STATE MATCH

Louisiana Content Standards and Grade-Level Expectations

English Language Arts,
Mathematics, and Science
Grades 7–12

and

ACT®

EXPLORE, PLAN, and ACT

December 2005

About This Report

EXECUTIVE SUMMARY

(pp. 1–2)

This portion summarizes the findings of the alignment between EXPLORE® (8th and 9th grades); PLAN® (10th grade); and the ACT (11th and 12th grades) and Louisiana's Content Standards and Grade-Level Expectations. It also presents ACT's involvement in meeting NCLB requirements and describes additional critical information that ACT could provide to Louisiana.

SECTION A

(pp. 3–5)

This section provides tables by content area (English language arts, Mathematics, and Science) listing the precise number of Louisiana Content Standards and Grade-Level Expectations measured by ACT's EPAS tests, by grade level.

SECTION B

(pp. 6–55)

All Louisiana Content Standards and Grade-Level Expectations are listed here; each one highlighted is measured by ACT's EPAS tests. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science Tests.

SECTION C

(pp. 57–66)

ACT's College Readiness Standards appear here. Highlighting indicates that a statement reflects one or more statements in the Louisiana Content Standards and Grade-Level Expectations. College Readiness Standards not highlighted are not addressed in Louisiana Content Standards and Grade-Level Expectations.

A supplement is available that identifies the specific ACT College Readiness Standard(s) corresponding to each Louisiana Content Standard or Grade-Level Expectation, in a side-by-side format. To request this supplement, please e-mail ACT at **statematch@act.org**.

Executive Summary

We at ACT believe our programs offer many advantages to Louisiana students and educators, and this report offers strong evidence for this belief. This alignment analysis clearly answers three 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)—measure Louisiana's Content Standards and Grade-Level Expectations?
2. Can ACT's EPAS test results be used to meet Louisiana's NCLB requirement?
3. Why should Louisiana choose ACT?

ACT'S TESTS MEASURE MANY IMPORTANT LOUISIANA CONTENT STANDARDS AND GRADE-LEVEL EXPECTATIONS IN ENGLISH LANGUAGE ARTS, MATHEMATICS, AND SCIENCE.

1. Match Results: Comparisons conducted by our content specialists show that ACT's Reading, English, Writing, Mathematics and Science Tests measure many of Louisiana's English Language Arts, Mathematics, and Science Content Standards (with grade-level expectation match totals appearing in Section B):

- English Language Arts: 5 out of 7 standards

  Many important English Language Arts Content Standards and Grade-Level Expectations are covered by ACT's English, Reading, and Writing Tests.

- Mathematics: 24–46 out of 27–48 grade-level expectations, depending on grade/course

  Nearly all of Louisiana's Mathematics Content Standards and Grade-Level Expectations are covered by ACT's Mathematics Tests.

- Science: *Process Grade-Level Expectations:* Grades 7–8: 22 out of 40
  Grades 9–12: 12 out of 16
  (*Content Grade-Level Expectations:* 42–125 out of 42–140, depending on grade/course)

  Many of Louisiana's Science Content Standards and Grade-Level Expectations are covered by ACT's Science Tests.

  (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 Science Content Standards and Grade-Level Expectations.

  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 Content Standards and Grade-Level Expectations measured by ACT 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 Louisiana's Content Standards and Grade-Level Expectations arise from standards not being assessable in

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STATES CHOOSE ACT BECAUSE:

- **STUDENT MOTIVATION IS HIGH.**
- **ACT'S IS THE ONLY CURRICULUM-BASED ASSESSMENT SYSTEM THAT MEASURES STUDENT READINESS ALONG A CONTINUUM OF EMPIRICALLY DERIVED COLLEGE READINESS BENCHMARKS.**
- **EPAS DATA PROVIDE HELPFUL FEEDBACK FOR TEACHERS, STUDENTS, AND POLICYMAKERS TO MAKE EDUCATIONAL DECISIONS AND IDENTIFY WAYS TO IMPROVE.**

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 Louisiana on developing any necessary augmentation.

2. NCLB requirement? Yes; states like Illinois intend to use ACT EPAS components as part of testing that will be 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 worked backwards to develop data-driven, empirically derived statements of what students typically know and are able to do in various score ranges on ACT's English, Reading, Writing, Mathematics, and Science Tests. These statements provide specific details about students' college readiness and can be used to identify next steps for improvement.

ACT BUILDS ITS DEFINITION OF COLLEGE READINESS ON A SOUND EMPIRICAL BASE:

1. **THE ACT NATIONAL CURRICULUM SURVEY**
2. **ACT'S COLLEGE READINESS BENCHMARK SCORES**
3. **ACT'S COLLEGE READINESS STANDARDS**

In sum, ACT's EPAS programs provide abundant data relevant to Louisiana's Content Standards and Grade-Level Expectations and to Louisiana students' readiness for college and work.

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Section A: Number of Louisiana Content Standards and Grade-Level Expectations Measured by EXPLORE, PLAN, and the ACT

Table A-1. Number of English Language Arts Content Standards and Grade-Level Expectations Measured by EXPLORE, PLAN, and the ACT

	Louisiana Content Standard*	Number of Louisiana's GLEs Measured by ACT's tests	Aspects of Not-Measured Louisiana Content Standards and Grade-Level Expectations
Reading and Responding	Standard 1	7th: 5 out of 5 8th: 5 out of 5 9th: 4 out of 5 10th: 4 out of 5 11–12: 4 out of 4	Explain how ideas and information connect to real-life situations
	Standard 6	7th: 1 out of 3 8th: 1 out of 3 9th: 0 out of 6 10th: 0 out of 6 11–12: 1 out of 4	Identify universal themes and cultural viewpoints Classify genres
	Standard 7	7th: 4 out of 6 8th: 3 out of 6 9th: 2 out of 4 10th: 2 out of 5 11–12: 3 out of 5	Explain the relationship between life experiences and texts Use technical information and other resources (web, dictionaries) Identify impact of author's life
Writing	Standard 2	7th: 4 out of 8 8th: 4 out of 8 9th: 5 out of 7 10th: 4 out of 9 11–12: 6 out of 7	Write for various purposes
Writing/ Proofreading	Standard 3	7th: 4 out of 5 8th: 4 out of 5 9th: 3 out of 5 10th: 3 out of 5 11–12: 3 out of 4	Use a variety of resources (dictionary, thesaurus, etc.)
Speaking and Listening	Standard 4	7th: 0 out of 11 8th: 0 out of 11 9th: 0 out of 9 10th: 0 out of 9 11–12: 0 out of 9	Speak Listen Discuss
Information Resources	Standard 5	7th: 0 out of 8 8th: 0 out of 8 9th: 0 out of 8 10th: 0 out of 8 11–12: 0 out of 8	Locate resources Use word processing to draft Give credit for borrowed information
	TOTALS	7th: 18 out of 46 8th: 15 out of 46 9th: 14 out of 44 10th: 13 out of 47 11–12: 17 out of 41	

*Refer to Louisiana's English Language Arts Content Standards and Grade-Level Expectations on pages 6–28

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Table A-2. Number of Mathematics Content Standards and Grade-Level Expectations Measured by EXPLORE, PLAN, and the ACT		
Louisiana Content Standard*	**Number of Louisiana's GLEs Measured by ACT's tests**	**Aspects of Not-Measured Louisiana Content Standards and Grade-Level Expectations**
Number and Number Relations	7th: 11 out of 11 8th: 9 out of 9 9th: 6 out of 7 10th: 4 out of 4 11–12: 3 out of 3	Distinguish between an exact and an approximate answer
Algebra	7th: 8 out of 8 8th: 7 out of 7 9th: 9 out of 9 10th: 2 out of 2 11–12: 7 out of 7	
Measurement	7th: 4 out of 4 8th: 6 out of 6 9th: 3 out of 6 10th: 2 out of 2 11–12: 3 out of 4	Distinguish between precision and accuracy Explain how the scale of a measuring instrument determines its precision Relative versus absolute error Calculate angle measures in degrees, minutes, seconds
Geometry	7th: 7 out of 7 8th: 10 out of 11 9th: 4 out of 4 10th: 8 out of 11 11–12: 2 out of 2	Construct polyhedra using 2-dimensional patterns Inductive versus deductive reasoning Develop formal & informal proofs
Data Analysis, Probability, and Discrete Math	7th: 7 out of 8 8th: 11 out of 12 9th: 7 out of 7 10th: 6 out of 6 11–12: 3 out of 7	Compare theoretical and experimental probability in real-life situations Select random samples Distinguish between samples and populations Conduct surveys Describe normal and non-normal distributions
Patterns, Relations, and Functions	7th: 3 out of 3 8th: 3 out of 3 9th: 6 out of 6 10th: 2 out of 2 11–12: 6 out of 6	
TOTALS	7th: 40 out of 41 8th: 46 out of 48 9th: 35 out of 39 10th: 24 out of 27 11–12: 24 out of 29	

*Refer to Louisiana's Mathematics Content Standards and Grade-Level Expectations on pages 29–38

Table A-3. Number of Science Content Standards and Grade-Level Expectations Measured by EXPLORE, PLAN, and the ACT		
Louisiana Content Standard*	**Number of Louisiana's GLEs Measured by ACT's tests**	**Aspects of Not-Measured Louisiana Standards**
Science As Inquiry	7–8: 22 out of 40 9–12: 12 out of 16	Nature of science Science/technology/society issues Identify appropriate safety measures
Physical Science	7th: (1) out of 1 8th: (7) out of 7 9th: (49) out of 49 11–12:(78) out of 82	Perform dimensional analysis Use trigonometric functions to make indirect measurements
Life Science	7th: (33) out of 33 10th:(42) out of 42	
Earth and Space Science	8th: (41) out of 42 11–12:(30) out of 30	Identify practical applications of technical advances
Science and the Environment	7th: (7) out of 9 8th: (4) out of 4 11–12:(16) out of 28	Resource management Environmental awareness and protection
TOTALS	7–8: 22 out of 40 9–12: 12 out of 16	**Science Process**
	7th: (43) out of 43 8th: (52) out of 53 9th: (49) out of 49 10th:(42) out of 42 11–12:(125) out of 140	**Content Topics**

*Refer to Louisiana's Science Content Standards and Grade-Level Expectations on pages 39–55

Section B: Louisiana's Grades 7–12 Content Standards and Grade-Level Expectations Measured by EXPLORE, PLAN, and the ACT

English Language Arts

LOUISIANA Grade 7 English Language Arts
Standards and Grade-Level Expectations

Reading and Responding

Standard 1: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

1. Develop vocabulary using a variety of strategies, including:
   - use of connotative and denotative meanings
   - use of Greek, Latin, and Anglo-Saxon base words, roots, affixes, and word parts (ELA-1-M1)
2. Explain story elements, including:
   - the revelation of character motivation through thoughts, words, and actions
   - plot sequence (e.g., exposition, rising action, climax, falling action, resolution)
   - conflicts (e.g., man vs. man, nature, society, self) and their effect on plot
   - effects of first- and third-person points of view
   - theme development (ELA-1-M2)
3. Interpret literary devices, including:
   - symbolism
   - puns
   - analogies (ELA-1-M2)
4. Draw conclusions and make inferences in oral and written responses about ideas and information in grade-appropriate texts, including:
   - instructional materials
   - essays
   - dramas (ELA-1-M3)
5. Interpret ideas and information in a variety of texts, including periodical articles, editorials, and lyrics, and make connections to real-life situations and other texts (ELA-1-M4)

Standard 6: Students read, analyze, and respond to literature as a record of life experiences.

6. Identify universal themes (e.g., search for identity, love, friendship, family, courage, adversity) and cultural viewpoints found in national, world, and multicultural literature in oral and written responses (ELA-6-M1)
7. Compare and contrast elements (e.g., plot, setting, character, theme) in multiple genres in oral and written responses (ELA-6-M2)
8. Use knowledge of the distinctive characteristics to classify and interpret elements of various genres, including:
   - fiction (e.g., science fiction/fantasy)
   - nonfiction (e.g., essays, letters)
   - poetry (e.g., lyric, narrative)
   - drama (e.g., short plays) (ELA-6-M3)

Standard 7: Students apply reasoning and problem solving skills to reading, writing, speaking, listening, viewing, and visually representing.

9. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including:
   - sequencing events and steps in a process
   - summarizing and paraphrasing information
   - identifying stated or implied main ideas and explaining how details support ideas
   - comparing and contrasting literary elements and ideas

- making inferences and drawing conclusions
- predicting the outcome of a story or situation
- identifying literary devices (ELA-7-M1)

10. Explain the relationship between life experiences and texts to generate solutions to problems (ELA-7-M2)
11. Use technical information and other available resources (e.g., Web sites, interviews) to solve problems (ELA-7-M2)
12. Explain the effects of an author's stated purpose for writing (ELA-7-M3)
13. Identify an author's bias (objectivity) for, against, or neutral toward an issue (ELA-7-M3)
14. Analyze grade-appropriate print and nonprint texts using various reasoning skills, for example:
    - identifying cause-effect relationships
    - raising questions
    - reasoning inductively and deductively
    - generating a theory or hypothesis
    - skimming/scanning (ELA-7-M4)

Writing

Standard 2: Students write competently for a variety of purposes and audiences.

15. Write multiparagraph compositions on student- or teacher-selected topics organized with the following:
    - established central idea
    - organizational patterns (e.g., comparison/contrast, order of importance, chronological order) appropriate to the topic
    - elaboration (e.g., fact, examples, and/or specific details)
    - transitional words and phrases that unify ideas and points
    - overall structure including an introduction, a body/middle, and a concluding paragraph that summarizes important ideas and details (ELA-2-M1)
16. Organize individual paragraphs with topic sentences, relevant elaboration, and concluding sentences (ELA-2-M1)
17. Develop grade-appropriate compositions on student- or teacher-selected topics that include the following:
    - word choices (diction) appropriate to the identified audience and/or purpose
    - vocabulary selected to clarify meaning, create images, and set a tone
    - information/ideas selected to engage the interest of the reader
    - clear voice (individual personality)
    - variety in sentence structure (ELA-2-M2)
18. Develop grade-appropriate compositions by identifying and applying writing processes, such as the following:
    - selecting topic and form
    - prewriting (e.g., brainstorming, researching, raising questions, generating graphic organizers)
    - drafting
    - conferencing (e.g., peer and teacher)
    - revising based on feedback and use of various tools (e.g., LEAP21 Writer's Checklist, rubrics)
    - proofreading/editing
    - publishing using technology (ELA-2-M3)
19. Develop grade-appropriate paragraphs and multiparagraph compositions using the various modes of writing (e.g., description, narration, exposition, persuasion), emphasizing narration and exposition (ELA-2-M4)
20. Use the various modes to write compositions, including:
    - essays based on a stated opinion
    - fictional narratives (ELA-2-M4)
21. Develop writing using a variety of literary devices, including analogies, symbolism, and puns (ELA-2-M5)
22. Write for various purposes, including:
    - letters of complaint supported with complete and accurate information and reasons
    - evaluations of media, such as television, radio, and the arts

- text-supported interpretations of elements of grade-appropriate stories, poems, plays, and novels
- applications, such as memberships and library cards (ELA-2-M6)

Writing/Proofreading

Standard 3: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

23. Use standard English punctuation, including:
    - commas to set off direct quotations, nouns of direct address, and after introductory words or phrases
    - semicolons or colons to separate independent clauses (ELA-3-M2)
24. Write paragraphs and compositions following standard English structure and usage, including:
    - varied sentence structures, including complex sentences
    - antecedents that agree with pronouns in number, person, and gender
    - sentences without double negatives (ELA-3-M3)
25. Apply knowledge of parts of speech in writing, including:
    - infinitives and participles
    - superlative and comparative degrees of adjectives
    - adverbs (ELA-3-M4)
26. Spell high-frequency, commonly confused, frequently misspelled words and derivatives (e.g., roots, affixes) correctly (ELA-3-M5)
27. Use a variety of resources (e.g., glossaries, dictionaries, thesauruses, spell check) to find correct spellings (ELA-3-M5)

Speaking and Listening

Standard 4: Students demonstrate competence in speaking and listening as tools for learning and communicating.

28. Adjust diction and enunciation to suit the purpose for speaking (ELA-4-M1)
29. Use standard English grammar, diction, syntax, and pronunciation when speaking (ELA-4-M1)
30. Follow procedures (e.g., read, question, write a response, form groups) from detailed oral instructions (ELA-4-M2)
31. State oral directions/procedures for tasks (ELA-4-M2)
32. Adjust volume and inflection to suit the audience and purpose of presentations (ELA-4-M3)
33. Organize oral presentations with a thesis, an introduction, a body developed with relevant details, and a conclusion (ELA-4-M3)
34. Evaluate and determine bias and credibility of various media presentations (e.g., TV and radio advertising) (ELA-4-M4)
35. Deliver formal and informal persuasive presentations (ELA-4-M4)
36. Deliver grade-appropriate research-based presentations (ELA-4-M4)
37. Evaluate a variety of media for impressions/effect on listeners, faulty reasoning, propaganda techniques, and delivery (ELA-4-M5)
38. Participate in group and panel discussions, including:
    - explaining the effectiveness and dynamics of group process
    - applying agreed-upon rules for formal and informal discussions
    - assuming a variety of roles (e.g., facilitator, recorder, leader, listener) (ELA-4-M6)

Information Resources

Standard 5: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

39. Locate and select information using organizational features of grade-appropriate resources, including:
    - complex reference sources (e.g., almanacs, atlases, newspapers, magazines, brochures, map legends, prefaces, appendices)
    - electronic storage devices (e.g., CD-ROMs, diskettes, software, drives)
    - frequently accessed and bookmarked Web addresses
    - features of electronic texts (e.g., hyperlinks, cross-referencing, Web resources, including online sources and remote sites) (ELA-5-M1)

40. Locate and integrate information from a variety of grade-appropriate resources, including:
    - multiple printed texts (e.g., encyclopedias, atlases, library catalogs, specialized dictionaries, almanacs, technical encyclopedias)
    - electronic sources (e.g., Web sites, databases)
    - other media sources (e.g., audio and video tapes, films, documentaries, television, radio) (ELA-5-M2)
41. Explain the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date, coverage) (ELA-5-M2)
42. Gather and select information using data-gathering strategies/tools, including:
    - surveying
    - interviewing
    - paraphrasing (ELA-5-M3)
43. Generate grade-appropriate research reports that include information presented in a variety of forms, including:
    - visual representations of data/information
    - graphic organizers (e.g., outlines, timelines, charts, webs)
    - works cited lists and/or bibliographies (ELA-5-M3)
44. Use word processing and/or other technology to draft, revise, and publish a variety of works, including reports and research documents (ELA-5-M4)
45. Give credit for borrowed information following acceptable use policy, including:
    - integrating quotations and citations
    - using end notes
    - creating bibliographies and/or works cited lists (ELA-5-M5)
46. Interpret information from a variety of graphic organizers including timelines, charts, schedules, tables, diagrams, and maps in grade-appropriate sources (ELA-5-M6)

Reading and Responding

Standard 1: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

1. Develop vocabulary using a variety of strategies, including:
   - use of connotative and denotative meanings
   - use of Greek, Latin, and Anglo-Saxon roots and word parts (ELA-1-M1)
2. Interpret story elements, including:
   - stated and implied themes
   - development of character types (e.g., flat, round, dynamic, static)
   - effectiveness of plot sequence and/or subplots
   - the relationship of conflicts and multiple conflicts (e.g., man vs. man, nature, society, self) to plot
   - difference in third-person limited and omniscient points of view
   - how a theme is developed (ELA-1-M2)
3. Interpret literary devices, including:
   - allusions
   - understatement (meiosis)
   - how word choice and images appeal to the senses and suggest mood and tone
   - the use of foreshadowing and flashback to direct plot development
   - the effects of hyperbole and symbolism (ELA-1-M2)
4. Draw conclusions and make inferences in print and nonprint responses about ideas and information in grade-appropriate texts, including:
   - epics
   - consumer materials
   - public documents (ELA-1-M3)
5. Interpret ideas and information in a variety of texts (e.g., scientific reports, technical guidelines, business memos) and make connections to real-life situations and other texts (ELA-1-M4)

Standard 6: Students read, analyze, and respond to literature as a record of life experiences.

6. Analyze universal themes found in a variety of world and multicultural texts in oral and written responses (ELA-6-M1)
7. Compare and contrast elements (e.g., plot, setting, character, theme) in multiple genres (ELA-6-M2)
8. Use knowledge of the distinctive characteristics to classify and explain the significance of various genres, including:
   - fiction (e.g., mystery, novel)
   - nonfiction (e.g., workplace documents, editorials)
   - poetry (e.g., lyric, narrative)
   - drama (e.g., plays) (ELA-6-M3)

Standard 7: Students apply reasoning and problem solving skills to reading, writing, speaking, listening, viewing, and visually representing.

9. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including:
   - sequencing events to examine and evaluate information
   - summarizing and paraphrasing to examine and evaluate information
   - interpreting stated or implied main ideas
   - comparing and contrasting literary elements and ideas within and across texts
   - making inferences and drawing conclusions
   - predicting the outcome of a story or situation
   - identifying literary devices (ELA-7-M1)

10. Explain the relationship between life experiences and texts to generate solutions to problems (ELA-7-M2)
11. Use technical information and other available resources (e.g., Web sites, interviews) to solve problems (ELA-7-M2)
12. Evaluate the effectiveness of an author's purpose (ELA-7-M3)
13. Analyze an author's viewpoint by assessing appropriateness of evidence and persuasive techniques (e.g., appeal to authority, social disapproval) (ELA-7-M3)
14. Analyze grade-appropriate print and nonprint texts using various reasoning skills, including:
    - identifying cause-effect relationships
    - raising questions
    - reasoning inductively and deductively
    - generating a theory or hypothesis
    - skimming/scanning
    - distinguishing facts from opinions and probability (ELA-7-M4)

Writing

Standard 2: Students write competently for a variety of purposes and audiences.

15. Write complex, multiparagraph compositions on student- or teacher-selected topics organized with the following:
    - a clearly stated focus or central idea
    - important ideas or events stated in a selected order
    - organizational patterns (e.g., comparison/contrast, order of importance, chronological order) appropriate to the topic
    - elaboration (anecdotes, relevant facts, examples, and/or specific details)
    - transitional words and phrases that unify ideas and points
    - an overall structure (e.g., introduction, body/middle, and concluding paragraph that summarizes important ideas and details) (ELA-2-M1)
16. Organize individual paragraphs with topic sentences, relevant elaboration, and concluding sentences (ELA-2-M1)
17. Develop grade-appropriate compositions on student- or teacher-selected topics that include the following:
    - word choices (diction) appropriate to the identified audience and/or purpose
    - vocabulary selected to clarify meaning, create images, and set a tone
    - information/ideas selected to engage the interest of the reader
    - clear voice (individual personality)
    - variety in sentence structure (ELA-2-M2)
18. Develop grade-appropriate compositions by identifying and applying writing processes such as the following:
    - selecting topic and form
    - prewriting (e.g., brainstorming, researching, raising questions, generating graphic organizers)
    - drafting
    - conferencing (e.g., peer and teacher)
    - revising based on feedback and use of various tools (e.g., LEAP21 Writer's Checklist, rubrics)
    - proofreading/editing
    - publishing using technology (ELA-2-M3)
19. Develop grade-appropriate paragraphs and multiparagraph compositions using the various modes of writing (e.g., description, narration, exposition, and persuasion), emphasizing narration and exposition (ELA-2-M4)
20. Use the various modes to write compositions, including:
    - short stories developed with literary devices
    - problem/solution essays
    - essays defending a stated position (ELA-2-M4)
21. Develop writing using a variety of literary devices, including understatements and allusions (ELA-2-M5)
22. Write for a wide variety of purposes, including:
    - persuasive letters that include appropriate wording and tone and that state an opinion

- evaluations of advertisements, political cartoons, and speeches
- text-supported interpretations of elements of grade-appropriate stories, poems, plays, and novels (ELA-2-M6)

Writing/Proofreading

Standard 3: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

23. Use standard English capitalization and punctuation consistently (ELA-3-M2)
24. Write paragraphs and compositions following standard English structure and usage, including:
    - varied sentence structures and patterns, including complex sentences
    - phrases and clauses used correctly as modifiers (ELA-3-M3)
25. Apply knowledge of parts of speech in writing, including:
    - infinitives, participles, and gerunds
    - superlative and comparative degrees of adjectives
    - adverbs (ELA-3-M4)
26. Spell high-frequency, commonly confused, frequently misspelled words and derivatives (e.g., roots and affixes) correctly (ELA-3-M5)
27. Use a variety of resources (e.g., glossaries, dictionaries, thesauruses, spell check) to find correct spellings (ELA-3-M5)

Speaking and Listening

Standard 4: Students demonstrate competence in speaking and listening as tools for learning and communicating.

28. Adjust diction and enunciation to suit the purpose for speaking (ELA-4-M1)
29. Use standard English grammar, diction, syntax, and pronunciation when speaking (ELA-4-M1)
30. Follow procedures (e.g., read, question, write a response, form groups) from detailed oral instructions (ELA-4-M2)
31. State oral directions/procedures for tasks (ELA-4-M2)
32. Adjust volume and inflection to suit the audience and purpose of presentations (ELA-4-M3)
33. Organize oral presentations with a thesis, an introduction, a body/middle developed with relevant details, and a conclusion (ELA-4-M3)
34. Determine the credibility of the speaker (e.g., hidden agenda, slanted or biased materials) (ELA-4-M4)
35. Deliver grade-appropriate persuasive presentations (ELA-4-M4)
36. Summarize a speaker's purpose and point of view (ELA-4-M4)
37. Compare, contrast, and evaluate information found in a wide variety of text/electronic media, (e.g., microprint, public speeches, art form) (ELA-4-M5)
38. Participate in group and panel discussions, including:
    - explaining the effectiveness and dynamics of group process
    - applying agreed-upon rules for formal and informal discussions
    - assuming a variety of roles (e.g., facilitator, recorder, leader, listener) (ELA-4-M6)

Information Resources

Standard 5: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

39. Locate and select information using organizational features of grade-appropriate resources, including:
    - complex reference sources (e.g., almanacs, atlases, newspapers, magazines, brochures, map legends, prefaces, appendices)
    - electronic storage devices (e.g., CD-ROMs, diskettes, software, drives)
    - frequently accessed and bookmarked Web addresses
    - organizational features of electronic information (e.g., Web resources including online sources and remote sites) (ELA-5-M1)
40. Locate and integrate information from a variety of grade-appropriate resources, including:
    - multiple printed texts (e.g., encyclopedias, atlases, library catalogs, specialized dictionaries, almanacs, technical encyclopedias)

- electronic sources (e.g., Web sites, databases)
- other media sources (e.g., audio and video tapes, films, documentaries, television, radio) (ELA-5-M2)

41. Explain the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date, coverage) (ELA-5-M2)
42. Gather and select information using data-gathering strategies/tools, including:
    - surveying
    - interviewing
    - paraphrasing (ELA-5-M3)
43. Generate grade-appropriate research reports that include information presented in a variety of forms, including:
    - visual representations of data/information
    - graphic organizers (e.g., outlines, timelines, charts, webs)
    - works cited lists and/or bibliographies (ELA-5-M3)
44. Use word processing and/or other technology to draft, revise, and publish a variety of works, including documented research reports with bibliographies (ELA-5-M4)
45. Give credit for borrowed information following acceptable use policy, including:
    - integrating quotations and citations
    - using endnotes
    - creating bibliographies and/or works cited lists (ELA-5-M5)
46. Interpret information from a variety of graphic organizers including timelines, charts, schedules, tables, diagrams, and maps in grade-appropriate sources (ELA-5-M6)

Reading and Responding

Standard 1: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

47. Extend basic and technical vocabulary using a variety of strategies, including:
    - use of context clues
    - use of knowledge of Greek and Latin roots and affixes
    - use of denotative and connotative meanings
    - tracing etymology (ELA-1-H1)
48. Identify and explain story elements, including:
    - the author's use of direct and indirect characterization
    - the author's pacing of action and use of plot development, subplots, parallel episodes, and climax to impact the reader
    - the revelation of character through dialect, dialogue, dramatic monologues, and soliloquies (ELA-1-H2)
49. Identify and explain the significance of literary devices, including:
    - mixed metaphors
    - imagery
    - symbolism
    - flashback
    - foreshadowing
    - sarcasm/irony
    - implied metaphors
    - oxymoron (ELA-1-H2)
50. Draw conclusions and make inferences in oral and written responses about ideas and information in texts, including:
    - nonfiction works
    - short stories/novels
    - five-act plays
    - poetry/epics
    - film/visual texts
    - consumer/instructional materials
    - public documents (ELA-1-H3)
51. Explain ways in which ideas and information in a variety of texts (e.g., scientific reports, technical guidelines, business memos, literary texts) connect to real-life situations and other texts (ELA-1-H4)

Standard 6: Students read, analyze, and respond to literature as a record of life experiences.

52. Compare/contrast cultural elements including a group's history, perspectives, and language found in multicultural texts in oral and written responses (ELA-6-H1)
53. Identify and explain connections between historical contexts and works of various authors, including Homer, Sophocles, and Shakespeare (ELA-6-H2)
54. Identify and explain recurrent themes in world literature (ELA-6-H2)
55. Analyze in oral and written responses distinctive elements (including theme, structure, characterization) of a variety of literary forms and types, including:
    - essays by early and modern writers
    - epic poetry such as *The Odyssey*
    - forms of lyric and narrative poetry such as ballads and sonnets
    - drama, including ancient, Renaissance, and modern
    - short stories and novels

- biographies and autobiographies (ELA-6-H3)

56. Identify and explain in oral and written responses ways in which particular genres reflect life experiences, for example:
    - an essay expresses a point of view
    - a legend chronicles the life of a cultural hero
    - a short story or novel provides a vicarious life experience (ELA-6-H4)

Standard 7: Students apply reasoning and problem solving skills to reading, writing, speaking, listening, viewing, and visually representing.

57. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including:
    - summarizing and paraphrasing information and story elements
    - comparing and contrasting information in texts, including televised news, news magazines, documentaries, and online information
    - comparing and contrasting complex literary elements, devices, and ideas within and across texts
    - examining the sequence of information and procedures in order to critique the logic or development of ideas in texts
    - making inferences and drawing conclusions
    - making predictions and generalizations (ELA-7-H1)
58. Solve problems using reasoning skills, including:
    - using supporting evidence to verify solutions
    - analyzing the relationships between prior knowledge and life experiences and information in texts
    - using technical information in specialized software programs, manuals, interviews, surveys, and access guides to Web sites (ELA-7-H2)
59. Identify and explain the impact of an author's life on themes and issues of a single text or multiple texts by the same author (ELA-7-H3)
60. Analyze information within and across grade-appropriate texts using various reasoning skills, including:
    - identifying cause-effect relationships
    - raising questions
    - reasoning inductively and deductively
    - generating a theory or hypothesis
    - distinguishing facts from opinions and probability (ELA-7-H4)

Writing

Standard 2: Students write competently for a variety of purposes and audiences.

61. Develop organized, coherent paragraphs that include the following:
    - topic sentences
    - logical sequence
    - transitional words and phrases
    - appropriate closing sentences
    - parallel construction where appropriate (ELA-2-H1)
62. Develop multiparagraph compositions organized with the following:
    - a clearly stated central idea or thesis statement
    - a clear, overall structure that includes an introduction, a body, and an appropriate conclusion
    - supporting paragraphs appropriate to the topic organized in a logical sequence (e.g., spatial order, order of importance, ascending/descending order, chronological order, parallel construction)
    - transitional words and phrases that unify throughout (ELA-2-H1)
63. Develop complex compositions on student- or teacher-selected topics that are suited to an identified audience and purpose and that include the following:
    - word choices appropriate to the identified audience and/or purpose
    - vocabulary selected to clarify meaning, create images, and set a tone
    - information/ideas selected to engage the interest of the reader

- clear voice (individual personality) (ELA-2-H2)

64. Develop complex compositions using writing processes, including:
    - selecting topic and form (e.g., determining a purpose and audience)
    - prewriting (e.g., brainstorming, clustering, outlining, generating main idea/thesis statements)
    - drafting
    - conferencing (e.g., peer and teacher)
    - revising for content and structure based on feedback
    - proofreading/editing to improve conventions of language
    - publishing using technology (ELA-2-H3)
65. Develop paragraphs and complex, multiparagraph compositions using all modes of writing (description, narration, exposition, and persuasion) emphasizing exposition and persuasion (ELA-2-H4)
66. Develop paragraphs and complex, multiparagraph compositions that include complex stylistic features, including:
    - literary devices such as student-composed oxymoron, touches of sarcasm, and/or irony
    - vocabulary and phrasing that reflect an individual character (voice)
    - a variety of sentence lengths and structures, including simple, compound, and complex (ELA-2-H5)
67. Write for various purposes, including:
    - formal and business letters, such as letters of complaint and requests for information
    - letters to the editor
    - job applications
    - text-supported interpretations that connect life experiences to works of literature (ELA-2-H6)

Writing/Proofreading

Standard 3: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

68. Apply standard rules of sentence formation, avoiding common errors, such as:
    - fragments
    - run-on sentences
    - syntax problems (ELA-3-H2)
69. Apply standard rules of usage, including:
    - making subjects and verbs agree
    - using verbs in appropriate tenses
    - making pronouns agree with antecedents
    - using pronouns appropriately in nominative, objective, and possessive cases
    - using adjectives in comparative and superlative degrees and adverbs correctly
    - avoiding double negatives
    - using all parts of speech appropriately (ELA-3-H2)
70. Apply standard rules of mechanics, including:
    - using commas to set off appositives or parenthetical phrases
    - using quotation marks to set off titles of short works
    - using colons preceding a list and after a salutation in a business letter
    - using standard capitalization for names of political and ethnic groups, religions, and continents (ELA-3-H2)
71. Use correct spelling conventions when writing and editing (ELA-3-H3)
72. Use a variety of resources, such as dictionaries, thesauruses, glossaries, technology, and textual features (e.g., definitional footnotes, sidebars) to verify word spellings (ELA-3-H3)

Speaking and Listening

Standard 4: Students demonstrate competence in speaking and listening as tools for learning and communicating.

73. Use standard English grammar, diction, and syntax when responding to questions, participating in informal group discussions, and making presentations (ELA-4-H1)
74. Select language appropriate to specific purposes and audiences when speaking, including:
    - delivering informational/book reports in class
    - conducting interviews/surveys of classmates or the general public
    - participating in class discussions (ELA-4-H1)
75. Listen to oral instructions and presentations, speeches, discussions, and carry out procedures, including:
    - taking accurate notes
    - writing summaries or responses
    - forming groups (ELA-4-H2)
76. Organize and use precise language to deliver oral directions and instructions about general, technical, or scientific topics (ELA-4-H2)
77. Deliver oral presentations that include the following:
    - phrasing, enunciation, voice modulation, verbal and nonverbal techniques, and inflection adjusted to stress important ideas and impact audience response
    - language choices selected to suit the content and context
    - an organization that includes an introduction, relevant details that develop the topic, and a conclusion (ELA-4-H3)
78. Use active listening strategies, including:
    - monitoring messages for clarity
    - selecting and organizing essential information
    - noting cues such as changes in pace
    - generating and asking questions concerning a speaker's content, delivery, and attitude toward the subject (ELA-4-H4)
79. Deliver clear, coherent, and concise oral presentations about information and ideas in texts (ELA-4-H4)
80. Analyze media information in oral and written responses, including:
    - summarizing the coverage of a media event
    - comparing messages from different media (ELA-4-H5)
81. Participate in group and panel discussions, including:
    - identifying the strengths and talents of other participants
    - acting as facilitator, recorder, leader, listener, or mediator
    - evaluating the effectiveness of participant's performance (ELA-4-H6)

Information Resources

Standard 5: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

82. Identify and use organizational features to locate relevant information for research projects using a variety of resources, including:
    - print resources (e.g., prefaces, appendices, annotations, citations, bibliographic references)
    - electronic texts (e.g., database keyword searches, search engines, e-mail addresses) (ELA-5-H1)
83. Locate, analyze, and synthesize information from a variety of grade-appropriate resources, including:
    - multiple printed texts (e.g., encyclopedias, atlases, library catalogs, specialized dictionaries, almanacs, technical encyclopedias, and periodicals)
    - electronic sources (e.g., Web sites, databases)
    - other media sources (e.g., community and government data, television and radio resources, and other audio and visual materials) (ELA-5-H2)
84. Analyze the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date, and coverage) (ELA-5-H2)

85. Access information and conduct research using various grade-appropriate, data-gathering strategies/tools, including:
    - formulating clear research questions
    - gathering evidence from primary and secondary sources
    - using graphic organizers (e.g., outlining, charts, timelines, webs)
    - compiling and organizing information to support the central ideas, concepts, and themes of formal papers or presentations (ELA-5-H3)
86. Write a variety of research reports, which include the following:
    - research supporting the main ideas
    - facts, details, examples, and explanations from sources
    - graphics when appropriate
    - complete documentation (e.g., endnotes, parenthetical citations, works cited lists or bibliographies) (ELA-5-H3)
87. Use word processing and/or other technology (e.g., illustration, page-layout, Web-design programs) to draft, revise, and publish various works, including research reports documented with parenthetical citations and bibliographies or works cited lists (ELA-5-H4)
88. Give credit for borrowed information in grade-appropriate research reports following acceptable use policy, including:
    - using parenthetical documentation to integrate quotes and citations
    - preparing bibliographies and/or works cited list (ELA-5-H5)
89. Analyze information found in a variety of complex graphic organizers, including detailed maps, comparative charts, extended tables, graphs, diagrams, cutaways, overlays, and sidebars to determine usefulness for research (ELA-5-H6)

Reading and Responding

Standard 1: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

1. Extend basic and technical vocabulary using a variety of strategies, including:
   - use of context clues
   - use of knowledge of Greek and Latin roots and affixes
   - use of denotative and connotative meanings
   - tracing etymology (ELA-1-H1)
2. Analyze the development of story elements, including:
   - characterization
   - plot and subplot(s)
   - theme
   - mood/atmosphere (ELA-1-H2)
3. Analyze the significance within a context of literary devices, including:
   - imagery
   - symbolism
   - flashback
   - foreshadowing
   - irony, ambiguity, contradiction
   - allegory
   - tone
   - dead metaphor
   - personification, including pathetic fallacy (ELA-1-H2)
4. Draw conclusions and make inferences about ideas and information in grade-appropriate texts in oral and written responses, including:
   - short stories/novels
   - nonfiction works
   - five-act plays
   - poetry/epics
   - film/visual texts
   - consumer/instructional materials
   - public documents (ELA-1-H3)
5. Analyze ways in which ideas and information in texts, such as almanacs, microfiche, news sources, technical documents, Internet sources, and literary texts, connect to real-life situations and other texts or represent a view or comment on life (ELA-1-H4)

Standard 6: Students read, analyze, and respond to literature as a record of life experiences.

6. Compare and/or contrast cultural elements including a group's history, perspectives, and language found in multicultural texts in oral and written responses (ELA-6-H1)
7. Analyze connections between historical contexts and the works of authors, including Sophocles and Shakespeare (ELA-6-H2)
8. Analyze recurrent themes in world literature (ELA-6-H2)
9. Analyze, in oral and written responses, distinctive elements, including theme and structure, of literary forms and types, including:
   - essays by early and modern writers
   - lyric, narrative, and dramatic poetry

- drama, including ancient, Renaissance, and modern
- short stories, novellas, and novels
- biographies and autobiographies
- speeches (ELA-6-H3)

10. Identify and explain in oral and written responses the ways in which particular genres reflect life experiences, for example:
    - an essay expresses a point of view
    - a legend chronicles the life of a cultural hero
    - a short story or novel provides a vicarious life experience (ELA-6-H4)

Standard 7: Students apply reasoning and problem solving skills to reading, writing, speaking, listening, viewing, and visually representing.

11. Demonstrate understanding of information in grade-appropriate texts using a variety of reasoning strategies, including:
    - summarizing and paraphrasing information and story elements
    - comparing and contrasting information in various texts (e.g., televised news, news magazines, documentaries, online information)
    - comparing and contrasting complex literary elements, devices, and ideas within and across texts
    - examining the sequence of information and procedures in order to critique the logic or development of ideas in texts
    - making inferences and drawing conclusions
    - making predictions and generalizations (ELA-7-H1)
12. Solve problems using reasoning skills, including:
    - using supporting evidence to verify solutions
    - analyzing the relationships between prior knowledge and life experiences and information in texts
    - using technical information in specialized software programs, manuals, interviews, surveys, and access guides to Web sites (ELA-7-H2)
13. Use knowledge of an author's background, culture, and philosophical assumptions to analyze the relationship of his/her works to the themes and issues of the historical period in which he/she lived (ELA-7-H3)
14. Evaluate the effects of an author's life in order to interpret universal themes and messages across different works by the same author (ELA-7-H3)
15. Analyze information within and across grade-appropriate texts using various reasoning skills, including:
    - identifying cause-effect relationships
    - raising questions
    - reasoning inductively and deductively
    - generating a theory or hypothesis
    - distinguishing facts from opinions and probability (ELA-7-H4)

Writing

Standard 2: Students write competently for a variety of purposes and audiences.

16. Develop organized, coherent paragraphs that include the following:
    - topic sentences
    - logical sequence
    - transitional words and phrases
    - appropriate closing sentences
    - parallel construction where appropriate (ELA-2-H1)
17. Develop multiparagraph compositions organized with the following:
    - a clearly stated central idea/thesis statement
    - a clear, overall structure that includes an introduction, a body, and an appropriate conclusion
    - supporting paragraphs appropriate to the topic organized in a logical sequence (e.g., spatial order, order of importance, ascending/descending order, chronological order, parallel construction)

- transitional words and phrases that unify throughout (ELA-2-H1)

18. Develop complex compositions on student- or teacher-selected topics that are suited to an identified audience and purpose and that include the following:
    - word choices appropriate to the identified audience and/or purpose
    - vocabulary selected to clarify meaning, create images, and set a tone
    - information/ideas selected to engage the interest of the reader
    - clear voice (individual personality) (ELA-2-H2)
19. Develop complex compositions using writing processes, including:
    - selecting topic and form
    - determining purpose and audience
    - prewriting (e.g., brainstorming, clustering, outlining, generating main idea/thesis statements)
    - drafting
    - conferencing (e.g., with peers and teachers)
    - revising for content and structure based on feedback
    - proofreading/editing to improve conventions of language
    - publishing using technology (ELA-2-H3)
20. Develop complex paragraphs and multiparagraph compositions using all modes of writing, emphasizing exposition and persuasion (ELA-2-H4)
21. Use all modes to write complex compositions, including:
    - comparison/contrast of ideas and information in reading materials or current issues
    - literary analyses that compare and contrast multiple texts
    - editorials on current affairs (ELA-2-H4)
22. Develop writing using a variety of complex literary and rhetorical devices, including imagery and the rhetorical question (ELA-2-H5)
23. Develop individual writing style that includes the following:
    - a variety of sentence structures (e.g., parallel or repetitive) and lengths
    - diction selected to create a tone and set a mood
    - selected vocabulary and phrasing that reflect the character and temperament (voice) of the writer (ELA-2-H5)
24. Write for various purposes, including:
    - formal and business letters, such as letters of complaint and requests for information
    - letters to the editor
    - job applications
    - text-supported interpretations that connect life experiences to works of literature (ELA-2-H6)

Writing/Proofreading

Standard 3: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

25. Apply standard rules of sentence formation, avoiding common errors, such as:
    - fragments
    - run-on sentences
    - syntax problems (ELA-3-H2)
26. Apply standard rules of usage, including:
    - making subjects and verbs agree
    - using verbs in appropriate tenses
    - making pronouns agree with antecedents
    - using pronouns in appropriate cases (e.g., nominative and objective)
    - using adjectives in comparative and superlative degrees

- using adverbs correctly
- avoiding double negatives (ELA-3-H2)

27. Apply standard rules of mechanics, including:
    - using commas to set off appositives or parenthetical phrases
    - using quotation marks to set off titles of short works
    - using colons preceding a list and after a salutation in a business letter
    - using appropriate capitalization, including names of political and ethnic groups, religions, and continents (ELA-3-H2)
28. Use correct spelling conventions when writing and editing (ELA-3-H3)
29. Use a variety of resources, such as dictionaries, thesauruses, glossaries, technology, and textual features (e.g., definitional footnotes, sidebars), to verify word spellings (ELA-3-H3)

Speaking and Listening

Standard 4: Students demonstrate competence in speaking and listening as tools for learning and communicating.

30. Use standard English grammar, diction, and syntax when speaking in formal presentations and informal group discussions (ELA-4-H1)
31. Select language appropriate to specific purposes and audiences, including:
    - delivering informational/book reports in class
    - conducting interviews/surveys of classmates or the general public
    - participating in class discussions (ELA-4-H1)
32. Listen to detailed oral instructions and presentations and carry out complex procedures, including:
    - taking accurate notes
    - writing summaries or responses
    - forming groups (ELA-4-H2)
33. Organize and use precise language to deliver oral directions and instructions about general, technical, or scientific topics (ELA-4-H2)
34. Deliver oral presentations that include the following:
    - volume, phrasing, enunciation, voice modulation, and inflection adjusted to stress important ideas and impact audience response
    - language choices adjusted to suit the content and context
    - an organization that includes an introduction, selected details, and a conclusion arranged to impact an audience (ELA-4-H3)
35. Use active listening strategies, including:
    - monitoring message for clarity
    - selecting and organizing essential information
    - noting cues such as changes in pace
    - generating and asking questions concerning a speaker's content, delivery, and attitude toward the subject (ELA-4-H4)
36. Deliver clear, coherent, and concise oral presentations and responses about information and ideas in a variety of texts (ELA-4-H4)
37. Analyze media information in oral and written responses, including:
    - comparing and contrasting the ways in which print and broadcast media cover the same event
    - evaluating media messages for clarity, quality, effectiveness, motive, and coherence
    - listening to and critiquing audio/video presentations (ELA-4-H5)
38. Participate in group and panel discussions, including:
    - identifying the strengths and talents of other participants
    - acting as facilitator, recorder, leader, listener, or mediator
    - evaluating the effectiveness of participants' performances (ELA-4-H6)

Information Resources

Standard 5: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

39. Select and evaluate relevant information for a research project using the organizational features of a variety of resources, including:
    - print texts such as prefaces, appendices, annotations, citations, bibliographic references, and endnotes
    - electronic texts such as database keyword searches, search engines, and e-mail addresses (ELA-5-H1)
40. Locate, analyze, and synthesize information from grade-appropriate resources, including:
    - multiple printed texts (e.g., encyclopedias, atlases, library catalogs, specialized dictionaries, almanacs, technical encyclopedias, and periodicals)
    - electronic sources (e.g., Web sites and databases)
    - other media sources (e.g., community and government data, television and radio resources, and other audio and visual materials) (ELA-5-H2)
41. Analyze the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date, coverage) (ELA-5-H2)
42. Access information and conduct research using various grade-appropriate data-gathering strategies/tools, including:
    - formulating clear research questions
    - using research methods to gather evidence from primary and secondary sources
    - using graphic organizers (e.g., outlining, charts, timelines, webs)
    - compiling and organizing information to support the central ideas, concepts, and themes of a formal paper or presentation (ELA-5-H3)
43. Write a variety of research reports, which include the following:
    - research that supports the main ideas
    - facts, details, examples, and explanations from multiple sources
    - graphics when appropriate
    - complete documentation (e.g., endnotes, parenthetical citations, works cited lists, or bibliographies) (ELA-5-H3)
44. Use word processing and/or technology to draft, revise, and publish various works, including research reports documented with parenthetical citations and bibliographies or works cited lists (ELA-5-H4)
45. Follow acceptable use policy to document sources in research reports using various formats, including:
    - preparing extended bibliographies of reference materials
    - integrating quotations and citations while maintaining flow of ideas
    - using standard formatting for source acknowledgment according to a specified style guide
    - using parenthetical documentation following *MLA Guide* within a literature-based research report (ELA-5-H5)
46. Analyze information found in complex graphic organizers, including detailed maps, comparative charts, extended tables, graphs, diagrams, cutaways, overlays, and sidebars to determine usefulness for research (ELA-5-H6)

Reading and Responding

Standard 1: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

1. Extend basic and technical vocabulary using a variety of strategies, including:
   - analysis of an author's word choice
   - use of related forms of words
   - analysis of analogous statements (ELA-1-H1)
2. Analyze the significance of complex literary and rhetorical devices in American, British, or world texts, including:
   - apostrophes
   - rhetorical questions
   - metaphysical conceits
   - implicit metaphors (metonymy and synecdoche) (ELA-1-H2)
3. Draw conclusions and make inferences about ideas and information in complex texts in oral and written responses, including:
   - fiction/nonfiction
   - drama/poetry
   - public documents
   - film/visual texts
   - debates/speeches (ELA-1-H3)
4. Evaluate ways in which the main idea, rationale or thesis, and information in complex texts, including consumer, workplace, public, and historical documents, represent a view or comment on life (ELA-1-H4)

Standard 6: Students read, analyze, and respond to literature as a record of life experiences.

5. Analyze and critique the impact of historical periods, diverse ethnic groups, and major influences (e.g., philosophical, political, religious, ethical, social) on American, British, or world literature in oral and written responses (ELA-6-H1)
6. Analyze and explain the significance of literary forms, techniques, characteristics, and recurrent themes of major literary periods in ancient, American, British, or world literature (ELA-6-H2)
7. Analyze and synthesize in oral and written responses distinctive elements (e.g., structure) of a variety of literary forms and types, including:
   - essays and memoirs by early and modern essay writers
   - epic poetry such as *Beowulf*
   - forms of lyric and narrative poetry such as the ballad, sonnets, pastorals, elegies, and the dramatic monologue
   - drama, including ancient, Renaissance, and modern comedies and tragedies
   - short stories, novellas, and novels
   - biographies and autobiographies
   - speeches (ELA-6-H3)
8. Analyze in oral and written responses the ways in which works of ancient, American, British, or world literature represent views or comments on life, for example:
   - an autobiography/diary gives insight into a particular time and place
   - the pastoral idealizes life in the country
   - the parody mocks people and institutions
   - an allegory uses fictional figures to express truths about human experiences (ELA-6-H4)

Standard 7: Students apply reasoning and problem solving skills to reading, writing, speaking, listening, viewing, and visually representing.

9. Demonstrate understanding of information in American, British, and world literature using a variety of strategies, for example:
   - interpreting and evaluating presentation of events and information
   - evaluating the credibility of arguments in nonfiction works
   - making inferences and drawing conclusions
   - evaluating the author's use of complex literary elements, (e.g., symbolism, themes, characterization, ideas)
   - comparing and contrasting major periods, themes, styles, and trends within and across texts
   - making predictions and generalizations about ideas and information
   - critiquing the strengths and weaknesses of ideas and information
   - synthesizing (ELA-7-H1)
10. Identify, gather, and evaluate appropriate sources and relevant information to solve problems using multiple sources, including:
    - school library catalogs
    - online databases
    - electronic resources
    - Internet-based resources (ELA-7-H2)
11. Analyze and evaluate the philosophical arguments presented in literary works, including American, British, or world literature (ELA-7-H2)
12. Analyze and evaluate works of American, British, or world literature in terms of an author's life, culture, and philosophical assumptions (ELA-7-H3)
13. Analyze information within and across grade-appropriate print and nonprint texts using various reasoning skills, including:
    - identifying cause-effect relationships
    - raising questions
    - reasoning inductively and deductively
    - generating a theory or hypothesis
    - skimming/scanning
    - distinguishing facts from opinions and probability (ELA-7-H4)

Writing

Standard 2: Students write competently for a variety of purposes and audiences.

14. Develop complex compositions, essays, and reports that include the following:
    - a clearly stated central idea/thesis statement
    - a clear, overall structure (e.g., introduction, body, appropriate conclusion)
    - supporting paragraphs organized in a logical sequence (e.g., spatial order, order of importance, ascending/descending order, chronological order, parallel construction)
    - transitional words, phrases, and devices that unify throughout (ELA-2-H1)
15. Develop complex compositions on student- or teacher-selected topics that are suited to an identified audience and purpose and that include the following:
    - word choices appropriate to the identified audience and/or purpose
    - vocabulary selected to clarify meaning, create images, and set a tone
    - information/ideas selected to engage the interest of the reader
    - clear voice (individual personality) (ELA-2-H2)
16. Develop complex compositions using writing processes such as the following:
    - selecting topic and form (e.g., determining a purpose and audience)
    - prewriting (e.g., brainstorming, clustering, outlining, generating main idea/thesis statements)
    - drafting

- conferencing with peers and teachers
- revising for content and structure based on feedback
- proofreading/editing to improve conventions of language
- publishing using available technology (ELA-2-H3)

17. Use the various modes to write complex compositions, including:
    - definition essay
    - problem/solution essay
    - a research project
    - literary analyses that incorporate research
    - cause-effect essay
    - process analyses
    - persuasive essays (ELA-2-H4)
18. Develop writing/compositions using a variety of complex literary and rhetorical devices (ELA-2-H5)
19. Extend development of individual style to include the following:
    - avoidance of overused words, clichés, and jargon
    - a variety of sentence structures and patterns
    - diction that sets tone and mood
    - vocabulary and phrasing that reflect the character and temperament (voice) of the writer (ELA-2-H5)
20. Write for various purposes, including:
    - interpretations/explanations that connect life experiences to works of American, British, and world literature
    - functional documents (e.g., resumes, memos, proposals) (ELA-2-H6)

Writing/Proofreading

Standard 3: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

21. Apply standard rules of sentence formation, including parallel structure (ELA-3-H2)
22. Apply standard rules of usage, for example:
    - avoid splitting infinitives
    - use the subjunctive mood appropriately (ELA-3-H2)
23. Apply standard rules of mechanics and punctuation, including:
    - parentheses
    - brackets
    - dashes
    - commas after introductory adverb clauses and long introductory phrases
    - quotation marks for secondary quotations
    - internal capitalization
    - manuscript form (ELA-3-H2)
24. Use a variety of resources (e.g., dictionaries, thesauruses, glossaries, technology) and textual features, (e.g., definitional footnotes, sidebars) to verify word spellings (ELA-3-H3)

Speaking and Listening

Standard 4: Students demonstrate competence in speaking and listening as tools for learning and communicating.

25. Use standard English grammar, diction, and syntax when speaking in formal presentations and informal group discussions (ELA-4-H1)
26. Select language appropriate to specific purposes and audiences for speaking, including:
    - delivering informational/book reports in class
    - conducting interviews/surveys of classmates or the general public
    - participating in class discussions (ELA-4-H1)

27. Listen to detailed oral instructions and presentations and carry out complex procedures, including:
    - reading and questioning
    - writing responses
    - forming groups
    - taking accurate, detailed notes (ELA-4-H2)
28. Organize and use precise language to deliver complex oral directions or instructions about general, technical, or scientific topics (ELA-4-H2)
29. Deliver presentations that include the following:
    - language, diction, and syntax selected to suit a purpose and impact an audience
    - delivery techniques including repetition, eye contact, and appeal to emotion suited to a purpose and audience
    - an organization that includes an introduction, relevant examples, and/or anecdotes, and a conclusion arranged to impact an audience (ELA-4-H3)
30. Use active listening strategies, including:
    - monitoring messages for clarity
    - selecting and organizing information
    - noting cues such as changes in pace (ELA-4-H4)
31. Deliver oral presentations, including:
    - speeches that use appropriate rhetorical strategies
    - responses that analyze information in texts and media
    - persuasive arguments that clarify or defend positions (ELA-4-H4)
32. Give oral and written analyses of media information, including:
    - identifying logical fallacies (e.g., attack *ad hominem*, false causality, overgeneralization, bandwagon effect) used in oral addresses
    - analyzing the techniques used in media messages for a particular audience
    - critiquing a speaker's diction and syntax in relation to the purpose of an oral presentation
    - critiquing strategies (e.g., advertisements, propaganda techniques, visual representations, special effects) used by the media to inform, persuade, entertain, and transmit culture (ELA-4-H5)
33. Participate in group and panel discussions, including:
    - identifying the strengths and talents of other participants
    - acting as facilitator, recorder, leader, listener, or mediator
    - evaluating the effectiveness of participants' performance (ELA-4-H6)

Information Resources

Standard 5: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

34. Select and critique relevant information for a research project using the organizational features of a variety of resources, including:
    - print texts (e.g., prefaces, appendices, annotations, citations, bibliographic references)
    - electronic texts (e.g., database keyword searches, search engines, e-mail addresses) (ELA-5-H1)
35. Locate, analyze, and synthesize information from a variety of complex resources, including:
    - multiple print texts (e.g., encyclopedias, atlases, library catalogs, specialized dictionaries, almanacs, technical encyclopedias, and periodicals)
    - electronic sources (e.g., Web sites or databases)
    - other media (e.g., community and government data, television and radio resources, and audio and visual materials) (ELA-5-H2)
36. Analyze the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date, coverage) (ELA-5-H2)
37. Access information and conduct research using various grade-appropriate data-gathering strategies/tools, including:
    - formulating clear research questions

- evaluating the validity and/or reliability of primary and/or secondary sources
- using graphic organizers (e.g., outlining, charts, timelines, webs)
- compiling and organizing information to support the central ideas, concepts, and themes of a formal paper or presentation
- preparing annotated bibliographies and anecdotal scripts (ELA-5-H3)

38. Write extended research reports (e.g., historical investigations, reports about high interest and library subjects) which include the following:
    - researched information that supports main ideas
    - facts, details, examples, and explanations from sources
    - graphics when appropriate
    - complete documentation (e.g., endnotes or parenthetical citations, works cited lists or bibliographies) consistent with a specified style guide (ELA-5-H3)
39. Use word processing and/or technology to draft, revise, and publish various works, including:
    - functional documents (e.g., requests for information, resumes, letters of complaint, memos, proposals), using formatting techniques that make the document user friendly
    - analytical reports that include databases, graphics, and spreadsheets
    - research reports on high-interest and literary topics (ELA-5-H4)
40. Use selected style guides to produce complex reports that include the following:
    - credit for sources (e.g., appropriate parenthetical documentation and notes)
    - standard formatting for source acknowledgment (ELA-5-H5)
41. Analyze and synthesize information found in various complex graphic organizers, including detailed maps, comparative charts, extended tables, graphs, diagrams, cutaways, overlays, and sidebars (ELA-5-H6)

Mathematics

LOUISIANA Grade 7 Mathematics
Standards and Grade-Level Expectations

Number and Number Relations

Standard: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

1. Recognize and compute equivalent representations of fractions, decimals, and percents (i.e., halves, thirds, fourths, fifths, eighths, tenths, hundredths) (N-1-M)
2. Compare positive fractions, decimals, percents, and integers using symbols (i.e., <, ≤, =, ≥, >) and position on a number line (N-2-M)
3. Solve order of operations problems involving grouping symbols and multiple operations (N-4-M)
4. Model and apply the distributive property in real-life applications (N-4-M)
5. Multiply and divide positive fractions and decimals (N-5-M)
6. Set up and solve simple percent problems using various strategies, including mental math (N-5-M) (N-6-M) (N-8-M)
7. Select and discuss appropriate operations and solve single- and multi-step, real-life problems involving positive fractions, percents, mixed numbers, decimals, and positive and negative integers (N-5-M) (N-3-M) (N-4-M)
8. Determine the reasonableness of answers involving positive fractions and decimals by comparing them to estimates (N-6-M) (N-7-M)
9. Determine when an estimate is sufficient and when an exact answer is needed in real-life problems using decimals and percents (N-7-M) (N-5-M)
10. Determine and apply rates and ratios (N-8-M)
11. Use proportions involving whole numbers to solve real-life problems (N-8-M)

Algebra

Standard: In problem-solving investigations students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.

12. Evaluate algebraic expressions containing exponents (especially 2 and 3) and square roots, using substitution (A-1-M)
13. Determine the square root of perfect squares and mentally approximate other square roots by identifying the two whole numbers between which they fall (A-1-M)
14. Write a real-life meaning of a simple algebraic equation or inequality, and vice versa (A-1-M) (A-5-M)
15. Match algebraic inequalities with equivalent verbal statements and vice versa (A-1-M)
16. Solve one- and two-step equations and inequalities (with one variable) in multiple ways (A-2-M)
17. Graph solutions sets of one-step equations and inequalities as points, or open and closed rays on a number line (e.g., $x = 5$, $x < 5$, $x \leq 5$, $x > 5$, $x \geq 5$) (A-2-M)
18. Describe linear, multiplicative, or changing growth relationships (e.g., 1, 3, 6, 10, 15, 21, …) verbally and algebraically (A-3-M) (A-4-M) (P-1-M)
19. Use *function machines* to determine and describe the rule that generates outputs from given inputs (A-4-M) (P-3-M)

Measurement

Standard: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

20. Determine the perimeter and area of composite plane figures by subdivision and area addition (M-1-M) (G-7-M)
21. Compare and order measurements within and between the U.S. and metric systems in terms of common reference points (e.g., weight/mass and area) (M-4-M) (G-1-M)
22. Convert between units of area in U.S. and metric units within the same system (M-5-M)

23. Demonstrate an intuitive sense of comparisons between degrees Fahrenheit and Celsius in real-life situations using common reference points (M-5-M)

Geometry

Standard: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.

24. Identify and draw angles (using protractors), circles, diameters, radii, altitudes, and 2-dimensional figures with given specifications (G-2-M)
25. Draw the results of reflections and translations of geometric shapes on a coordinate grid (G-3-M)
26. Recognize π as the ratio between the circumference and diameter of any circle (i.e., π = C/d or π = C/2r) (G-5-M)
27. Model and explain the relationship between perimeter and area (how scale change in a linear dimension affects perimeter and area) and between circumference and area of a circle (G-5-M)
28. Determine the radius, diameter, circumference, and area of a circle and apply these measures in real-life problems (G-5-M) (G-7-M) (M-6-M)
29. Plot points on a coordinate grid in all 4 quadrants and locate the coordinates of a missing vertex in a parallelogram (G-6-M) (A-5-M)
30. Apply the knowledge that the measures of the interior angles in a triangle add up to 180 degrees (G-7-M)

Data Analysis, Probability, and Discrete Math

Standard: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.

31. Analyze and interpret circle graphs, and determine when a circle graph is the most appropriate type of graph to use (D-2-M)
32. Describe data in terms of patterns, clustered data, gaps, and outliers (D-2-M)
33. Analyze discrete and continuous data in real-life applications (D-2-M) (D-6-M)
34. Create and use Venn diagrams with three overlapping categories to solve counting logic problems (D-3-M)
35. Use informal thinking procedures of elementary logic involving *if/then* statements (D-3-M)
36. Apply the fundamental counting principle in real-life situations (D-4-M)
37. Determine probability from experiments and from data displayed in tables and graphs (D-5-M)
38. Compare theoretical and experimental probability in real-life situations (D-5-M)

Patterns, Relations, and Functions

Standard: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.

39. Analyze and describe simple exponential number patterns (e.g., 3, 9, 27 or 3^1, 3^2, 3^3) (P-1-M)
40. Analyze and verbally describe real-life additive and multiplicative patterns involving fractions and integers (P-1-M) (P-4-M)
41. Illustrate patterns of change in length(s) of sides and corresponding changes in areas of polygons (P-3-M)

LOUISIANA Grade 8 Mathematics
Standards and Grade-Level Expectations

Number and Number Relations

Standard: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

1. Compare rational numbers using symbols (i.e., <, ≤, =, ≥, >) and position on a number line (N-1-M) (N-2-M)
2. Use whole number exponents (0–3) in problem-solving contexts (N-1-M) (N-5-M)
3. Estimate the answer to an operation involving rational numbers based on the original numbers (N-2-M) (N-6-M)
4. Read and write numbers in scientific notation with positive exponents (N-3-M)
5. Simplify expressions involving operations on integers, grouping symbols, and whole number exponents using order of operations (N-4-M)
6. Identify missing information or suggest a strategy for solving a real-life, rational-number problem (N-5-M)
7. Use proportional reasoning to model and solve real-life problems (N-8-M)
8. Solve real-life problems involving percentages, including percentages less than 1 or greater than 100 (N-8-M) (N-5-M)
9. Find unit/cost rates and apply them in real-life problems (N-8-M) (N-5-M) (A-5-M)

Algebra

Standard: In problem-solving investigations students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.

10. Write real-life meanings of expressions and equations involving rational numbers and variables (A-1-M) (A-5-M)
11. Translate real-life situations that can be modeled by linear or exponential relationships to algebraic expressions, equations, and inequalities (A-1-M) (A-4-M) (A-5-M)
12. Solve and graph solutions of multi-step linear equations and inequalities (A-2-M)
13. Switch between functions represented as tables, equations, graphs, and verbal representations, with and without technology (A-3-M) (P-2-M) (A-4-M)
14. Construct a table of *x*- and *y*-values satisfying a linear equation and construct a graph of the line on the coordinate plane (A-3-M) (A-2-M)
15. Describe and compare situations with constant or varying rates of change (A-4-M)
16. Explain and formulate generalizations about how a change in one variable results in a change in another variable (A-4-M)

Measurement

Standard: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

17. Determine the volume and surface area of prisms and cylinders (M-1-M) (G-7-M)
18. Apply rate of change in real-life problems, including density, velocity, and international monetary conversions (M-1-M) (N-8-M) (M-6-M)
19. Demonstrate an intuitive sense of the relative sizes of common units of volume in relation to real-life applications and use this sense when estimating (M-2-M) (G-1-M)
20. Identify and select appropriate units for measuring volume (M-3-M)
21. Compare and estimate measurements of volume and capacity within and between the U.S. and metric systems (M-4-M) (G-1-M)
22. Convert units of volume/capacity within systems for U.S. and metric units (M-5-M)

Geometry

Standard: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.

23. Define and apply the terms *measure*, *distance*, *midpoint*, *bisect*, *bisector*, and *perpendicular bisector* (G-2-M)
24. Demonstrate conceptual and practical understanding of symmetry, similarity, and congruence and identify similar and congruent figures (G-2-M)

25. Predict, draw, and discuss the resulting changes in lengths, orientation, angle measures, and coordinates when figures are translated, reflected across horizontal or vertical lines, and rotated on a grid (G-3-M) (G-6-M)
26. Predict, draw, and discuss the resulting changes in lengths, orientation, and angle measures that occur in figures under a similarity transformation (dilation) (G-3-M) (G-6-M)
27. Construct polyhedra using 2-dimensional patterns (nets) (G-4-M)
28. Apply concepts, properties, and relationships of adjacent, corresponding, vertical, alternate interior, complementary, and supplementary angles (G-5-M)
29. Solve problems involving lengths of sides of similar triangles (G-5-M) (A-5-M)
30. Construct, interpret, and use scale drawings in real-life situations (G-5-M) (M-6-M) (N-8-M)
31. Use area to justify the Pythagorean theorem and apply the Pythagorean theorem and its converse in real-life problems (G-5-M) (G-7-M)
32. Model and explain the relationship between the dimensions of a rectangular prism and its volume (i.e., how scale change in linear dimension(s) affects volume) (G-5-M)
33. Graph solutions to real-life problems on the coordinate plane (G-6-M)

Data Analysis, Probability, and Discrete Math

Standard: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.

34. Determine what kind of data display is appropriate for a given situation (D-1-M)
35. Match a data set or graph to a described situation, and vice versa (D-1-M)
36. Organize and display data using circle graphs (D-1-M)
37. Collect and organize data using box-and-whisker plots and use the plots to interpret quartiles and range (D-1-M) (D-2-M)
38. Sketch and interpret a trend line (i.e., line of best fit) on a scatterplot (D-2-M) (A-4-M) (A-5-M)
39. Analyze and make predictions from discovered data patterns (D-2-M)
40. Explain factors in a data set that would affect measures of central tendency (e.g., impact of extreme values) and discuss which measure is most appropriate for a given situation (D-2-M)
41. Select random samples that are representative of the population, including sampling with and without replacement, and explain the effect of sampling on bias (D-2-M) (D-4-M)
42. Use lists, tree diagrams, and tables to apply the concept of permutations to represent an ordering with and without replacement (D-4-M)
43. Use lists and tables to apply the concept of combinations to represent the number of possible ways a set of objects can be selected from a group (D-4-M)
44. Use experimental data presented in tables and graphs to make outcome predictions of independent events (D-5-M)
45. Calculate, illustrate, and apply single- and multiple-event probabilities, including mutually exclusive, independent events and non-mutually exclusive, dependent events (D-5-M)

Patterns, Relations, and Functions

Standard: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.

46. Distinguish between and explain when real-life numerical patterns are linear/arithmetic (i.e., grows by addition) or exponential/geometric (i.e., grows by multiplication) (P-1-M) (P-4-M)
47. Represent the n^{th} term in a pattern as a formula and test the representation (P-1-M) (P-2-M) (P-3-M) (A-5-M)
48. Illustrate patterns of change in dimension(s) and corresponding changes in volumes of rectangular solids (P-3-M)

LOUISIANA Grade 9 Mathematics
Standards and Grade-Level Expectations

Number and Number Relations

Standard: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

1. Identify and describe differences among natural numbers, whole numbers, integers, rational numbers, and irrational numbers (N-1-H) (N-2-H) (N-3-H)
2. Evaluate and write numerical expressions involving integer exponents (N-2-H)
3. Apply scientific notation to perform computations, solve problems, and write representations of numbers (N-2-H)
4. Distinguish between an exact and an approximate answer, and recognize errors introduced by the use of approximate numbers with technology (N-3-H) (N-4-H) (N-7-H)
5. Demonstrate computational fluency with all rational numbers (e.g., estimation, mental math, technology, paper/pencil) (N-5-H)
6. Simplify and perform basic operations on numerical expressions involving radicals (e.g., $2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}$) (N-5-H)
7. Use proportional reasoning to model and solve real-life problems involving direct and inverse variation (N-6-H)

Algebra

Standard: In problem-solving investigations students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.

8. Use order of operations to simplify or rewrite variable expressions (A-1-H) (A-2-H)
9. Model real-life situations using linear expressions, equations, and inequalities (A-1-H) (D-2-H) (P-5-H)
10. Identify independent and dependent variables in real-life relationships (A-1-H)
11. Use equivalent forms of equations and inequalities to solve real-life problems (A-1-H)
12. Evaluate polynomial expressions for given values of the variable (A-2-H)
13. Translate between the characteristics defining a line (i.e., slope, intercepts, points) and both its equation and graph (A-2-H) (G-3-H)
14. Graph and interpret linear inequalities in one or two variables and systems of linear inequalities (A-2-H) (A-4-H)
15. Translate among tabular, graphical, and algebraic representations of functions and real-life situations (A-3-H) (P-1-H) (P-2-H)
16. Interpret and solve systems of linear equations using graphing, substitution, elimination, with and without technology, and matrices using technology (A-4-H)

Measurement

Standard: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

17. Distinguish between precision and accuracy (M-1-H)
18. Demonstrate and explain how the scale of a measuring instrument determines the precision of that instrument (M-1-H)
19. Use significant digits in computational problems (M-1-H) (N-2-H)
20. Demonstrate and explain how relative measurement error is compounded when determining absolute error (M-1-H) (M-2-H) (M-3-H)
21. Determine appropriate units and scales to use when solving measurement problems (M-2-H) (M-3-H) (M-1-H)
22. Solve problems using indirect measurement (M-4-H)

Geometry

Standard: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.

23. Use coordinate methods to solve and interpret problems (e.g., slope as rate of change, intercept as initial value, intersection as common solution, midpoint as equidistant) (G-2-H) (G-3-H)
24. Graph a line when the slope and a point or when two points are known (G-3-H)
25. Explain slope as a representation of “rate of change” (G-3-H) (A-1-H)
26. Perform translations and line reflections on the coordinate plane (G-3-H)

Data Analysis, Probability, and Discrete Math

Standard: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.

27. Determine the most appropriate measure of central tendency for a set of data based on its distribution (D-1-H)
28. Identify trends in data and support conclusions by using distribution characteristics such as patterns, clusters, and outliers (D-1-H) (D-6-H) (D-7-H)
29. Create a scatter plot from a set of data and determine if the relationship is linear or nonlinear (D-1-H) (D-6-H) (D-7-H)
30. Use simulations to estimate probabilities (D-3-H) (D-5-H)
31. Define probability in terms of sample spaces, outcomes, and events (D-4-H)
32. Compute probabilities using geometric models and basic counting techniques such as combinations and permutations (D-4-H)
33. Explain the relationship between the probability of an event occurring, and the odds of an event occurring and compute one given the other (D-4-H)
34. Follow and interpret processes expressed in flow charts (D-8-H)

Patterns, Relations, and Functions

Standard: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.

35. Determine if a relation is a function and use appropriate function notation (P-1-H)
36. Identify the domain and range of functions (P-1-H)
37. Analyze real-life relationships that can be modeled by linear functions (P-1-H) (P-5-H)
38. Identify and describe the characteristics of families of linear functions, with and without technology (P-3-H)
39. Compare and contrast linear functions algebraically in terms of their rates of change and intercepts (P-4-H)
40. Explain how the graph of a linear function changes as the coefficients or constants are changed in the function's symbolic representation (P-4-H)

LOUISIANA Grade 10 Mathematics
Standards and Grade-Level Expectations

Number and Number Relations

Standard: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

1. Simplify and determine the value of radical expressions (N-2-H) (N-7-H)
2. Predict the effect of operations on real numbers (e.g., the quotient of a positive number divided by a positive number less than 1 is greater than the original dividend) (N-3-H) (N-7-H)
3. Define *sine*, *cosine*, and *tangent* in ratio form and calculate them using technology (N-6-H)
4. Use ratios and proportional reasoning to solve a variety of real-life problems including similar figures and scale drawings (N-6-H) (M-4-H)

Algebra

Standard: In problem-solving investigations students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.

5. Write the equation of a line of best fit for a set of 2-variable real-life data presented in table or scatter plot form, with or without technology (A-2-H) (D-2-H)
6. Write the equation of a line parallel or perpendicular to a given line through a specific point (A-3-H) (G-3-H)

Measurement

Standard: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

7. Find volume and surface area of pyramids, spheres, and cones (M-3-H) (M-4-H)
8. Model and use trigonometric ratios to solve problems involving right triangles (M-4-H) (N-6-H)

Geometry

Standard: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.

9. Construct 2- and 3-dimensional figures when given the name, description, or attributes, with and without technology (G-1-H)
10. Form and test conjectures concerning geometric relationships including lines, angles, and polygons (i.e., triangles, quadrilaterals, and n-gons), with and without technology (G-1-H) (G-4-H) (G-6-H)
11. Determine angle measurements using the properties of parallel, perpendicular, and intersecting lines in a plane (G-2-H)
12. Apply the Pythagorean theorem in both abstract and real-life settings (G-2-H)
13. Solve problems and determine measurements involving chords, radii, arcs, angles, secants, and tangents of a circle (G-2-H)
14. Develop and apply coordinate rules for translations and reflections of geometric figures (G-3-H)
15. Draw or use other methods, including technology, to illustrate dilations of geometric figures (G-3-H)
16. Represent and solve problems involving distance on a number line or in the plane (G-3-H)
17. Compare and contrast inductive and deductive reasoning approaches to justify conjectures and solve problems (G-4-H) (G-6-H)
18. Determine angle measures and side lengths of right and similar triangles using trigonometric ratios and properties of similarity, including congruence (G-5-H) (M-4-H)
19. Develop formal and informal proofs (e.g., Pythagorean theorem, flow charts, paragraphs) (G-6-H)

Data Analysis, Probability, and Discrete Math

Standard: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.

20. Show or justify the correlation (match) between a linear or non-linear data set and a graph (D-2-H) (P-5-H)
21. Determine the probability of conditional and multiple events, including mutually and nonmutually exclusive events (D-4-H) (D-5-H)

22. Interpret and summarize a set of experimental data presented in a table, bar graph, line graph, scatter plot, matrix, or circle graph (D-7-H)
23. Draw and justify conclusions based on the use of logic (e.g., conditional statements, converse, inverse, contrapositive) (D-8-H) (G-6-H) (N-7-H)
24. Use counting procedures and techniques to solve real-life problems (D-9-H)
25. Use discrete math to model real life situations (e.g., fair games, elections) (D-9-H)

Patterns, Relations, and Functions

Standard: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.

26. Generalize and represent patterns symbolically, with and without technology (P-1-H)
27. Translate among tabular, graphical, and symbolic representations of patterns in real-life situations, with and without technology (P-2-H) (P-3-H) (A-3-H)

Number and Number Relations

Standard: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

1. Read, write, and perform basic operations on complex numbers (N-1-H) (N-5-H)
2. Evaluate and perform basic operations on expressions containing rational exponents (N-2-H)
3. Describe the relationship between exponential and logarithmic equations (N-2-H)

Algebra

Standard: In problem-solving investigations students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.

4. Translate and show the relationships among non-linear graphs, related tables of values, and algebraic symbolic representations (A-1-H)
5. Factor simple quadratic expressions including general trinomials, perfect squares, difference of two squares, and polynomials with common factors (A-2-H)
6. Analyze functions based on zeros, asymptotes, and local and global characteristics of the function (A-3-H)
7. Explain, using technology, how the graph of a function is affected by change of degree, coefficient, and constants in polynomial, rational, radical, exponential, and logarithmic functions (A-3-H)
8. Categorize non-linear graphs and their equations as quadratic, cubic, exponential, logarithmic, step function, rational, trigonometric, or absolute value (A-3-H) (P-5-H)
9. Solve quadratic equations by factoring, completing the square, using the quadratic formula, and graphing (A-4-H)
10. Model and solve problems involving quadratic, polynomial, exponential, logarithmic, step function, rational, and absolute value equations using technology (A-4-H)

Measurement

Standard: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

11. Calculate angle measures in degrees, minutes, and seconds (M-1-H)
12. Explain the unit circle basis for radian measure and show its relationship to degree measure of angles (M-1-H)
13. Identify and apply the unit circle definition to trigonometric functions and use this definition to solve real-life problems (M-4-H)
14. Use the Law of Sines and the Law of Cosines to solve problems involving triangle measurements (M-4-H)

Geometry

Standard: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.

15. Identify conic sections, including the degenerate conics, and describe the relationship of the plane and double-napped cone that forms each conic (G-1-H)
16. Represent translations, reflections, rotations, and dilations of plane figures using sketches, coordinates, vectors, and matrices (G-3-H)

Data Analysis, Probability, and Discrete Math

Standard: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.

17. Discuss the differences between samples and populations (D-1-H)
18. Devise and conduct well-designed experiments/surveys involving randomization and considering the effects of sample size and bias (D-1-H)
19. Correlate/match data sets or graphs and their representations and classify them as exponential, logarithmic, or polynomial functions (D-2-H)

20. Interpret and explain, with the use of technology, the regression coefficient and the correlation coefficient for a set of data (D-2-H)
21. Describe and interpret displays of normal and non-normal distributions (D-6-H)
22. Explain the limitations of predictions based on organized sample sets of data (D-7-H)
23. Represent data and solve problems involving Euler and Hamiltonian paths (D-9-H)

Patterns, Relations, and Functions

Standard: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.

24. Model a given set of real-life data with a non-linear function (P-1-H) (P-5-H)
25. Apply the concept of a function and function notation to represent and evaluate functions (P-1-H) (P-5-H)
26. Represent and solve problems involving n^{th} terms and sums for arithmetic and geometric series (P-2-H)
27. Compare and contrast the properties of families of polynomial, rational, exponential, and logarithmic functions, with and without technology (P-3-H)
28. Represent and solve problems involving the translation of functions in the coordinate plane (P-4-H)
29. Determine the family or families of functions that can be used to represent a given set of real-life data, with and without technology (P-5-H)

Science

LOUISIANA Grades 7–8 Science

Standards and Grade-Level Expectations

Science As Inquiry

Standard: The students will do science by engaging in partial and full inquiries that are within their developmental capabilities.

The Abilities Necessary to Do Scientific Inquiry

1. Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
2. Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)
3. Use a variety of sources to answer questions (SI-M-A1)
4. Design, predict outcomes, and conduct experiments to answer guiding questions (SIM-A2)
5. Identify independent variables, dependent variables, and variables that should be controlled in designing an experiment (SI-M-A2)
6. Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)
7. Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
8. Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)
9. Use computers and/or calculators to analyze and interpret quantitative data (SI-M-A3)
10. Identify the difference between description and explanation (SI-M-A4)
11. Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
12. Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
13. Identify patterns in data to explain natural events (SI-M-A4)
14. Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5)
15. Identify and explain the limitations of models used to represent the natural world (SIM-A5)
16. Use evidence to make inferences and predict trends (SI-M-A5)
17. Recognize that there may be more than one way to interpret a given set of data, which can result in alternative scientific explanations and predictions (SI-M-A6)
18. Identify faulty reasoning and statements that misinterpret or are not supported by the evidence (SI-M-A6)
19. Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)
20. Write clear, step-by-step instructions that others can follow to carry out procedures or conduct investigations (SI-M-A7)
21. Distinguish between observations and inferences (SI-M-A7)
22. Use *evidence* and *observations* to explain and communicate the results of investigations (SI-M-A7)
23. Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8)
24. Provide appropriate care and utilize safe practices and ethical treatment when animals are involved in scientific field and laboratory research (SI-M-A8)

Understanding Scientific Inquiry

25. Compare and critique scientific investigations (SI-M-B1)
26. Use and describe alternate methods for investigating different types of testable questions (SI-M-B1)
27. Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving (SI-M-B1)
28. Recognize that investigations generally begin with a review of the work of others (SIM-B2)

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29. Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3)
30. Describe why all questions cannot be answered with present technologies (SI-M-B3)
31. Recognize that there is an acceptable range of variation in collected data (SI-M-B3)
32. Explain the use of statistical methods to confirm the significance of data (e.g., mean, median, mode, range) (SI-M-B3)
33. Evaluate models, identify problems in design, and make recommendations for improvement (SI-M-B4)
34. Recognize the importance of communication among scientists about investigations in progress and the work of others (SI-M-B5)
35. Explain how skepticism about accepted scientific explanations (i.e., hypotheses and theories) leads to new understanding (SI-M-B5)
36. Explain why an experiment must be verified through multiple investigations and yield consistent results before the findings are accepted (SI-M-B5)
37. Critique and analyze their own inquiries and the inquiries of others (SI-M-B5)
38. Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas (SI-M-B6)
39. Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) (SI-M-B7)
40. Evaluate the impact of research on scientific thought, society, and the environment (SI-M-B7)

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LOUISIANA Grade 7 Science
Standards and Grade-Level Expectations

Physical Science

Standard: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

Properties and Changes of Properties in Matter

1. Identify the elements most often found in living organisms (e.g., C, N, H, O, P, S, Ca, Fe) (PS-M-A9)

Life Science

Standard: The students will become aware of the characteristics and life cycles of organisms and understand their relationships to each other and to their environment.

Structure and Function in Living Systems

2. Compare the basic structures and functions of different types of cells (LS-M-A1)
3. Illustrate and demonstrate osmosis and diffusion in cells (LS-M-A1)
4. Compare functions of plant and animal cell structures (i.e., organelles) (LS-M-A2)
5. Compare complete and incomplete metamorphosis in insects (e.g., butterflies, mealworms, grasshoppers) (LS-M-A3)
6. Compare the life cycles of a variety of organisms, including non-flowering and flowering plants, reptiles, birds, amphibians, and mammals (LS-M-A3)
7. Construct a word equation that illustrates the processes of photosynthesis and respiration (LS-M-A4)
8. Distinguish between *aerobic* respiration and *anaerobic* respiration (LS-M-A4)
9. Relate structural features of organs to their functions in major systems (LS-M-A5)
10. Describe the way major organ systems in the human body interact to sustain life (LSM-A5)
11. Describe the growth and development of humans from infancy to old age (LS-M-A6)
12. Explain how external factors and genetics can influence the quality and length of human life (e.g., nutrition, smoking, drug use, exercise) (LS-M-A6)
13. Identify and describe common communicable and noncommunicable diseases and the methods by which they are transmitted, treated, and prevented (LS-M-A7)

Reproduction and Heredity

14. Differentiate between sexual and asexual reproduction (LS-M-B1)
15. Contrast the processes of mitosis and meiosis in relation to growth, repair, reproduction, and heredity (LS-M-B1)
16. Explain why chromosomes in body cells exist in pairs (LS-M-B2)
17. Explain the relationship of genes to chromosomes and genotypes to phenotypes (LS-M-B2)
18. Recognize genetic errors caused by changes in chromosomes (LS-M-B2)
19. Apply the basic laws of Mendelian genetics to solve simple monohybrid crosses, using a Punnett square (LS-M-B3)
20. Explain the differences among the inheritance of dominant, recessive, and incomplete dominant traits (LS-M-B3)
21. Use a Punnett square to demonstrate how sex-linked traits are inherited (LS-M-B3)
22. Give examples of the importance of selective breeding (e.g., domestic animals, livestock, horticulture) (LS-M-B3)

Populations and Ecosystems

23. Classify organisms based on structural characteristics, using a dichotomous key (LSM-C1)
24. Analyze food webs to determine energy transfer among organisms (LS-M-C2)
25. Locate and describe the major biomes of the world (LS-M-C3)
26. Describe and compare the levels of organization of living things within an ecosystem (LS-M-C3)
27. Identify the various relationships among plants and animals (e.g., mutualistic, parasitic, producer/consumer) (LS-M-C4)
28. Differentiate between ecosystem components of habitat and niche (LS-M-C4)
29. Predict the impact changes in a species' population have on an ecosystem (LS-M-C4)

Adaptations of Organisms

30. Differentiate between structural and behavioral adaptations in a variety of organisms (LS-M-D1)

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31. Describe and evaluate the impact of introducing nonnative species into an ecosystem (LS-M-D1)
32. Describe changes that can occur in various ecosystems and relate the changes to the ability of an organism to survive (LS-M-D2)
33. Illustrate how variations in individual organisms within a population determine the success of the population (LS-M-D2)
34. Explain how environmental factors impact survival of a population (LS-M-D2)

Science and the Environment

Standard: In learning environmental science, students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world.

35. Identify resources humans derive from ecosystems (SE-M-A1)
36. Distinguish the essential roles played by biotic and abiotic components in various ecosystems (SE-M-A1)
37. Identify and describe the effects of limiting factors on a given population (SE-M-A2)
38. Evaluate the carrying capacity of an ecosystem (SE-M-A2)
39. Analyze the consequences of human activities on ecosystems (SE-M-A4)
40. Construct or draw food webs for various ecosystems (SE-M-A5)
41. Describe the nitrogen cycle and explain why it is important for the survival of organisms (SE-M-A7)
42. Describe how photosynthesis and respiration relate to the carbon cycle (SE-M-A7)
43. Identify and analyze the environmental impact of humans' use of technology (e.g., energy production, agriculture, transportation, human habitation) (SE-M-A8)

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Physical Science

Standard: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

Properties and Changes of Properties in Matter

1. Determine that all atoms of the same element are similar to but different from atoms of other elements (PS-M-A2)
2. Recognize that elements with the same number of protons may or may not have the same charge (PS-M-A2)
3. Define ions and describe them in terms of the number of protons, electrons, and their charges (PS-M-A2)
4. Demonstrate that Earth has a magnetic field by using magnets and compasses (PSM-B2)
5. Define gravity and describe the relationship among the force of gravity, the mass of objects, and the distance between objects (PS-M-B2)
6. Predict how the gravitational attraction between two masses will increase or decrease when changes are made in the masses or in the distance between the objects (PS-M-B2)
7. Explain the relationships among force, mass, and acceleration (PS-M-B5)

Earth and Space Science

Standard: The students will develop an understanding of the properties of earth materials, the structure of the Earth system, the Earth's history, and the Earth's place in the universe.

Structure of Earth

8. Identify and describe the four density layers of Earth (ESS-M-A1)
9. Explain the historical development of the theories of plate tectonics, including continental drift and sea-floor spreading (ESS-M-A2)
10. Illustrate the movement of convection currents (ESS-M-A2)
11. Illustrate the movements of lithospheric plates as stated in the plate tectonics theory (ESS-M-A2)
12. Identify the edges of plate boundaries as likely areas of earthquakes and volcanic action (ESS-M-A3)
13. Describe the processes responsible for earthquakes and volcanoes and identify the effects of these processes (e.g., faulting, folding) (ESS-M-A3)
14. Distinguish between chemical and mechanical (physical) weathering and identify the role of weathering agents (e.g., wind, water, ice, gravity) (ESS-M-A4)
15. Illustrate the role of organic processes in soil formation (ESS-M-A4)
16. Compare the physical characteristics of rock and mineral specimens to observe that a rock is a mixture of minerals (ESS-M-A5)
17. Describe the properties of minerals (e.g., color, luster, hardness, streak) (ESS-M-A5)
18. Describe how sedimentary, igneous, and metamorphic rocks form and change in the rock cycle (ESS-M-A6)
19. Determine the results of constructive and destructive forces upon landform development with the aid of geologic maps of Louisiana (ESS-M-A7)
20. Describe how humans' actions and natural processes have modified coastal regions in Louisiana and other locations (ESS-M-A8)
21. Read and interpret topographic maps (ESS-M-A9)
22. Compare ocean floor topography to continental topography by using topographic maps (ESS-M-A9)
23. Explain the processes of evaporation, condensation, precipitation, infiltration, transpiration, and sublimation as they relate to the water cycle (ESS-M-A10)
24. Investigate and explain how given factors affect the rate of water movement in the water cycle (e.g., climate, type of rock, ground cover) (ESS-M-A10)
25. Explain and give examples of how climatic conditions on Earth are affected by the proximity of water (ESS-M-A11)
26. Describe and illustrate the layers of Earth's atmosphere (ESS-M-A11)
27. Identify different air masses, jet streams, global wind patterns, and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña (ESS-M-A12)

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28. Use historical data to plot the movement of hurricanes and explain events or conditions that affected their paths (ESS-M-A12)
29. Make predictions about future weather conditions based on collected weather data (ESS-M-A12)

Earth History

30. Interpret a geologic timeline (ESS-M-B1)
31. Compare fossils from different geologic eras and areas of Earth to show that life changes over time (ESS-M-B1)
32. Interpret a timeline starting with the birth of the solar system to the present day (ESS-M-B2)
33. Use historical data to draw conclusions about the age of Earth (e.g., half-life, rock strata) (ESS-M-B2)
34. Apply geological principles to determine the relative ages of rock layers (e.g., original horizontality, superposition, cross-cutting relationships) (ESS-M-B3)
35. Describe how processes seen today are similar to those in the past (e.g., weathering, erosion, lithospheric plate movement) (ESS-M-B3)

Earth in the Solar System

36. Describe the life cycle of a star and predict the next likely stage of the Sun (ESS-M-C1)
37. Use a Hertzsprung-Russell diagram and other data to compare the approximate mass, size, luminosity, temperature, structure, and composition of the Sun to other stars (ESS-M-C1)
38. Use data to compare the planets in terms of orbit, size, composition, density, rotation, revolution, and atmosphere (ESS-M-C2)
39. Relate Newton's laws of gravity to the motions of celestial bodies and objects on Earth (ESS-M-C3)
40. Identify and illustrate the relative positions of Earth, the Moon, and the Sun during eclipses and phases of the Moon (ESS-M-C4)
41. Describe the effects of the Moon on tides (ESS-M-C4)
42. Interpret a scale model of the solar system (ESS-M-C5)
43. Identify the processes involved in the creation of land and sea breezes (ESS-M-C6)
44. Describe how unequal heating of Earth's surface affects movement of air masses and water in the atmosphere and hydrosphere (ESS-M-C6)
45. Explain how seasonal changes are caused by the tilt of Earth as it rotates on its axis and revolves around the Sun (ESS-M-C7)
46. Illustrate and explain how the angle at which sunlight strikes Earth produces changes in the seasons and length of daylight (ESS-M-C7)
47. Compare the relative distances from Earth to the Sun on the first day of summer and the first day of winter (ESS-M-C7)
48. Communicate ways that information from space exploration and technological research have advanced understanding about Earth, the solar system, and the universe (ESS-M-C8)
49. Identify practical applications of technological advances resulting from space exploration and scientific and technological research (ESS-M-C8)

Science and the Environment

Standard: In learning environmental science, students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world.

50. Illustrate possible point and non-point source contributions to pollution and natural or human-induced pathways of a pollutant in an ecosystem (SE-M-A3)
51. Analyze the consequences of human activities on global Earth systems (SE-M-A4)
52. Describe the relationship between plant type and soil compatibility (SE-M-A9)
53. Distinguish among several examples of erosion (e.g., stream bank, topsoil, coastal) and describe common preventive measures (SE-M-A10)

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Science As Inquiry

Standard: The students will do science by engaging in partial and full inquiries that are within their developmental capabilities.

The Abilities Necessary to Do Scientific Inquiry

1. Write a testable question or hypothesis when given a topic (SI-H-A1)
2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)
3. Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2)
4. Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2)
5. Utilize mathematics, organizational tools, and graphing skills to solve problems (SIH-A3)
6. Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)
7. Choose appropriate models to explain scientific knowledge or experimental results (e.g., objects, mathematical relationships, plans, schemes, examples, role-playing, computer simulations) (SI-H-A4)
8. Give an example of how new scientific data can cause an existing scientific explanation to be supported, revised, or rejected (SI-H-A5)
9. Write and defend a conclusion based on logical analysis of experimental data (SI-HA-6) (SI-H-A2)
10. Given a description of an experiment, identify appropriate safety measures (SI-H-A7)

Understanding Scientific Inquiry

11. Evaluate selected theories based on supporting scientific evidence (SI-H-B1)
12. Cite evidence that scientific investigations are conducted for many different reasons (SI-H-B2)
13. Identify scientific evidence that has caused modifications in previously accepted theories (SI-H-B2)
14. Cite examples of scientific advances and emerging technologies and how they affect society (e.g., MRI, DNA in forensics) (SI-H-B3)
15. Analyze the conclusion from an investigation by using data to determine its validity (SI-H-B4)
16. Use the following rules of evidence to examine experimental results:
    a. Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability?
    b. Has the technique or theory been subjected to peer review and publication?
    c. What is the known or potential rate of error of the technique or theory when applied?
    d. Were standards and controls applied and maintained?
    e. Has the technique or theory been generally accepted in the scientific community? (SI-H-B5) (SI-H-B1) (SI-H-B4)

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Physical Science

Standard: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

Measurement and Symbolic Representation

1. Measure the physical properties of different forms of matter in metric system units (e.g., length, mass, volume, temperature) (PS-H-A1)
2. Gather and organize data in charts, tables, and graphs (PS-H-A1)
3. Distinguish among symbols for atoms, ions, molecules, and equations for chemical reactions (PS-H-A2)
4. Name and write chemical formulas using symbols and subscripts (PS-H-A2)

Atomic Structure

5. Identify the three subatomic particles of an atom by location, charge, and relative mass (PS-H-B1)
6. Determine the number of protons, neutrons, and electrons of elements by using the atomic number and atomic mass from the periodic table (PS-H-B1)
7. Describe the results of loss/gain of electrons on charges of atoms (PS-H-B1) (PS-H-C5)
8. Evaluate the uses and effects of radioactivity in people's daily lives (PS-H-B2)
9. Compare nuclear fission to nuclear fusion (PS-H-B2)
10. Identify the number of valence electrons of the first 20 elements based on their positions in the periodic table (PS-H-B3)

The Structure and Properties of Matter

11. Investigate and classify common materials as elements, compounds, or mixtures (heterogeneous or homogeneous) based on their physical and chemical properties (PS-H-C1)
12. Classify elements as metals or nonmetals based on their positions in the periodic table (PS-H-C2)
13. Predict how factors such as particle size and temperature influence the rate of dissolving (PS-H-C3)
14. Investigate and compare methods for separating mixtures by using the physical properties of the components (PS-H-C4) (PS-H-C1)
15. Using selected elements from atomic numbers 1 to 20, draw Bohr models (PS-H-C5) (PS-H-B3)
16. Name and write the formulas for simple ionic and covalent compounds (PS-H-C5)
17. Name and predict the bond type formed between selected elements based on their locations in the periodic table (PS-H-C5)
18. Diagram or construct models of simple hydrocarbons (four or fewer carbons) with single, double, or triple bonds (PS-H-C6)
19. Analyze and interpret a graph that relates temperature and heat energy absorbed during phase changes of water (PS-H-C7)
20. Predict the particle motion as a substance changes phases (PS-H-C7) (PS-H-C3)

Chemical Reactions

21. Classify changes in matter as physical or chemical (PS-H-D1)
22. Identify evidence of chemical changes (PS-H-D1)
23. Classify unknowns as acidic, basic, or neutral using indicators (PS-H-D2)
24. Identify balanced equations as neutralization, combination, and decomposition reactions (PS-H-D3)
25. Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation) (PS-H-D4)
26. Illustrate the laws of conservation of matter and energy through balancing simple chemical reactions (PS-H-D5) (PS-H-D3) (PS-H-D7)
27. Distinguish between endothermic and exothermic reactions (PS-H-D6)
28. Identify chemical reactions that commonly occur in the home and nature (PS-H-D7)

Forces and Motion

29. Differentiate between mass and weight (PS-H-E1)
30. Compare the characteristics and strengths of forces in nature (e.g., gravitational, electrical, magnetic, nuclear) (PS-H-E1)
31. Differentiate between speed and velocity (PS-H-E2)
32. Plot and compare line graphs of acceleration and velocity (PS-H-E2)

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33. Calculate velocity and acceleration using equations (PS-H-E2)
34. Demonstrate Newton's three laws of motion (e.g., inertia, net force using F = ma, equal and opposite forces) (PS-H-E3)
35. Describe and demonstrate the motion of common objects in terms of the position of the observer (PS-H-E4)

Energy

36. Measure and calculate the relationships among energy, work, and power (PS-H-F1)
37. Model and explain how momentum is conserved during collisions (PS-H-F2)
38. Analyze diagrams to identify changes in kinetic and potential energy (PS-H-F2)
39. Distinguish among thermal, chemical, electromagnetic, mechanical, and nuclear energy (PS-H-F2)
40. Demonstrate energy transformation and conservation in everyday actions (PS-H-F2)

Interactions of Energy and Matter

41. Identify the parts and investigate the properties of transverse and compression waves (PS-H-G1)
42. Describe the relationship between wavelength and frequency (PS-H-G1)
43. Investigate and construct diagrams to illustrate the laws of reflection and refraction (PS-H-G1)
44. Illustrate the production of static electricity (PS-H-G2)
45. Evaluate diagrams of series and parallel circuits to determine the flow of electricity (PS-H-G2)
46. Diagram a magnetic field (PS-H-G2)
47. Explain how electricity and magnetism are related (PS-H-G2)
48. Compare properties of waves in the electromagnetic spectrum (PS-H-G3)
49. Describe the Doppler effect on sound (PS-H-G3)

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LOUISIANA Grade 10 Biology
Standards and Grade-Level Expectations

Life Science

Standard: The students will become aware of the characteristics and life cycles of organisms and understand their relationships to each other and to their environment.

The Cell

1. Compare prokaryotic and eukaryotic cells (LS-H-A1)
2. Identify and describe structural and functional differences among organelles (LS-H-A1)
3. Investigate and describe the role of enzymes in the function of a cell (LS-H-A1)
4. Compare active and passive cellular transport (LS-H-A2)
5. Analyze the movement of water across a cell membrane in hypotonic, isotonic, and hypertonic solutions (LS-H-A2)
6. Analyze a diagram of a developing zygote to determine when cell differentiation occurs (LS-H-A3)

The Molecular Basis of Heredity

7. Identify the basic structure and function of nucleic acids (e.g., DNA, RNA) (LS-H-B1)
8. Describe the relationships among DNA, genes, chromosomes, and proteins (LS-H-B1)
9. Compare mitosis and meiosis (LS-H-B2)
10. Analyze pedigrees to identify patterns of inheritance for common genetic disorders (LS-H-B3)
11. Calculate the probability of genotypes and phenotypes of offspring given the parental genotypes (LS-H-B3)
12. Describe the processes used in modern biotechnology related to genetic engineering (LS-H-B4) (LS-H-B1)
13. Identify possible positive and negative effects of advances in biotechnology (LS-H-B4) (LS-H-B1)

Biological Evolution

14. Analyze evidence on biological evolution, utilizing descriptions of existing investigations, computer models, and fossil records (LS-H-C1)
15. Compare the embryological development of animals in different phyla (LS-H-C1) (LSH-A3)
16. Explain how DNA evidence and fossil records support Darwin's theory of evolution (LS-H-C2)
17. Explain how factors affect gene frequency in a population over time (LS-H-C3)
18. Classify organisms from different kingdoms at several taxonomic levels, using a dichotomous key (LS-H-C4)
19. Compare characteristics of the major kingdoms (LS-H-C5)
20. Analyze differences in life cycles of selected organisms in each of the kingdoms (LSH-C6)
21. Compare the structures, functions, and cycles of viruses to those of cells (LS-H-C7)
22. Describe the role of viruses in causing diseases and conditions (e.g., AIDS, common colds, smallpox, influenza, warts) (LS-H-C7) (LS-H-G2)

Interdependence of Organisms

23. Illustrate the flow of carbon, nitrogen, and water through an ecosystem (LS-H-D1) (SE-H-A6)
24. Analyze food webs by predicting the impact of the loss or gain of an organism (LS-H-D2)
25. Evaluate the efficiency of the flow of energy and matter through a food chain/pyramid (LS-H-D2)
26. Analyze the dynamics of a population with and without limiting factors (LS-H-D3)
27. Analyze positive and negative effects of human actions on ecosystems (LS-H-D4) (SE-H-A7)

Matter, Energy, and Organization of Living Systems

28. Explain why ecosystems require a continuous input of energy from the Sun (LS-H-E1)
29. Use balanced equations to analyze the relationship between photosynthesis and cellular respiration (LS-H-E1)
30. Explain the role of adenosine triphosphate (ATP) in a cell (LS-H-E2)
31. Compare the levels of organization in the biosphere (LS-H-E3)

Systems and the Behavior of Organisms

32. Analyze the interrelationships of organs in major systems (LS-H-F1) (LS-H-E3)
33. Compare structure to function of organs in a variety of organisms (LS-H-F1)

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_____ = Standards content sampled by ACT's Science tests

34. Explain how body systems maintain homeostasis (LS-H-F2)
35. Explain how selected organisms respond to a variety of stimuli (LS-H-F3)
36. Explain how behavior affects the survival of species (LS-H-F4)

Personal and Community Health

37. Explain how fitness and health maintenance can result in a longer human life span (LS-H-G1)
38. Discuss mechanisms of disease transmission and processes of infection (LS-H-G2) (LS-H-G4)
39. Compare the functions of the basic components of the human immune system (LSH-G3)
40. Determine the relationship between vaccination and immunity (LS-H-G3)
41. Describe causes, symptoms, treatments, and preventions of major communicable and noncommunicable diseases (LS-H-G4)
42. Summarize the uses of selected technological developments related to the prevention, diagnosis, and treatment of diseases or disorders (LS-H-G5)

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Earth Science

Earth and Space Science

Standard: The students will develop an understanding of the properties of earth materials, the structure of the Earth system, the Earth's history, and the Earth's place in the universe.

Energy in Earth's System

1. Describe what happens to the solar energy received by Earth every day (ESS-H-A1)
2. Trace the flow of heat energy through the processes in the water cycle (ESS-H-A1)
3. Describe the effect of natural insulation on energy transfer in a closed system (ESS-H-A1)
4. Describe the relationship between seasonal changes in the angle of incoming solar radiation and its consequences to Earth's temperature (e.g., direct vs. slanted rays) (ESS-H-A2)
5. Explain how the process of fusion inside the Sun provides the external heat source for Earth (ESS-H-A3)
6. Discuss how heat energy is generated at the inner core-outer core boundary (ESS-H-A4)
7. Analyze how radiant heat from the Sun is absorbed and transmitted by several different earth materials (ESS-H-A5)
8. Explain why weather only occurs in the tropospheric layer of Earth's atmosphere (ESS-H-A5)
9. Compare the structure, composition, and function of the layers of Earth's atmosphere (ESS-H-A6)
10. Analyze the mechanisms that drive weather and climate patterns and relate them to the three methods of heat transfer (ESS-H-A6)
11. Describe the processes that drive lithospheric plate movements (i.e., radioactive decay, friction, convection) (ESS-H-A7) (ESS-H-A3) (ESS-H-A4)
12. Relate lithospheric plate movements to the occurrences of earthquakes, volcanoes, mid-ocean ridge systems, and off-shore trenches found on Earth (ESS-H-A7)

Geochemical Cycles

13. Explain how stable elements and atoms are recycled during natural geologic processes (ESS-H-B1)
14. Compare the conditions of mineral formation with weathering resistance at Earth's surface (ESS-H-B1)
15. Identify the sun-driven processes that move substances at or near Earth's surface (ESS-H-B2)

The Origin and Evolution of the Earth System

16. Use the nebular hypothesis to explain the formation of a solar system (ESS-H-C1)
17. Determine the relative ages of rock layers in a geologic profile or cross section (ESS-H-C2)
18. Use data from radioactive dating techniques to estimate the age of earth materials (ESS-H-C2)
19. Interpret geological maps of Louisiana to describe the state's geologic history (ESS-H-C3)
20. Determine the chronological order of the five most recent major lobes of the Mississippi River delta in Louisiana (ESS-H-C3)
21. Use fossil records to explain changes in the concentration of atmospheric oxygen over time (ESS-H-C4)
22. Analyze data related to a variety of natural processes to determine the time frame of the changes involved (e.g., formation of sedimentary rock layers, deposition of ash layers, fossilization of plant or animal species) (ESS-H-C5)

The Origin and Evolution of the Universe

23. Identify the evidence that supports the big bang theory (ESS-H-D1)
24. Describe the organization of the known universe (ESS-H-D2)
25. Using the surface temperature and absolute magnitude data of a selected star, locate its placement on the Hertzsprung-Russell diagram and infer its color, size, and life stage (ESS-H-D3)
26. Identify the elements present in selected stars, given spectrograms of known elements and those of the selected stars (ESS-H-D4)
27. Trace the movement and behavior of hydrogen atoms during the process of fusion as it occurs in stars like the Sun (ESS-H-D5)
28. Identify the relationship between orbital velocity and orbital diameter (ESS-H-D6) (PS-H-E2)
29. Demonstrate the elliptical shape of Earth's orbit and describe how the point of orbital focus changes during the year (ESS-H-D6)
30. Summarize how current technology has directly affected our knowledge of the universe (ESS-H-D7)

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Environmental Science

Science and the Environment

Standard: In learning environmental science, students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world.

Ecological Systems and Interactions

1. Describe the abiotic and biotic factors that distinguish Earth's major ecological systems (SE-H-A1)
2. Describe the characteristics of major biomes on Earth (SE-H-A1)
3. Use the 10% rule and data analysis to measure the flow of energy as represented by biomass in a system (SE-H-A2)
4. Determine the effects of limiting factors on a population and describe the concept of carrying capacity (SE-H-A3)
5. Examine and discuss the major stages of succession, describing the generalized sequential order of the types of plant species (SE-H-A4)
6. Analyze the consequences of changes in selected divisions of the biosphere (e.g., ozone depletion, global warming, acid rain) (SE-H-A5) (SE-H-A7)
7. Illustrate the flow of carbon, water, oxygen, nitrogen, and phosphorus through an ecosystem (SE-H-A6) (LS-H-D1)
8. Explain how species in an ecosystem interact and link in a complex web (SE-H-A7) (SE-H-A10)
9. Cite and explain examples of organisms' adaptations to environmental pressures over time (SE-H-A8)
10. Analyze the effect of an invasive species on the biodiversity within ecosystems (SEH-A9)
11. Explain why biodiversity is essential to the survival of organisms (SE-H-A9)
12. Give examples and describe the effect of pollutants on selected populations (SE-HA11)

Resources and Resource Management

13. Evaluate whether a resource is renewable by analyzing its relative regeneration time (SE-H-B1)
14. Analyze data to determine the effect of preservation practices compared to conservation practices for a sample species (SE-H-B2)
15. Identify the factors that cause the inequitable distribution of Earth's resources (e.g., politics, economics, climate) (SE-H-B3)
16. Evaluate the effectiveness of natural resource management in Louisiana (SE-H-B4) (SE-H-B5)
17. Analyze data to determine when reuse, recycling, and recovery are applicable (SEH-B5)
18. Identify the factors that affect sustainable development (SE-H-B6)

Environmental Awareness and Protection

19. Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1)
20. Relate environmental quality to quality of life (SE-H-C2)
21. Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3)
22. Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4)
23. Describe the relationship between public support and the enforcement of environmental policies (SE-H-C5)
24. Identify the advantages and disadvantages of using disposable items versus reusable items (SE-H-D1)
25. Discuss how education and collaboration can affect the prevention and control of a selected pollutant (SE-H-D2) (SE-H-D3)
26. Determine local actions that can affect the global environment (SE-H-D4)
27. Describe how accountability toward the environment affects sustainability (SE-H-D5)
28. Discuss the reduction of combustible engines needed to significantly decrease CO2 in the troposphere (SE-H-D6)

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Physical Science

Standard: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

Measurement and Symbolic Representation

1. Convert metric system units involving length, mass, volume, and time using dimensional analysis (i.e., factor-label method) (PS-H-A1)
2. Differentiate between accuracy and precision and evaluate percent error (PS-H-A1)
3. Determine the significant figures based on precision of measurement for stated quantities (PS-H-A1)
4. Use scientific notation to express large and small numbers (PS-H-A1)
5. Write and name formulas for ionic and covalent compounds (PS-H-A2)
6. Write and name the chemical formula for the products that form from the reaction of selected reactants (PS-H-A2)
7. Write a balanced symbolic equation from a word equation (PS-H-A2)

Atomic Structure

8. Analyze the development of the modern atomic theory from a historical perspective (PS-H-B1)
9. Draw accurate valence electron configurations and Lewis dot structures for selected molecules, ionic and covalent compounds, and chemical equations (PS-H-B1)
10. Differentiate among alpha, beta, and gamma emissions (PS-H-B2)
11. Calculate the amount of radioactive substance remaining after a given number of half-lives has passed (PS-H-B2)
12. Describe the uses of radioactive isotopes and radiation in such areas as plant and animal research, health care, and food preservation (PS-H-B2)
13. Identify the number of bonds an atom can form given the number of valence electrons (PS-H-B3)

The Structure and Properties of Matter

14. Identify unknowns as elements, compounds, or mixtures based on physical properties (e.g., density, melting point, boiling point, solubility) (PS-H-C1)
15. Predict the physical and chemical properties of an element based only on its location in the periodic table (PS-H-C2)
16. Predict the stable ion(s) an element is likely to form when it reacts with other specified elements (PS-H-C2)
17. Use the periodic table to compare electronegativities and ionization energies of elements to explain periodic properties, such as atomic size (PS-H-C2)
18. Given the concentration of a solution, calculate the predicted change in its boiling and freezing points (PS-H-C3)
19. Predict the conductivity of a solution (PS-H-C3)
20. Express concentration in terms of molarity, molality, and normality (PS-H-C3)
21. Design and conduct a laboratory investigation in which physical properties are used to separate the substances in a mixture (PS-H-C4)
22. Predict the kind of bond that will form between two elements based on electronic structure and electronegativity of the elements (e.g., ionic, polar, nonpolar) (PS-H-C5)
23. Model chemical bond formation by using Lewis dot diagrams for ionic, polar, and nonpolar compounds (PS-H-C5)
24. Describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds (PS-H-C5)
25. Name selected structural formulas of organic compounds (PS-H-C6)
26. Differentiate common biological molecules, such as carbohydrates, lipids, proteins, and nucleic acids by using structural formulas (PS-H-C6)
27. Investigate and model hybridization in carbon compounds (PS-H-C6)
28. Name, classify, and diagram alkanes, alkenes, and alkynes (PS-H-C6)
29. Predict the properties of a gas based on gas laws (e.g., temperature, pressure, volume) (PS-H-C7)
30. Solve problems involving heat flow and temperature changes by using known values of specific heat and latent heat of phase change (PS-H-C7)

= Standards measured by ACT's Science tests

_____ = Standards content sampled by ACT's Science tests

Chemical Reactions

31. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1)
32. Determine the concentration of an unknown acid or base by using data from a titration with a standard solution and an indicator (PS-H-D2)
33. Calculate pH of acids, bases, and salt solutions based on the concentration of hydronium and hydroxide ions (PS-H-D2)
34. Describe chemical changes by developing word equations, balanced formula equations, and net ionic equations (PS-H-D3)
35. Predict products (with phase notations) of simple reactions, including acid/base, oxidation/reduction, and formation of precipitates (PS-H-D3)
36. Identify the substances gaining and losing electrons in simple oxidation-reduction reactions (PS-H-D3)
37. Predict the direction of a shift in equilibrium in a system as a result of stress by using LeChatalier's principle (PS-H-D4)
38. Relate the law of conservation of matter to the rearrangement of atoms in a balanced chemical equation (PS-H-D5)
39. Conduct an investigation in which the masses of the reactants and products from a chemical reaction are calculated (PS-H-D5)
40. Compute percent composition, empirical formulas, and molecular formulas of selected compounds in chemical reactions (PS-H-D5)
41. Apply knowledge of stoichiometry to solve mass/mass, mass/volume, volume/volume, and mole/mole problems (PS-H-D5)
42. Differentiate between activation energy in endothermic reactions and exothermic reactions (PS-H-D6)
43. Graph and compute the energy changes that occur when a substance, such as water, goes from a solid to a liquid state, and then to a gaseous state (PS-H-D6)
44. Measure and graph energy changes during chemical reactions observed in the laboratory (PS-H-D6)
45. Give examples of common chemical reactions, including those found in biological systems (PS-H-D7)

Forces and Motion

46. Identify and compare intermolecular forces and their effects on physical and chemical properties (PS-H-E1)

Interactions of Energy and Matter

47. Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4)

= Standards measured by ACT's Science tests

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Physical Science

Standard: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.

Measurement and Symbolic Representation

1. Measure and determine the physical quantities of an object or unknown sample using correct prefixes and metric system units (e.g., mass, charge, pressure, volume, temperature, density) (PS-H-A1)
2. Determine and record measurements correctly using significant digits and scientific notation (PS-H-A1)
3. Determine accuracy and precision of measured data (PS-H-A1)
4. Perform dimensional analysis to verify problem set-up (PS-H-A1)
5. Use trigonometric functions to make indirect measurements (PS-H-A1)

Forces and Motion

6. Explain the role of strong nuclear forces and why they are the strongest of all forces (PS-H-E1)
7. Relate gravitational force to mass and distance (PS-H-E1)
8. Compare and calculate electrostatic forces acting within and between atoms to the gravitational forces acting between atoms (PS-H-E1)
9. Describe and measure motion in terms of position, displacement time, and the derived quantities of velocity and acceleration (PS-H-E2)
10. Determine constant velocity and uniform acceleration mathematically and graphically (PS-H-E2)
11. Plot and interpret displacement-time and velocity-time graphs and explain how these two types of graphs are interrelated (PS-H-E2)
12. Model scalar and vector quantities (PS-H-E2)
13. Solve for missing variables in kinematic equations relating to actual situations (PS-H-E2)
14. Add and resolve vectors graphically and mathematically to determine resultant/equilibrant of concurrent force vectors (PS-H-E3)
15. Calculate centripetal force and acceleration in circular motion (PS-H-E3)
16. Analyze circular motion to solve problems relating to angular velocity, acceleration, momentum, and torque (PS-H-E3)
17. Analyze simple harmonic motion (PS-H-E3)
18. Demonstrate the independence of perpendicular components in projectile motion and predict the optimum angles and velocities of projectiles (PS-H-E3)

Energy

19. Explain quantitatively the conversion between kinetic and potential energy for objects in motion (e.g., roller coaster, pendulum) (PS-H-F1)
20. Calculate the mechanical advantage and efficiency of simple machines and explain the loss of efficiency using the dynamics of the machines (PS-H-F1)
21. Explain and calculate the conversion of one form of energy to another (e.g., chemical to thermal, thermal to mechanical, magnetic to electrical) (PS-H-F1)
22. Analyze energy transformations using the law of conservation of energy (PS-H-F2)
23. Apply the law of conservation of momentum to collisions in one and two dimensions, including angular momentum (PS-H-F2)
24. Apply the concept of Interactions of Energy and Matter
25. Determine the relationships among amplitude, wavelength, frequency, period, and velocity in different media (PS-H-G1)
26. Evaluate how different media affect the properties of reflection, refraction, diffraction, polarization, and interference (PS-H-G1)
27. Investigate and construct diagrams to illustrate the laws of reflection and refraction (PS-H-G1)
28. Draw constructive and destructive interference patterns and explain how the principle of superposition applies to wave propagation (PS-H-G1)
29. Describe observed electrostatic phenomena, calculate Coulomb's law, and test charge pole, electric field, and magnetic field (PS-H-G2)

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30. Construct basic electric circuits and solve problems involving voltage, current, resistance, power, and energy (PS-H-G2)
31. Describe the relationship of electricity, magnetism, and inductance as aspects of a single electromagnetic force (PS-H-G2)
32. Compare properties of electromagnetic and mechanical waves (PS-H-G3)
33. Solve problems related to sound and light in different media (PS-H-G3)
34. Compare the properties of the electromagnetic spectrum as a wave and as a particle (PS-H-G3)
35. Analyze the Doppler effect of a moving wave source (PS-H-G3)

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Section C: ACT's College Readiness Standards Included in Louisiana's Grades 7–12 Curriculum Framework

Using thousands of student records and responses, content and measurement experts worked backwards to develop data-driven, empirically derived statements of what students know and are typically able to do in various score ranges on the English, Reading, Mathematics, and Science tests on the EXPLORE, PLAN, and ACT tests. These empirically derived score descriptors are called **ACT's College Readiness Standards**. Because of this unique way the ACT Standards were derived, ACT's Standards contain specific descriptions of proficiency and content including descriptions of the complexity of the test material. The ACT standards prove to be an effective way to communicate the skills and knowledge measured by our EXPLORE, PLAN, and ACT tests.

> In this section (Section C), the ACT Standards that are highlighted are those that are included in Louisiana's Content Standards and Grade-Level Expectations. ACT Standards not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Louisiana's Content Standards and Grade-Level Expectations.

Because Louisiana educators are the experts on the Louisiana Content Standards and Grade-Level Expectations, we would strongly encourage them to examine this document and offer their interpretations.

ACT

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

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

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

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

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