STATE MATCH

Georgia Performance Standards

English Language Arts,
Mathematics, and Science
Grades 8–12

and

EXPLORE®, PLAN®, the ACT®, and WorkKeys®

January 2008

ACT®

EXECUTIVE SUMMARY
(pp. 1–3)

This portion summarizes the findings of the alignment between Georgia's Performance Standards and ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (8th and 9th grades); PLAN® (10th grade); and the ACT® (11th and 12th grades) and ACT's WorkKeys® assessments (Reading for Information, Applied Mathematics, and Locating Information). It also presents ACT's involvement in meeting NCLB requirements and describes additional information about the unique programs and services ACT can provide to Georgia.

SECTION A
(pp. 5–8)

This section provides tables by content area (English Language Arts, Mathematics, and Science), listing the precise number of Georgia Performance Standards measured by ACT's EPAS tests and/or WorkKeys assessments by grade level.

SECTION B
(pp. 9–83)

All Georgia Performance Standards are listed here; each one highlighted is measured by ACT's EPAS tests and/or WorkKeys assessments. Georgia standards listed here are from the Georgia Performance Standards as presented on the Georgia Department of Education's website in October 2007. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests.

SECTION C
(pp. 85–94)

ACT's College Readiness Standards appear here. Highlighting indicates that a statement reflects one or more statements in the Georgia Performance Standards. College Readiness Standards not highlighted are not addressed in the Georgia Performance Standards.

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SECTION D
(pp. 95–96)

WorkKeys Level Skills appear here. Highlighting indicates that a statement reflects one or more statements in the Georgia Performance Standards. Level Skills not highlighted are not addressed in the Georgia Performance Standards.

A supplement is available in each content area—English Language Arts, Mathematics, and Science—that identifies the specific ACT College Readiness Standard(s) and WorkKeys Skill(s) corresponding to each Georgia Performance Standard in a side-by-side format. To request a supplement, please e-mail ACT at **statematch@act.org**.

Executive Summary

We at ACT believe our programs offer many advantages to Georgia students and educators, and this report offers strong evidence for this belief. This alignment analysis clearly answers four critical questions:

1. To what extent do ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (8th and 9th grades), PLAN® (10th grade), and the ACT® (11th and 12th grades)—and ACT's WorkKeys® assessments (Reading for Information, Applied Mathematics, and Locating Information) measure Georgia's Performance Standards?

2. Can the results from ACT's testing programs be used to meet Georgia's NCLB requirement?

3. Why should Georgia choose EPAS?

4. Why choose to include WorkKeys assessments?

1. Match Results: Comparisons conducted by our content specialists show that ACT's Reading, English, Writing, Mathematics, and Science tests and WorkKeys Reading for Information and Applied Mathematics assessments measure many of Georgia's English Language Arts, Mathematics, and Science Performance Standards. WorkKeys Locating Information assessment measures some skills listed in Georgia's Science courses (Objective match totals appear in Section A.):

- English Language Arts: 4 out of 5 Strands

  Almost all of Georgia's English Language Arts Standards are covered by ACT's English, Reading, and Writing tests and WorkKeys Reading for Information assessment.

- Mathematics: 5 out of 6 Strands

  Almost all of Georgia's Mathematics Standards are covered by ACT's Mathematics tests and WorkKeys Applied Mathematics assessment.

- Science: Process Standards: 119 out of 122
  (Content Standards: 49 out of 49)

  Almost all of Georgia's Science standards are covered by ACT's Science tests and WorkKeys Locating Information assessment.

  (A note about science content: ACT's Science tests present content from biology, chemistry, physics, and Earth/space sciences. Although content knowledge in these content areas is needed to answer some of the test questions, the test questions emphasize scientific reasoning and are based in experimental science contexts. Factual content knowledge, although needed to answer some of the test questions, is not systematically sampled from the full content knowledge domain. Therefore, each ACT Science Test covers some, but not all, of the discrete science content knowledge specifically described in the Georgia Science Performance Standards.

  To emphasize the point that content is included, but not necessarily covered in its entirety, on every test form, science content match results appear in parentheses in Section A of this document (which describes the number of Georgia standards measured by ACT's tests), and are underlined rather than highlighted in Section B. Our goal here is to clearly communicate that science content will be included, but each specific content topic will not be covered consistently enough for inferences to be made about student proficiency in all areas.)

Most exceptions to a match between ACT's tests and Georgia's Performance Standards arise from standards not being assessable in group settings, standards that are personal in nature, and standards requiring measurement over extended time. If additional testing is deemed necessary, ACT would be interested in working with Georgia on developing any necessary augmentation.

2. NCLB requirement? Yes; states like Michigan and Illinois use ACT components as part of testing that is submitted to the U.S. Department of Education for NCLB approval.

3. Why choose ACT? States and school districts choose ACT's EPAS programs because student motivation is high, and EPAS is the *only curriculum-based assessment system that measures student readiness along a continuum of empirically derived college readiness benchmarks*. Various groups claim to describe what students truly need to know and be able to do for college and/or workplace readiness. Such groups typically ask individual experts in education to gather and discuss what they feel is important for students to understand. Not surprisingly, the answers vary. In contrast, ACT defines college readiness through a unique and rigorous empirical process:

- **The knowledge and skills necessary for students to be ready for college-level work are empirically identified via the ACT National Curriculum Survey.®**

  ACT surveys thousands of secondary and postsecondary instructors across the nation to determine which skills and knowledge are most important at each course level and for college and work readiness. The responses drive the test specifications for EXPLORE, PLAN, and the ACT.

- **The empirically derived performance levels necessary for students to be ready to succeed in college-level work are defined in ACT's College Readiness Benchmark Scores.**

  ACT analyzed thousands of student records to identify the ACT scores associated with success in postsecondary coursework (i.e., a 50% chance of earning a B or better in credit-bearing first-year college courses): 18 for English, 22 for Math, 21 for Reading, and 24 for Science.

- **Skills and knowledge a student currently has and areas for improvement can be identified by the empirically derived ACT College Readiness Standards.**

  Using thousands of student records and responses, content and measurement experts at ACT have developed detailed statements that describe what students typically know and are able to do at different levels of test performance. These data-driven, empirically derived score descriptors articulate student achievement within various score ranges on the English, Reading, Writing, Mathematics, and Science tests on the EXPLORE, PLAN, and ACT. These statements provide specific details about students' college readiness and can be used to identify next steps for improvement.

4. Why choose to include WorkKeys assessments? Students can use WorkKeys to help determine the skill levels and education required for various jobs. Educators can use WorkKeys to ensure that students enter the work world with the foundational skills needed in any field they choose.

Further, the WorkKeys scores offer a clear way for students to demonstrate their knowledge and skills to prospective employers. WorkKeys is at the center of the nationwide Career Readiness System that links qualified individuals with employers who recognize the value of skilled job applicants. ACT's National Career Readiness Certificate (NCRC) ensures that an individual has certain foundational skills that are important across a range of positions. The NCRC is a portable credential that employees can use anywhere in the nation. Individuals seeking employment gain a competitive edge with an NCRC because they are able to provide prospective employers with clear evidence that their knowledge and skills align with the requirements of the job they are applying for. The NCRC offers job seekers, employers, and educators an easily understood, conveniently attained, and universally valued credential.

Test takers are most commonly certified in the skills areas of Applied Mathematics, Locating Information, and Reading for Information. Higher scores qualify students for more jobs than do lower scores. Georgia, Virginia, Louisiana, Kentucky, North Carolina, and New Mexico have already initiated certificate programs, and many other states are in the process of developing similar programs.

In sum, ACT's EPAS and WorkKeys programs provide abundant data regarding student readiness for college and work. This information can help Georgia educators and students make well-informed decisions in planning students' career and academic goals.

Section A: Number of Georgia Performance Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

Table A-1. Number of Georgia English Language Arts Performance Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
Georgia Strands*	**Number of Georgia Performance Standards Measured by ACT's tests**	**Aspects of Georgia Standards that are Not Measured**
A. Reading and Literature	8th: 2 out of 4 9th: 3 out of 5 10th: 3 out of 5 Reading/Amer Lit: 3 out of 5	Reading aloud Knowledge of Georgia authors Relating literary works to contemporary content or historical background
B. Reading Across the Curriculum	8th: 3 out of 4 9th: 3 out of 4 10th: 3 out of 4 Reading/Amer Lit: 3 out of 4	Student participates in discussions related to curricular learning
C. Writing	8th: 3 out of 4 9th: 3 out of 4 10th: 3 out of 4 11th: 3 out of 4 12th: 3 out of 4	Demonstrates using research and technology to support writing
D. Conventions	8th: 1 out of 1 9th: 1 out of 2 10th: 1 out of 2 11th: 1 out of 2 12th: 1 out of 2	Understanding of manuscript form
E. Listening/ Speaking/Viewing	8th: 0 out of 2 9th: 0 out of 2 10th: 0 out of 2 11th: 0 out of 2 12th: 0 out of 2	Verbal interaction Listening and viewing various forms of text and media Delivering focused, coherent, and polished presentations
TOTALS **4 out of 5 Strands**	8th: 9 out of 15 9th: 10 out of 17 10th: 10 out of 16 11th: 4 out of 8 12th: 4 out of 8 Reading/Amer Lit: 6 out of 9	

*Refer to Georgia's English Language Arts Performance Standards on pages 9–28.

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Table A-2. Number of Georgia Mathematics Performance Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
Georgia Strands*	**Number of Georgia Performance Standards Measured by ACT's tests**	**Aspects of Georgia Standards that are Not Measured**
A. Number and Operations	8th: 1 out of 1 Math 2: 1 out of 1 Core Math 4: 1 out of 1 Accelerated Math 1: 1 out of 1	
B. Algebra	8th: 5 out of 5 Math 1: 3 out of 3 Math 2: 5 out of 5 Math 3: 7 out of 7 Math 4: 10 out of 10 Core Math 1: 1 out of 1 Core Math 2: 2 out of 2 Core Math 3: 2 out of 2 Core Math 4: 3 out of 3 Accelerated Math 1: 5 out of 5 Accelerated Math 2: 9 out of 9 Accelerated Math 3: 13 out of 13	
C. Geometry	8th: 2 out of 2 Math 1: 3 out of 3 Math 2: 4 out of 4 Math 3: 3 out of 3 Core Math 1: 1 out of 1 Core Math 2: 2 out of 2 Core Math 3: 2 out of 2 Core Math 4: 2 out of 2 Accelerated Math 1: 5 out of 5 Accelerated Math 2: 5 out of 5	
D. Data Analysis and Probability	8th: 4 out of 4 Math 1: 3 out of 4 Math 2: 2 out of 2 Math 3: 3 out of 3 Math 4: 0 out of 3 Core Math 1: 2 out of 2 Core Math 2: 1 out of 2 Core Math 3: 2 out of 2 Core Math 4: 1 out of 1 Accelerated Math 1: 5 out of 5 Accelerated Math 2: 4 out of 4 Accelerated Math 3: 0 out of 3	Explore variability of data by determining the mean absolute deviation Using simulation Using student generated data Using confidence intervals and margins of error to make inferences from data
E. Process Standards	8th: 5 out of 5 Math 1: 5 out of 5 Math 2: 5 out of 5 Math 3: 5 out of 5 Math 4: 5 out of 5 Core Math 1: 5 out of 5 Core Math 2: 5 out of 5 Core Math 3: 5 out of 5 Core Math 4: 5 out of 5 Accelerated Math 1: 5 out of 5 Accelerated Math 2: 5 out of 5 Accelerated Math 3: 5 out of 5	

Table A-2. Number of Georgia Mathematics Performance Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
Georgia Strands*	**Number of Georgia Performance Standards Measured by ACT's tests**	**Aspects of Georgia Standards that are Not Measured**
F. Math Reading Content	8th: 0 out of 1 Math 1: 0 out of 1 Math 2: 0 out of 1 Math 3: 0 out of 1 Math 4: 0 out of 1 Core Math 1: 0 out of 1 Core Math 2: 0 out of 1 Core Math 3: 0 out of 1 Core Math 4: 0 out of 1 Accelerated Math 1: 0 out of 1 Accelerated Math 2: 0 out of 1 Accelerated Math 3: 0 out of 1	
TOTALS **5 out of 6 Strands**	8th: 17 out of 18 Math 1: 14 out of 16 Math 2: 17 out of 18 Math 3: 18 out of 19 Math 4: 16 out of 19 Core Math 1: 09 out of 10 Core Math 2: 10 out of 12 Core Math 3: 11 out of 12 Core Math 4: 12 out of 13 Accelerated Math 1: 21 out of 22 Accelerated Math 2: 23 out of 24 Accelerated Math 3: 18 out of 22	

*Refer to Georgia's Mathematics Performance Standards on pages 29–59.

Table A-3. Number of Georgia Science Performance Standards Measured by EXPLORE, PLAN, and the ACT		
Georgia Strands*	**Number of Georgia Performance Standards Measured by ACT's tests**	**Aspects of Georgia Standards that are Not Measured**
A. Habits of Mind	8th: 5 out of 7 Biology: 6 out of 6 Environmental Science: 6 out of 6 Physical Science: 6 out of 6 Earth Systems: 6 out of 6 Chemistry: 6 out of 6 Human Anatomy: 6 out of 6 Physics: 6 out of 6	Explore importance of curiosity Using ideas of system, model, change and scale in exploring scientific and technological matters
B. Nature of Science	8th: 2 out of 3 Biology: 3 out of 3 Environmental Science: 3 out of 3 Physical Science: 3 out of 3 Earth Systems: 3 out of 3 Chemistry: 3 out of 3 Human Anatomy: 3 out of 3 Physics: 3 out of 3	Familiar with the characteristics of scientific knowledge
TOTALS 2 out of 2 Strands	**Process Standards** 119 out of 122	
D. Co-Requisite Content	8th: (5) out of (5) Biology: (5) out of (5) Environmental Science: (5) out of (5) Physical Science: (10) out of (10) Earth Systems: (6) out of (6) Chemistry: (7) out of (7) Human Anatomy: (5) out of (5) Physics: (6) out of (6)	
TOTALS 1 out of 1 Strand	**Content Standards** (49) out of (49)	

*Refer to Georgia's Science Performance Standards on pages 60–83.

ACT

English Language Arts

GEORGIA Grade 8 English Language Arts
Performance Standards

Reading and Literature

In reading a text closely, the student works carefully to discern the author's perspective and the particular facts and details that support it. The student reads thoughtfully and purposefully, constantly checking for understanding of the author's intent and meaning so that the interpretation will be sound.

ELA8R1. The student demonstrates comprehension and shows evidence of a warranted and responsible explanation of a variety of literary and informational texts.

For literary texts, the student identifies the characteristics of various genres and produces evidence of reading that:

a. Identifies the difference between the concepts of theme in a literary work and author's purpose in an expository text.

b. Compares and contrasts genre characteristics from two or more selections of literature.

c. Analyzes a character's traits, emotions, or motivations and gives supporting evidence from the text(s).

d. Compares and contrasts motivations and reactions of literary characters from different historical eras confronting similar situations or conflicts.

e. Evaluates recurring or similar themes across a variety of selections, distinguishing theme from topic.

f. Evaluates the structural elements of the plot (e.g., subplots, climax), the plot's development, and the way in which conflicts are (or are not) addressed and resolved.

g. Analyzes and evaluates the effects of sound, form, figurative language, and graphics in order to uncover meaning in literature:

    i. Sound (e.g., alliteration, onomatopoeia, internal rhyme, rhyme scheme, meter)

    ii. Figurative language (e.g., simile, metaphor, personification, hyperbole, symbolism, imagery).

h. Analyzes and evaluates how an author's use of words creates tone and mood and provides supporting details from text.

For informational texts, the student reads and comprehends in order to develop understanding and expertise and produces evidence of reading that:

a. Analyzes and evaluates common textual features (e.g., paragraphs, topic sentences, concluding sentences, introduction, conclusion, footnotes, index, bibliography).

b. Applies, analyzes, and evaluates common organizational structures (e.g., graphic organizers, logical order, cause and effect relationships, comparison and contrast).

c. Recognizes and traces the development of an author's argument, point of view, or perspective in text.

d. Understands and explains the use of a complex mechanical device by following technical directions.

e. Uses information from a variety of consumer, workplace, and public documents (e.g., job applications) to explain a situation or decision and to solve a problem.

ELA8R2. The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

a. Determines pronunciations, meanings, alternate word choices, parts of speech, or etymologies of words.

b. Determines the meaning of unfamiliar words in content and context specific to reading and writing.

c. Demonstrates an initial understanding of the history of the English Language.

ELA8R3. The student reads aloud, accurately (in the range of 95%), familiar material in a variety of genres, in a way that makes meaning clear to listeners. The student

a. Uses letter-sound knowledge to decode written English and uses a range of cueing systems (e.g., phonics and context clues) to determine pronunciation and meaning.

b. Uses self-correction when subsequent reading indicates an earlier miscue (self-monitoring and self-correcting strategies).

c. Reads with a rhythm, flow, and meter that sounds like everyday speech (prosody).

ELA8R4. The student acquires knowledge of Georgia authors and significant text created by them. The student

a. Identifies a variety of Georgia authors both male and female.

b. Identifies authors' connections to Georgia through a variety of materials including electronic media.

c. Identifies award winning Georgia authors.

d. Examines texts from different genres (e.g. picture books, poetry, short stories, novels, essays, informational writing, and dramatic literature) created by Georgia authors.

e. Relates literary works created by Georgia authors to historical settings and or events.

f. Explains how Georgia is reflected in a literary work through setting, characterization, historical context, or current events.

g. Evaluates recurring or similar themes across a variety of selections written by Georgia authors, distinguishing theme from topic.

Reading Across the Curriculum

ELA8RC1. The student reads a minimum of 25 grade–level appropriate books or book equivalents (approximately 1,000,000 words) per year from a variety of subject disciplines. The student reads both informational and fictional texts in a variety of genres and modes of discourse, including technical texts related to various subject areas.

ELA8RC2. The student participates in discussions related to curricular learning in all subject areas. The student

a. Identifies messages and themes from books in all subject areas.

b. Responds to a variety of texts in multiple modes of discourse.

c. Relates messages and themes from one subject area to those in another area.

d. Evaluates the merits of texts in every subject discipline.

e. Examines the author's purpose in writing.

f. Recognizes and uses the features of disciplinary texts (e.g., charts, graphs, photos, maps, highlighted vocabulary).

ELA8RC3. The student acquires new vocabulary in each content area and uses it correctly. The student

a. Demonstrates an understanding of contextual vocabulary in various subjects.

b. Uses content vocabulary in writing and speaking.

c. Explores understanding of new words found in subject area texts.

ELA8RC4. The student establishes a context for information acquired by reading across subject areas. The student

a. Explores life experiences related to subject area content.

b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.

c. Determines strategies for finding content and contextual meaning for unfamiliar words or concepts.

Writing

The student writes clear, coherent text that develops a central idea or tells a story. The writing shows consideration of the audience and purpose. The student progresses through the stages of the writing process (e.g., prewriting, drafting, revising, and editing successive versions).

ELA8W1. The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure. The student

a. Selects a focus, organizational structure, and a point of view based on purpose, genre expectations, audience, length, and format requirements.

b. Writes texts of a length appropriate to address the topic or tell the story.

c. Uses traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question).

d. Uses appropriate structures to ensure coherence (e.g., transition elements, parallel structure).

e. Supports statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

ELA8W2. The student demonstrates competence in a variety of genres. The student produces a narrative (fictional, personal, experiential) that:

a. Engages readers by establishing and developing a plot, setting, and point of view that are appropriate to the story (e.g., varied beginnings, standard plot line, cohesive devices, and a sharpened focus).

b. Creates an organizing structure appropriate to purpose, audience, and context.

c. Relates a clear, coherent incident, event, or situation by using well-chosen details.

d. Reveals the significance of the writer's attitude about the subject.

e. Develops complex major and minor characters using standard methods of characterization.

f. Includes sensory details and concrete language to develop plot, setting, and character (e.g., vivid verbs, descriptive adjectives, varied sentence structures, and specific narrative action).

g. Excludes extraneous and inappropriate information.

h. Uses a range of strategies (e.g., suspense, figurative language, dialogue, expanded vocabulary, flashback, movement, gestures, expressions, foreshadowing, tone, and mood).

i. Provides a sense of closure appropriate to the writing.

The student produces writing (multi-paragraph expository composition such as description, explanation, comparison and contrast, or problem and solution) that:

a. Engages the reader by establishing a context, creating a speaker's voice, and otherwise developing reader interest.

b. Develops a controlling idea that conveys a perspective on the subject.

c. Creates an organizing structure appropriate to purpose, audience, and context.

d. Develops the topic with supporting details.

e. Excludes extraneous and inappropriate information.

f. Follows an organizational pattern appropriate to the type of composition.

g. Concludes with a detailed summary linked to the purpose of the composition.

The student produces technical writing (business correspondence: letters of application and letters of recommendation, résumés, abstracts, user guides or manuals, web pages).

a. Creates or follows an organizing structure appropriate to purpose, audience, and context.

b. Excludes extraneous and inappropriate information.

= Measured by EXPLORE English and/or Reading tests

c. Follows an organizational pattern appropriate to the type of composition.

d. Applies rules of Standard English.

The student produces a response to literature that:

a. Engages the reader by establishing a context, creating a speaker's voice, or otherwise developing reader interest.

b. Demonstrates an understanding of the literary work.

c. Supports a judgment through references to the text and personal knowledge.

d. Justifies interpretations through sustained use of examples and textual evidence from the literary work.

e. Supports a judgment through references to the text, references to other works, authors, or non-print media, or references to personal knowledge.

f. Produces a judgment that is interpretive, analytic, evaluative, or reflective (orally, graphically, in writing).

g. Anticipates and answers a reader's questions.

h. Provides a sense of closure to the writing.

The student produces a multi-paragraph persuasive essay that:

a. Engages the reader by establishing a context, creating a speaker's voice, and otherwise developing reader interest.

b. States a clear position or perspective in support of a proposition or proposal.

c. Creates an organizing structure that is appropriate to the needs, values, and interests of a specified audience, and arranges details, reasons, and examples.

d. Includes appropriate relevant information and arguments.

e. Excludes information and arguments that are irrelevant.

f. Provides details, reasons, and examples, arranging them effectively by anticipating and answering reader concerns and counter-arguments.

g. Supports arguments with detailed evidence, citing sources of information as appropriate.

h. Anticipates and addresses reader concerns and counter-arguments.

i. Provides a sense of closure to the writing.

The student produces a piece of writing drawn from research that:

a. Poses relevant and tightly drawn questions about the topic.

b. Engages the reader by establishing a context.

c. Conveys clear and accurate perspectives on the subject.

d. States a thesis.

e. Records important ideas, concepts, and direct quotations from significant information sources, and paraphrases and summarizes all perspectives on the topic, as appropriate.

f. Uses a variety of primary and secondary sources and distinguishes the nature and value of each.

g. Organizes and displays information on charts, maps, and graphs.

h. Provides a sense of closure to the writing.

i. Documents resources (bibliography, footnotes, endnotes, etc.).

ELA8W3. The student uses research and technology to support writing. The student

a. Plans and conducts multiple-step information searches by using computer networks and modems.

b. Achieves an effective balance between researched information and original ideas.

c. Avoids plagiarism.

ELA8W4. The student consistently uses the writing process to develop, revise, and evaluate writing. The student

a. Plans and drafts independently and resourcefully.

b. Revises writing for appropriate organization, consistent point of view, and transitions between paragraphs, passages, and ideas.

c. Edits writing to improve word choice, grammar, punctuation, etc.

Conventions

Conventions are essential for reading, writing, and speaking. Instruction in language conventions will, therefore, occur within the context of reading, writing, and speaking, rather than in isolation. The student writes to make connections with the larger world. A student's ideas are more likely to be taken seriously when the words are spelled accurately and the sentences are grammatically correct. Use of Standard English conventions helps readers understand and follow the student's meaning, while errors can be distracting and confusing. Standard English conventions are the "good manners" of writing and speaking that make communication fluid.

ELA8C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

a. Declines pronouns by gender and case, and demonstrates correct usage in sentences.

b. Analyzes and uses simple, compound, complex, and compound-complex sentences correctly, punctuates properly, and avoids fragments and run-ons.

c. Revises sentences by correcting misplaced and dangling modifiers.

d. Revises sentences by correcting errors in usage.

e. Demonstrates appropriate comma and semicolon usage (compound, complex, and compound-complex sentences, split dialogue, and for clarity).

f. Analyzes the structure of a sentence (basic sentence parts, noun-adjective adverb clauses and phrases).

g. Produces final drafts/presentations that demonstrate accurate spelling and the correct use of punctuation and capitalization.

= Measured by EXPLORE English and/or Reading tests

Listening/Speaking/Viewing

The student demonstrates an understanding of listening, speaking, and viewing skills for a variety of purposes. The student listens critically and responds appropriately to oral communication in a variety of genres and media. The student speaks in a manner that guides the listener to understand important ideas.

ELA8LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

a. Initiates new topics in addition to responding to adult-initiated topics.

b. Asks relevant questions.

c. Responds to questions with appropriate information.

d. Confirms understanding by paraphrasing the adult's directions or suggestions.

e. Displays appropriate turn-taking behaviors.

f. Actively solicits another person's comments or opinions.

g. Offers own opinion forcefully without domineering.

h. Responds appropriately to comments and questions.

i. Volunteers contributions and responds when directly solicited by teacher or discussion leader.

j. Gives reasons in support of opinions expressed.

k. Clarifies, illustrates, or expands on a response when asked to do so.

l. Employs a group decision-making technique such as brainstorming or a problem-solving sequence (e.g., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).

m. Develops a plan of action or agenda for written and/or verbal follow-up.

ELA8LSV2. The student listens to and views various forms of text and media in order to gather and share information, persuade others, and express and understand ideas. The student will select and critically analyze messages using rubrics as assessment tools.

When responding to visual and oral texts and media (e.g., television, radio, film productions, and electronic media), the student:

a. Interprets and evaluates the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.

b. Analyzes oral communication by paraphrasing a speaker's purpose and point of view, and asks relevant questions concerning the speaker's content, delivery, and purpose.

When delivering and responding to presentations, the student:

a. Gives oral presentations or dramatic interpretations for various purposes.

b. Organizes information (e.g., message, vocabulary) to achieve particular purposes and to appeal to the background and interests of the audience.

c. Shows appropriate changes in delivery (e.g., gestures, expression, tone, pace, visuals).

d. Uses language for dramatic effect.

e. Uses rubrics as assessment tools.

f. Responds to oral communications with questions, challenges, or affirmations.

g. Uses multimedia for presentations.

READING AND LITERATURE

Focusing on a study of literary genres, ==the student develops initial understanding of both the structure and the meaning of a work of literature==. The student develops initial understanding of the way the form of a work of literature affects the meaning of the work and of the process of interpretation of a text. ==The student reads thoughtfully and purposefully, constantly checking for understanding of the author's intent and meaning in order to determine a sound interpretation.==

ELA9RL1. ==The student demonstrates comprehension by identifying evidence== (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) ==in a variety of texts representative of different genres== (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) ==and using this evidence as the basis for interpretation.==

==The student identifies, analyzes, and applies knowledge of the structures and elements of fiction and provides evidence from the text to support understanding; the student:==

a. ==Locates and analyzes such elements in fiction as language== (i.e., diction, imagery, symbolism, figurative language), ==character development, setting and mood, point of view, foreshadowing, and irony.==

b. ==Identifies and analyzes patterns of imagery or symbolism.==

c. ==Relates identified elements in fiction to theme or underlying meaning.==

==The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:==

a. Analyzes and applies knowledge of the characteristics of memoir, biography, and/or autobiography.

b. ==Analyzes and explains the purpose, structure, and elements of nonfiction works, including memoir, biography, and autobiography.==

c. ==Analyzes and evaluates the effects of language== (i.e., diction, imagery, symbolism, figurative language), ==structure, point of view, and selection of details in memoir, biography, and/or autobiography.==

The student identifies and responds to differences in style and subject matter in poems by a variety of contemporary and canonical poets; the student:

a. Identifies and responds to the aesthetic effects of subject matter (i.e. topic, theme), sound devices (i.e., alliteration, onomatopoeia, rhyme scheme), figurative language (i.e., personification, metaphor, simile, hyperbole), and structure (i.e., fixed and free forms, rhymed and unrhymed, narrative and lyric) in a variety of poems.

b. Sorts and classifies poems by specified criteria (i.e., fixed and free forms, rhymed and unrhymed, narrative and lyric, and/or universal themes and topics).

The student identifies, analyzes, and applies knowledge of the themes, structures, and elements of dramatic literature and provides evidence from the text to support understanding; the student:

a. Identifies and analyzes types of dramatic literature (i.e., Shakespearean tragedy and comedy).

b. Analyzes the characters, structures, and themes of dramatic literature.

c. Identifies and analyzes dramatic elements, (i.e., exposition, rising action, climax, denouement, dialogue, monologue, soliloquy, aside, dramatic irony).

d. Identifies and analyzes how dramatic elements support and enhance interpretation of dramatic literature.

ELA9RL2. ==The student identifies, analyzes, and applies knowledge of theme in literary works from various genres and provides evidence from the works to support understanding. The student==

a. Applies knowledge of the concept that the theme or meaning of a selection represents a universal view or comment on life or society and ==provides support from the text for the identified theme.==

b. ==Evaluates how an author's choice of words advances the theme or purpose of a work.==

c. Applies knowledge of the concept that a text can contain more than one theme.

d. Compares and contrasts the presentation of a theme or topic across genres and explains how the selection of genre affects the delivery of universal ideas about life and society.

The student close reads a fictional text (short story or novel) that has not been studied in class and, in the classroom within a specific period of time (e.g., 30 to 45 minutes), responds in writing to that text, identifying the evidence in the text and applying that evidence to support a specific theme, underlying meaning, or interpretation.

ELA9RL3. The student deepens understanding of literary works by relating them to contemporary context or historical background. The student

a. Relates a literary work to non-literary documents and/or other texts from its literary period.

b. Relates a literary work to non-literary documents and/or other texts relevant to its historical setting.

ELA9RL4. The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in selected literary works. The student composes essays, narratives, poems, or technical documents. The student

a. Demonstrates understanding of significant themes in specific literary works.

b. Supports important ideas and viewpoints through accurate and detailed references or allusions to the text.

c. Includes a formal works cited or bibliography when applicable.

ELA9RL5. The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

a. Identifies and correctly uses idioms, cognates, words with literal and figurative meanings, and patterns of word changes that indicate different meanings or functions.

b. Uses knowledge of Greek and Latin prefixes, suffixes, and roots to understand the meanings of new words.

c. Uses general dictionaries, specialized dictionaries, thesauruses, or related references as needed to increase learning.

READING ACROSS THE CURRICULUM

ELA9RC1. The student reads a minimum of 25 grade–level appropriate books or book equivalents (approximately 1,000,000 words) per year from a variety of subject disciplines. The student reads both informational and fictional texts in a variety of genres and modes of discourse, including technical texts related to various subject areas.

ELA9RC2. The student participates in discussions related to curricular learning in all subject areas. The student

a. Identifies messages and themes from books in all subject areas.

b. Responds to a variety of texts in multiple modes of discourse.

c. Relates messages and themes from one subject area to those in another area.

d. Evaluates the merits of texts in every subject discipline.

e. Examines the author's purpose in writing.

f. Recognizes the features of disciplinary texts.

ELA9RC3. The student acquires new vocabulary in each content area and uses it correctly. The student

a. Demonstrates an understanding of contextual vocabulary in various subjects.

b. Uses content vocabulary in writing and speaking.

c. Explores understanding of new words found in subject area texts.

ELA9RC4. The student establishes a context for information acquired by reading across subject areas. The student

a. Explores life experiences related to subject area content.

b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.

c. Determines strategies for finding content and contextual meaning for unfamiliar words or concepts.

WRITING

All modes or genres are practiced at each grade level; however, in order to achieve mastery, each grade level has a particular writing focus. Technical writing is the focus for 9th grade; by the end of 9th grade, the student will demonstrate competency in technical writing. The student writes coherent and focused texts that convey a well-defined perspective or tightly-reasoned argument. The writing exhibits the student's awareness of audience and purpose. When appropriate, the texts contain introductions, supporting evidence, and conclusions. The student regularly progresses through the stages of the writing process (i.e., prewriting, drafting, revising, and editing successive versions).

ELA9W1. The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure. The student

a. Establishes a clear, distinctive, and coherent thesis or perspective and maintains a consistent tone and focus throughout.

b. Selects a focus, structure, and point of view relevant to the purpose, genre expectations, audience, length, and format requirements.

c. Constructs arguable topic sentences, when applicable, to guide unified paragraphs.

d. Uses precise language, action verbs, sensory details, appropriate modifiers, and active rather than passive voice.

e. Writes texts of a length appropriate to address the topic or tell the story.

f. Uses traditional structures for conveying information (i.e., chronological order, cause and effect, similarity and difference, and posing and answering a question).

g. Supports statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

ELA9W2. The student demonstrates competence in a variety of genres.

The student produces narrative writing and applies polished narrative strategies acquired in grades 6-8 to other genres of writing such as reflective compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

The student produces expository (informational) writing to convey information and ideas from primary and secondary sources accurately and coherently; the student:

a. Engages the interest of the reader.

b. Formulates a coherent thesis or controlling idea.

c. Coherently develops the controlling idea and/or supports the thesis by incorporating evidence from at least one secondary source.

d. Follows an organizational pattern appropriate to the type of composition.

e. Attains closure (i.e., by including a detailed summary of the main points, restating the thesis, generalizing the thesis or controlling idea for additional purposes, or employing a significant quotation that brings the argument in the composition together).

The student produces persuasive writing and applies persuasive strategies acquired in previous grades to other genres of writing such as expository compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

The student produces technical writing that reports technical information and/or conveys ideas clearly, logically, and purposefully to a particular audience; the student:

        = Measured by EXPLORE English and/or Reading tests

a. Engages the interest of the reader.

b. Provides clear and purposeful information logically and correctly in order to address an intended audience appropriately.

c. Uses appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipients.

d. Uses varied levels, patterns, and types of language to achieve intended effects and aid comprehension.

e. Provides detailed and accurate information or specifications to anticipate readers' problems, mistakes, and misunderstandings.

f. Follows style conventions for specific types of documents (i.e., surveys or questionnaires, technical reports, research studies, proposals) and uses page formats, fonts, spacing, highlighting, and images that contribute to the readability and impact of the document.

g. Combines text, images, and sound as well as other information from many sources (i.e., television broadcasts, videos, films, books, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images).

h. Polishes and refines documents using such aids as advanced publishing software and graphic programs.

i. Provides closure.

ELA9W3. The student uses research and technology to support writing. The student

a. Formulates clear research questions and utilizes appropriate research venues (i.e., library, electronic media, personal interview, survey) to locate and incorporate evidence from primary and secondary sources.

b. Uses supporting evidence from multiple sources to develop the main ideas within the body of an essay, composition, or technical document.

c. Synthesizes information from multiple sources and identifies complexities and discrepancies in the information and the different perspectives found in each medium (i.e., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, or technical documents).

d. Integrates quotations and citations into a written text while maintaining the flow of ideas.

e. Uses appropriate conventions for documentation in the text, notes, and bibliographies by adhering to an appropriate style manual such as the *Modern Language Association Handbook, The Chicago Manual of Style*, Turabian, *American Psychological Association*, etc.

f. Designs and publishes documents, using aids such as advanced publishing software and graphic programs.

ELA9W4. The student practices both timed and process writing and, when applicable, uses the writing process to develop, revise, and evaluate writing. The student

a. Plans and drafts independently and resourcefully.

b. Revises writing to improve the logic and coherence of the organization and controlling perspective.

c. Revises writing for specific audiences, purposes, and formality of the contexts.

d. Revises writing to sharpen the precision of word choice and achieve desired tone.

e. Edits writing to improve word choice, grammar, punctuation, etc.

CONVENTIONS

Conventions are essential for reading, writing, and speaking. Instruction in language conventions will, therefore, occur within the context of reading, writing, and speaking, rather than in isolation. The student writes to make connections with the larger world. A student's ideas are more likely to be taken seriously when the words are spelled accurately and the sentences are grammatically correct. Use of standard English conventions helps readers understand and follow the student's meaning, while errors can be distracting and confusing. Standard English conventions are the "good manners" of writing and speaking that make communication fluid.

ELA9C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

a. Demonstrates an understanding of proper English usage and control of grammar, sentence and paragraph structure, diction, and syntax.

b. Correctly uses clauses (i.e., main and subordinate) and mechanics of punctuation (i.e., end marks, commas, semicolons, and quotation marks).

c. Demonstrates an understanding of sentence construction (i.e., subordination, proper placement of modifiers) and proper English usage (i.e., consistency of verb tenses).

ELA9C2. The student demonstrates understanding of manuscript form, realizing that different forms of writing require different formats. The student

a. Produces writing that conforms to appropriate manuscript requirements.

b. Produces legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

c. Reflects appropriate format requirements, including pagination, spacing, and margins, and integration of source material with appropriate citations (i.e., in-text citations, use of direct quotations, paraphrase, and summary, and weaving of source and support materials with writer's own words, etc.).

d. Includes formal works cited or bibliography when applicable.

LISTENING, SPEAKING, AND VIEWING

The student demonstrates an understanding of listening, speaking, and viewing skills for a variety of purposes. The student observes and listens critically and responds appropriately to written and oral communication in a variety of genres and media. The student speaks in a manner that guides the listener to understand important ideas.

= Measured by EXPLORE English and Reading tests

ELA9LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

a. Initiates new topics and responds to adult-initiated topics.

b. Asks relevant questions.

c. Responds to questions with appropriate information.

d. Actively solicits another person's comments or opinions.

e. Offers own opinion forcefully without domineering.

f. Volunteers contributions and responds when directly solicited by teacher or discussion leader.

g. Gives reasons in support of opinions expressed.

h. Clarifies, illustrates, or expands on a response when asked to do so; asks classmates for similar expansions.

i. Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).

j. Divides labor to achieve the overall group goal efficiently.

ELA9LSV2. The student formulates reasoned judgments about written and oral communication in various media genres. The student delivers focused, coherent, and polished presentations that convey a clear and distinct perspective, demonstrate solid reasoning, and combine traditional rhetorical strategies of narration, exposition, persuasion, and description.

When responding to written and oral texts and media (i.e., television, radio, film productions, and electronic media), the student:

a. Assesses the ways language and delivery affect the mood and tone of the oral communication and impact the audience.

b. Analyzes the types of arguments used by the speaker, including argument by authority, emotion, and logic.

c. Formulates judgments about ideas under discussion and supports those judgments with convincing evidence.

d. Compares and contrasts the ways in which media genres (i.e., televised news, news magazines, documentaries, online information) cover the same event.

e. Creates an appropriate scoring guide to prepare, improve, and assess presentations.

f. Develops and applies criteria for assessing the effectiveness of the presentation, style, and content of films and other forms of electronic communication.

g. Identifies the aesthetic effects of a media presentation (i.e., layout, lighting, color, camera angles, background, etc.).

h. Identifies differences between the voice, tone, and diction used in media presentations (i.e., documentary films, news broadcasts, taped interviews) and informal speech.

When delivering and responding to presentations, the student:

a. Delivers narrative, expository, or persuasive presentations that incorporate the same elements found in that mode or genre of writing.

b. Applies appropriate interviewing techniques (i.e., prepares and asks relevant questions; makes notes of responses; uses language that conveys maturity, sensitivity and respect; responds correctly and effectively to questions).

c. Delivers oral responses to literature that incorporate the same elements found in written literary analysis.

d. Uses props, visual aids, graphs, or electronic media to enhance the appeal and accuracy of presentations.

READING AND LITERATURE

Focusing on a study of literary themes, the student develops understanding that theme is what relates literature to life, and that themes recur in diverse works of literature. The student develops understanding that the interpretation of a work of literature derives from the theme or themes in the work; the student connects the theme or themes in literary texts to his or her life or experience.

ELA10RL1. The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

The student identifies, analyzes, and applies knowledge of the structures and elements of fiction and provides evidence from the text to support understanding; the student:

a. Locates and analyzes such elements in fiction as language and style, character development, point of view, irony, and structures (i.e., chronological, *in medias res*, flashback, frame narrative).

b. Identifies and analyzes patterns of imagery or symbolism.

c. Relates identified elements in fiction to theme or underlying meaning.

The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

a. Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational texts.

b. Analyzes the logic and use of evidence in an author's argument.

c. Analyzes, evaluates, and applies knowledge of the ways authors use language, style, syntax, and rhetorical strategies for specific purposes in nonfiction works.

The student identifies and analyzes elements of poetry and provides evidence from the text to support understanding; the student:

a. Identifies, responds to, and analyzes the effects of diction, syntax, sound, form, figurative language, and structure of poems as these elements relate to meaning.

    i. sound: alliteration, end rhyme, internal rhyme, consonance, assonance

    ii. form: lyric poem, narrative poem, fixed form poems (i.e., ballad, sonnet)

    iii. figurative language: personification, imagery, metaphor, simile, synecdoche, hyperbole, symbolism

b. Analyzes and evaluates the appropriateness of diction and imagery (controlling images, figurative language, understatement, irony, paradox).

The student identifies, analyzes, and applies knowledge of the themes, structures, and elements of dramatic literature and provides evidence from the text to support understanding; the student:

a. Identifies and analyzes types of dramatic literature (i.e., classical tragedy, history play, modern drama).

b. Analyzes the characters, structures, and themes of dramatic literature.

c. Identifies and analyzes dramatic elements, (i.e., unity of time, place, and action; tragic hero; *deus ex machina*; recognition; reversal; chorus; aside; dramatic irony).

d. Identifies and analyzes how dramatic elements support and enhance the interpretation of dramatic literature.

ELA10RL2. The student identifies, analyzes, and applies knowledge of theme in literary works and provides evidence from the works to support understanding. The student

a. Applies knowledge of the concept that the theme or meaning of a selection represents a universal view or comment on life or society and provides support from the text for the identified theme.

b. Evaluates the way an author's choice of words advances the theme or purpose of the work.

c. Applies knowledge of the concept that a text can contain more than one theme.

d. Analyzes and compares texts that express a universal theme, and locates support in the text for the identified theme.

e. Compares and contrasts the presentation of a theme or topic across genres and explains how the selection of genre affects the delivery of universal ideas about life and society.

    i. Archetypal Characters (i.e., hero, good mother, sage, trickster, etc.)

    ii. Archetypal Patterns (i.e., journey of initiation, search for the father, etc.)

    iii. Archetypal Symbols (i.e., colors, water, light/dark, etc.)

    iv. Universal Connections (i.e., making choices, winning/losing, relationships, self and other, etc.)

ELA10RL3. The student deepens understanding of literary works by relating them to contemporary context or historical background, as well as to works from other time periods. The student

a. Relates a literary work to non-literary documents and/or other texts from its literary period.

b. Relates a literary work to non-literary documents and/or other texts relevant to its historical setting.

c. Analyzes the influence of mythical, classical, and canonical literature on contemporary literature and film.

ELA10RL4. The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas

in selected literary works. The student composes essays, narratives, poems, or technical documents. The student

a. Demonstrates awareness of an author's use of stylistic devices for specific effects.

b. Explains important ideas and viewpoints introduced in a text through accurate and detailed references or allusions to the text and other relevant works.

c. Identifies and assesses the impact of ambiguities, nuances, and complexities within the text.

d. Includes a formal works cited or bibliography when applicable.

ELA10RL5. The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

a. Identifies and correctly uses idioms, cognates, words with literal and figurative meanings, and patterns of word changes that indicate different meanings or functions.

b. Uses knowledge of mythology, the Bible, and other works often alluded to in literature to understand the meanings of new words.

c. Uses general dictionaries, specialized dictionaries, thesauruses, or related references as need to increase learning.

READING ACROSS THE CURRICULUM

ELA10RC1. The student reads a minimum of 25 grade-level appropriate books or book equivalents (approximately 1,000,000 words) per year from a variety of subject disciplines. The student reads both informational and fictional texts in a variety of genres and modes of discourse, including technical texts related to various subject areas.

ELA10RC2. The student participates in discussions related to curricular learning in all subject areas. The student

a. Identifies messages and themes from books in all subject areas.

b. Responds to a variety of texts in multiple modes of discourse.

c. Relates messages and themes from one subject area to those in another area.

d. Evaluates the merits of texts in every subject discipline.

e. Examines the author's purpose in writing.

f. Recognizes the features of disciplinary texts.

ELA10RC3. The student acquires new vocabulary in each content area and uses it correctly. The student

a. Demonstrates an understanding of contextual vocabulary in various subjects.

b. Uses content vocabulary in writing and speaking.

c. Explores understanding of new words found in subject area texts.

ELA10RC4. The student establishes a context for information acquired by reading across subject areas. The student

a. Explores life experiences related to subject area content.

b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.

c. Determines strategies for finding content and contextual meaning for unfamiliar words or concepts.

WRITING

All modes or genres are practiced at each grade level; however, in order to achieve mastery each grade level has a particular writing focus. Persuasive writing is the focus for 10th grade; by the end of 10th grade, the student will demonstrate competency in persuasive writing. The student writes coherent and focused texts that convey a well-defined perspective or tightly-reasoned argument. The writing exhibits the student's awareness of audience and purpose. When appropriate, the texts contain introductions, supporting evidence, and conclusions. The student regularly progresses through the stages of the writing process (e.g., prewriting, drafting, revising, and editing successive versions).

ELA10W1. The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals closure. The student

a. Establishes a clear, distinctive, and coherent thesis or perspective and maintains a consistent tone and focus throughout.

b. Selects a focus, structure, and point of view relevant to the purpose, genre expectations, audience, length, and format requirements.

c. Constructs arguable topic sentences, when applicable, to guide unified paragraphs.

d. Uses precise language, action verbs, sensory details, appropriate modifiers, and active rather than passive voice.

e. Writes texts of a length appropriate to address the topic or tell the story.

f. Uses traditional structures for conveying information (i.e., chronological order, cause and effect, similarity and difference, and posing and answering a question).

g. Supports statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

ELA10W2. The student demonstrates competence in a variety of genres.

The student produces narrative writing that applies polished narrative strategies acquired in previous grades to other genres of writing such as reflective compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

The student produces expository (informational) writing to convey information and ideas from primary and secondary sources accurately and coherently; the student:

a. Engages the interest of the reader.

b. Formulates a coherent thesis or controlling idea.

c. Coherently develops the controlling idea and/or supports the thesis by incorporating evidence from primary and secondary sources.

d. Follows an organizational pattern appropriate to the type of composition.

☐ = Standards measured by PLAN English and/or Reading tests

e. Attains closure (i.e., by including a detailed summary of the main points, restating the thesis, generalizing the thesis or controlling idea for additional purposes, or employing a significant quotation that brings the argument in the composition together).

The student produces persuasive writing that structures ideas and arguments in a sustained and logical fashion; the student:

a. Engages the reader by establishing a context and developing reader interest.

b. Develops a controlling idea or formulates an arguable thesis that makes a clear and knowledgeable judgment.

c. Uses specific rhetorical devices to support assertions (i.e., appeal to emotion or ethical belief, personal anecdote, case study, analogy, and/or logical reasoning).

d. Clarifies and defends positions with precise and relevant evidence (i.e., facts, expert opinions, quotations, or expressions of commonly accepted beliefs).

e. Excludes information and arguments that are irrelevant.

f. Organizes points of argument effectively to achieve desired outcome.

g. Addresses readers' concerns, counterclaims, biases, and expectations.

h. Achieves closure by summarizing main points of argument, appealing to reason, ethics, or emotion, or encouraging action.

The student produces technical writing that clearly, logically, and purposefully applies technical writing strategies acquired in previous grades to other genres of writing and in a variety of writing situations such as expository compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

ELA10W3. The student uses research and technology to support writing. The student

a. Formulates clear research questions and utilizes appropriate research venues (i.e., library, electronic media, personal interview, survey) to locate and incorporate evidence from primary and secondary sources.

b. Uses supporting evidence from multiple sources to develop the main ideas within the body of a researched essay, a composition, or a technical document.

c. Synthesizes information from multiple sources and identifies complexities and discrepancies in the information and the different perspectives found in each medium (i.e., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents).

d. Integrates quotations and citations into a written text while maintaining the flow of ideas.

e. Uses appropriate conventions for documentation in the text, notes, and bibliographies by adhering to an appropriate style manual such as the *Modern Language Association Handbook, The Chicago Manual of Style*, Turabian, *American Psychological Association*, etc.

f. Designs and publishes documents, using aids such as advanced publishing software and graphic programs.

ELA10W4. The student practices both timed and process writing and, when applicable, uses the writing process to develop, revise, and evaluate writing. The student

a. Plans and drafts independently and resourcefully.

b. Revises writing to improve the logic and coherence of the organization and controlling perspective.

c. Revises writing for specific audiences, purposes, and formality of the contexts.

d. Revises writing to sharpen the precision of word choice and achieve desired tone.

e. Edits writing to improve word choice, grammar, punctuation, etc.

CONVENTIONS

Conventions are essential for reading, writing, and speaking. Instruction in language conventions will, therefore, occur within the context of reading, writing, and speaking, rather than in isolation. The student writes to make connections with the larger world. A student's ideas are more likely to be taken seriously when the words are spelled accurately and the sentences are grammatically correct. Use of standard English conventions helps readers understand and follow the student's meaning, while errors can be distracting and confusing. Standard English conventions are the "good manners" of writing and speaking that make communication fluid.

ELA10C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

a. Demonstrates an understanding of proper English usage and control of grammar, sentence and paragraph structure, diction, and syntax.

b. Correctly uses clauses (i.e., main and subordinate), phrases (i.e., gerund, infinitive, and participial), and mechanics of punctuation (i.e., end marks, commas, semicolons, quotation marks, colons, ellipses, hyphens).

c. Demonstrates an understanding of sentence construction (e.g., subordination, proper placement of modifiers, parallel structure) and proper English usage (i.e., consistency of verb tenses, agreement).

ELA10C2. The student demonstrates understanding of manuscript form, realizing that different forms of writing require different formats. The student

a. Produces writing that conforms to appropriate manuscript requirements.

b. Produces legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

c. Reflects appropriate format requirements, including pagination, spacing, and margins, and integration of source material with appropriate citations (i.e., in-text citations, use of direct quotations, paraphrase, and

= Measured by PLAN English and/or Reading tests

summary, and weaving of source and support materials with writer's own words, etc.).

   d. Includes formal works cited or bibliography when applicable.

LISTENING, SPEAKING, AND VIEWING

The student demonstrates an understanding of listening, speaking, and viewing skills for a variety of purposes. The student observes and listens critically and responds appropriately to written and oral communication in a variety of genres and media. The student speaks in a manner that guides the listener to understand important ideas.

ELA10LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

a. Initiates new topics in addition to responding to adult-initiated topics.

b. Asks relevant questions.

c. Responds to questions with appropriate information.

d. Actively solicits another person's comments or opinion.

e. Offers own opinion forcefully without domineering.

f. Contributes voluntarily and responds directly when solicited by teacher or discussion leader.

g. Gives reasons in support of opinions expressed.

h. Clarifies, illustrates, or expands on a response when asked to do so; asks classmates for similar expansions.

i. Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).

j. Divides labor so as to achieve the overall group goal efficiently.

ELA10LSV2. The student formulates reasoned judgments about written and oral communication in various media genres. The student delivers focused, coherent, and polished presentations that convey a clear and distinct perspective, demonstrate solid reasoning, and combine traditional rhetorical strategies of narration, exposition, persuasion, and description.

When responding to visual and oral texts and media (i.e., television, radio, film productions, and electronic media), the student:

a. Analyzes historically significant speeches to find the rhetorical devices and features that make them memorable.

b. Evaluates the clarity, quality, effectiveness, and general coherence of a speaker's important points, arguments, evidence, organization of ideas, delivery, diction, and syntax.

c. Analyzes the types of arguments used by the speaker, including argument by causation, analogy, authority, emotion, and logic.

d. Identifies logical fallacies used in oral addresses (i.e., attack *ad hominem*, false causality, red herring, overgeneralization, bandwagon effect).

e. Analyzes the four basic types of persuasive speech (i.e., propositions of fact, value, problem, or policy) and understands the similarities and differences in their patterns of organization and the use of persuasive language, reasoning, and proof.

When delivering and responding to presentations, the student:

a. Delivers narrative, expository, or persuasive presentations that incorporate the same elements found in that mode or genre of writing.

b. Delivers oral responses to literature that incorporate the same elements found in written literary analysis.

c. Uses props, visual aids, graphs, or electronic media to enhance the appeal and accuracy of presentations.

WRITING

All modes or genres are practiced at each grade level; however, in order to achieve mastery each grade level has a particular writing focus. Expository writing is the focus for 11th grade; by the end of 11th grade, the student will demonstrate developing competency of specified strategies in expository writing. The student writes coherent and focused texts that convey a well-defined perspective and tightly-reasoned argument. The writing exhibits the student's awareness of audience and purpose. When appropriate, the texts contain introductions, supporting evidence, and conclusions. The student regularly progresses through the stages of the writing process (i.e., prewriting, drafting, revising, and editing successive versions).

ELA11W1. The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure. The student

a. Establishes a clear, distinctive, and coherent thesis or perspective and maintains a consistent tone and focus throughout.

b. Selects a focus, structure, and point of view relevant to the purpose, genre expectations, audience, length, and format requirements.

c. Constructs arguable topic sentences, when applicable, to guide unified paragraphs.

d. Uses precise language, action verbs, sensory details, appropriate modifiers, and active rather than passive voice.

e. Writes texts of a length appropriate to address the topic or tell the story.

f. Uses traditional structures for conveying information (i.e., chronological order, cause and effect, similarity and difference, and posing and answering a question).

g. Supports statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

ELA11W2. The student demonstrates competence in a variety of genres.

The student produces narrative writing that applies polished narrative strategies acquired in previous grades, in other genres of writing such as reflective compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

The student produces expository (informational) writing to explain an idea or concept and/or convey information and ideas from primary and secondary sources accurately and coherently; the student:

a. Engages the interest of the reader.

b. Formulates a coherent thesis or controlling idea.

c. Coherently develops the controlling idea and/or supports the thesis by incorporating evidence from both primary and secondary sources, as applicable.

d. Conveys information and ideas from primary and secondary sources, when applicable, accurately and coherently.

e. Includes a variety of information on relevant perspectives, as applicable.

f. Maintains coherence by relating all topic sentences to the thesis or controlling idea, as applicable.

g. Structures ideas and arguments effectively in a sustained way and follows an organizational pattern appropriate to the purpose and intended audience of the essay.

h. Demonstrates an understanding of the elements of expository discourse (i.e., purpose, speaker, audience, form).

i. Incorporates elements of discourse from other writing genres into exposition.

j. Enhances meaning by employing rhetorical devices, including the use of parallelism, repetition, and analogy.

k. Uses language, point of view, characterization, style, and related elements effectively for specific rhetorical and aesthetic purposes.

l. Attains closure (i.e., by including a detailed summary of the main points, restating the thesis, generalizing the thesis or controlling idea for additional purposes, or employing a significant quotation that brings the argument in the composition together).

The student produces persuasive writing that clearly, logically, and purposefully applies persuasive writing strategies acquired in previous grades in other genres of writing and in a variety of writing situations such as expository compositions, historical investigative reports, and literary analysis, by raising the level of critical thinking skills and rhetorical techniques and the sophistication of the language and style.

The student produces technical writing that clearly, logically, and purposefully applies technical writing strategies acquired in previous grades in other genres of writing and in a variety of writing situations such as expository compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques and the sophistication of the language and style.

ELA11W3. The student uses research and technology to support writing. The student

a. Formulates clear research questions and utilizes appropriate research venues (i.e., library, electronic media, personal interview, survey) to locate and incorporate evidence from primary and secondary sources.

b. Uses supporting evidence from multiple sources to develop the main ideas within the body of a researched essay, a composition, or a technical document.

c. Synthesizes information from multiple sources and identifies complexities, discrepancies, and different perspectives found in a variety of media (i.e., almanacs,

microfiche, news sources, in-depth field studies, speeches, journals, technical documents).

d. Integrates quotations and citations into a written text while maintaining the flow of ideas.

e. Uses appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals such as the *Modern Language Association Handbook, The Chicago Manual of Style*, Turabian, *American Psychological Association*, etc.

f. Uses systematic strategies to organize and record information (i.e., anecdotal scripting, annotated bibliographies).

g. Designs and publishes documents, using such aids as advanced publishing software and graphic programs.

ELA11W4. The student practices both timed and process writing and, when applicable, uses the writing process to develop, revise, and evaluate writing. The student

a. Plans and drafts independently and resourcefully.

b. Revises writing to improve the logic and coherence of the organization and controlling perspective.

c. Revises writing for specific audiences, purposes, and formality of the contexts.

d. Revises writing to sharpen the precision of word choice and achieve desired tone.

e. Revises text to highlight the individual voice and to improve sentence variety and style.

f. Edits writing to improve word choice, grammar, punctuation, etc.

CONVENTIONS

Conventions are essential for reading, writing, and speaking. Instruction in language conventions will, therefore, occur within the context of reading, writing, and speaking, rather than in isolation. The student writes to make connections with the larger world. A student's ideas are more likely to be taken seriously when the words are spelled accurately and the sentences are grammatically correct. Use of standard English conventions helps readers understand and follow the student's meaning, while errors can be distracting and confusing. Standard English conventions are the "good manners" of writing and speaking that make communication fluid.

ELA11C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

a. Demonstrates an understanding of proper English usage and control of grammar, sentence and paragraph structure, diction, and syntax.

b. Correctly uses clauses (i.e., main and subordinate), phrases (i.e., gerund, infinitive, and participial), and mechanics of punctuation (i.e., end marks, commas, semicolons, quotations marks, colons, ellipses, hyphens).

c. Demonstrates an understanding of sentence construction (i.e., subordination, proper placement of

modifiers, parallel structure) and proper English usage (i.e., consistency of verb tenses, agreement).

ELA11C2. The student demonstrates understanding of manuscript form, realizing that different forms of writing require different formats. The student

a. Produces writing that conforms to appropriate manuscript requirements.

b. Produces legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

c. Reflects appropriate format requirements, including pagination, spacing, and margins, and integration of source material with appropriate citations (i.e., in-text citations, use of direct quotations, paraphrase, and summary, and weaving of source and support materials with writer's own words, etc.).

d. Includes formal works cited or bibliography when applicable.

LISTENING, SPEAKING, AND VIEWING

The student demonstrates an understanding of listening, speaking, and viewing skills for a variety of purposes. The student observes and listens critically and responds appropriately to written and oral communication in a variety of genres and media. The student speaks in a manner that guides the listener to understand important ideas.

ELA11LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

a. Initiates new topics in addition to responding to adult-initiated topics.

b. Asks relevant questions.

c. Responds to questions with appropriate information.

d. Actively solicits another person's comments or opinion.

e. Offers own opinion forcefully without domineering.

f. Volunteers contributions and responds when directly solicited by teacher or discussion leader.

g. Gives reasons in support of opinions expressed.

h. Clarifies, illustrates, or expands on a response when asked to do so; asks classmates for similar expansions.

i. Employ group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).

j. Divides labor so as to achieve the overall group goal efficiently.

ELA11LSV2. The student formulates reasoned judgments about written and oral communication in various media genres. The student delivers focused, coherent, and polished presentations that convey a clear and distinct perspective, demonstrate solid reasoning, and combine traditional rhetorical strategies of narration, exposition, persuasion, and description.

When responding to visual and oral texts and media (i.e., television, radio, film productions, and electronic media), the student:

a. Recognizes strategies used by the media to inform, persuade, entertain (i.e., advertisements, perpetuation of stereotypes, use of visual representations, special effects, language).

b. Analyzes visual or aural techniques used in a media message for a particular audience and evaluates their effectiveness.

c. Develops and applies criteria for assessing the effectiveness of the presentation, style, and content of films and other forms of electronic communication.

d. Identifies the aesthetic effects of a media presentation (i.e., layout, lighting, color, camera angles, background, etc.)

e. Analyzes the effect of dialect and language on positive or negative stereotypes among social groups.

When delivering and responding to presentations, the student:

a. Uses effective and interesting language, including informal expressions for effect, Standard American English for clarity, technical language for specificity.

b. Evaluates and uses different effects (i.e., visual, music, sound, graphics) to create competent presentations or productions.

c. Analyzes effective speeches made for a variety of purposes and prepares and delivers a speech containing these same features.

d. Delivers oral presentations that incorporate the elements of narration, exposition, persuasion, and/or literary analysis.

WRITING

All modes or genres are practiced at each grade level; however, in order to achieve mastery each grade level has a particular writing focus. Continued development of expository writing is the focus for 12th grade; by the end of 12th grade, the student will demonstrate competency in expository writing. The student writes coherent and focused texts that convey a well-defined perspective and tightly-reasoned argument. The writing exhibits the student's awareness of audience and purpose. When appropriate, the texts contain introductions, supporting evidence, and conclusions. The student regularly progresses through the stages of the writing process (i.e., prewriting, drafting, revising, and editing successive versions).

ELA12W1. The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure. The student

a. Establishes a clear, distinctive, and coherent thesis or perspective and maintains a consistent tone and focus throughout.

b. Selects a focus, structure, and point of view relevant to the purpose, genre expectations, audience, length, and format requirements.

c. Constructs arguable topic sentences, when applicable, to guide unified paragraphs.

d. Uses precise language, action verbs, sensory details, appropriate modifiers, and active rather than passive voice.

e. Writes texts of a length appropriate to address the topic or tell the story.

f. Uses traditional structures for conveying information (i.e., chronological order, cause and effect, similarity and difference, and posing and answering a question).

g. Supports statements and claims with anecdotes, descriptions, facts and statistics, and specific examples.

ELA12W2. The student demonstrates competence in a variety of genres.

The student produces narrative writing that applies polished narrative strategies acquired in previous grades, in other genres of writing such as reflective compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques.

The student produces expository (informational) writing to explain an idea or concept and/or convey information and ideas from primary and secondary sources accurately and coherently; the student:

a. Engages the interest of the reader.

b. Formulates a coherent thesis or controlling idea.

c. Coherently develops the controlling idea and/or supports the thesis by incorporating evidence from both primary and secondary sources, as applicable.

d. Conveys information and ideas from primary and secondary sources, when applicable, accurately and coherently.

e. Includes a variety of information on relevant perspectives, as applicable.

f. Anticipates and addresses readers' potential misunderstandings, biases, and expectations.

g. Maintains coherence by relating all topic sentences to the thesis or controlling idea, as applicable.

h. Structures ideas and arguments effectively in a sustained way and follows an organizational pattern appropriate to the purpose and intended audience of the essay.

i. Demonstrates an understanding of the elements of expository discourse (i.e., purpose, speaker, audience, form).

j. Incorporates elements of discourse from other writing genres into exposition.

k. Enhances meaning by employing rhetorical devices, including the use of parallelism, repetition, analogy, and humor.

l. Varies language, point of view, characterization, style, and related elements effectively for different rhetorical and aesthetic purposes.

m. Attains closure (i.e., by including a detailed summary of the main points, restating the thesis, generalizing the thesis or controlling idea for additional purposes, or employing a significant quotation that brings the argument in the composition together).

The student produces persuasive writing that clearly, logically, and purposefully applies persuasive writing strategies acquired in previous grades in other genres of writing and in a variety of writing situations such as expository compositions, historical investigative reports, and literary analysis, by raising the level of critical thinking skills and rhetorical techniques and the sophistication of the language and style.

The student produces technical writing that clearly, logically, and purposefully applies technical writing strategies acquired in previous grades in other genres of writing and in a variety of writing situations such as expository compositions, historical investigative reports, and literary analyses, by raising the level of critical thinking skills and rhetorical techniques and the sophistication of the language and style.

ELA12W3. The student uses research and technology to support writing. The student

a. Formulates clear research questions and utilizes appropriate research venues (i.e., library, electronic media, personal interview, survey) to locate and incorporate evidence from primary and secondary sources.

b. Uses supporting evidence from multiple sources to develop the main ideas within the body of a researched essay, a composition, or a technical document.

c. Synthesizes information from multiple sources and identifies complexities, discrepancies, and different perspectives found in a variety of media (i.e., almanacs,

microfiche, news sources, in-depth field studies, speeches, journals, technical documents).

d. Integrates quotations and citations into a written text while maintaining the flow of ideas.

e. Uses appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals such as the *Modern Language Association Handbook*, *The Chicago Manual of Style*, Turabian, *American Psychological Association*, etc.

f. Uses systematic strategies to organize and record information (i.e., anecdotal scripting, annotated bibliographies).

g. Integrates databases, graphics, and spreadsheets into word-processed documents.

h. Designs and publishes documents, using such aids as advanced publishing software and graphic programs.

ELA12W4. The student practices both timed and process writing and, when applicable, uses the writing process to develop, revise, and evaluate writing. The student

a. Plans and drafts independently and resourcefully.

b. Revises writing to improve the logic and coherence of the organization and controlling perspective.

c. Revises writing for specific audiences, purposes, and formality of the contexts.

d. Revises text to highlight the individual voice and to improve sentence variety and style.

e. Revises writing to enhance subtlety of meaning and tone in ways that are consistent with purpose, audience, and genre.

f. Edits writing to improve word choice, grammar, punctuation, etc.

CONVENTIONS

Conventions are essential for reading, writing, and speaking. Instruction in language conventions will, therefore, occur within the context of reading, writing, and speaking, rather than in isolation. The student writes to make connections with the larger world. A student's ideas are more likely to be taken seriously when the words are spelled accurately and the sentences are grammatically correct. Use of standard English conventions helps readers understand and follow the student's meaning, while errors can be distracting and confusing. Standard English conventions are the "good manners" of writing and speaking that make communication fluid.

ELA12C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats. The student

a. Demonstrates an understanding of proper English usage and control of grammar, sentence and paragraph structure, diction, and syntax.

b. Correctly uses clauses (i.e., main and subordinate), phrases (i.e., gerund, infinitive, and participial), and mechanics of punctuation (i.e., end marks, commas, semicolons, quotation marks, colons, ellipses, hyphens).

c. Demonstrates an understanding of sentence construction (i.e., subordination, proper placement of modifiers, parallel structure) and proper English usage (i.e., consistency of verb tense, agreement).

ELA12C2. The student demonstrates understanding of manuscript form, realizing that different forms of writing require different formats. The student

a. Produces writing that conforms to appropriate manuscript requirements.

b. Produces legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. Produces writing that conforms to appropriate manuscript requirements.

c. Reflects appropriate format requirements, including pagination, spacing, and margins, and integration of source material with appropriate citations (i.e., in-text citations, use of direct quotations, paraphrase, and summary, and weaving of source and support materials with writer's own words, etc.).

d. Includes formal works cited or bibliography when applicable.

LISTENING, SPEAKING, AND VIEWING

The student demonstrates an understanding of listening, speaking, and viewing skills for a variety of purposes. The student observes and listens critically and responds appropriately to written and oral communication in a variety of genres and media. The student speaks in a manner that guides the listener to understand important ideas.

ELA12LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

a. Initiates new topics in addition to responding to adult-initiated topics.

b. Asks relevant questions.

c. Responds to questions with appropriate information.

d. Actively solicits another person's comments or opinion.

e. Offers own opinion forcefully without domineering.

f. Volunteers contributions and responds when directly solicited by teacher or discussion leader.

g. Gives reasons in support of opinions expressed.

h. Clarifies, illustrates, or expands on a response when asked to do so; asks classmates for similar expansions.

i. Employs group decision-making techniques such as brainstorming or a problem-solving sequence (i.e., recognizes problem, defines problem, identifies possible solutions, selects optimal solution, implements solution, evaluates solution).

j. Divides labor so as to achieve the overall group goal efficiently.

ELA12LSV2. The student formulates reasoned judgments about written and oral communication in various media genres. The student delivers focused, coherent, and polished presentations that convey a clear and distinct perspective, demonstrate solid reasoning, and combine traditional rhetorical strategies of narration, exposition, persuasion, and description.

= Measured by ACT English, Reading and/or Writing tests and/or WorkKeys RI

When responding to visual and oral texts and media (i.e., television, radio, film productions, and electronic media), the student:

a. Identifies and evaluates strategies used by the media to inform, persuade, entertain, and transmit culture (i.e., advertisements, perpetuation of stereotypes, use of visual representations, special effects, language).

b. Analyzes the impact of the media on the democratic process (i.e., exerting influence on elections, creating images of leaders, shaping attitudes) at the local, state, and national levels.

c. Identifies and evaluates the effect of media on the production and consumption of personal and societal values.

d. Interprets and evaluates the various ways in which local, national, and international events are presented and the ways information is communicated by visual image makers (i.e., graphic artists, documentary filmmakers, illustrators, news photographers).

e. Critiques a speaker's diction and syntax in relation to the purpose of an oral communication and the impact the words may have on the audience.

f. Delivers oral presentations that incorporate the elements of narration, exposition, persuasion, and/or literary analysis.

When delivering and responding to presentations, the student:

a. Uses rhetorical questions, parallel structure, concrete images, figurative language, characterization, irony, and dialogue to achieve clarity, force, and aesthetic effect.

b. Distinguishes between and uses various forms of classical and contemporary logical arguments, including syllogisms and analogies.

c. Uses ethical and emotional appeals that enhance a specific tone and purpose.

d. Applies appropriate interviewing techniques (i.e., demonstrates knowledge of the subject and organization, compiles and reports responses, evaluates the effectiveness of the interview).

READING AND AMERICAN LITERATURE

ELAALRL1. The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

The student identifies, analyzes, and applies knowledge of the structures and elements of American fiction and provides evidence from the text to support understanding; the student:

a. Locates and analyzes such elements in fiction as language and style, character development, point of view, irony, and structures (i.e., chronological, in medias res, flashback, frame narrative, epistolary narrative) in works of American fiction from different time periods.

b. Identifies and analyzes patterns of imagery or symbolism.

c. Relates identified elements in fiction to theme or underlying meaning.

d. Analyzes, evaluates, and applies knowledge of the ways authors use techniques and elements in fiction for rhetorical and aesthetic purposes.

e. Analyzes the influence of mythic, traditional, or classical literature on American literature.

f. Traces the history of the development of American fiction.

The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

a. Analyzes and explains the structures and elements of nonfiction works of American literature such as letters, journals and diaries, speeches, and essays.

b. Analyzes and evaluates the logic and use of evidence in an author's argument.

c. Analyzes, evaluates, and applies knowledge of the ways authors use language, style, syntax, and rhetorical strategies for specific purposes in nonfiction works.

The student identifies and analyzes elements of poetry from various periods of American literature and provides evidence from the text to support understanding; the student:

a. Identifies, responds to, and analyzes the effects of diction, tone, mood, syntax, sound, form, figurative language, and structure of poems as these elements relate to meaning.

   i. sound: alliteration, end rhyme, slant rhyme, internal rhyme, consonance, assonance

   ii. form: fixed and free, lyric, ballad, sonnet, narrative poem, blank verse

   iii. figurative language: personification, imagery, metaphor, conceit, simile, metonymy, synecdoche, hyperbole, symbolism, allusion

b. Analyzes and evaluates the effects of diction and imagery (i.e., controlling images, figurative language, extended metaphor, understatement, hyperbole, irony, paradox, and tone) as they relate to underlying meaning.

c. Traces the historical development of poetic styles and forms in American literature

The student identifies, analyzes, and applies knowledge of the themes, structures, and elements of dramatic American literature and provides evidence from the text to support understanding; the student:

a. Identifies and analyzes types of dramatic literature (i.e., political drama, modern drama, theatre of the absurd).

b. Analyzes the characters, structures, and themes of dramatic literature.

c. Identifies and analyzes dramatic elements, (i.e., stage directions, fourth wall, expressionism, minimalism, dramatic irony).

d. Identifies and analyzes how dramatic elements support and enhance the interpretation of dramatic literature.

ELAALRL2. The student identifies, analyzes, and applies knowledge of theme in a work of American literature and provides evidence from the work to support understanding. The student

a. Applies knowledge of the concept that the theme or meaning of a selection represents a universal view or comment on life or society and provides support from the text for the identified theme.

b. Evaluates the way an author's choice of words advances the theme or purpose of the work.

c. Applies knowledge of the concept that a text can contain more than one theme.

d. Analyzes and compares texts that express universal themes characteristic of American literature across time and genre (i.e., American individualism, the American dream, cultural diversity, and tolerance) and provides support from the texts for the identified themes.

ELAALRL3. The student deepens understanding of literary works by relating them to their contemporary context or historical background, as well as to works from other time periods.

The student relates a literary work to primary source documents of its literary period or historical setting; the student:

a. Relates a literary work to the seminal ideas of the time in which it is set or the time of its composition

   i. Native American literature

   ii. Colonial/Revolutionary/National literature

b. Relates a literary work to the characteristics of the literary time period that it represents.

   i. Romanticism/Transcendentalism

    ii. Realism

    iii. Naturalism

    iv. Modernism (including Harlem Renaissance)

    v. Postmodernism

The student compares and contrasts specific characteristics of different genres as they develop and change over time for different purposes (i.e., personal, meditative Colonial writing vs. public, political documents of the Revolutionary era, or replication of traditional European styles [Bradstreet, Taylor] vs. emerging distinctive American style [Dickinson, Whitman] in poetry).

The student analyzes a variety of works representative of different genres within specific time periods in order to identify types of discourse (i.e., satire, parody, allegory) that cross the lines of genre classifications.

ELAALRL4. The student employs a variety of writing genres to demonstrate a comprehensive grasp of significant ideas in selected literary works. The student composes essays, narratives, poems, or technical documents. The student

a. Demonstrate awareness of an author's use of stylistic devices and an appreciation of the effects created by the devices.

b. Analyze the use of imagery, language, and other particular aspects of a text that contribute to theme or underlying meaning.

c. Draw comparisons between specific incidents in a text and broader themes that illustrate the writer's important beliefs or generalizations about life.

d. Analyze multiple, relevant historical records of a single event and examine their critical relationships to a literary work.

e. Include a formal works cited or bibliography when applicable.

ELAALRL5. The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

a. Identifies and correctly uses idioms, cognates, words with literal and figurative meanings, and patterns of word changes that indicate different meanings or functions.

b. Uses knowledge of mythology, the Bible, and other works often alluded to in American literature to understand the meanings of new words.

c. Uses general dictionaries, specialized dictionaries, thesauruses, or related references as needed to increase learning.

READING ACROSS THE CURRICULUM

ELAALRC1. The student reads a minimum of 25 grade-level appropriate books or book equivalents (approximately 1,000,000 words) per year from a variety of subject disciplines. The student reads both informational and fictional texts in a variety of genres and modes of discourse, including technical texts related to various subject areas.

ELAALRC2. The student participates in discussions related to curricular learning in all subject areas. The student

a. Identifies messages and themes from books in all subject areas.

b. Responds to a variety of texts in multiple modes of discourse.

c. Relates messages and themes from one subject area to those in another area.

d. Evaluates the merits of texts in every subject discipline.

e. Examines the author's purpose in writing.

f. Recognizes the features of disciplinary texts.

ELAALRC3. The student acquires new vocabulary in each content area and uses it correctly. The student

a. Demonstrates an understanding of contextual vocabulary in various subjects.

b. Uses content vocabulary in writing and speaking.

c. Explores understanding of new words found in subject area texts.

ELAALRC4. The student establishes a context for information acquired by reading across subject areas. The student

a. Explores life experiences related to subject area content.

b. Discusses in both writing and speaking how certain words and concepts relate to multiple subjects.

c. Determines strategies for finding content and contextual meaning for unfamiliar words or concepts.

Mathematics

GEORGIA Grade 8 Mathematics
Performance Standards

NUMBER AND OPERATIONS

Students will understand the numeric and geometric meaning of square root, apply properties of integer exponents and use scientific notation.

M8N1. Students will understand different representations of numbers including square roots, exponents, and scientific notation.

a. Find square roots of perfect squares.

b. Recognize the (positive) square root of a number as a length of a side of a square with a given area.

c. Recognize square roots as points and as lengths on a number line.

d. Understand that the square root of 0 is 0 and that every positive number has two square roots that are opposite in sign.

e. Recognize and use the radical symbol to denote the positive square root of a positive number.

f. Estimate square roots of positive numbers.

g. Simplify, add, subtract, multiply, and divide expressions containing square roots.

h. Distinguish between rational and irrational numbers.

i. Simplify expressions containing integer exponents.

j. Express and use numbers in scientific notation.

k. Use appropriate technologies to solve problems involving square roots, exponents, and scientific notation.

GEOMETRY

Students will use and apply geometric properties of plane figures, including congruence and the Pythagorean theorem.

M8G1. Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.

a. Investigate characteristics of parallel and perpendicular lines both algebraically and geometrically.

b. Apply properties of angle pairs formed by parallel lines cut by a transversal.

c. Understand the properties of the ratio of segments of parallel lines cut by one or more transversals.

d. Understand the meaning of congruence: that all corresponding angles are congruent and all corresponding sides are congruent.

M8G2. Students will understand and use the Pythagorean theorem.

a. Apply properties of right triangles, including the Pythagorean theorem.

b. Recognize and interpret the Pythagorean theorem as a statement about areas of squares on the sides of a right triangle.

ALGEBRA

Students will use linear algebra to represent, analyze and solve problems. They will use equations, tables, and graphs to investigate linear relations and functions, paying particular attention to slope as a rate of change.

M8A1. Students will use algebra to represent, analyze, and solve problems.

a. Represent a given situation using algebraic expressions or equations in one variable.

b. Simplify and evaluate algebraic expressions.

c. Solve algebraic equations in one variable, including equations involving absolute values.

d. Solve equations involving several variables for one variable in terms of the others.

e. Interpret solutions in problem contexts.

M8A2. Students will understand and graph inequalities in one variable.

a. Represent a given situation using an inequality in one variable.

b. Use the properties of inequality to solve inequalities.

c. Graph the solution of an inequality on a number line.

d. Interpret solutions in problem contexts.

M8A3. Students will understand relations and linear functions.

a. Recognize a relation as a correspondence between varying quantities.

b. Recognize a function as a correspondence between inputs and outputs where the output for each input must be unique.

c. Distinguish between relations that are functions and those that are not functions.

d. Recognize functions in a variety of representations and a variety of contexts.

e. Use tables to describe sequences recursively and with a formula in closed form.

f. Understand and recognize arithmetic sequences as linear functions with whole number input values.

g. Interpret the constant difference in an arithmetic sequence as the slope of the associated linear function.

h. Identify relations and functions as linear or nonlinear.

i. Translate among verbal, tabular, graphic, and algebraic representations of functions.

M8A4. Students will graph and analyze graphs of linear equations and inequalities.

= Measured by EXPLORE Mathematics Test

a. Interpret slope as a rate of change.

b. Determine the meaning of the slope and *y*-intercept in a given situation.

c. Graph equations of the form $y = mx + b$.

d. Graph equations of the form $ax + by = c$.

e. Graph the solution set of a linear inequality, identifying whether the solution set is an open or a closed half-plane.

f. Determine the equation of a line given a graph, numerical information that defines the line or a context involving a linear relationship.

g. Solve problems involving linear relationships.

M8A5. Students will understand systems of linear equations and inequalities and use them to solve problems.

a. Given a problem context, write an appropriate system of linear equations or inequalities.

b. Solve systems of equations graphically and algebraically, using technology as appropriate.

c. Graph the solution set of a system of linear inequalities in two variables.

d. Interpret solutions in problem contexts.

DATA ANALYSIS AND PROBABILITY

Students will use and understand set theory and simple counting techniques; determine the theoretical probability of simple events; and make inferences from data, particularly data that can be modeled by linear functions.

M8D1. Students will apply basic concepts of set theory.

a. Demonstrate relationships among sets through use of Venn diagrams.

b. Determine subsets, complements, intersection, and union of sets.

c. Use set notation to denote elements of a set.

M8D2. Students will determine the number of outcomes related to a given event.

a. Use tree diagrams to find the number of outcomes.

b. Apply the addition and multiplication principles of counting.

M8D3. Students will use the basic laws of probability.

a. Find the probability of simple independent events.

b. Find the probability of compound independent events.

M8D4. Students will organize, interpret, and make inferences from statistical data

a. Gather data that can be modeled with a linear function.

b. Estimate and determine a line of best fit from a scatter plot.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

M8P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

M8P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

M8P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

M8P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

M8P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
- Read both informational and fictional texts in a variety of genres and modes of discourse
- Read technical texts related to various subject areas

b. Discussing books

- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context.

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

GEORGIA Mathematics 1
Performance Standards

ALGEBRA

Students will explore functions and solve simple equations. Students will simplify and operate with radical, polynomial, and rational expressions.

MM1A1. Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.

a. Represent functions using function notation.

b. Graph the basic functions $f(x) = x^n$, where $n = 1$ to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

c. Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes.

d. Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

e. Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.

f. Recognize sequences as functions with domains that are whole numbers.

g. Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.

h. Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

i. Understand that any equation in x can be interpreted as the equation $f(x) = g(x)$, and interpret the solutions of the equation as the x-value(s) of the intersection point(s) of the graphs of $y = f(x)$ and $y = g(x)$.

MM1A2. Students will simplify and operate with radical expressions, polynomials, and rational expressions.

a. Simplify algebraic and numeric expressions involving square root.

b. Perform operations with square roots.

c. Add, subtract, multiply, and divide polynomials.

d. Expand binomials using the Binomial Theorem.

e. Add, subtract, multiply, and divide rational expressions.

f. Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below.
$(x + y)^2 = x^2 + 2xy + y^2$
$(x - y)^2 = x^2 - 2xy + y^2$
$(x + y)(x - y) = x^2 - y^2$
$(x + a)(x + b) = x^2 + (a + b)x + ab$
$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$
$(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$

g. Use area and volume models for polynomial arithmetic.

MM1A3. Students will solve simple equations.

a. Solve quadratic equations in the form $ax^2 + bx + c = 0$, where $a = 1$, by using factorization and finding square roots where applicable.

b. Solve equations involving radicals such as $\sqrt{x} + b = c$, using algebraic techniques.

c. Use a variety of techniques, including technology, tables, and graphs to solve equations resulting from the investigation of $x^2 + bx + c = 0$.

d. Solve simple rational equations that result in linear equations or quadratic equations with leading coefficient of 1.

GEOMETRY

Students will explore, understand, and use the formal language of reasoning and justification. Students will apply properties of polygons and determine distances and points of concurrence.

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

a. Determine the distance between two points.

b. Determine the distance between a point and a line.

c. Determine the midpoint of a segment.

d. Understand the distance formula as an application of the Pythagorean theorem.

e. Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

MM1G2. Students will understand and use the language of mathematical argument and justification.

a. Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.

b. Understand and use the relationships among a statement and its converse, inverse, and contrapositive.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

a. Determine the sum of interior and exterior angles in a polygon.

b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.

c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).

d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.

e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

= Measured by EXPLORE and/or PLAN Mathematics tests

DATA ANALYSIS AND PROBABILITY

Students will use counting techniques and determine probability. Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will organize, represent, investigate, interpret, and make inferences from data.

MM1D1. Students will determine the number of outcomes related to a given event.

a. Apply the addition and multiplication principles of counting.

b. Calculate and use simple permutations and combinations.

MM1D2. Students will use the basic laws of probability.

a. Find the probabilities of mutually exclusive events.

b. Find the probabilities of dependent events.

c. Calculate conditional probabilities.

d. Use expected value to predict outcomes.

MM1D3. Students will relate samples to a population.

a. Compare summary statistics (mean, median, quartiles, and interquartile range) from one sample data distribution to another sample data distribution in describing center and variability of the data distributions.

b. Compare the averages of the summary statistics from a large number of samples to the corresponding population parameters.

c. Understand that a random sample is used to improve the chance of selecting a representative sample.

MM1D4. Students will explore variability of data by determining the mean absolute deviation (the average of the absolute values of the deviations).

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MM1P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MM1P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MM1P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MM1P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum aeas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas

- Read both informational and fictional texts in a variety of genres and modes of discourse

- Read technical texts related to various subject areas

b. Discussing books

- Discuss messages and themes from books in all subject areas.

- Respond to a variety of texts in multiple modes of discourse.

- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.

- Examine author's purpose in writing.

- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.

= Measured by EXPLORE and/or PLAN Mathematics tests

- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context
- Explore life experiences related to subject area content.

- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

NUMBER AND OPERATIONS

Students will use the complex number system.

MM2N1. Students will represent and operate with complex numbers.

a. Write square roots of negative numbers in imaginary form.

b. Write complex numbers in the form $a + bi$.

c. Add, subtract, multiply, and divide complex numbers.

d. Simplify expressions involving complex numbers.

ALGEBRA

Students will investigate piecewise, exponential, and quadratic functions, using numerical, analytical, and graphical approaches, focusing on the use of these functions in problem-solving situations. Students will solve equations and inequalities and explore inverses of functions.

MM2A1. Students will investigate step and piecewise functions, including greatest integer and absolute value functions.

a. Write absolute value functions as piecewise functions.

b. Investigate and explain characteristics of a variety of piecewise functions including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, points of discontinuity, intervals over which the function is constant, intervals of increase and decrease, and rates of change.

c. Solve absolute value equations and inequalities analytically, graphically, and by using appropriate technology.

MM2A2. Students will explore exponential functions.

a. Extend properties of exponents to include all integer exponents.

b. Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.

c. Graph functions as transformations of $f(x) = a^x$.

d. Solve simple exponential equations and inequalities analytically, graphically, and by using appropriate technology.

e. Understand and use basic exponential functions as models of real phenomena.

f. Understand and recognize geometric sequences as exponential functions with domains that are whole numbers.

g. Interpret the constant ratio in a geometric sequence as the base of the associated exponential function.

MM2A3. Students will analyze quadratic functions in the forms $f(x) = ax^2 + bx + c$ and $f(x) = a(x - h)^2 + k$.

a. Convert between standard and vertex form.

b. Graph quadratic functions as transformations of the function $f(x) = x^2$.

c. Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change.

d. Explore arithmetic series and various ways of computing their sums.

e. Explore sequences of partial sums of arithmetic series as examples of quadratic functions.

MM2A4. Students will solve quadratic equations and inequalities in one variable.

a. Solve equations graphically using appropriate technology.

b. Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.

c. Analyze the nature of roots using technology and using the discriminant.

d. Solve quadratic inequalities both graphically and algebraically, and describe the solutions using linear inequalities.

MM2A5. Students will explore inverses of functions.

a. Discuss the characteristics of functions and their inverses, including one-to-oneness, domain, and range.

b. Determine inverses of linear, quadratic, and power functions and functions of the form $f(x) = \frac{a}{x}$, including the use of restricted domains.

c. Explore the graphs of functions and their inverses.

d. Use composition to verify that functions are inverses of each other.

GEOMETRY

Students will explore right triangles and right-triangle trigonometry. They will understand and apply properties of circles and spheres, and use them in determining related measures.

MM2G1. Students will identify and use special right triangles.

a. Determine the lengths of sides of 30°-60°-90° triangles.

b. Determine the lengths of sides of 45°-45°-90° triangles.

MM2G2. Students will define and apply sine, cosine, and tangent ratios to right triangles.

a. Discover the relationship of the trigonometric ratios for similar triangles.

b. Explain the relationship between the trigonometric ratios of complementary angles.

c. Solve application problems using the trigonometric ratios.

MM2G3. Students will understand the properties of circles.

a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.

b. Understand and use properties of central, inscribed, and related angles.

c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.

d. Justify measurements and relationships in circles using geometric and algebraic properties.

MM2G4. Students will find and compare the measures of spheres.

a. Use and apply surface area and volume of a sphere.

b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

DATA ANALYSIS AND PROBABILITY

Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will organize, represent, investigate, interpret, and make inferences from data. They will use regression to analyze data and to make inferences.

MM2D1. Using sample data, students will make informal inferences about population means and standard deviations.

a. Pose a question and collect sample data from at least two different populations.

b. Understand and calculate the means and standard deviations of sets of data.

c. Use means and standard deviations to compare data sets.

d. Compare the means and standard deviations of random samples with the corresponding population parameters, including those population parameters for normal distributions. Observe that the different sample means vary from one sample to the next. Observe that the distribution of the sample means has less variability than the population distribution.

MM2D2. Students will determine an algebraic model to quantify the association between two quantitative variables.

a. Gather and plot data that can be modeled with linear and quadratic functions.

b. Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."

c. Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.

d. Investigate issues that arise when using data to explore the relationship between two variables, including confusion between correlation and causation.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MM2P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MM2P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MM2P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MM2P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MM2P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

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MATH READING CONTENT

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- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.
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- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

ALGEBRA

Students will investigate exponential, logarithmic and polynomial functions of degree higher than 2. Students will understand matrices and use them to solve problems.

MM3A1. Students will analyze graphs of polynomial functions of higher degree.

a. Graph simple polynomial functions as translations of the function $f(x) = ax^n$.

b. Understand the effects of the following on the graph of a polynomial function: degree, lead coefficient, and multiplicity of real zeros.

c. Determine whether a polynomial function has symmetry and whether it is even, odd, or neither.

d. Investigate and explain characteristics of polynomial functions, including domain and range, intercepts, zeros, relative and absolute extrema, intervals of increase and decrease, and end behavior.

MM3A2. Students will explore logarithmic functions as inverses of exponential functions.

a. Define and understand the properties of nth roots.

b. Extend properties of exponents to include rational exponents.

c. Define logarithmic functions as inverses of exponential functions.

d. Understand and use properties of logarithms by extending laws of exponents.

e. Investigate and explain characteristics of exponential and logarithmic functions including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, and rate of change.

f. Graph functions as transformations of $f(x) = a^x$, $f(x) = \log_a x$, $f(x) = e^x$, $f(x) = \ln x$.

g. Explore real phenomena related to exponential and logarithmic functions including half-life and doubling time.

MM3A3. Students will solve a variety of equations and inequalities.

a. Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates.

b. Solve polynomial, exponential, and logarithmic equations analytically, graphically, and using appropriate technology.

c. Solve polynomial, exponential, and logarithmic inequalities analytically, graphically, and using appropriate technology. Represent solution sets of inequalities using interval notation.

d. Solve a variety of types of equations by appropriate means choosing among mental calculation, pencil and paper, or appropriate technology.

MM3A4. Students will perform basic operations with matrices.

a. Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.

b. Find the inverses of two-by-two matrices using pencil and paper, and find inverses of larger matrices using technology.

c. Examine the properties of matrices, contrasting them with properties of real numbers.

MM3A5. Students will use matrices to formulate and solve problems.

a. Represent a system of linear equations as a matrix equation.

b. Solve matrix equations using inverse matrices.

c. Represent and solve realistic problems using systems of linear equations.

MM3A6. Students will solve linear programming problems in two variables.

a. Solve systems of inequalities in two variables, showing the solutions graphically.

b. Represent and solve realistic problems using linear programming.

MM3A7. Students will understand and apply matrix representations of vertex-edge graphs.

a. Use graphs to represent realistic situations.

b. Use matrices to represent graphs, and solve problems that can be represented by graphs.

GEOMETRY

Students will understand and use the analytic geometry of conic sections and of planes and spheres in space.

MM3G1. Students will investigate the relationships between lines and circles.

a. Find equations of circles.

b. Graph a circle given an equation in general form.

c. Find the equation of a tangent line to a circle at a given point.

d. Solve a system of equations involving a circle and a line.

e. Solve a system of equations involving two circles.

MM3G2. Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas).

a. Convert equations of conics by completing the square.

b. Graph conic sections, identifying fundamental characteristics.

c. Write equations of conic sections given appropriate information.

MM3G3. Students will investigate planes and spheres.

a. Plot the point (x, y, z) and understand it as a vertex of a rectangular prism.

b. Apply the distance formula in 3-space.

c. Recognize and understand equations of planes and spheres.

DATA ANALYSIS AND PROBABILITY

Students will use a normal distribution to calculate probabilities. They will organize, represent, investigate, interpret, and make inferences using data from both observational studies and experiments.

MM3D1. Students will create probability histograms of discrete random variables, using both experimental and theoretical probabilities.

MM3D2. Students will solve problems involving probabilities by interpreting a normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution).

a. Determine intervals about the mean that include a given percent of data.

b. Determine the probability that a given value falls within a specified interval.

c. Estimate how many items in a population fall within a specified interval.

MM3D3. Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MM3P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MM3P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MM3P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MM3P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MM3P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

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- Evaluate the merit of texts in every subject discipline.

- Examine author's purpose in writing.

- Recognize the features of disciplinary texts.

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- Use content vocabulary in writing and speaking.

= Measured by ACT Mathematics tests and/or WorkKeys AM

- Explore understanding of new words found in subject area texts.

d. Establishing context
- Explore life experiences related to subject area content

- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

ALGEBRA

Students will analyze rational and trigonometric functions. Students will investigate and apply sequences and series and will understand and use vectors.

MM4A1. Students will explore rational functions.

a. Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior.

b. Find inverses of rational functions, discussing domain and range, symmetry, and function composition.

c. Solve rational equations and inequalities analytically, graphically, and by using appropriate technology.

MM4A2. Students will use the circle to define the trigonometric functions.

a. Define and understand angles measured in degrees and radians, including but not limited to 0°, 30°, 45°, 60°, 90°, their multiples, and equivalences.

b. Understand and apply the six trigonometric functions as functions of general angles in standard position.

c. Find values of trigonometric functions using points on the terminal sides of angles in the standard position.

d. Understand and apply the six trigonometric functions as functions of arc length on the unit circle.

e. Find values of trigonometric functions using the unit circle.

MM4A3. Students will investigate and use the graphs of the six trigonometric functions.

a. Understand and apply the six basic trigonometric functions as functions of real numbers.

b. Determine the characteristics of the graphs of the six basic trigonometric functions.

c. Graph transformations of trigonometric functions including changing period, amplitude, phase shift, and vertical shift.

d. Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena.

MM4A4. Students will investigate functions.

a. Compare and contrast properties of functions within and across the following types: linear, quadratic, polynomial, power, rational, exponential, logarithmic, trigonometric, and piecewise.

b. Investigate transformations of functions.

c. Investigate characteristics of functions built through sum, difference, product, quotient, and composition.

MM4A5. Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements.

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\cot\theta = \frac{\cos\theta}{\sin\theta}$

$\sec\theta = \frac{1}{\cos\theta}$

$\csc\theta = \frac{1}{\sin\theta}$

$\sin^2\theta + \cos^2\theta = 1$
$1 + \tan^2\theta = \sec^2\theta$
$1 + \cot^2\theta = \csc^2\theta$
$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$
$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \pm \sin\alpha\sin\beta$
$\sin(2\theta) = 2\sin\theta\cos\theta$
$\cos(2\theta) = \cos^2\theta - \sin^2\theta$

MM4A6. Students will solve trigonometric equations both graphically and algebraically.

a. Solve trigonometric equations over a variety of domains, using technology as appropriate.

b. Use the coordinates of a point on the terminal side of an angle to express x as $r\cos\theta$ and y as $r\sin\theta$.

c. Apply the law of sines and the law of cosines.

MM4A7. Students will verify and apply $A = \frac{1}{2}ab\sin C$ to find the area of a triangle.

MM4A8. Students will investigate and use inverse sine, inverse cosine, and inverse tangent functions.

a. Find values of the above functions using technology as appropriate.

b. Determine characteristics of the above functions and their graphs.

MM4A9. Students will use sequences and series.

a. Use and find recursive and explicit formulas for the terms of sequences.

b. Recognize and use simple arithmetic and geometric sequences.

c. Find and apply the sums of finite and, where appropriate, infinite arithmetic and geometric series.

d. Use summation notation to explore finite series.

MM4A10. Students will understand and use vectors.

a. Represent vectors algebraically and geometrically.

b. Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.

c. Add, subtract, and compute scalar multiples of vectors.

d. Use vectors to solve realistic problems.

DATA ANALYSIS AND PROBABILITY

Students will organize, represent, investigate, interpret, and make inferences from data, using the central limit theorem and the standard normal distribution. Students will apply the

Central Limit Theorem to calculate confidence intervals for a population mean using data from large samples. Students will use sample data and confidence intervals to draw conclusions about populations.

MM4D1. Using simulation, students will develop the idea of the central limit theorem.

MM4D2. Using student-generated data from random samples of at least 30 members, students will determine the margin of error and confidence interval for a specified level of confidence.

MM4D3. Students will use confidence intervals and margins of error to make inferences from data about a population. Technology is used to evaluate confidence intervals, but students will be aware of the ideas involved.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MM4P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MM4P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MM4P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MM4P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MM4P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas

- Read both informational and fictional texts in a variety of genres and modes of discourse

- Read technical texts related to various subject areas

b. Discussing books

- Discuss messages and themes from books in all subject areas.

- Respond to a variety of texts in multiple modes of discourse.

- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.

- Examine author's purpose in writing.

- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.

- Use content vocabulary in writing and speaking.

- Explore understanding of new words found in subject area texts.

d. Establishing context

- Explore life experiences related to subject area content.

- Discuss in both writing and speaking how certain words are subject area related.

- Determine strategies for finding content and contextual meaning for unknown words.

= Measured by ACT Mathematics Test and/or WorkKeys AM

ALGEBRA

Students will explore and interpret the characteristics of functions.

MC1A1. Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.

a. Represent functions using function notation.

b. Graph the basic functions $f(x) = x^n$, where n = 1 to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

c. Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes.

d. Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

e. Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.

f. Recognize sequences as functions with domains that are whole numbers.

g. Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.

h. Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

i. Understand that any equation in x can be interpreted as the equation $f(x) = g(x)$, and interpret the solutions of the equation as the x-value(s) of the intersection point(s) of the graphs of $y = f(x)$ and $y = g(x)$.

GEOMETRY

The student will apply properties of polygons and determine distances.

MC1G1. Students will investigate properties of geometric figures in the coordinate plane.

a. Determine the distance between two points.

b. Determine the distance between a point and a line.

c. Determine the midpoint of a segment.

d. Understand the distance formula as an application of the Pythagorean theorem.

e. Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

DATA ANALYSIS AND PROBABILITY

Students will use counting techniques and determine probability.

MC1D1. Students will determine the number of outcomes related to a given event

a. Apply addition and multiplication principles of counting.

b. Calculate and use simple permutations and combinations.

MC1D2. Students will use the basic laws of probability

a. Find the probabilities of mutually exclusive events.

b. Find the probabilities of dependent events.

c. Calculate conditional probabilities.

d. Use expected value to predict outcomes.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MC1P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MC1P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MC1P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MC1P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

= Measured by EXPLORE and/or PLAN Mathematics tests

c. Recognize and apply mathematics in contexts outside of mathematics.

MC1P5. <mark>Students will represent mathematics in multiple ways.</mark>

a. <mark>Create and use representations to organize, record, and communicate mathematical ideas.</mark>

b. <mark>Select, apply, and translate among mathematical representations to solve problems.</mark>

c. <mark>Use representations to model and interpret physical, social, and mathematical phenomena.</mark>

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
   - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
   - Read both informational and fictional texts in a variety of genres and modes of discourse
   - Read technical texts related to various subject areas

b. Discussing books
   - Discuss messages and themes from books in all subject areas.
   - Respond to a variety of texts in multiple modes of discourse.
   - Relate messages and themes from one subject area to messages and themes in another area.
   - Evaluate the merit of texts in every subject discipline.
   - Examine author's purpose in writing.
   - Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
   - Demonstrate an understanding of contextual vocabulary in various subjects.
   - Use content vocabulary in writing and speaking.
   - Explore understanding of new words found in subject area texts.

d. Establishing context
   - Explore life experiences related to subject area content.
   - Discuss in both writing and speaking how certain words are subject area related.
   - Determine strategies for finding content and contextual meaning for unknown words.

GEORGIA Core Mathematics 2
Performance Standards

ALGEBRA

Students will simplify and operate with radical expressions, polynomials, and rational expressions. Students will solve simple equations.

MC2A1. Students will simplify and operate with radical expressions, polynomials, and rational expressions.

a. Simplify algebraic and numeric expressions involving square root.

b. Perform operations with square roots.

c. Add, subtract, multiply, and divide polynomials.

d. Add, subtract, multiply, and divide rational expressions.

e. Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below.
$$(x + y)^2 = x^2 + 2xy + y^2$$
$$(x - y)^2 = x^2 - 2xy + y^2$$
$$(x + y)(x - y) = x^2 - y^2$$
$$(x + a)(x + b) = x^2 + (a + b)x + ab$$
$$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$
$$(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3.$$

f. Use area and volume models for polynomial arithmetic

MC2A2. Students will solve simple equations.

a. Solve quadratic equations in the form $ax^2 + bx + c = 0$, where $a = 1$, by using factorization and finding square roots where applicable.

b. Solve equations involving radicals such as $\sqrt{x} + b = c$, using algebraic techniques.

c. Use a variety of techniques, including technology, tables, and graphs to solve equations resulting from the investigation of $x^2 + bx + c = 0$.

d. Solve simple rational equations that result in linear equations or quadratic equations with leading coefficient of 1.

GEOMETRY

Students will explore, understand and use the formal language of reasoning and justification. Students will apply properties of polygons.

MC2G1. Students will understand and use the language of mathematical argument and justification.

a. Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.

b. Understand and use the relationships among a statement and its converse, inverse, and contrapositive.

MC2G2. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

a. Determine the sum of interior and exterior angles in a polygon.

b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.

c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).

d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.

e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

DATA ANALYSIS AND PROBABILITY

Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will organize, represent, investigate, interpret, and make inferences from data.

MC2D1. Students will relate samples to a population.

a. Compare summary statistics (mean, median, quartiles, and interquartile range) from one sample data distribution to another sample data distribution in describing center and variability of the data distributions.

b. Compare the averages of the summary statistics from a large number of samples to the corresponding population parameters.

c. Understand that a random sample is used to improve the chance of selecting a representative sample.

MC2D2. Students will explore variability of data by determining the mean absolute deviation (the average of the absolute values of the deviations).

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MC2P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MC2P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

☐ = Measured by PLAN Mathematics Test

d. Select and use various types of reasoning and methods of proof.

MC2P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MC2P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MC2P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
   - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
   - Read both informational and fictional texts in a variety of genres and modes of discourse
   - Read technical texts related to various subject areas

b. Discussing books
   - Discuss messages and themes from books in all subject areas.
   - Respond to a variety of texts in multiple modes of discourse.
   - Relate messages and themes from one subject area to messages and themes in another area.
   - Evaluate the merit of texts in every subject discipline.
   - Examine author's purpose in writing.
   - Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
   - Demonstrate an understanding of contextual vocabulary in various subjects.
   - Use content vocabulary in writing and speaking.
   - Explore understanding of new words found in subject area texts.

d. Establishing context
   - Explore life experiences related to subject area content.
   - Discuss in both writing and speaking how certain words are subject area related.
   - Determine strategies for finding content and contextual meaning for unknown words.

GEORGIA Core Mathematics 3
Performance Standards

ALGEBRA

Students will investigate piecewise and exponential functions from numerical, analytical and graphical approaches, focusing on the use of these functions in problem-solving situations.

MC3A1. Students will investigate step and piecewise functions, including greatest integer and absolute value functions.

a. Write absolute value functions as piecewise functions.

b. Investigate and explain characteristics of a variety of piecewise functions including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, points of discontinuity, intervals over which the function is constant, intervals of increase and decrease, and rates of change.

c. Solve absolute value equations and inequalities analytically, graphically, and by using appropriate technology.

MC3A2. Students will explore exponential functions.

a. Extend properties of exponents to include all integer exponents.

b. Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.

c. Graph functions as transformations of $f(x) = a^x$.

d. Solve simple exponential equations and inequalities analytically, graphically, and by using appropriate technology.

e. Understand and use basic exponential functions as models of real phenomena.

f. Understand and recognize geometric sequences as exponential functions with domains that are sets of whole numbers.

g. Interpret the constant ratio in a geometric sequence as the base of the associated exponential function.

GEOMETRY

Students will explore right triangles and right triangular trigonometry.

MC3G1. Students will identify and use special right triangles.

a. Determine the lengths of sides of 30°-60°-90° triangles.

b. Determine the lengths of sides of 45°-45°-90° triangles.

MC3G2. Students will define and apply sine, cosine, and tangent ratios to right triangles.

a. Discover the relationship of the trigonometric ratios for similar triangles.

b. Explain the relationship between the trigonometric ratios of complementary angles.

c. Solve application problems using the trigonometric ratios.

DATA ANALYSIS AND PROBABILITY

Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will organize, represent, investigate, interpret, and make inferences from data. Students will use regression to analyze data, and to make inferences.

MC3D1. Using sample data, students will make informal inferences about population means and standard deviations.

a. Pose a question and collect sample data from at least two different populations.

b. Understand and calculate the means and standard deviations of sets of data.

c. Use means and standard deviations to compare data sets.

d. Compare the means and standard deviations of random samples with the corresponding population parameters. Observe that the different sample means vary from one sample to the next. Observe that the distribution of the sample means has less variability than the population distribution.

MC3D2. Students will determine an algebraic model to quantify the association between two quantitative variables.

a. Gather and plot data that can be modeled with linear functions.

b. Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."

c. Understand and apply the processes of linear regression for curve fitting using appropriate technology.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MC3P1. Students will solve problems (using appropriate technology)

a. Build new mathematical knowledge through problem solving

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MC3P2. Students will reason and evaluate mathematical arguments

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MC3P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MC3P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole

c. Recognize and apply mathematics in contexts outside of mathematics.

MC3P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
  - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
  - Read both informational and fictional texts in a variety of genres and modes of discourse
  - Read technical texts related to various subject areas

b. Discussing books
  - Discuss messages and themes from books in all subject areas.
  - Respond to a variety of texts in multiple modes of discourse.
  - Relate messages and themes from one subject area to messages and themes in another area.
  - Evaluate the merit of texts in every subject discipline.
  - Examine author's purpose in writing.
  - Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
  - Demonstrate an understanding of contextual vocabulary in various subjects.
  - Use content vocabulary in writing and speaking.
  - Explore understanding of new words found in subject area texts.

d. Establishing context
  - Explore life experiences related to subject area content.
  - Discuss in both writing and speaking how certain words are subject area related.
  - Determine strategies for finding content and contextual meaning for unknown words

= Measured by ACT Mathematics Test and/or WorkKeys AM

NUMBER AND OPERATIONS

Students will use the complex number system.

MC4N1. Students will represent and operate with complex numbers.

a. Write square roots of negative numbers in imaginary form.

b. Write complex numbers in the form $a + bi$.

c. Add, subtract, multiply, and divide complex numbers.

d. Simplify expressions involving complex numbers.

ALGEBRA

Students will investigate quadratic functions from numerical, analytical and graphical approaches, focusing on the use of these functions in problem-solving situations. Students will solve quadratic equations and inequalities and explore inverses of functions.

MC4A1. Students will analyze quadratic functions in the forms $f(x) = ax^2 + bx + c$ and $f(x) = a(x - h)^2 + k$.

a. Convert between standard and vertex form.

b. Graph quadratic functions as transformations of the function $f(x) = x^2$.

c. Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change.

d. Explore arithmetic series and various ways of computing their sums.

e. Explore sequences of partial sums of arithmetic series as examples of quadratic functions.

MC4A2. Students will solve quadratic equations and inequalities in one variable.

a. Solve equations graphically using appropriate technology.

b. Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.

c. Analyze the nature of roots using technology and using the discriminant.

d. Solve quadratic inequalities both graphically and algebraically, and describe the solutions using linear inequalities.

MC4A3. Students will explore inverses of functions.

a. Discuss the characteristics of functions and their inverses, including one-to-oneness, domain, and range.

b. Determine inverses of linear, quadratic, and power functions and functions of the form $f(x) = \frac{a}{x}$, including the use of restricted domains.

c. Explore the graphs of functions and their inverses.

d. Use composition to verify that functions are inverses of each other.

GEOMETRY

Students will understand and apply properties of circles and spheres and use them in determining related measures.

MC4G1. Students will understand the properties of circles.

a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.

b. Understand and use properties of central, inscribed, and related angles.

c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.

d. Justify measurements and relationships in circles using geometric and algebraic properties.

MC4G2. Students will find and compare the measures of spheres.

a. Use and apply surface area and volume of a sphere.

b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

DATA ANALYSIS AND PROBABILITY

Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will use regression to analyze data, and to make inferences.

MC4D1. Students will determine an algebraic model to quantify the association between two quantitative variables.

a. Gather and plot data that can be modeled with quadratic functions.

b. Understand and apply the processes of quadratic regression for curve fitting using appropriate technology.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MC4P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MC4P2. Students will reason and evaluate mathematical arguments.

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a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MC4P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MC4P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MC4P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
- Read both informational and fictional texts in a variety of genres and modes of discourse
- Read technical texts related to various subject areas

b. Discussing books
- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context
- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

= Measured by ACT Mathematics Test and/or WorkKeys AM

NUMBER AND OPERATIONS

Students will use the complex number system.

MA1N1. Students will represent and operate with complex numbers.

a. Write square roots of negative numbers in imaginary form.

b. Write complex numbers in the form $a + bi$.

c. Add, subtract, multiply, and divide complex numbers.

d. Simplify expressions involving complex numbers.

ALGEBRA

Students will explore functions, solve equations and operate with radical, polynomial and rational expressions.

MA1A1. Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.

a. Represent functions using function notation.

b. Graph the basic functions $f(x) = x^n$, where n = 1 to 3, $f(x) = \sqrt{x}$, $f(x) = |x|$, and $f(x) = \frac{1}{x}$.

c. Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes.

d. Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior.

e. Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.

f. Recognize sequences as functions with domains that are sets of whole numbers.

g. Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.

h. Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

i. Understand that any equation in x can be interpreted as the equation $f(x) = g(x)$, and interpret the solutions of the equation as the x-value(s) of the intersection point(s) of the graphs of $y = f(x)$ and $y = g(x)$.

MA1A2. Students will simplify and operate with radical expressions, polynomials, and rational expressions.

a. Simplify algebraic and numeric expressions involving square root.

b. Perform operations with square roots.

c. Add, subtract, multiply, and divide polynomials.

d. Add, subtract, multiply, and divide rational expressions.

e. Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below.
$(x + y)^2 = x^2 + 2xy + y^2$
$(x - y)^2 = x^2 - 2xy + y^2$
$(x + y)(x - y) = x^2 - y^2$
$(x + a)(x + b) = x^2 + (a + b)x + ab$
$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$
$(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$

f. Use area and volume models for polynomial arithmetic.

MA1A3. Students will analyze quadratic functions in the forms $f(x) = ax^2 + bx + c$ and $f(x) = a(x - h)^2 + k$.

a. Convert between standard and vertex form.

b. Graph quadratic functions as transformations of the function $f(x) = x^2$.

c. Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change.

d. Explore arithmetic series and various ways of computing their sums.

e. Explore sequences of partial sums of arithmetic series as examples of quadratic functions.

MA1A4. Students will solve quadratic equations and inequalities in one variable.

a. Solve equations graphically using appropriate technology.

b. Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.

c. Analyze the nature of roots using technology and using the discriminant.

d. Solve quadratic inequalities both graphically and algebraically, and describe the solutions using linear inequalities.

MA1A5. Students will investigate step and piecewise functions, including greatest integer and absolute value functions.

a. Write absolute value functions as piecewise functions.

b. Investigate and explain characteristics of a variety of piecewise functions including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, points of discontinuity, intervals over which the function is constant, intervals of increase and decrease, and rates of change.

c. Solve absolute value equations and inequalities analytically, graphically, and by using appropriate technology.

GEOMETRY

Students will explore, understand and use the formal language of reasoning and justification. Students will apply properties of polygons, circles and spheres, and determine distances and points of concurrence.

MA1G1. Students will investigate properties of geometric figures in the coordinate plane.

a. Determine the distance between two points.

b. Determine the distance between a point and a line.

c. Determine the midpoint of a segment.

d. Understand the distance formula as an application of the Pythagorean theorem.

e. Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

MA1G2. Students will understand and use the language of mathematical argument and justification.

a. Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.

b. Understand and use the relationships among a statement and its converse, inverse, and contrapositive.

MA1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

a. Determine the sum of interior and exterior angles in a polygon.

b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.

c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).

d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.

e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MA1G4. Students will understand the properties of circles.

a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.

b. Understand and use properties of central, inscribed, and related angles.

c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.

d. Justify measurements and relationships in circles using geometric and algebraic properties.

MA1G5. Students will find and compare the measures of spheres.

a. Use and apply surface area and volume of a sphere.

b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

DATA ANALYSIS AND PROBABILITY

Students will use counting techniques and determine probability. Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. Students will organize, represent, investigate, interpret, and make inferences from data. Students will determine algebraic models from data.

MA1D1. Students will determine the number of outcomes related to a given event.

a. Apply the addition and multiplication principles of counting.

b. Calculate and use simple permutations and combinations.

MA1D2. Students will use the basic laws of probability.

a. Find the probabilities of mutually exclusive events.

b. Find the probabilities of dependent events.

c. Calculate conditional probabilities.

d. Use expected value to predict outcomes.

MA1D3. Students will relate samples to a population.

a. Compare summary statistics (mean, median, quartiles, and interquartile range) from one sample data distribution to another sample data distribution in describing center and variability of the data distributions.

b. Compare the averages of the summary statistics from a large number of samples to the corresponding population parameters.

c. Understand that a random sample is used to improve the chance of selecting a representative sample.

MA1D4. Students will explore variability of data by determining the mean absolute deviation (the average of the absolute values of the deviations).

MA1D5. Students will determine an algebraic model to quantify the association between two quantitative variables.

a. Gather and plot data that can be modeled with linear and quadratic functions.

b. Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."

c. Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MA1P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

= Measured by ACT Mathematics Test and/or WorkKeys AM

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MA1P2. Students will reason and evaluate mathematical arguments.

a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MA1P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MA1P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MA1P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas

- Read both informational and fictional texts in a variety of genres and modes of discourse

- Read technical texts related to various subject areas

b. Discussing books

- Discuss messages and themes from books in all subject areas.

- Respond to a variety of texts in multiple modes of discourse.

- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.

- Examine author's purpose in writing.

- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.

- Use content vocabulary in writing and speaking.

- Explore understanding of new words found in subject area texts.

d. Establishing context

- Explore life experiences related to subject area content.

- Discuss in both writing and speaking how certain words are subject area related.

- Determine strategies for finding content and contextual meaning for unknown words.

ALGEBRA

Students will investigate exponential, logarithmic, and polynomial functions of higher degree; understand matrices and use them to solve problems; and solve linear programming problems in two variables.

MA2A1. Students will explore exponential functions.

a. Extend properties of exponents to include all integer exponents.

b. Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.

c. Graph functions as transformations of $f(x) = a^x$.

d. Solve simple exponential equations and inequalities analytically, graphically, and by using appropriate technology.

e. Understand and use basic exponential functions as models of real phenomena.

f. Understand and recognize geometric sequences as exponential functions with domains that are sets of whole numbers.

g. Interpret the constant ratio in a geometric sequence as the base of the associated exponential function.

MA2A2. Students will explore inverses of functions.

a. Discuss the characteristics of functions and their inverses, including one-to-oneness, domain, and range.

b. Determine inverses of linear, quadratic, and power functions and functions of the form $f(x) = \frac{a}{x}$, including the use of restricted domains.

c. Explore the graphs of functions and their inverses.

d. Use composition to verify that functions are inverses of each other.

MA2A3. Students will analyze graphs of polynomial functions of higher degree.

a. Graph simple polynomial functions as translations of the function $f(x) = ax^n$.

b. Understand the effects of the following on the graph of a polynomial function: degree, lead coefficient, and multiplicity of real zeros.

c. Determine whether a polynomial function has symmetry and whether it is even, odd, or neither.

d. Investigate and explain characteristics of polynomial functions, including domain and range, intercepts, zeros, relative and absolute extrema, intervals of increase and decrease, and end behavior.

MA2A4. Students will explore logarithmic functions as inverses of exponential functions.

a. Define and understand the properties of nth roots.

b. Extend properties of exponents to include rational exponents.

c. Define logarithmic functions as inverses of exponential functions.

d. Understand and use properties of logarithms by extending laws of exponents.

e. Investigate and explain characteristics of exponential and logarithmic functions including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, and rate of change.

f. Graph functions as transformations of $f(x) = a^x$, $f(x) = \log_a x$, $f(x) = e^x$, $f(x) = \ln x$.

g. Explore real phenomena related to exponential and logarithmic functions including half-life and doubling time.

MA2A5. Students will solve a variety of equations and inequalities.

a. Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates.

b. Solve polynomial, exponential, and logarithmic equations analytically, graphically, and using appropriate technology.

c. Solve polynomial, exponential, and logarithmic inequalities analytically, graphically, and using appropriate technology. Represent solution sets of inequalities using interval notation.

d. Solve a variety of types of equations by appropriate means choosing among mental calculation, pencil and paper, or appropriate technology.

MA2A6. Students will perform basic operations with matrices.

a. Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.

b. Find the inverses of two-by-two matrices using pencil and paper, and find inverses of larger matrices using technology.

c. Examine the properties of matrices, contrasting them with properties of real numbers.

MA2A7. Students will use matrices to formulate and solve problems.

a. Represent a system of linear equations as a matrix equation.

b. Solve matrix equations using inverse matrices.

c. Represent and solve realistic problems using systems of linear equations.

MA2A8. Students will solve linear programming problems in two variables.

a. Solve systems of inequalities in two variables, showing the solutions graphically.

b. Represent and solve realistic problems using linear programming.

MA2A9. Students will understand and apply matrix representations of vertex-edge graphs.

a. Use graphs to represent realistic situations.

b. Use matrices to represent graphs, and solve problems that can be represented by graphs.

GEOMETRY

Students will explore right triangles and right triangular trigonometry. They will understand and apply properties of conic sections, planes, and spheres.

MA2G1. Students will identify and use special right triangles.

a. Determine the lengths of sides of 30°-60°-90° triangles.

b. Determine the lengths of sides of 45°-45°-90° triangles.

MA2G2. Students will define and apply sine, cosine, and tangent ratios to right triangles.

a. Discover the relationship of the trigonometric ratios for similar triangles.

b. Explain the relationship between the trigonometric ratios of complementary angles.

c. Solve application problems using the trigonometric ratios.

MA2G3. Students will investigate the relationships between lines and circles.

a. Find equations of circles.

b. Graph a circle given an equation in general form.

c. Find the equation of a tangent line to a circle at a given point.

d. Solve a system of equations involving a circle and a line.

e. Solve a system of equations involving two circles.

MA2G4. Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas).

a. Convert equations of conics by completing the square.

b. Graph conic sections, identifying fundamental characteristics.

c. Write equations of conic sections given appropriate information.

MA2G5. Students will investigate planes and spheres.

a. Plot the point (x, y, z) and understand it as a vertex of a rectangular prism.

b. Apply the distance formula in 3-space.

c. Recognize and understand equations of planes and spheres.

DATA ANALYSIS AND PROBABILITY

Students will make informal inferences about means and standard deviations. Students will use a normal distribution to calculate probabilities. Students will organize, represent, investigate, interpret, and make inferences from both observational studies and experiments.

MA2D1. Using sample data, students will make informal inferences about population means and standard deviations.

a. Pose a question and collect sample data from at least two different populations.

b. Understand and calculate the means and standard deviations of sets of data.

c. Use means and standard deviations to compare data sets.

d. Compare the means and standard deviations of random samples with the corresponding population parameters. Observe that the different sample means vary from one sample to the next. Observe that the distribution of the sample means has less variability than the population distribution.

MA2D2. Students will create probability histograms of discrete random variables, using both experimental and theoretical probabilities.

MA2D3. Students will solve problems involving probabilities by interpreting a normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution).

a. Determine intervals about the mean that include a given percent of data.

b. Determine the probability that a given value falls within a specified interval.

c. Estimate how many items in a population fall within a specified interval.

MA2D4. Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

MA2P1. Students will solve problems (using appropriate technology).

a. Build new mathematical knowledge through problem solving.

b. Solve problems that arise in mathematics and in other contexts.

c. Apply and adapt a variety of appropriate strategies to solve problems.

d. Monitor and reflect on the process of mathematical problem solving.

MA2P2. Students will reason and evaluate mathematical arguments.

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a. Recognize reasoning and proof as fundamental aspects of mathematics.

b. Make and investigate mathematical conjectures.

c. Develop and evaluate mathematical arguments and proofs.

d. Select and use various types of reasoning and methods of proof.

MA2P3. Students will communicate mathematically.

a. Organize and consolidate their mathematical thinking through communication.

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

c. Analyze and evaluate the mathematical thinking and strategies of others.

d. Use the language of mathematics to express mathematical ideas precisely.

MA2P4. Students will make connections among mathematical ideas and to other disciplines.

a. Recognize and use connections among mathematical ideas.

b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

c. Recognize and apply mathematics in contexts outside of mathematics.

MA2P5. Students will represent mathematics in multiple ways.

a. Create and use representations to organize, record, and communicate mathematical ideas.

b. Select, apply, and translate among mathematical representations to solve problems.

c. Use representations to model and interpret physical, social, and mathematical phenomena.

MATH READING CONTENT

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
   • Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
   • Read both informational and fictional texts in a variety of genres and modes of discourse
   • Read technical texts related to various subject areas

b. Discussing books
   • Discuss messages and themes from books in all subject areas.
   • Respond to a variety of texts in multiple modes of discourse.
   • Relate messages and themes from one subject area to messages and themes in another area.
   • Evaluate the merit of texts in every subject discipline.
   • Examine author's purpose in writing.
   • Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
   • Demonstrate an understanding of contextual vocabulary in various subjects.
   • Use content vocabulary in writing and speaking.
   • Explore understanding of new words found in subject area texts.

d. Establishing context
   • Explore life experiences related to subject area content.
   • Discuss in both writing and speaking how certain words are subject area related.
   • Determine strategies for finding content and contextual meaning for unknown words.

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ALGEBRA

Students will explore characteristics of various functions, understand and use concepts of trigonometric functions, investigate and apply sequences and series, and use parametric and polar equations to represent functions and curves.

MA3A1. Students will explore rational functions.

a. Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior.

b. Find inverses of rational functions, discussing domain and range, symmetry, and function composition.

c. Solve rational equations and inequalities analytically, graphically, and by using appropriate technology.

MA3A2. Students will use the circle to define the trigonometric functions.

a. Define and understand angles measured in degrees and radians, including but not limited to 0°, 30°, 45°, 60°, 90°, their multiples, and equivalences.

b. Understand and apply the six trigonometric functions as functions of general angles in standard position.

c. Find values of trigonometric functions using points on the terminal sides of angles in the standard position.

d. Understand and apply the six trigonometric functions as functions of arc length on the unit circle.

e. Find values of trigonometric functions using the unit circle.

MA3A3. Students will investigate and use the graphs of the six trigonometric functions.

a. Understand and apply the six basic trigonometric functions as functions of real numbers.

b. Determine the characteristics of the graphs of the six basic trigonometric functions.

c. Graph transformations of trigonometric functions including changing period, amplitude, phase shift, and vertical shift.

d. Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena.

MA3A4. Students will investigate functions.

a. Compare and contrast properties of functions within and across the following types: linear, quadratic, polynomial, power, rational, exponential, logarithmic, trigonometric, and piecewise.

b. Investigate transformations of functions.

c. Investigate characteristics of functions built through sum, difference, product, quotient, and composition.

MA3A5. Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements.

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\sec\theta = \frac{1}{\cos\theta}$$

$$\csc\theta = \frac{1}{\sin\theta}$$

$$\sin^2\theta + \cos^2\theta = 1$$

$$\cot^2\theta + 1 = \csc^2\theta$$

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$$

$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \pm \sin\alpha\sin\beta$$

$$\sin(2\theta) = 2\sin\theta\cos\theta$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

MA3A6. Students will solve trigonometric equations both graphically and algebraically.

a. Solve trigonometric equations over a variety of domains, using technology as appropriate.

b. Use the coordinates of a point on the terminal side of an angle to express x as $r\cos\theta$ and y as $r\sin\theta$.

d. Apply the law of sines and the law of cosines.

MA3A7. Students will verify and apply $\frac{1}{2}ab\sin C$ to find the area of a triangle.

MA3A8. Students will investigate and use inverse sine, inverse cosine, and inverse tangent functions.

a. Find values of the above functions using technology as appropriate.

b. Determine characteristics of the above functions and their graphs.

MA3A9. Students will use sequences and series

a. Use and find recursive and explicit formulae for the terms of sequences.

b. Recognize and use simple arithmetic and geometric sequences.

c. Investigate limits of sequences.

d. Use mathematical induction to find and prove formulae for sums of finite series.

e. Find and apply the sums of finite and, where appropriate, infinite arithmetic and geometric series.

f. Use summation notation to explore series.

g. Determine geometric series and their limits.

MA3A10. Students will understand and use vectors.

a. Represent vectors algebraically and geometrically.

b. Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.

c. Add and subtract vectors and compute scalar multiples of vectors.

d. Use vectors to solve realistic problems.

MA3A11. Students will use complex numbers in trigonometric form.

a. Represent complex numbers in trigonometric form.

b. Find products, quotients, powers, and roots of complex numbers in trigonometric form.

MA3A12. Students will explore parametric representations of plane curves.

a. Convert between Cartesian and parametric form.

b. Graph equations in parametric form showing direction and beginning and ending points where appropriate.

MA3A13. Students will explore polar equations.

a. Express coordinates of points in rectangular and polar form.

b. Graph and identify characteristics of simple polar equations including lines, circles, cardioids, limaçons, and roses.

DATA ANALYSIS AND PROBABILITY

Students will organize, represent, investigate, interpret, and make inferences from data, using the central limit theorem and the standard normal distribution. Students will apply the Central Limit Theorem to calculate confidence intervals for a population mean using data from large samples. Students will use sample data and confidence intervals to draw conclusions about populations.

MA3D1. Using simulation, students will develop the idea of the central limit theorem.

MA3D2. Using student-generated data from random samples of at least 30 members, students will determine the margin of error and confidence interval for a specified level of confidence.

MA3D3. Students will use confidence intervals and margins of error to make inferences from data about a population. Technology is used to evaluate confidence intervals, but students will be aware of the ideas involved.

PROCESS STANDARDS

The following process standards are essential to mastering each of the mathematics content standards. They emphasize critical dimensions of the mathematical proficiency that all students need.

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c. Apply and adapt a variety of appropriate strategies to solve problems.

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MA3P2. Students will reason and evaluate mathematical arguments.

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d. Select and use various types of reasoning and methods of proof.

MA3P3. Students will communicate mathematically.

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MA3P4. Students will make connections among mathematical ideas and to other disciplines.

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Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas

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- Read technical texts related to various subject areas

b. Discussing books

- Discuss messages and themes from books in all subject areas.

- Respond to a variety of texts in multiple modes of discourse.

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- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context
- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

GEORGIA Grade 8 Science
Performance Standards

HABITS OF MIND

S8CS1. Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

   a. Understand the importance of—and keep—honest, clear, and accurate records in science.

   b. Understand that hypotheses can be valuable even if they turn out not to be completely accurate.

S8CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

   a. ==Follow correct procedures for use of scientific apparatus.==

   b. ==Demonstrate appropriate techniques in all laboratory situations.==

   c. Follow correct protocol for identifying and reporting safety problems and violations.

S8CS3. ==Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.==

   a. ==Analyze scientific data by using, interpreting, and comparing numbers in several equivalent forms, such as integers, fractions, decimals, and percents.==

   b. ==Find the mean,== median, and mode ==and use== them ==to analyze a set of scientific data.==

   c. ==Apply the metric system to scientific investigations that include metric to metric conversions (i.e., centimeters to meters).==

   d. Decide what degree of precision is adequate, and round off appropriately.

   e. Address the relationship between accuracy and precision.

   f. ==Use ratios and proportions, including constant rates, in appropriate problems.==

S8CS4. ==Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities== utilizing safe laboratory procedures.

   a. Use appropriate technology to store and retrieve scientific information in topical, alphabetical, numerical, and keyword files, and create simple files.

   b. ==Use appropriate tools and units for measuring objects and/or substances.==

   c. Learn and use standard safety practices when conducting scientific investigations.

S8CS5. Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

   a. Observe and explain how parts can be related to other parts in a system such as the role of simple machines in complex machines.

   b. Understand that different models (such as physical replicas, pictures, and analogies) can be used to represent the same thing.

S8CS6. Students will communicate scientific ideas and activities clearly.

   a. ==Write clear, step-by-step instructions for conducting scientific investigations, operating a piece of equipment, or following a procedure.==

   b. Write for scientific purposes incorporating information from a circle, bar, or line graph, data tables, diagrams, and symbols.

   c. ==Organize scientific information in appropriate tables, charts, and graphs, and identify relationships they reveal.==

S8CS7. Students will question scientific claims and arguments effectively.

   a. Question claims based on vague attributions (such as "Leading doctors say...") or on statements made by people outside the area of their particular expertise.

   b. ==Identify the flaws of reasoning in arguments that are based on poorly designed research (e.g., facts intermingled with opinion, conclusions based on insufficient evidence).==

   c. Question the value of arguments based on small samples of data, biased samples, or samples for which there was no control.

   d. Recognize that there may be more than one way to interpret a given set of findings.

THE NATURE OF SCIENCE

S8CS8. Students will be familiar with the characteristics of scientific knowledge and how it is achieved. Students will apply the following to scientific concepts:

   a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.

   b. When new experimental results are inconsistent with an existing, well-established theory, scientists may pursue further experimentation to determine whether the results are flawed or the theory requires modification.

   c. As prevailing theories are challenged by new information, scientific knowledge may change.

S8CS9. ==Students will understand the features of the process of scientific inquiry.== Students will apply the following to inquiry learning practices:

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a. <mark>Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing different theories.</mark>

b. <mark>Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.</mark>

c. <mark>Scientific experiments investigate the effect of one variable on another. All other variables are kept constant.</mark>

d. Scientists often collaborate to design research. To prevent this bias, scientists conduct independent studies of the same questions.

e. Accurate record keeping, data sharing, and replication of results are essential for maintaining an investigator's credibility with other scientists and society.

f. <mark>Scientists use technology and mathematics to enhance the process of scientific inquiry.</mark>

g. The ethics of science require that special care must be taken and used for human subjects and animals in scientific research. Scientists must adhere to the appropriate rules and guidelines when conducting research.

S8CS10. Students will enhance reading in all curriculum areas by:

a. Reading in All Curriculum Areas
   • Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
   • Read both informational and fictional texts in a variety of genres and modes of discourse.
   • <mark>Read technical texts related to various subject areas.</mark>

b. Discussing books
   • Discuss messages and themes from books in all subject areas.
   • Respond to a variety of texts in multiple modes of discourse.
   • Relate messages and themes from one subject area to messages and themes in another area.
   • Evaluate the merit of texts in every subject discipline.
   • Examine author's purpose in writing.
   • Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
   • <mark>Demonstrate an understanding of contextual vocabulary in various subjects.</mark>
   • Use content vocabulary in writing and speaking.
   • <mark>Explore understanding of new words found in subject area texts.</mark>

d. Establishing context

• Explore life experiences related to subject area content.
• Discuss in both writing and speaking how certain words are subject area related.
• <mark>Determine strategies for finding content and contextual meaning for unknown words.</mark>

CO-REQUISITE – CONTENT

S8P1. Students will examine the scientific view of the nature of matter.

a. Distinguish between atoms and molecules.

b. Describe the difference between pure substances (elements and compounds) and mixtures.

c. Describe the movement of particles in solids, liquids, gases, and plasmas states.

d. Distinguish between physical and chemical properties of matter as physical (i.e., density, melting point, boiling point) or chemical (i.e., reactivity, combustibility).

e. Distinguish between changes in matter as physical (i.e., physical change) or chemical (development of a gas, formation of precipitate, and change in color).

f. Recognize that there are more than 100 elements and some have similar properties as shown on the Periodic Table of Elements.

g. Identify and demonstrate the Law of Conservation of Matter.

S8P2. Students will be familiar with the forms and transformations of energy.

a. Explain energy transformation in terms of the Law of Conservation of Energy.

b. Explain the relationship between potential and kinetic energy.

c. Compare and contrast the different forms of energy (heat, light, electricity, mechanical motion, sound) and their characteristics.

d. Describe how heat can be transferred through matter by the collisions of atoms (conduction) or through space (radiation). In a liquid or gas, currents will facilitate the transfer of heat (convection).

S8P3. Students will investigate relationship between force, mass, and the motion of objects.

a. Determine the relationship between velocity and acceleration.

b. Demonstrate the effect of balanced and unbalanced forces on an object in terms of gravity, inertia, and friction.

c. Demonstrate the effect of simple machines (lever, inclined plane, pulley, wedge, screw, and wheel and axle) on work.

S8P4. Students will explore the wave nature of sound and electromagnetic radiation.

a. Identify the characteristics of electromagnetic and mechanical waves.

<mark>▢</mark> = Measured by EXPLORE Science Test
___ = Content sampled by EXPLORE Science Test

b. Describe how the behavior of light waves is manipulated causing reflection, refraction diffraction, and absorption.

c. Explain how the human eye sees objects and colors in terms of wavelengths.

d. Describe how the behavior of waves is affected by medium (such as air, water, solids).

e. Relate the properties of sound to everyday experiences.

f. Diagram the parts of the wave and explain how the parts are affected by changes in amplitude and pitch.

S8P5. Students will recognize characteristics of gravity, electricity, and magnetism as major kinds of forces acting in nature.

a. Recognize that every object exerts gravitational force on every other object and that the force exerted depends on how much mass the objects have and how far apart they are.

b. Demonstrate the advantages and disadvantages of series and parallel circuits and how they transfer energy.

c. Investigate and explain that electric currents and magnets can exert force on each other.

HABITS OF MIND

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

a. Exhibit the above traits in their own scientific activities.

b. Recognize that different explanations often can be given for the same evidence.

c. Explain that further understanding of scientific problems relies on the design and execution of new experiments which may reinforce or weaken opposing explanations.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

a. Follow correct procedures for use of scientific apparatus.

b. Demonstrate appropriate technique in all laboratory situations.

c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSh3. Students will identify and investigate problems scientifically.

a. Suggest reasonable hypotheses for identified problems.

b. Develop procedures for solving scientific problems.

c. Collect, organize and record appropriate data.

d. Graphically compare and analyze data points and/or summary statistics.

e. Develop reasonable conclusions based on data collected.

f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

a. Develop and use systematic procedures for recording and organizing information.

b. Use technology to produce tables and graphs.

c. Use technology to develop, test, and revise experimental or mathematical models.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

a. Trace the source on any large disparity between estimated and calculated answers to problems.

b. Consider possible effects of measurement errors on calculations.

c. Recognize the relationship between accuracy and precision.

d. Express appropriate numbers of significant figures for calculated data, using scientific notation where appropriate.

e. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.

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b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data.

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SCSh7. Students analyze how scientific knowledge is developed. Students recognize that:

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b. Universal principles are discovered through observation and experimental verification.

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- Explore life experiences related to subject area content.
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CO-REQUISITE – CONTENT

SB1. Students will analyze the nature of the relationships between structures and functions in living cells.

a. Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction.

b. Explain how enzymes function as catalysts.

c. Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids).

d. Explain the impact of water on life processes (i.e., osmosis, diffusion).

SB2. Students will analyze how biological traits are passed on to successive generations.

a. Distinguish between DNA and RNA.

b. Explain the role of DNA in storing and transmitting cellular information.

c. Using Mendel's laws, explain the role of meiosis in reproductive variability.

d. Describe the relationships between changes in DNA and potential appearance of new traits including
    • Alterations during replication.
    • Insertions
    • Deletions
    • Substitutions
    • Mutagenic factors that can alter DNA.
    • High energy radiation (x-rays and ultraviolet)
    • Chemical

e. Compare the advantages of sexual reproduction and asexual reproduction in different situations.

f. Examine the use of DNA technology in forensics, medicine, and agriculture.

SB3. Students will derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

a. Explain the cycling of energy through the processes of photosynthesis and respiration.

b. Compare how structures and function vary between the six kingdoms (archaebacteria, eubacteria, protists, fungi, plants, and animals).

c. Examine the evolutionary basis of modern classification systems.

d. Compare and contrast viruses with living organisms.

SB4. Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

a. Investigate the relationships among organisms, populations, communities, ecosystems, and biomes.

b. Explain the flow of matter and energy through ecosystems by

- Arranging components of a food chain according to energy flow.
- Comparing the quantity of energy in the steps of an energy pyramid.
- Explaining the need for cycling of major nutrients (C, O, H, N, P).

c. Relate environmental conditions to successional changes in ecosystems.

d. Assess and explain human activities that influence and modify the environment such as global warming, population growth, pesticide use, and water and power consumption.

e. Relate plant adaptations, including tropisms, to the ability to survive stressful environmental conditions.

f. Relate animal adaptations, including behaviors, to the ability to survive stressful environmental conditions.

SB5. Students will evaluate the role of natural selection in the development of the theory of evolution.

a. Trace the history of the theory.

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b. Explain the history of life in terms of biodiversity, ancestry, and the rates of evolution.

c. Explain how fossil and biochemical evidence support the theory.

d. Relate natural selection to changes in organisms.

e. Recognize the role of evolution to biological resistance (pesticide and antibiotic resistance).

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CO-REQUISITE – CONTENT

SEV1. Students will investigate the flow of energy and cycling of matter within an ecosystem and relate these phenomena to human society.

a. Interpret biogeochemical cycles including hydrologic, nitrogen, phosphorus, oxygen, and carbon cycles. Recognize that energy is not recycled in ecosystems.

b. Relate energy changes to food chains, food webs, and to trophic levels in a generalized ecosystem, recognizing that entropy is a primary factor in the loss of usable food energy during movement up the trophic levels.

c. Relate food production and quality of nutrition to population growth and the trophic levels

d. Relate the cycling of matter and the flow of energy to the Laws of Conservation of matter and energy. Identify the role and importance of decomposers in the recycling process.

e. Distinguish between abiotic and biotic factors in an ecosystem and describe how matter and energy move between these.

SEV2. Students will demonstrate an understanding that the Earth is one interconnected system.

a. Describe how the abiotic components (water, air, and energy) affect the biosphere.

b. Recognize and give examples of the hierarchy of the biological entities of the biosphere (organisms, populations, communities, ecosystems, and biosphere).

c. Characterize the components that define a Biome.

- Abiotic Factors – to include precipitation, temperature and soils.

- Biotic Factors – plant and animal adaptations that create success in that biome.

d. Characterize the components that define fresh-water and marine systems.

- Abiotic Factors – to include light, dissolved oxygen, phosphorus, nitrogen, pH and substrate.

- Biotic Factors – plant and animal adaptations characteristic to that system.

SEV3. Students will describe stability and change in ecosystems.

a. Describe interconnections between abiotic and biotic factors, including normal cyclic fluctuations and changes associated with climatic change (i.e. ice ages).

b. Explain succession in terms of changes in communities through time to include changes in biomass, diversity, and complexity.

c. Explain how succession may be altered by traumatic events.

d. Explain how biotic and abiotic factors influence populations.

e. Describe interactions between individuals (i.e. mutualism, commensalisms, parasitism, predation, and competition).

SEV4. Students will understand and describe availability, allocation and conservation of energy and other resources

a. Differentiate between renewable and nonrenewable resources including how different resources are produced, rates of use, renewal rates, and limitations of sources. Distinguish between natural and produced resources.

b. Describe how technology is increasing the efficiency of utilization and accessibility of resources.

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c. Describe how energy and other resource utilization impact the environment and recognize that individuals as well as larger entities (businesses, governments, etc.) have impact on energy efficiency.

d. Describe the relationship of energy consumption and the living standards of societies.

e. Describe the commonly used fuels (e.g. fossil fuels, nuclear fuels, etc.) and some alternative fuels (e.g. wind, solar, ethanol, etc.) including the required technology, availability, pollution problems and implementation problems. Recognize the origin of fossil fuels and the problems associated with our dependence on this energy source.

f. Describe the need for informed decision making of resource utilization. (i.e. energy and water usage allocation, conservation, food and land, and long-term depletion)

SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

a. Describe factors affecting population growth of all organisms, including humans. Relate these to factors affecting growth rates and carrying capacity of the environment.

b. Describe the effects of population growth, demographic transitions, cultural differences, emergent diseases, etc. on societal stability.

c. Explain how human activities affect global and local sustainability.

d. Describe the actual and potential effects of habitat destruction, erosion, and depletion of soil fertility associated with human activities.

e. Describe the effects and potential implications of pollution and resource depletion on the environment at the local and global levels (e.g. air and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses).

f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

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CO-REQUISITE – CONTENT

SPS1. Students will investigate our current understanding of the atom.

a. Examine the structure of the atom in terms of

- proton, electron, and neutron locations.
- atomic mass and atomic number.
- atoms with different numbers of neutrons (isotopes).
- explain the relationship of the proton number to the element's identity.

b. Compare and contrast ionic and covalent bonds in terms of electron movement.

SPS2. Students will explore the nature of matter, its classifications, and its system for naming types of matter.

a. Calculate density when given a means to determine a substance's mass and volume.

b. Predict formulas for stable binary ionic compounds based on balance of charges.

c. Use IUPAC nomenclature for transition between chemical names and chemical formulas of

- binary ionic compounds (containing representative elements)
- binary covalent compounds (i.e. carbon dioxide, carbon tetrachloride).

d. Demonstrate the Law of Conservation of Matter in a chemical reaction.

e. Apply the Law of Conservation of Matter by balancing the following types of chemical equations:

- Synthesis
- Decomposition
- Single Replacement
- Double Replacement

SPS3. Students will distinguish the characteristics and components of radioactivity.

a. Differentiate among alpha and beta particles and gamma radiation.

b. Differentiate between fission and fusion.

c. Explain the process half-life as related to radioactive decay.

d. Describe nuclear energy, its practical application as an alternative energy source, and its potential problems.

SPS4. ==Students will investigate the arrangement of the Periodic Table.==

a. ==Determine the trends of the following:==

- ==Number of valence electrons==
- ==Types of ions formed by representative elements==
- ==Location of metals, nonmetals, and metalloids==
- ==Phases at room temperature==

b. ==Use the Periodic Table to predict the above properties for representative elements.==

SPS5. Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

a. Compare and contrast the atomic/molecular motion of solids, liquids, gases and plasmas.

b. Relate temperature, pressure, and volume of gases to the behavior of gases.

SPS6. Students will investigate the properties of solutions.

a. Describe solutions in terms of

- solute/solvent
- conductivity
- concentration

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b. Observe factors affecting the rate a solute dissolves in a specific solvent.

c. Demonstrate that solubility is related to temperature by constructing a solubility curve.

d. Compare and contrast the components and properties of acids and bases.

e. Determine whether common household substances are acidic, basic, or neutral.

SPS7. Students will relate transformations and flow of energy within a system.

a. Identify energy transformations within a system (e.g. lighting of a match).

b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

c. Determine the heat capacity of a substance using mass, specific heat, and temperature.

d. Explain the flow of energy in phase changes through the use of a phase diagram.

SPS8. Students will determine relationships among force, mass, and motion.

a. Calculate velocity and acceleration.

b. Apply Newton's three laws to everyday situations by explaining the following:
   - Inertia
   - Relationship between force, mass and acceleration
   - Equal and opposite forces

c. Relate falling objects to gravitational force

d. Explain the difference in mass and weight.

e. Calculate amounts of work and mechanical advantage using simple machines.

SPS9. Students will investigate the properties of waves.

a. Recognize that all waves transfer energy.

b. Relate frequency and wavelength to the energy of different types of electromagnetic waves and mechanical waves.

c. Compare and contrast the characteristics of electromagnetic and mechanical (sound) waves.

d. Investigate the phenomena of reflection, refraction, interference, and diffraction.

e. Relate the speed of sound to different mediums.

f. Explain the Doppler Effect in terms of everyday interactions.

SPS10. Students will investigate the properties of electricity and magnetism.

a. Investigate static electricity in terms of
   - friction
   - induction
   - conduction

b. Explain the flow of electrons in terms of
   - alternating and direct current.
   - the relationship among voltage, resistance and current.
   - simple series and parallel circuits.

c. Investigate applications of magnetism and/or its relationship to the movement of electrical charge as it relates to
   - electromagnets
   - simple motors
   - permanent magnets

GEORGIA Earth Systems
Performance Standards

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CO-REQUISITE – CONTENT

SES1. Students will investigate the composition and formation of Earth systems, including the Earth's relationship to the solar system.

a. Describe the early evolution of the Earth and solar system, including the formation of Earth's solid layers (core, mantle, crust), the distribution of major elements, the origin of internal heat sources, and the mechanism by which heat transfer drives plate tectonics.

b. Explain how the composition of the Earth's crust, mantle and core is determined and compare it to that of other solar system objects.

c. Describe how the decay of radioactive isotopes is used to determine the age of rocks, Earth, and solar system.

d. Describe how the Earth acquired its initial oceans and atmosphere.

e. Identify the transformations and major reservoirs that make up the rock cycle, hydrologic cycle, carbon cycle, and other important geochemical cycles.

SES2. Students will understand how plate tectonics creates certain geologic features, materials, and hazards.

a. Distinguish among types of plate tectonic settings produced by plates diverging, converging, and sliding past each other.

b. Relate modern and ancient geologic features to each kind of plate tectonic setting.

c. Relate certain geologic hazards to specific plate tectonic settings.

d. Associate specific plate tectonic settings with the production of particular groups of igneous and metamorphic rocks and mineral resources.

e. Explain how plate tectonics creates and destroys sedimentary basins through time.

SES3. Students will explore the actions of water, wind, ice, and gravity that create landforms and systems of landforms (landscapes).

a. Describe how surface water and groundwater act as the major agents of physical and chemical weathering.

b. Explain how soil results from weathering and biological processes acting on parent rock.

c. Describe the processes and hazards associated with both sudden and gradual mass wasting.

d. Relate the past and present actions of ice, wind, and water to landform distribution and landscape evolution.

e. Explain the processes that transport and deposit material in terrestrial and marine sedimentary basins, which result, over time, in sedimentary rock.

SES4. Students will understand how rock relationships and fossils are used to reconstruct the Earth's past.

a. Describe and apply principles of relative age (superposition, original horizontality, cross-cutting relations, and original lateral continuity) and describe how unconformities form.

b. Interpret the geologic history of a succession of rocks and unconformities.

c. Apply the principle of uniformitarianism to relate sedimentary rock associations and their fossils to the environments in which the rocks were deposited.

d. Explain how sedimentary rock units are correlated within and across regions by a variety of methods (e.g., geologic map relationships, the principle of fossil succession, radiometric dating, and paleomagnetism).

e. Use geologic maps and stratigraphic relationships to interpret major events in Earth history (e.g., mass extinction, major climatic change, tectonic events).

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SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.

a. Explain how latitudinal variations in solar heating create atmospheric and ocean currents that redistribute heat globally.

b. Explain the relationship between air masses and the surfaces over which they form.

c. Relate weather patterns to interactions among ocean currents, air masses, and topography.

d. Describe how temperature and precipitation produce the pattern of climate regions (classes) on Earth.

e. Describe the hazards associated with extreme weather events and climate change (e.g., hurricanes, tornadoes, El Niño/La Niña, global warming).

f. Relate changes in global climate to variation in Earth/Sun relationships and to natural and anthropogenic modification of atmospheric composition.

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

a. Relate the nature and distribution of life on Earth, including humans, to the chemistry and availability of water.

b. Relate the distribution of biomes (terrestrial, freshwater, and marine) to climate regions through time.

c. Explain how geological and ecological processes interact through time to cycle matter and energy, and how human activity alters the rates of these processes (e.g., fossil fuel formation and combustion).

d. Describe how fossils provide a record of shared ancestry, evolution, and extinction that is best explained by the mechanism of natural selection.

e. Identify the evolutionary innovations that most profoundly shaped Earth systems: photosynthetic prokaryotes and the atmosphere; multicellular animals and marine environments; land plants and terrestrial environments.

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b. Recognize that different explanations often can be given for the same evidence.

c. Explain that further understanding of scientific problems relies on the design and execution of new experiments which may reinforce or weaken opposing explanations.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

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b. Demonstrate appropriate techniques in all laboratory situations.

c. Follow correct protocol for identifying and reporting safety problems and violations.

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a. Suggest reasonable hypotheses for identified problems.

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c. Collect, organize and record appropriate data.

d. Graphically compare and analyze data points and/or summary statistics.

e. Develop reasonable conclusions based on data collected.

f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

a. Develop and use systematic procedures for recording and organizing information.

b. Use technology to produce tables and graphs.

c. Use technology to develop, test, and revise experimental or mathematical models.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

a. Trace the source on any large disparity between estimated and calculated answers to problems.

b. Consider possible effects of measurement errors on calculations.

c. Recognize the relationship between accuracy and precision.

d. Express appropriate numbers of significant figures for calculated data, using scientific notation where appropriate.

e. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.

SCSh6. Students will communicate scientific investigations and information clearly.

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b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data

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THE NATURE OF SCIENCE

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c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.

d. Hypotheses often cause scientists to develop new experiments that produce additional data.

e. Testing, revising, and occasionally rejecting new and old theories never ends.

SCSh8. Students will understand important features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

a. Scientific investigators control the conditions of their experiments in order to produce valuable data.

b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in their investigations' hypotheses, observations, data analyses, and interpretations.

c. Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.

d. The merit of a new theory is judged by how well scientific data are explained by the new theory.

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e. The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.

f. Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.

SCSh9. Students will enhance reading in all curriculum areas by:

a. Reading in All Curriculum Areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas

- Read both informational and fictional texts in a variety of genres and modes of discourse

- <mark>Read technical texts related to various subject areas</mark>

b. Discussing books

- Discuss messages and themes from books in all subject areas.

- Respond to a variety of texts in multiple modes of discourse.

- Relate messages and themes from one subject area to messages and themes in another area.

- Evaluate the merit of texts in every subject discipline.

- Examine author's purpose in writing.

- Recognize the features of disciplinary texts.

c. Building vocabulary knowledge

- <mark>Demonstrate an understanding of contextual vocabulary in various subjects.</mark>

- Use content vocabulary in writing and speaking.

- <mark>Explore understanding of new words found in subject area texts.</mark>

d. Establishing context

- Explore life experiences related to subject area content.

- Discuss in both writing and speaking how certain words are subject area related.

- <mark>Determine strategies for finding content and contextual meaning for unknown words.</mark>

CO-REQUISITE - CONTENT

SC1. Students will analyze the nature of matter and its classifications.

a. Relate the role of nuclear fusion in producing essentially all elements heavier than helium.

b. Identify substances based on chemical and physical properties.

c. Predict formulas for stable ionic compounds (binary and tertiary) based on balance of charges.

d. Use IUPAC nomenclature for both chemical names and formulas:

- Ionic compounds (Binary and tertiary)
- Covalent compounds (Binary and tertiary)
- Acidic compounds (Binary and tertiary)

SC2. Students will relate how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.

a. Identify and balance the following types of chemical equations:

- Synthesis
- Decomposition
- Single Replacement
- Double Replacement
- Combustion

b. Experimentally determine indicators of a chemical reaction specifically precipitation, gas evolution, water production, and changes in energy to the system.

c. Apply concepts of the mole and Avogadro's number to conceptualize and calculate

- Empirical/molecular formulas,
- Mass, moles and molecules relationships,
- Molar volumes of gases.

d. Identify and solve different types of stoichiometry problems, specifically relating mass to moles and mass to mass.

e. Demonstrate the conceptual principle of limiting reactants.

f. Explain the role of equilibrium in chemical reactions.

SC3. Students will use the modern atomic theory to explain the characteristics of atoms.

a. Discriminate between the relative size, charge, and position of protons, neutrons, and electrons in the atom.

b. Use the orbital configuration of neutral atoms to explain its effect on the atom's chemical properties.

c. Explain the relationship of the proton number to the element's identity.

d. Explain the relationship of isotopes to the relative abundance of atoms of a particular element.

e. Compare and contrast types of chemical bonds (i.e. ionic, covalent).

f. Relate light emission and the movement of electrons to element identification.

SC4. <mark>Students will use the organization of the Periodic Table to predict properties of elements.</mark>

a. <mark>Use the Periodic Table to predict periodic trends</mark> including atomic radii, ionic radii, ionization energy, and electronegativity of various elements.

b. <mark>Compare and contrast trends</mark> in the chemical and physical properties of elements and their placement <mark>on the Periodic Table.</mark>

SC5. Students will understand that the rate at which a chemical reaction occurs can be affected by changing

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concentration, temperature, or pressure and the addition of a catalyst.

a. Demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.

b. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

c. Explain the role of activation energy and degree of randomness in chemical reactions.

SC6. Students will understand the effects motion of atoms and molecules in chemical and physical processes.

a. Compare and contrast atomic/molecular motion in solids, liquids, gases, and plasmas.

b. Collect data and calculate the amount of heat given off or taken in by chemical or physical processes.

c. Analyzing (both conceptually and quantitatively) flow of energy during change of state (phase).

SC7. Students will characterize the properties that describe solutions and the nature of acids and bases.

a. Explain the process of dissolving in terms of solute/solvent interactions:

- Observe factors that effect the rate at which a solute dissolves in a specific solvent,
- Express concentrations as molarities,
- Prepare and properly label solutions of specified molar concentration,
- Relate molality to colligative properties.

b. Compare, contrast, and evaluate the nature of acids and bases:

- Arrhenius, Bronsted-Lowry Acid/Bases
- Strong vs. weak acids/bases in terms of percent dissociation
- Hydronium ion concentration
- pH
- Acid-Base neutralization

GEORGIA Human Anatomy and Physiology
Performance Standards

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SCSh8. Students will understand important features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

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   • Discuss messages and themes from books in all subject areas.
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   • Relate messages and themes from one subject area to messages and themes in another area.
   • Evaluate the merit of texts in every subject discipline.
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   • Demonstrate an understanding of contextual vocabulary in various subjects.
   • Use content vocabulary in writing and speaking.
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   • Explore life experiences related to subject area content.
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CO-REQUISITE – CONTENT

SAP1. Students will analyze anatomical structures in relationship to their physiological functions.

a. Apply correct terminology when explaining the orientation of body parts and regions.

b. Investigate the interdependence of the various body systems to each other and to the body as a whole.

c. Explain the role of homeostasis and its mechanisms as these relate to the body as a whole and predict the consequences of the failure to maintain homeostasis.

d. Relate cellular metabolism and transport to homeostasis and cellular reproduction.

e. Describe how structure and function are related in terms of cell and tissue types.

SAP2. Students will analyze the interdependence of the integumentary, skeletal, and muscular systems as these relate to the protection, support and movement of the human body.

a. Relate the structure of the integumentary system to its functional role in protecting the body and maintaining homeostasis.

b. Explain how the skeletal structures provide support and protection for tissues, and function together with the muscular system to make movements possible.

SAP3. Students will assess the integration and coordination of body functions and their dependence on the endocrine and nervous systems to regulate physiological activities.

a. Interpret interactions among hormones, senses, and nerves which make possible the coordination of functions of the body.

b. Investigate the physiology of electrochemical impulses and neural integration and trace the pathway of an impulse, relating biochemical changes involved in the conduction of the impulse.

c. Describe how the body perceives internal and external stimuli and responds to maintain a stable internal environment, as it relates to biofeedback.

SAP4. Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

a. Describe the chemical and physical mechanisms of digestion, elimination, transportation, and absorption within the body to change food and derive energy.

b. Analyze, and explain the relationships between the respiratory and cardiovascular systems as they obtain oxygen needed for the oxidation of nutrients and removal of carbon dioxide.

c. Relate the role of the urinary system to regulation of body wastes (i.e. waterelectrolyte balance, volume of body fluids).

d. Examine various conditions that change normal body functions (e.g. tissue rejection, allergies, injury, diseases and disorders) and how the body responds.

e. Describe the effects of aging on body systems.

SAP5. Students will analyze the role of the reproductive system as it pertains to the growth and development of humans.

a. Explain how the functions of the reproductive organs are regulated by hormonal interactions.

b. Describe the stages of human embryology and gestation including investigation of gestational and congenital disorders (e.g. ectopic pregnancy, miscarriage, cleft palate, hydrocephaly, fetal alcohol syndrome).

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c. Describe the stages of development from birth to adulthood (i.e. neonatal period, infancy, childhood, adolescence and puberty, and maturity).

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CO-REQUISITE – CONTENT

SP1. Students will analyze the relationships between force, mass, gravity, and the motion of objects.

a. Calculate average velocity, instantaneous velocity, and acceleration in a given frame of reference.

b. Compare and contrast scalar and vector quantities.

c. Compare graphically and algebraically the relationships among position, velocity, acceleration, and time.

d. Measure and calculate the magnitude of frictional forces and Newton's three Laws of Motion.

e. Measure and calculate the magnitude of gravitational forces.

f. Measure and calculate two-dimensional motion (projectile and circular) by using component vectors.

g. Measure and calculate centripetal force.

h. Determine the conditions required to maintain a body in a state of static equilibrium.

SP2. Students will evaluate the significance of energy in understanding the structure of matter and the universe.

a. Relate the energy produced through fission and fusion by stars as a driving force in the universe.

b. Explain how the instability of radioactive isotopes results in spontaneous nuclear reactions.

SP3. Students will evaluate the forms and transformations of energy.

a. Analyze, evaluate, and apply the principle of conservation of energy and measure the components of work-energy theorem by
- describing total energy in a closed system.
- identifying different types of potential energy.
- calculating kinetic energy given mass and velocity.
- relating transformations between potential and kinetic energy.

b. Explain the relationship between matter and energy.

c. Measure and calculate the vector nature of momentum.

d. Compare and contrast elastic and inelastic collisions.

e. Demonstrate the factors required to produce a change in momentum.

f. Analyze the relationship between temperature, internal energy, and work done in a physical system.

g. Analyze and measure power.

SP4. Students will analyze the properties and applications of waves.

a. Explain the processes that results in the production and energy transfer of electromagnetic waves.

b. Experimentally determine the behavior of waves in various media in terms of reflection, refraction, and diffraction of waves.

c. Explain the relationship between the phenomena of interference and the principle of superposition.

d. Demonstrate the transfer of energy through different mediums by mechanical waves.

e. Determine the location and nature of images formed by the reflection or refraction of light.

SP5. Students will evaluate relationships between electrical and magnetic forces.

a. Describe the transformation of mechanical energy into electrical energy and the transmission of electrical energy.

b. Determine the relationship among potential difference, current, and resistance in a direct current circuit.

c. Determine equivalent resistances in series and parallel circuits.

d. Determine the relationship between moving electric charges and magnetic fields.

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SP6. The student will describe the corrections to Newtonian physics given by quantum mechanics and relativity when matter is very small, moving fast compared to the speed of light, or very large.

a. Explain matter as a particle and as a wave.

b. Describe the Uncertainty Principle.

c. Explain the differences in time, space, and mass measurements by two observers when one is in a frame of reference moving at constant velocity parallel to one of the coordinate axes of the other observer's frame of reference if the constant velocity is greater than one tenth the speed of light.

d. Describe the gravitational field surrounding a large mass and its effect on a ray of light.

In recent years ACT has brought a distinctive voice to the debate on what it means to be truly ready for college. Using a wealth of longitudinal data—data that no one else possesses—ACT has pioneered empirical approaches to assessing students' college readiness. Using thousands of student records and responses, content and measurement experts at ACT have developed detailed statements that describe what students typically know and are able to do at different levels of test performance. These data-driven, empirically derived score descriptors, known as **ACT's College Readiness Standards,** describe student achievement within various score ranges on the English, Reading, Writing, Mathematics, and Science tests on the EXPLORE, PLAN, and ACT.

In this section (Section C), the ACT College Readiness Standards included in Georgia's Performance Standards are highlighted. Standards not highlighted are those that include specific content, complexity, and/or proficiency level descriptors that ACT content experts determined were not included in Georgia's Performance Standards.

Table C-1. ACT's College Readiness Standards — English

	Topic Development in Terms of Purpose and Focus	Organization, Unity, and Coherence	Word Choice in Terms of Style, Tone, Clarity, and Economy
13–15		Use conjunctive adverbs or phrases to show time relationships in simple narrative essays (e.g., *then*, *this time*)	Revise sentences to correct awkward and confusing arrangements of sentence elements Revise vague nouns and pronouns that create obvious logic problems
16–19	Identify the basic purpose or role of a specified phrase or sentence Delete a clause or sentence because it is obviously irrelevant to the essay	Select the most logical place to add a sentence in a paragraph	Delete obviously synonymous and wordy material in a sentence Revise expressions that deviate from the style of an essay
20–23	Identify the central idea or main topic of a straightforward piece of writing Determine relevancy when presented with a variety of sentence-level details	Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., *first*, *afterward*, *in response*) Decide the most logical place to add a sentence in an essay Add a sentence that introduces a simple paragraph	Delete redundant material when information is repeated in different parts of speech (e.g., "alarmingly startled") Use the word or phrase most consistent with the style and tone of a fairly straightforward essay Determine the clearest and most logical conjunction to link clauses
24–27	Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal Delete material primarily because it disturbs the flow and development of the paragraph Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement	Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., *therefore, however, in addition*) Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward	Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence Identify and correct ambiguous pronoun references Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay
28–32	Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence, or to determine the need to delete plausible but irrelevant material Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation	Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs Rearrange sentences to improve the logic and coherence of a complex paragraph Add a sentence to introduce or conclude a fairly complex paragraph	Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., "an aesthetic viewpoint" versus "the outlook of an aesthetic viewpoint") Correct vague and wordy or clumsy and confusing writing containing sophisticated language
33–36	Determine whether a complex essay has accomplished a specific purpose Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay	Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay	Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole

Table C-1. ACT's College Readiness Standards — English (continued)

	Sentence Structure and Formation	Conventions of Usage	Conventions of Punctuation
13–15	Use conjunctions or punctuation to join simple clauses Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences	Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives	Delete commas that create basic sense problems (e.g., between verb and direct object)
16–19	Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences Decide the appropriate verb tense and voice by considering the meaning of the entire sentence	Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject-verb and pronoun-antecedent agreement, and which preposition to use in simple contexts Recognize and use the appropriate word in frequently confused pairs such as *there* and *their*, *past* and *passed*, and *led* and *lead*	Provide appropriate punctuation in straightforward situations (e.g., items in a series) Delete commas that disturb the sentence flow (e.g., between modifier and modified element)
20–23	Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers)	Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., *long for*, *appeal to*) Ensure that a verb agrees with its subject when there is some text between the two	Use commas to set off simple parenthetical phrases Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause)
24–27	Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence	Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences Identify the correct past and past participle forms of irregular and infrequently used verbs and form present-perfect verbs by using *have* rather than *of*	Use punctuation to set off complex parenthetical phrases Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by *and*) Use apostrophes to indicate simple possessive nouns Recognize inappropriate uses of colons and semicolons
28–32	Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole	Correctly use reflexive pronouns, the possessive pronouns *its* and *your*, and the relative pronouns *who* and *whom* Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject-verb order is inverted or when the subject is an indefinite pronoun)	Use commas to set off a nonessential/nonrestrictive appositive or clause Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical) Use an apostrophe to show possession, especially with irregular plural nouns Use a semicolon to indicate a relationship between closely related independent clauses
33–36	Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses	Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb	Use a colon to introduce an example or an elaboration

Table C-2. ACT's College Readiness Standards — Reading

	Main Ideas and Author's Approach	Supporting Details
13–15	Recognize a clear intent of an author or narrator in uncomplicated literary narratives	Locate basic facts (e.g., names, dates, events) clearly stated in a passage
16–19	Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives	Locate simple details at the sentence and paragraph level in uncomplicated passages Recognize a clear function of a part of an uncomplicated passage
20–23	Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages	Locate important details in uncomplicated passages Make simple inferences about how details are used in passages
24–27	Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages Infer the main idea or purpose of straightforward paragraphs in more challenging passages Summarize basic events and ideas in more challenging passages Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages	Locate important details in more challenging passages Locate and interpret minor or subtly stated details in uncomplicated passages Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages
28–32	Infer the main idea or purpose of more challenging passages or their paragraphs Summarize events and ideas in virtually any passage Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage	Locate and interpret minor or subtly stated details in more challenging passages Use details from different sections of some complex informational passages to support a specific point or argument
33–36	Identify clear main ideas or purposes of complex passages or their paragraphs	Locate and interpret details in complex passages Understand the function of a part of a passage when the function is subtle or complex

Descriptions of the ACT Reading Passages

Uncomplicated Literary Narratives refers to excerpts from essays, short stories, and novels that tend to use simple language and structure, have a clear purpose and a familiar style, present straightforward interactions between characters, and employ only a limited number of literary devices such as metaphor, simile, or hyperbole.

More Challenging Literary Narratives refers to excerpts from essays, short stories, and novels that tend to make moderate use of figurative language, have a more intricate structure and messages conveyed with some subtlety, and may feature somewhat complex interactions between characters.

Complex Literary Narratives refers to excerpts from essays, short stories, and novels that tend to make generous use of ambiguous language and literary devices, feature complex and subtle interactions between characters, often contain challenging context-dependent vocabulary, and typically contain messages and/or meanings that are not explicit but are embedded in the passage.

Table C-2. ACT's College Readiness Standards — Reading (continued)

	Sequential, Comparative, and Cause-Effect Relationships	Meanings of Words	Generalizations and Conclusions
13–15	Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages Recognize clear cause-effect relationships described within a single sentence in a passage	Understand the implication of a familiar word or phrase and of simple descriptive language	Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives
16–19	Identify relationships between main characters in uncomplicated literary narratives Recognize clear cause-effect relationships within a single paragraph in uncomplicated literary narratives	Use context to understand basic figurative language	Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages
20–23	Order simple sequences of events in uncomplicated literary narratives Identify clear relationships between people, ideas, and so on in uncomplicated passages Identify clear cause-effect relationships in uncomplicated passages	Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages	Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages Draw simple generalizations and conclusions using details that support the main points of more challenging passages
24–27	Order sequences of events in uncomplicated passages Understand relationships between people, ideas, and so on in uncomplicated passages Identify clear relationships between characters, ideas, and so on in more challenging literary narratives Understand implied or subtly stated cause-effect relationships in uncomplicated passages Identify clear cause-effect relationships in more challenging passages	Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages	Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives Draw generalizations and conclusions about people, ideas, and so on in more challenging passages
28–32	Order sequences of events in more challenging passages Understand the dynamics between people, ideas, and so on in more challenging passages Understand implied or subtly stated cause-effect relationships in more challenging passages	Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts	Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on
33–36	Order sequences of events in complex passages Understand the subtleties in relationships between people, ideas, and so on in virtually any passage Understand implied, subtle, or complex cause-effect relationships in virtually any passage	Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage	Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage Understand and generalize about portions of a complex literary narrative

Uncomplicated Informational Passages refers to materials that tend to contain a limited amount of data, address basic concepts using familiar language and conventional organizational patterns, have a clear purpose, and are written to be accessible.

More Challenging Informational Passages refers to materials that tend to present concepts that are not always stated explicitly and that are accompanied or illustrated by more—and more detailed—supporting data, include some difficult context-dependent words, and are written in a somewhat more demanding and less accessible style.

Complex Informational Passages refers to materials that tend to include a sizable amount of data, present difficult concepts that are embedded (not explicit) in the text, use demanding words and phrases whose meaning must be determined from context, and are likely to include intricate explanations of processes or events.

Table C-3. ACT's College Readiness Standards — Writing

	Expressing Judgments	Focusing on the Topic	Developing a Position
3–4	Show a little understanding of the persuasive purpose of the task but neglect to take or to maintain a position on the issue in the prompt Show limited recognition of the complexity of the issue in the prompt	Maintain a focus on the general topic in the prompt through most of the essay	Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas Show little or no movement between general and specific ideas and examples
5–6	Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position	Maintain a focus on the general topic in the prompt throughout the essay	Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas Show little movement between general and specific ideas and examples
7–8	Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt Show some recognition of the complexity of the issue in the prompt by • acknowledging counterarguments to the writer's position • providing some response to counter-arguments to the writer's position	Maintain a focus on the general topic in the prompt throughout the essay and attempt a focus on the specific issue in the prompt Present a thesis that establishes focus on the topic	Develop ideas by using some specific reasons, details, and examples Show some movement between general and specific ideas and examples
9–10	Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion Show recognition of the complexity of the issue in the prompt by • partially evaluating implications and/or complications of the issue, and/or • posing and partially responding to counter-arguments to the writer's position	Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay Present a thesis that establishes a focus on the writer's position on the issue	Develop most ideas fully, using some specific and relevant reasons, details, and examples Show clear movement between general and specific ideas and examples
11–12	Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion Show understanding of the complexity of the issue in the prompt by • examining different perspectives, and/or • evaluating implications or complications of the issue, and/or • posing and fully discussing counter-arguments to the writer's position	Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay Present a critical thesis that clearly establishes the focus on the writer's position on the issue	Develop several ideas fully, using specific and relevant reasons, details, and examples Show effective movement between general and specific ideas and examples

     = Included in Georgia Performance Standards

Table C-3. ACT's College Readiness Standards — Writing (continued)

	Organizing Ideas	Using Language
3–4	Provide a discernible organization with some logical grouping of ideas in parts of the essay Use a few simple and obvious transitions Present a discernible, though minimally developed, introduction and conclusion	Show limited control of language by • correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding • using simple vocabulary • using simple sentence structure
5–6	Provide a simple organization with logical grouping of ideas in parts of the essay Use some simple and obvious transitional words, though they may at times be inappropriate or misleading Present a discernible, though underdeveloped, introduction and conclusion	Show a basic control of language by • correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding • using simple but appropriate vocabulary • using a little sentence variety, though most sentences are simple in structure
7–8	Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas Use some simple and obvious, but appropriate, transitional words and phrases Present a discernible introduction and conclusion with a little development	Show adequate use of language to communicate by • correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding • using appropriate vocabulary • using some varied kinds of sentence structures to vary pace
9–10	Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas Present a somewhat developed introduction and conclusion	Show competent use of language to communicate ideas by • correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding • using some precise and varied vocabulary • using several kinds of sentence structures to vary pace and to support meaning
11–12	Provide unity and coherence throughout the essay, often with a logical progression of ideas Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas Present a well-developed introduction and conclusion	Show effective use of language to clearly communicate ideas by • correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors • using precise and varied vocabulary • using a variety of kinds of sentence structures to vary pace and to support meaning

Table C-4. ACT's College Readiness Standards — Mathematics

	Basic Operations & Applications	Probability, Statistics, & Data Analysis	Numbers: Concepts & Properties	Expressions, Equations, & Inequalities
13–15	Perform one-operation computation with whole numbers and decimals Solve problems in one or two steps using whole numbers Perform common conversions (e.g., inches to feet or hours to minutes)	Calculate the average of a list of positive whole numbers Perform a single computation using information from a table or chart	Recognize equivalent fractions and fractions in lowest terms	Exhibit knowledge of basic expressions (e.g., identify an expression for a total as $b + g$) Solve equations in the form $x + a = b$, where a and b are whole numbers or decimals
16–19	Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent Solve some routine two-step arithmetic problems	Calculate the average of a list of numbers Calculate the average, given the number of data values and the sum of the data values Read tables and graphs Perform computations on data from tables and graphs Use the relationship between the probability of an event and the probability of its complement	Recognize one-digit factors of a number Identify a digit's place value	Substitute whole numbers for unknown quantities to evaluate expressions Solve one-step equations having integer or decimal answers Combine like terms (e.g., $2x + 5x$)
20–23	Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average	Calculate the missing data value, given the average and all data values but one Translate from one representation of data to another (e.g., a bar graph to a circle graph) Determine the probability of a simple event Exhibit knowledge of simple counting techniques	Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor	Evaluate algebraic expressions by substituting integers for unknown quantities Add and subtract simple algebraic expressions Solve routine first-degree equations Perform straightforward word-to-symbol translations Multiply two binomials
24–27	Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour)	Calculate the average, given the frequency counts of all the data values Manipulate data from tables and graphs Compute straightforward probabilities for common situations Use Venn diagrams in counting	Find and use the least common multiple Order fractions Work with numerical factors Work with scientific notation Work with squares and square roots of numbers Work problems involving positive integer exponents Work with cubes and cube roots of numbers Determine when an expression is undefined Exhibit some knowledge of the complex numbers	Solve real-world problems using first-degree equations 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) Identify solutions to simple quadratic equations Add, subtract, and multiply polynomials Factor simple quadratics (e.g., the difference of squares and perfect square trinomials) Solve first-degree inequalities that do not require reversing the inequality sign
28–32	Solve word problems containing several rates, proportions, or percentages	Calculate or use a weighted average Interpret and use information from figures, tables, and graphs Apply counting techniques Compute a probability when the event and/or sample space are not given or obvious	Apply number properties involving prime factorization Apply number properties involving even/odd numbers and factors/multiples Apply number properties involving positive/negative numbers Apply rules of exponents Multiply two complex numbers	Manipulate expressions and equations Write expressions, equations, and inequalities for common algebra settings Solve linear inequalities that require reversing the inequality sign Solve absolute value equations Solve quadratic equations Find solutions to systems of linear equations
33–36	Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings)	Distinguish between mean, median, and mode for a list of numbers Analyze and draw conclusions based on information from figures, tables, and graphs Exhibit knowledge of conditional and joint probability	Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers Exhibit knowledge of logarithms and geometric sequences Apply properties of complex numbers	Write expressions that require planning and/or manipulating to accurately model a situation Write equations and inequalities that require planning, manipulating, and/or solving Solve simple absolute value inequalities

▢ = Included in Georgia Performance Standards

Table C-4. ACT's College Readiness Standards — Mathematics (continued)

	Graphical Representations	Properties of Plane Figures	Measurement	Functions
13–15	Identify the location of a point with a positive coordinate on the number line		Estimate or calculate the length of a line segment based on other lengths given on a geometric figure	
16–19	Locate points on the number line and in the first quadrant	Exhibit some knowledge of the angles associated with parallel lines	Compute the perimeter of polygons when all side lengths are given Compute the area of rectangles when whole number dimensions are given	
20–23	Locate points in the coordinate plane Comprehend the concept of length on the number line Exhibit knowledge of slope	Find the measure of an angle using properties of parallel lines Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	Compute the area and perimeter of triangles and rectangles in simple problems Use geometric formulas when all necessary information is given	Evaluate quadratic functions, expressed in function notation, at integer values
24–27	Identify the graph of a linear inequality on the number line Determine the slope of a line from points or equations Match linear graphs with their equations Find the midpoint of a line segment	Use several angle properties to find an unknown angle measure Recognize Pythagorean triples Use properties of isosceles triangles	Compute the area of triangles and rectangles when one or more additional simple steps are required Compute the area and circumference of circles after identifying necessary information Compute the perimeter of simple composite geometric figures with unknown side lengths	Evaluate polynomial functions, expressed in function notation, at integer values Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths
28–32	Interpret and use information from graphs in the coordinate plane Match number line graphs with solution sets of linear inequalities Use the distance formula Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle)	Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles Use the Pythagorean theorem	Use relationships involving area, perimeter, and volume of geometric figures to compute another measure	Evaluate composite functions at integer values Apply basic trigonometric ratios to solve right-triangle problems
33–36	Match number line graphs with solution sets of simple quadratic inequalities Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ Solve problems integrating multiple algebraic and/or geometric concepts Analyze and draw conclusions based on information from graphs in the coordinate plane	Draw conclusions based on a set of conditions Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas Use relationships among angles, arcs, and distances in a circle	Use scale factors to determine the magnitude of a size change Compute the area of composite geometric figures when planning or visualization is required	Write an expression for the composite of two simple functions Use trigonometric concepts and basic identities to solve problems Exhibit knowledge of unit circle trigonometry Match graphs of basic trigonometric functions with their equations

= Included in Georgia Performance Standards

Table C-5. ACT's College Readiness Standards — Science

	Interpretation of Data	Scientific Investigation	Evaluation of Models, Inferences, and Experimental Results
13–15	Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram) Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels)		
16–19	Select two or more pieces of data from a simple data presentation Understand basic scientific terminology Find basic information in a brief body of text Determine how the value of one variable changes as the value of another variable changes in a simple data presentation	Understand the methods and tools used in a simple experiment	
20–23	Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram) Compare or combine data from a simple data presentation (e.g., order or sum data from a table) Translate information into a table, graph, or diagram	Understand the methods and tools used in a moderately complex experiment Understand a simple experimental design Identify a control in an experiment Identify similarities and differences between experiments	Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model Identify key issues or assumptions in a model
24–27	Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table) Compare or combine data from a complex data presentation Interpolate between data points in a table or graph Determine how the value of one variable changes as the value of another variable changes in a complex data presentation Identify and/or use a simple (e.g., linear) mathematical relationship between data Analyze given information when presented with new, simple information	Understand the methods and tools used in a complex experiment Understand a complex experimental design Predict the results of an additional trial or measurement in an experiment Determine the experimental conditions that would produce specified results	Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why Identify strengths and weaknesses in one or more models Identify similarities and differences between models Determine which model(s) is(are) supported or weakened by new information Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion
28–32	Compare or combine data from a simple data presentation with data from a complex data presentation Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data Extrapolate from data points in a table or graph	Determine the hypothesis for an experiment Identify an alternate method for testing a hypothesis	Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model Determine whether new information supports or weakens a model, and why Use new information to make a prediction based on a model
33–36	Compare or combine data from two or more complex data presentations Analyze given information when presented with new, complex information	Understand precision and accuracy issues Predict how modifying the design or methods of an experiment will affect results Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results	Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why

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Science College Readiness Standards are measured in the context of science topics students encounter in science courses. These topics may include:

Life Science/Biology	Physical Science/Chemistry, Physics	Earth & Space Science
• Animal behavior • Animal development and growth • Body systems • Cell structure and processes • Ecology • Evolution • Genetics • Homeostasis • Life cycles • Molecular basis of heredity • Origin of life • Photosynthesis • Plant development, growth, structure • Populations • Taxonomy	• Atomic structure • Chemical bonding, equations, nomenclature, reactions • Electrical circuits • Elements, compounds, mixtures • Force and motions • Gravitation • Heat and work • Kinetic and potential energy • Magnetism • Momentum • The Periodic Table • Properties of solutions • Sound and light • States, classes, and properties of matter • Waves	• Earthquakes and volcanoes • Earth's atmosphere • Earth's resources • Fossils and geological time • Geochemical cycles • Groundwater • Lakes, rivers, oceans • Mass movements • Plate tectonics • Rocks, minerals • Solar system • Stars, galaxies, and the universe • Water cycle • Weather and climate • Weathering and erosion

▮ = Included in Georgia Performance Standards

Working with Charter States, national education organizations, educators, employers, and experts in employment and training requirements, ACT identified workplace skills that help individuals successfully perform a wide range of jobs. These skills form the basis of the WorkKeys assessments.

In this section (Section D), the WorkKeys Skills that are highlighted are those that are included in Georgia's Performance Standards. WorkKeys Skills not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Georgia's standards.

Because Georgia educators are the experts on the Georgia Performance Standards, we would strongly encourage them to examine this document and offer their interpretations.

Level	Reading for Information	Applied Mathematics	Locating Information
3	Identify main ideas and clearly stated details Choose the correct meaning of a word that is clearly defined in the reading Choose the correct meaning of common, everyday and workplace words Choose when to perform each step in a short series of steps Apply instructions to a situation that is the same as the one in the reading materials	Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers Add or subtract negative numbers Change numbers from one form to another using whole numbers, fractions, decimals, or percentages Convert simple money and time units (e.g., hours to minutes)	Find one or two pieces of information in a graphic Fill in one or two pieces of information that are missing from a graphic
4	Identify important details that may not be clearly stated Use the reading material to figure out the meaning of words that are not defined Apply instructions with several steps to a situation that is the same as the situation in the reading materials Choose what to do when changing conditions call for a different action (follow directions that include "if-then" statements)	Solve problems that require one or two operations Multiply negative numbers Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals Add commonly known fractions, decimals, or percentages (e.g., ½, .75, 25%) Add three fractions that share a common denominator Multiply a mixed number by a whole number or decimal Put the information in the right order before performing calculations	Find several pieces of information in one or two graphics Understand how graphics are related to each other Summarize information from one or two straightforward graphics Identify trends shown in one or two straightforward graphics Compare information and trends shown in one or two straightforward graphics
5	Figure out the correct meaning of a word based on how the word is used Identify the correct meaning of an acronym that is defined in the document Identify the paraphrased definition of a technical term or jargon that is defined in the document Apply technical terms and jargon and relate them to stated situations Apply straightforward instructions to a new situation that is similar to the one described in the material Apply complex instructions that include conditionals to situations described in the materials	Decide what information, calculations, or unit conversions to use to solve the problem Look up a formula and perform single-step conversions within or between systems of measurement Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes) Divide negative numbers Find the best deal using one- and two-step calculations and then comparing results Calculate perimeters and areas of basic shapes (rectangles and circles) Calculate percentage discounts or markups	Sort through distracting information Summarize information from one or more detailed graphics Identify trends shown in one or more detailed or complicated graphics Compare information and trends from one or more complicated graphics
6	Identify implied details Use technical terms and jargon in new situations Figure out the less common meaning of a word based on the context Apply complicated instructions to new situations Figure out the principles behind policies, rules, and procedures Apply general principles from the materials to similar and new situations Explain the rationale behind a procedure, policy, or communication	Use fractions, negative numbers, ratios, percentages, or mixed numbers Rearrange a formula before solving a problem Use two formulas to change from one unit to another within the same system of measurement Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement Find mistakes in items that belong at Levels 3, 4, and 5 Find the best deal and use the result for another calculation Find areas of basic shapes when it may be necessary to rearrange the formula, convert units of measurement in the calculations, or use the result in further calculations Find the volume of rectangular solids Calculate multiple rates	Draw conclusions based on one complicated graphic or several related graphics Apply information from one or more complicated graphics to specific situations Use the information to make decisions
7	Figure out the definitions of difficult, uncommon words based on how they are used Figure out the meaning of jargon or technical terms based on how they are used Figure out the general principles behind the policies and apply them to situations that are quite different from any described in the materials	Solve problems that include nonlinear functions and/or that involve more than one unknown Find mistakes in Level 6 items Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages Calculate multiple areas and volumes of spheres, cylinders, or cones Set up and manipulate complex ratios or proportions Find the best deal when there are several choices Apply basic statistical concepts	