromagnetism (e.g., motors, generators, electromagnets)

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0019 Understand the concepts and principles of life science.

For example:

- recognizing the characteristics of major groups of animals (e.g., amphibians, insects, birds, mammals) and plants (e.g., angiosperms, gymnosperms, ferns) and identifying criteria used to classify organisms
- demonstrating knowledge of the structure and organization of various types of organisms (e.g., plants, animals) and how they carry out basic life functions
- recognizing the structures and functions of cells in various types of organisms
- demonstrating knowledge of the structures and functions of the major organ systems in the human body
- demonstrating knowledge of the basic processes and principles of heredity and how biological traits are passed on to successive generations
- demonstrating knowledge of the evolution of living organisms through inherited characteristics that promote the survival of organisms and successive generations of their offspring
- demonstrating knowledge of characteristics of ecosystems and the dependence of organisms on one another

0020 Understand the characteristics, tools, and processes of science.

For example:

- demonstrating knowledge of the nature of scientific knowledge and the values of science (e.g., importance of curiosity, honesty, openness, and skepticism; reliance on verifiable evidence)
- demonstrating knowledge of the principles of scientific inquiry and the design of scientific investigations (e.g., devising hypotheses, determining what data to collect)
- recognizing appropriate tools, materials, instruments (e.g., graduated cylinder, triple-beam balance, microscope), methods, and safety procedures associated with given scientific investigations
- analyzing data by applying appropriate mathematical concepts and computational skills (e.g., using ratios, determining mean values)
- applying knowledge of strategies for analyzing and communicating scientific data (e.g., data tables, graphs)
- demonstrating familiarity with effective resources, technologies, and strategies for gaining information about science-related topics
- demonstrating knowledge of the criteria and strategies for evaluating scientific claims and arguments (e.g., expertise of the person making the claim, detecting flaws of reasoning)
- demonstrating knowledge of the unifying concepts of science and technology (e.g., systems, models, scale) and the connections of science to other subject areas and to everyday life

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