# STATE MATCH

## Colorado Academic Standards

Reading, Writing, and Communicating; Mathematics; and Science
Grades 8–12

and

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

August 2010



ACT®

# About This Report

## EXECUTIVE SUMMARY
(pp. 1–5)

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

## SECTION A
(pp. 7–10)

This section provides tables by content area (Reading, Writing, and Communicating; Mathematics; and Science), listing the precise number of Colorado Academic Standards measured by ACT's EPAS tests and/or WorkKeys assessments by grade level.

## SECTION B
(pp. 11–33)

All Colorado Academic Standards are listed here; each one highlighted is measured by ACT's EPAS tests and/or WorkKeys assessments. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests. Colorado standards listed here are from the Colorado Academic Standards as presented on the Colorado Department of Education website in June 2010:

| Colorado Academic Standards | Adopted |
|---|---|
| Reading, Writing, and Communicating | December 2009 |
| Mathematics | December 2009 |
| Science | December 2009 |

## SECTION C
(pp. 34–44)

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

## SECTION D
(pp. 45–46)

WorkKeys skills appear here. Highlighting indicates that a statement reflects one or more statements in the Colorado Academic Standards. Skills not highlighted are not addressed in the Colorado Academic Standards.

A supplement that identifies the specific ACT College Readiness Standard(s) and WorkKeys Skill(s) corresponding to each Colorado Graduate Competency or Academic Standard in a side-by-side format is available at **www.act.org/education/statematch**.



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# Executive Summary

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

1. To what extent do ACT's Educational Planning and Assessment System (EPAS®) tests—EXPLORE® (8th and 9th grades), PLAN® (10th grade), and the ACT® (11th and 12th grades)—and ACT's WorkKeys® assessments (*Reading for Information*, *Applied Mathematics*, and *Locating Information*) measure Colorado's Academic Standards?
2. Can the results from ACT's testing programs be used to meet Colorado's NCLB requirement?
3. Why should Colorado choose EPAS?
4. Why choose to include WorkKeys assessments?

**ACT'S TESTS MEASURE MOST COLORADO ACADEMIC STANDARDS IN READING, WRITING, AND COMMUNICATING; MATHEMATICS; AND SCIENCE.**

**1. Match Results:** Comparisons conducted by our content specialists show that ACT's English, Reading, Writing, Mathematics, and Science tests and WorkKeys *Reading for Information* and *Applied Mathematics* assessments measure most Colorado Reading, Writing, and Communicating; Mathematics; and Science Academic Standards. The WorkKeys *Locating Information* assessment measures those skills contained in Colorado's Science Standards that are associated with a student's ability to interpret and analyze graphic material.

- Reading, Writing, and Communicating:

  | | | |
  |---|---|---|
  | **Graduate Competencies** | | 2 out of 4 Competencies |
  | **Academic Standards** | Grade 8: | 2 out of 4 Standards |
  | | High School: | 2 out of 4 Standards |

  Many important evidence outcomes in the Colorado Academic Standards under "Reading for All Purposes" and "Writing and Composition" are covered by ACT's English, Reading, and Writing tests and WorkKeys *Reading for Information* (RI) assessment.

- Mathematics:

  | | | |
  |---|---|---|
  | **Graduate Competencies** | | 12 out of 12 Competencies |
  | **Academic Standards** | Grade 8: | 4 out of 4 Standards |
  | | High School: | 4 out of 4 Standards |

  Almost all Colorado Mathematics Academic Standards and Graduate Competencies are covered by ACT's Mathematics tests and WorkKeys Applied Mathematics (AM) assessment.

- Science:

  | | | |
  |---|---|---|
  | **Graduate Competencies** | | (3) out of (3) Competencies |
  | **Academic Standards** | | (3) out of (3) Standards |

  All Colorado Science Academic Standards and Graduate Competencies are covered by ACT's Science tests and WorkKeys *Locating Information* (LI) assessment. Most of the scientific inquiry and process skills contained within the Colorado Academic Standards are directly measured in ACT's Science tests; however, in order to present the most meaningful results, the tables in

Section A reflect only the level of coverage of ACT's tests and the science content knowledge contained in the Colorado Standards. Please see the note below for additional information.

(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 Colorado Science Academic Standards.

To emphasize the point that content is included, but not necessarily covered in its entirety on every test form, science content match results appear in parentheses in Section A of this document (which describes the number of Colorado standards measured by ACT's tests), and are underlined rather than highlighted in Section B. Our goal here is to clearly communicate that science content will be included, but each specific content topic will not be covered consistently enough for inferences to be made about student proficiency in all areas. The same approach applies to match results for the WorkKeys *Locating Information* test, which measures a student's ability to interpret and analyze graphic material and may present science content in the figures or tables used as the basis for assessing these skills.)

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

**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.**

**2. NCLB requirement?** Yes; states such as Illinois and Michigan use ACT's tests as integral components of their statewide academic assessment systems under NCLB for Grade 11 students and submit evidence of compliance with NCLB to the U.S. Department of Education (ED) for approval. Through the peer review process, the ED determines whether such evidence demonstrates that a given state's assessment system meets NCLB requirements. The more closely a state's standards align with its assessments, the more likely it is that the outcome of the NCLB peer review will be favorable. With so much at stake, states must be rigorous both in developing their academic standards and in choosing assessment instruments that will help achieve the common goal of preparing students for life after high school.

**3. Why implement EXPLORE, PLAN and the ACT?** ACT's EPAS tests provide a longitudinal, systematic approach to educational and career planning, assessment, instructional support, and evaluation. The system focuses on the integrated, higher-order thinking skills students develop in grades K–12 that are important for success both during and after high school.

Unlike many other large-scale assessments of academic ability, EXPLORE, PLAN, and the ACT are first and foremost achievement tests. They are measures whose tasks correspond to recognized high school learning experiences, but which at the same time do not precisely duplicate the high school curriculum. EXPLORE, PLAN, and the ACT measure not an abstract quality, such as

intelligence or aptitude, but rather what students are able to do with what they have learned in school.

States and school districts choose the EPAS system 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*. ACT's College Readiness Standards are precise descriptors of the essential skills and knowledge that students need to become ready for college and career, beginning in grade 8 and continuing through grade 12. 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:

**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**

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

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

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

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

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

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

ACT research has shown that, whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics. Graduates need this level of readiness if they are to succeed in college-level courses without

remediation and to enter workforce training programs ready to learn job-specific skills.

Early planning based on sound information is a key factor in helping students reach their academic and career goals. **EXPLORE** provides baseline information on the academic preparation of students that can be used to plan high school coursework. ACT's research has shown that eighth-grade academic achievement is the best predictor of college and career readiness by high school graduation. Further, improvement in eighth-grade academic achievement and being on target for college and career readiness in eighth grade are more beneficial than any high school-level achievement enhancement.

**PLAN** helps tenth-grade students build a foundation for future academic and career success and provides information needed to address school districts' high-priority issues. It is a comprehensive guidance resource that helps students measure their current academic development, explore career/training options, and make plans for the remaining years of high school and post-graduation years. PLAN provides a midpoint review of students' progress toward their education and career goals while there is still time to make necessary interventions.

**The ACT** test assesses high school students' general educational development and provides unparalleled information about a student's readiness for entry-level college coursework and ability to make successful transitions to college and work after high school.

Each test in ACT's EPAS system also includes noncognitive measures and surveys that allow students to build relationships between their academic development, their backgrounds, and their plans.

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

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

The NCRC, composed of three WorkKeys assessments (*Reading for Information*, *Applied Mathematics*, and *Locating Information*) measures skills critical to on-the-job success. Higher scores qualify students for more jobs than do lower scores.

New Jersey, Virginia, Louisiana, Kentucky, North Carolina, and New Mexico have already initiated certificate programs, and many other states are in the process of developing similar programs.

If the goal of high school education is to prepare students for college and career readiness, then we should be educating all high school students according to a common academic expectation, one that prepares them for both postsecondary education and the workforce. Only then—whether they are among the two-thirds who enter college directly after graduation or those who enter workforce training programs—will they be ready for life after high school.

ACT's EPAS system and WorkKeys would not only provide important information regarding students' academic achievement relative to the Colorado Academic Standards, but EPAS offers what no other testing program can: an empirically based, time-honored measure of college and career readiness that can help Colorado students reach their educational and career goals and help provide Colorado High Schools with the information they need to prepare their students for college and career.

# Section A: Number of Colorado Academic Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

**Table A-1a. Number of Colorado Reading, Writing, and Communicating Graduate Competencies Measured by EXPLORE, PLAN, the ACT, and WorkKeys**

| Colorado Standards* | Number of Colorado Graduate Competencies Measured by ACT's tests | Aspects of Colorado Graduate Competencies that are Not Measured |
|---|---|---|
| Oral Expression and Listening | | |
| Reading for All Purposes | 3 out of 6 | Interpret how the structure of written English contributes to the pronunciation and meaning of complex vocabulary<br>Read a wide range of literature<br>Seek feedback, self-assess, and reflect on personal learning |
| Writing and Composition | 5 out of 5 | |
| Research and Reasoning | 2 out of 7 | Discriminate and justify a position using traditional lines of rhetorical argument and reasoning<br>Articulate the position of self and others using experiential and material logic<br>Use primary, secondary, and tertiary written sources<br>Demonstrate the use of a range of strategies, research techniques, and persistence<br>Exercise ethical conduct when writing, researching, and documenting sources |
| **TOTALS**<br>2 out of 4 Standards | 10 out of 18 | |

*Refer to Colorado's Reading, Writing, and Communicating Graduate Competencies on page 11

= EPAS tests do not assess this material.

## Table A-1b. Number of Colorado Reading, Writing, and Communicating Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

| Colorado Standards* | Number of Colorado Evidence Outcomes Measured by ACT's tests | Aspects of Colorado Standards that are Not Measured |
|---|---|---|
| Oral Expression and Listening | | |
| Reading for All Purposes | Gr 8: 9 out of 17<br>Gr 9: 4 out of 10<br>Gr 10: 3 out of 9<br>Gr 11: 3 out of 9<br>Gr 12: 4 out of 11 | Evaluate clarity and accuracy of information through close text study and investigation via other sources<br>Critique author's choice of expository, narrative, persuasive, or descriptive modes to convey a message<br>Generalize about universal themes, cultural or historical perspectives from multiple texts<br>Apply understanding of the unique characteristics of literary text<br>Describe and contrast characteristics of specific literary movements and perspectives<br>Evaluate the influence of historical context on the form, style, and point of view of a written work<br>Demonstrate knowledge of classical foundational works of world literature<br>Use reading and note-taking strategies<br>Explain and interpret the visual components supporting the text |
| Writing and Composition | Gr 8: 8 out of 20<br>Gr 9: 8 out of 16<br>Gr 10: 8 out of 16<br>Gr 11: 10 out of 17<br>Gr 12: 13 out of 16 | Write literary and narrative texts<br>Use a range of strategies to evaluate whether the writing is presented in a clear and engaging manner<br>Choose, develop, and refine appeals for desired effect on audience<br>Use a style guide<br>Use resources (print and electronic) and feedback to edit and enhance writing |
| Research and Reasoning | Gr 8: 2 out of 14<br>Gr 9: 0 out of 8<br>Gr 10: 0 out of 8<br>Gr 11: 2 out of 15<br>Gr 12: 3 out of 11 | Evaluate strengths and weaknesses of their logic and logic of others by using criteria including relevance, clarity, accuracy, fairness, significance, depth, breadth, logic and precision<br>Analyze and assess the logic of the interdisciplinary domains inherent in reasoning through complex situations<br>Monitor and assess the extent to which their own beliefs and biases influenced their reactions to the viewpoints and logic of others<br>Define and narrow a topic for self-designed research<br>Critique research questions of self and others for bias and underlying assumptions<br>Design and defend a set of diverse research strategies<br>Critique and defend evidence relative to its use to address a particular context and purpose<br>Determine and use the appropriate style guide<br>Analyze rhetorical devices used in own and others' appeals |
| **TOTALS**<br>2 out of 4 Standards | Gr 8: 19 out of 51<br>Gr 9: 12 out of 34<br>Gr 10: 11 out of 33<br>Gr 11: 15 out of 41<br>Gr 12: 20 out of 38 | |

*Refer to Colorado's Reading, Writing, and Communicating Academic Standards on pages 12–21

= EPAS tests do not assess this material.

| Table A-2a. Number of Colorado Mathematics Graduate Competencies Measured by EXPLORE, PLAN, the ACT, and WorkKeys | |
|---|---|
| **Number of Colorado Graduate Competencies Measured by ACT's tests** | **Aspects of Colorado Graduate Competencies that are Not Measured** |
| 12 out of 12 | |

*Refer to Colorado's Mathematics Graduate Competencies on page 22

| Table A-2b. Number of Colorado Mathematics Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys | | |
|---|---|---|
| **Colorado Standards *** | **Number of Colorado Evidence Outcomes Measured by ACT's tests** | **Aspects of Colorado Standards that are Not Measured** |
| Number Sense, Properties, and Operations | Gr 8: 5 out of 6<br>HS: 7 out of 7 | Analyze how credit and debt impact personal financial goals |
| Patterns, Functions, and Algebraic Structures | Gr 8: 11 out of 11<br>HS: 22 out of 22 | |
| Data Analysis, Statistics, and Probability | Gr 8: 3 out of 3<br>HS: 11 out of 19 | Identify the characteristics of well-designed and well-conducted surveys and experiments<br>Differentiate between the inferences that can be drawn in experiments versus observational studies<br>Define and explain the meaning of significance (both practical and statistical)<br>Explain the role of p-values in determining statistical significance<br>Determine the margin of error associated with an estimate of a population characteristic<br>Develop simulations that demonstrate probability as a long-run relative frequency<br>Analyze the cost of insurance as a method to offset the risk of a situation |
| Shape, Dimension, and Geometric Relationships | Gr 8: 7 out of 7<br>HS: 15 out of 15 | Use construction tools, including technology |
| **TOTALS**<br>4 out of 4 Standards | Gr 8: 26 out of 27<br>HS: 55 out of 63 | |

*Refer to Colorado's Mathematics Academic Standards on pages 23–26

| Table A-3a. Number of Colorado Science Graduate Competencies Measured by EXPLORE, PLAN, the ACT, and WorkKeys | | |
|---|---|---|
| **Colorado Standards*** | **Number of Colorado Graduate Competencies Measured by ACT's tests** | **Aspects of Colorado Graduate Competencies that are Not Measured** |
| Physical Science | (3) out of (3) | |
| Life Science | (4) out of (4) | |
| Earth Systems Science | (3) out of (3) | |
| **TOTALS**<br>3 out of 3 Standards | (10) out of (10) | |

*Refer to Colorado's Science Graduate Competencies on page 27

| Table A-3b. Number of Colorado Science Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys | | |
|---|---|---|
| **Colorado Standards*** | **Number of Colorado Evidence Outcomes Measured by ACT's tests** | **Aspects of Colorado Standards that are Not Measured** |
| Physical Science | Gr 8: (15) out of (15)<br>HS: (27) out of (27) | |
| Life Science | Gr 8: (10) out of (10)<br>HS: (42) out of (42) | |
| Earth Systems Science | Gr 8: (15) out of (15)<br>HS: (30) out of (30) | |
| **TOTALS**<br>3 out of 3 Standards | Gr 8: (40) out of (40)<br>HS: (99) out of (99) | |

*Refer to Colorado's Science Academic Standards on pages 28–33

# Section B: Colorado's Grades 8–12 Academic Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

## Reading, Writing, and Communicating

**COLORADO Reading, Writing, and Communicating**
Prepared Graduate Competencies

### Standard 1: Oral Expression and Listening

- Collaborate effectively as group members or leaders who listen actively and respectfully pose thoughtful questions, acknowledge the ideas of others, and contribute ideas to further the group's attainment of an objective
- Deliver organized and effective oral presentations for diverse audiences and varied purposes
- Use language appropriate for purpose and audience
- Demonstrate skill in inferential and evaluative listening

### Standard 2: Reading for All Purposes

- Interpret how the structure of written English contributes to the pronunciation and meaning of complex vocabulary
- Demonstrate comprehension of a variety of informational, literary, and persuasive texts
- Evaluate how an author uses words to create mental imagery, suggest mood, and set tone
- Read a wide range of literature (American and world literature) to understand important universal themes and the human experience
- Seek feedback, self-assess, and reflect on personal learning while engaging with increasingly more difficult texts
- Engage in a wide range of nonfiction and real-life reading experiences to solve problems, judge the quality of ideas, or complete daily tasks

### Standard 3: Writing and Composition

- Write with a clear focus, coherent organization, sufficient elaboration, and detail
- Effectively use content-specific language, style, tone, and text structure to compose or adapt writing for different audiences and purposes
- Apply standard English conventions to effectively communicate with written language
- Implement the writing process successfully to plan, revise, and edit written work
- Master the techniques of effective informational, literary, and persuasive writing

### Standard 4: Research and Reasoning

- Discriminate and justify a position using traditional lines of rhetorical argument and reasoning
- Articulate the position of self and others using experiential and material logic
- Gather information from a variety of sources; analyze and evaluate the quality and relevance of the source; and use it to answer complex questions
- Use primary, secondary, and tertiary written sources to generate and answer research questions
- Evaluate explicit and implicit viewpoints, values, attitudes, and assumptions concealed in speech, writing, and illustration
- Demonstrate the use of a range of strategies, research techniques, and persistence when engaging with difficult texts or examining complex problems or issues
- Exercise ethical conduct when writing, researching, and documenting sources

**COLORADO Reading, Writing, and Communicating**
Grade 8 Academic Standards

## Standard 1: Oral Expression and Listening

**GLE 1.** Communication skills and interviewing techniques are required to gather information and to develop and deliver oral presentations

a. Identify a central idea and prepare and ask relevant interview questions for researching and developing ideas further
b. Evaluate the effectiveness of the techniques used and information gained from the interview
c. Give a planned oral presentation to a specific audience for an intended purpose
d. Demonstrate appropriate verbal and nonverbal delivery techniques (clear enunciation, gesture, volume, pace, use of visuals, and language) for intended effect
e. Analyze audience engagement and audience response to presentations of self and others

**GLE 2.** A variety of response strategies clarifies meaning or messages

a. Use appropriate nonverbal cues to indicate level of understanding and agreement
b. Paraphrase speaker's meaning
c. Ask questions to clarify inferences

## Standard 2: Reading for All Purposes

**GLE 1.** Quality comprehension and interpretation of literary texts demand self-monitoring and self-assessment

a. Explain how exposition, conflict, rising and falling action, climax, and resolution function within the narrative advance the plot
b. Explain and compare the different roles and functions that characters play in a narrative (such as antagonist, protagonist, hero)
c. Interpret mood, tone, and literary devices (such as symbolism, flashback, foreshadowing, hyperbole), and provide supporting evidence from text
d. Identify use of third person, omniscient, and third person limited points of view; explain how each narrative point of view provides different insights in plots, characters and themes
e. Use graphic organizers and note-taking formats while reading to map relationships among implied or explicit ideas or viewpoints
f. Develop and share interpretations of literary works of personal interest
g. Identify personal attitudes and beliefs about events, ideas, and themes in text, and explain how these shape their comprehension of text

**GLE 2.** Quality comprehension and interpretation of informational and persuasive texts demand monitoring and self-assessment

a. Identify key words that signal a variety of organizational patterns (such as chronology, compare/contrast, problem/solution, cause/effect); explain how various organizational patterns structure information differently; use organizational patterns to guide interpretation of text
b. Evaluate viewpoints, values, and attitudes (such as detecting bias, word connotations, and incomplete data)
c. Make inferences and draw conclusions about relevance and accuracy of information
d. Interpret and explain informational texts of personal interest
e. Identify how specific details and larger portions of the text contribute to the meaning of the text
f. Find the gist of an article or factual text

**GLE 3.** Syntax, grammar, and word choice influence the understanding of literary, persuasive, and informational texts

a. Use knowledge of parts of speech, grammar, sentence structure, and context clues to construct meaning
b. Select and employ strategies to persist when encountering unknown or ambiguous words or difficult passages
c. Explain how authors use language to influence audience perceptions of events, people, and ideas
d. Explain how word choice and sentence structure are used to achieve specific effects (such as tone, voice, and mood)

## Standard 3: Writing and Composition

**GLE 1.** Stylistic devices and descriptive details in literary and narrative texts are organized for a variety of audiences and purposes and evaluated for quality

a. Produce literary and narrative texts using stylistic devices and descriptive details
b. Organize ideas consistent with text structure (chronology, rising action, problem/resolution)
c. Establish and maintain a controlling idea appropriate to audience and purpose
d. Integrate the use of organizing techniques that break up sequential presentation of chronology in a story (use of foreshadowing; starting in the middle of the action, then filling in background information using flashbacks)
e. Write using poetic techniques (alliteration, onomatopoeia); figurative language (simile, metaphor, personification, hyperbole); and graphic elements (capital letters, line length, word position) for intended effect
f. Express voice and tone and influence readers' perceptions by varying vocabulary, sentence structure, and descriptive details
g. Use mentor text/authors to help craft appropriate technique

**GLE 2.** Ideas and supporting details in informational and persuasive texts are organized for a variety of audiences and purposes and evaluated for quality

a. Develop texts that offer a comparison, show cause and effect, or support a point
b. Write and justify a personal interpretation of literary or informational text that includes a thesis, supporting details from the literature, and a conclusion
c. Select and use appropriate rhetorical techniques (such as asking questions, using humor, etc.) for a variety of purposes
d. Use specific details and references to text or relevant citations to support focus or judgment
e. Use planning strategies to select and narrow topic
f. Elaborate to give detail, add depth, and continue the flow of an idea
g. Explain and imitate emotional and logical appeals used by writers who are trying to persuade an audience

**GLE 3.** Editing writing for grammar, usage, mechanics, and clarity is an essential trait of a well-written document

a. Use punctuation correctly (commas to separate phrases and clauses in a series; commas with nonrestrictive phrases and clauses; and commas to offset appositives)
b. Format and punctuate dialogue correctly
c. Identify main and subordinate clauses and use that knowledge to write varied, strong, correct, complete sentences
d. Use comparative and superlative adjectives and adverbs correctly in sentences
e. Combine sentences with subordinate conjunctions
f. Use subject-verb agreement with intervening phrases and clauses

## Standard 4: Research and Reasoning

**GLE 1.** Individual research projects begin with information obtained from a variety of sources, and is organized, documented, and presented using logical procedures

a. Differentiate between primary and secondary source materials
b. Differentiate between paraphrasing and using direct quotes in a report
c. Organize and present research appropriately for audience and purpose
d. Document information and quotations; use a consistent format for footnotes or endnotes; and use standard bibliographic format to document sources
e. Write reports based on research that include quotations, footnotes or endnotes, and a bibliography or works cited page
f. Present findings

**GLE 2.** Common fallacies and errors occur in reasoning

a. Analyze the purpose, question at issue, information, points of view, implications and consequences, inferences, assumptions, and concepts inherent in thinking
b. Determine strengths and weaknesses of their thinking and thinking of others by using criteria including relevance, clarity, accuracy, fairness, significance, depth, breadth, logic, and precision
c. Identify common reasoning fallacies in print and nonprinted sources
d. Differentiate between valid and faulty generalizations

**GLE 3.** Quality reasoning relies on supporting evidence in media

a. Take a position on an issue and support it using quality reasoning
b. Analyze own or others' appeal for purpose, question at issue, information, points of view, implications and consequences, assumptions, and concepts
c. Evaluate own or others' appeal for relevance, clarity, accuracy, fairness, significance, depth, breadth, logic, and precision
d. Use appropriate media to demonstrate reasoning and explain decisions in the creative process

## Standard 1: Oral Expression and Listening

**GLE 1.** Oral presentations require effective preparation strategies

a. Give formal and informal talks to various audiences for various purposes using appropriate level of formality and rhetorical devices
b. Use verbal and nonverbal techniques to communicate information
c. Define a position and select evidence to support that position
d. Develop a well-organized presentation to defend a position
e. Use effective audience and oral delivery skills to persuade an audience

**GLE 2.** Listening critically to comprehend a speaker's message requires mental and physical strategies to direct and maintain attention

a. Follow the speaker's arguments as they develop; take notes when appropriate
b. Give verbal and nonverbal feedback to the speaker
c. Ask clarifying questions
d. Evaluate arguments and evidence
e. Explain how variables such as background knowledge, experiences, values, and beliefs can affect communication

## Standard 2: Reading for All Purposes

**GLE 1.** Increasingly complex literary elements in traditional and contemporary works of literature require scrutiny and comparison

a. Analyze character types, including dynamic/round character, static/flat character, stereotype, and caricature
b. Explain the relationships among elements of literature: characters, plot, setting, tone, point of view, and theme
c. Identify the characteristics that distinguish literary forms and genres
d. Examine the ways in which works of literature are related to the issues and themes of their historical periods
e. Use literary terms to describe and analyze selections

**GLE 2.** Increasingly complex informational texts require mature interpretation and study

a. Identify the intended effects of rhetorical strategies the author uses to influence readers' perspectives
b. Evaluate clarity and accuracy of information through close text study and investigation via other sources
c. Describe how the organizational structure and text features support the meaning and purpose of the text
d. Use flexible reading and note-taking strategies (outlining, mapping systems, skimming, scanning, key word search) to organize information and make connections within and across informational texts
e. Critique author's choice of expository, narrative, persuasive, or descriptive modes to convey a message

## Standard 3: Writing and Composition

**GLE 1.** Literary and narrative texts develop a controlling idea or theme with descriptive and expressive language

a. Write well-focused texts with an explicit or implicit theme and details that contribute to a definite point of view and tone
b. Organize paragraphs or stanzas to present ideas clearly and purposefully for a specific audience
c. Write literary and narrative texts using a range of poetic techniques, figurative language, and graphic elements to engage or entertain the intended audience
d. Refine the expression of voice and tone in a text by selecting and using appropriate vocabulary, sentence structure, and sentence organization
e. Review and revise ideas and development in substantive ways to improve the depth of ideas and vividness of supporting details
f. Explain strengths and weaknesses of own writing and the writing of others using criteria (e.g., checklists, scoring guides)

**GLE 2.** Informational and persuasive texts develop a topic and establish a controlling idea or thesis with relevant support

a. Develop texts that define or classify a topic
b. Use appropriate rhetorical appeals and genre to engage and guide the intended audience
c. Arrange paragraphs into a logical progression
d. Anticipate and address readers' biases and expectations
e. Revise ideas and structure to improve depth of information and logic of organization
f. Explain and imitate emotional, logical, and ethical appeals used by writers who are trying to persuade an audience

**GLE 3.** Writing for grammar, usage, mechanics, and clarity requires ongoing refinements and revisions

a. Use punctuation correctly (semicolons with conjunctive adverbs to combine clauses; colons for emphasis and to introduce a list)
b. Identify comma splices and fused sentences in writing and revise to eliminate them
c. Distinguish between phrases and clauses and use this knowledge to write varied, strong, correct, complete sentences
d. Use various reference tools to vary word choice and make sure words are spelled correctly

## Standard 4: Research and Reasoning

**GLE 1.** Informational materials, including electronic sources, need to be collected, evaluated, and analyzed for accuracy, relevance, and effectiveness for answering research questions

a. Integrate information from different sources to research and complete a project

b. Integrate information from different sources to form conclusions about an author's assumptions, biases, credibility, cultural and social perspectives, or world views

c. Judge the usefulness of information based on relevance to purpose, source, objectivity, copyright date, cultural and world perspective (such as editorials), and support the decision

d. Examine materials to determine appropriate primary and secondary sources to use for investigating a question, topic, or issue (e.g., library databases, print and electronic encyclopedia and other reference materials, pamphlets, book excerpts, online and print newspaper and magazine articles, letters to an editor, digital forums, oral records, research summaries, scientific and trade journals)

**GLE 2.** Effective problem-solving strategies require high-quality reasoning

a. Analyze the purpose, question at issue, information, points of view, implications and consequences, inferences, assumptions and concepts inherent in thinking

b. Assess strengths and weaknesses of their thinking and thinking of others by using criteria including relevance, clarity, accuracy, fairness, significance, depth, breadth, logic and precision

c. Implement a purposeful and articulated process to solve a problem

d. Monitor and reflect on the rationale for, and effectiveness of, choices made throughout the problem-solving process

## Standard 1: Oral Expression and Listening

**GLE 1.** Content that is gathered carefully and organized well successfully influences an audience

a. Organize and deliver a presentation that influences a specific audience
b. Reflect on the content and approach to a presentation
c. Select organizational patterns and structures and choose precise vocabulary and rhetorical devices
d. Make decisions about how to establish credibility and enhance appeal to the audience
e. Rehearse the presentation to gain fluency, to adjust tone and modulate volume for emphasis, and to develop poise
f. Use feedback to evaluate and revise the presentation

**GLE 2.** Effectively operating in small and large groups to accomplish a goal requires active listening

a. Listen actively in groups to accomplish a goal
b. Contribute effectively in both small and large groups to collaboratively accomplish a goal
c. Choose specific words for intended effect on particular audiences
d. Facilitate (or lead) a group by developing an agenda designed to accomplish a specified goal
e. Support others in discussions, activities, and presentations through active listening
f. Participate in group activities through full engagement in individual roles and responsibilities that support the specified goal of the group

## Standard 2: Reading for All Purposes

**GLE 1.** Literary and historical influences determine the meaning of traditional and contemporary literary texts

a. Generalize about universal themes, cultural or historical perspectives from multiple texts
b. Evaluate the contribution to society made by traditional, classic, and contemporary works of literature that deal with similar topics and problems
c. Relate a literary work to primary source documents of its literary period or historical setting
d. Analyze how literary components affect meaning
e. Explain the relationship between author's style and literary effect

**GLE 2.** The development of new ideas and concepts within informational and persuasive manuscripts

a. Provide a response to text that expresses an insight (such as an author's perspective or the nature of conflict) or use text-based information to solve a problem not identified in the text (for example, use information from a variety of sources to provide a response to text that expresses an insight)
b. Analyze how a concept is presented and developed in multiple texts
c. Compare the development of an idea or concept in multiple texts supported by text-based evidence
d. Describe how the author's use of persuasive vocabulary influences readers' opinions or actions

## Standard 3: Writing and Composition

**GLE 1.** Literary or narrative genres feature a variety of stylistic devices to engage or entertain an audience

a. Use conventional structures and expectations of literary genres (such as short story, personal narrative, script, poem, or song) to select content, represent ideas, make connections, generate new insights, and develop an organizational structure for drafting
b. Write literary and narrative texts using a range of stylistic devices (poetic techniques, figurative language, imagery, graphic elements) to support the presentation of implicit or explicit theme
c. Enhance the expression of voice, tone, and mood in a text by selecting and using vivid and precise diction, syntax, and punctuation
d. Use a variety of strategies to evaluate whether the writing is presented in a creative and reflective manner (e.g., reading the draft aloud, seeking feedback from a reviewer, scoring guides)
e. Revise texts using feedback to enhance the effect on the reader and clarify the presentation of implicit or explicit theme

**GLE 2.** Organizational writing patterns inform or persuade an audience

a. Devise and adjust a topic, claim, or thesis
b. Select and apply the organizational pattern best suited to purpose and audience
c. Choose and develop an effective appeal
d. Collect, organize, and evaluate materials to support ideas
e. Revise writing by evaluating relationship of central idea, evidence, and organizational pattern
f. Explain how writers use organization and details to communicate their purposes
g. Present writing to an authentic audience and gauge effect on audience for intended purpose

**GLE 3.** Grammar, language usage, mechanics, and clarity are the basis of ongoing refinements and revisions within the writing process

a. Apply dashes, colons, and semi-colons to create varied sentences, to emphasize important ideas, and to show relationships among ideas
b. Identify instances where sentences are not grammatically parallel and revise sentences to establish parallelism

c. Identify the various types of clauses and use this knowledge to write varied, strong, correct, complete sentences

d. Distinguish between the active and passive voice, and write in the active voice

## Standard 4: Research and Reasoning

**GLE 1.** Collect, analyze, and evaluate information obtained from multiple sources to answer a question, propose solutions, or share findings and conclusions

a. Define and narrow a topic for research, developing the central idea, focus, or question at issue

b. Formulate research questions that are clear and precise

c. Identify and evaluate potential sources of information for accuracy, reliability, validity, and timeliness

d. Use a variety of strategies (such as search engines, online databases , interview) to collect and organize relevant and significant information

e. Distinguish between types of evidence (such as expert testimony, analogies, anecdotes, statistics) and use a variety of types to support a particular research purpose

f. Use in-text parenthetical citations to document sources of quotations, paraphrases and information

**GLE 2.** An author's reasoning is the essence of legitimate writing and requires evaluating text for validity and accuracy

a. Analyze the logic (including assumptions and beliefs) and use of evidence (existing and missing information, primary sources, and secondary sources) used by two or more authors presenting similar or opposing arguments (such as articles by two political columnists that address the same issue)

b. Evaluate the accuracy of the information in a text, citing text-based evidence, author's use of expert authority, and author's credibility to defend the evaluation

**COLORADO Reading, Writing, and Communicating**
Grade 11 Academic Standards

## Standard 1: Oral Expression and Listening

**GLE 1.** Verbal and nonverbal cues impact the intent of communication

a. Give informal talks using an appropriate level of formality of verbal language and nonverbal interaction with audience
b. Deliver formal oral presentations for intended purpose and audience, using effective verbal and nonverbal communication
c. Deliver oral talks with clear enunciation, vocabulary, and appropriate organization; nonverbal gestures; and tone
d. Analyze audience responses to evaluate how effectively the talk or presentation met the purpose
e. Identify, explain, and use content-specific vocabulary, terminology, dialect, or jargon unique to particular groups, perspectives, or contexts (such as social, professional, political, cultural, historical or geographical)

**GLE 2.** Validity of a message is determined by its accuracy and relevance

a. Critique the accuracy, relevance, and organization of evidence of a presentation
b. Critique the clarity and effectiveness of delivery
c. Evaluate effectiveness of oral delivery techniques
d. Listen critically to evaluate the overall effectiveness of the presentation
e. Analyze the resources cited for validity

## Standard 2: Reading for All Purposes

**GLE 1.** Complex literary texts require critical reading approaches to effectively interpret and evaluate meaning

a. Analyze literary components (e.g., tone, symbolism, irony, extended metaphor, satire, hyperbole) to interpret theme
b. Explain the influence of historical context on the form, style, and point of view of a written work
c. Interpret and synthesize themes across multiple literary texts, providing support for interpretations
d. Demonstrate knowledge of classical foundational works of American literature

**GLE 2.** Ideas synthesized from informational texts serve a specific purpose

a. Designate a purpose for reading expository texts and use new learning to complete a specific task (such as convince an audience, shape a personal opinion or decision, or perform an activity)
b. Make generalizations and draw conclusions from persuasive texts, citing text-based evidence as support
c. Predict the impact an informational text will have on an audience and justify the prediction
d. Use text features and graphical representations to complement comprehension and enhance critical analysis of a text
e. Explain nuances and connotations of particular words and sentences, and draw conclusions about author's intent as well as potential impact on an audience

## Standard 3: Writing and Composition

**GLE 1.** Stylistic and thematic elements of literary or narrative texts can be refined to engage or entertain an audience

a. Organize events, details, ideas and reflections or observations strategically to influence the audience's emotions and understanding of the implicit or explicit theme
b. Write literary and narrative texts using a range of stylistic devices (poetic techniques, figurative language, symbolism, graphic or visual components) to support the presentation of implicit or explicit theme
c. Enhance the expression of voice, tone, and point of view in a text by strategically using precise diction (considering denotation, connotation, and audience associations); diverse syntax; varied sentence patterns; and punctuation for stylistic effect
d. Use a range of strategies to evaluate whether the writing is presented in a clear and engaging manner (such as reading the text from the perspective of the intended audience, seeking feedback from a reviewer)
e. Evaluate and revise text to eliminate unnecessary details, ineffective stylistic devices, and vague or confusing language

**GLE 2.** Elements of informational and persuasive texts can be refined to inform or influence an audience

a. Articulate a position through a concise and focused claim or thesis statement, and advance it using evidence, examples, and counterarguments
b. Locate and select appropriate information that clearly supports a definite purpose, topic, or position
c. Choose, develop, and refine appeals for desired effect on audience
d. Evaluate and revise own text as needed to eliminate logical fallacies and to enhance credibility of ideas and information
e. Use vocabulary for intentional development of voice and tone for a specific audience, purpose, or situation
f. Clarify and order ideas for best possible effect

**GLE 3.** Writing demands ongoing revisions and refinements for grammar, usage, mechanics, and clarity

a. Apply punctuation correctly and articulate stylistic choices
b. Use a variety of phrases (absolute, appositive) accurately and purposefully to improve writing
c. Use idioms correctly, particularly prepositions that follow verbs

d. Ensure that a verb agrees with its subject in complex constructions (such as inverted subject/verb order, indefinite pronoun as subject, intervening phrases or clauses)

e. Use a style guide to follow the conventions of Modern Language Association (MLA) or American Psychological Association (APA) format

f. Use resources (print and electronic) and feedback to edit and enhance writing for purpose and audience

## Standard 4: Research and Reasoning

**GLE 1.** Self-designed research provides insightful information, conclusions, and possible solutions

a. Define and narrow a topic for research (thesis statement, hypothesis, research question) to address a specific purpose and audience

b. Evaluate and revise research questions for precision and clarity

c. Evaluate quality, accuracy, and completeness of information and the bias, credibility and reliability of the sources

d. Use a variety of strategies (e.g., technical reading, direct observation, survey development) to collect relevant information to support the thesis/research question and explain why specific strategies were used instead of others

e. Evaluate and select appropriate types of evidence to support a particular research purpose

f. Document sources of quotations, paraphrases, and other information, using a style sheet, such as that of the Modern Language Association (MLA) or the American Psychological Association (APA)

**GLE 2.** Complex situations require critical thinking across multiple disciplines

a. Analyze the logic of complex situations by questioning the purpose, question at issue, information, points of view, implications and consequences inferences, assumptions and concepts

b. Evaluate strengths and weaknesses of their logic and logic of others by using criteria including relevance, clarity, accuracy, fairness, significance, depth, breadth, logic and precision

c. Determine the extent to which they entered empathetically into competing points of view, exercised confidence in reason, recognized the limits of their knowledge on the topic (intellectual humility), explored alternative approaches to solving or addressing complex problems (intellectual flexibility), and were open to constructive critique (intellectual open-mindedness)

d. Analyze and assess the logic of the interdisciplinary domains inherent in reasoning through complex situations

e. Monitor and assess the extent to which their own beliefs and biases influenced their reactions to the viewpoints and logic of others

**GLE 3.** Evaluating quality reasoning includes the value of intellectual character such as humility, empathy, and confidence

a. Analyze the purpose, question at issue, information, points of view, implications and consequences, inferences, assumptions, and concepts inherent in thinking

b. Assess strengths and weaknesses of thinking and thinking of others by using criteria including relevance, clarity, accuracy, fairness, significance, depth, breadth, logic, and precision

c. Determine the extent to which they entered empathetically into competing points of view, exercised confidence in reason, recognized the limits of their knowledge on the topic (intellectual humility), explored alternative approaches to solving or addressing complex problems (intellectual flexibility), were open to constructive critique (intellectual open-mindedness)

d. Evaluate the reasoning of self and others for quality, strong-sense thinking

**COLORADO Reading, Writing, and Communicating**
Grade 12 Academic Standards

## Standard 1: Oral Expression and Listening

**GLE 1.** Effective speaking in formal and informal settings requires appropriate use of methods and audience awareness

a. Prepare and deliver a formal presentation for different purposes and audiences (such as expositive, persuasive, entertaining, inspirational, or recognition)
b. Identify a central idea or thesis, organize ideas, and develop a speech for an intended purpose and audience
c. Use examples, illustrations, graphics, quotations, analogies, facts, and statistics to focus and support the content of a presentation
d. Use grammar and vocabulary appropriate for the situation, audience, topic, and purpose
e. Choose specific words and word order for intended effect and meaning
f. Select appropriate technical or specialized language

**GLE 2.** Effective collaborative groups accomplish goals

a. Design an effective group effort to accomplish a goal
b. Implement an effective group effort that achieves a goal
c. Analyze differences in group perspectives to help bring the group to consensus or to solve a perceived problem
d. Participate in the preparations of the group activity or product, defining and assuming individual roles and responsibilities
e. Assume a leadership role in a group that is collaboratively working to accomplish a goal
f. Self-evaluate roles in the preparation and completion of the group goal
g. Critique and offer suggestions for improving presentations given by own group and other groups

## Standard 2: Reading for All Purposes

**GLE 1.** Literary criticism of complex texts requires the use of analysis, interpretive, and evaluative strategies

a. Apply understanding of the unique characteristics of literary text (such as literary essay, elegy, sonnet, psalm, short story, history, comedy, or tragedy) to make connections and draw subtle generalizations and conclusions
b. Describe and contrast characteristics of specific literary movements and perspectives
c. Evaluate the influence of historical context on the form, style, and point of view of a written work
d. Analyze and relate a literary work to source documents of its literary period or to critical perspectives
e. Evaluate how literary components impact meaning (such as tone, symbolism, irony, extended metaphor, satire, hyperbole)
f. Demonstrate knowledge of classical foundational works of world literature

**GLE 2.** Interpreting and evaluating complex informational texts require the understanding of rhetoric, critical reading, and analysis skills

a. Use reading and note-taking strategies (outlining, mapping systems, skimming, scanning, key word search) to organize information and make connections within and across informational texts
b. Use semantic cues, signal words, and transitions to identify text structures (such as critique, proposition/support, inductive/deductive) and to summarize central ideas and supporting details
c. Obtain and use information from text and text features (index, bold or italicized text, subheadings, graphics) to answer questions, perform specific tasks, or identify and solve problems
d. Explain and interpret the visual components supporting the text (maps, complex tables and diagrams, and transitional devices, such as use of white space)
e. Identify, analyze, and evaluate rhetorical devices and appeals used to advance an author's purpose and viewpoint.

## Standard 3: Writing and Composition

**GLE 1.** Style, detail, expressive language, and genre create a well-crafted statement directed at an intended audience and purpose

a. Use a range of elaboration techniques (such as questioning, comparing, connecting, interpreting, analyzing, or describing) to establish and express point of view and theme
b. Create a clear and coherent, logically consistent structure appropriate to the chosen literary genre (biographical account, short story, personal narrative, narrative poem or song, parody of particular narrative style, play script)
c. Develop context, character/narrator motivation, problem/conflict and resolution, and descriptive details/examples to support and express theme
d. Manipulate elements of style, imagery, tone, and point of view to appeal to the senses and emotions of the reader
e. Critique own writing and the writing of others from the perspective of the intended audience to guide revisions, improve voice and style (word choice, sentence variety, figurative language) and achieve intended purpose and effect

**GLE 2.** Ideas, evidence, structure, and style create persuasive, academic, and technical texts for particular audiences and specific purposes

a. Articulate a position through a sophisticated claim or thesis statement and advance it using evidence, examples, and counterarguments
b. Select appropriate and relevant information (excluding extraneous details) to set context

c. Address audience needs and anticipate audience questions or misunderstandings

d. Select and build context for language appropriate to content (technical, formal)

e. Control and enhance the flow of ideas through transitional words or phrases appropriate to text structure

f. Support judgments with substantial evidence and purposeful elaboration

g. Draw a conclusion by synthesizing information

h. Revise writing using feedback to maximize effect on audience and to calibrate purpose

**GLE 3.** Standard English conventions effectively communicate to targeted audiences and purposes

a. Follow the conventions of standard English to write varied, strong, correct, complete sentences

b. Deliberately manipulate the conventions of standard English for stylistic effect appropriate to the needs of a particular audience and purpose

c. Seek and use an appropriate style guide to govern conventions for a particular audience and purpose

## Standard 4: Research and Reasoning

**GLE 1.** Independent research designs articulate and defend information, conclusions and solutions that address specific contexts and purposes

a. Define and narrow a topic for self-designed research for a variety of purposes and audiences

b. Critique research questions of self and others for bias and underlying assumptions

c. Critique and defend sources and information based on credibility, relevance and appropriateness relative to context and purpose

d. Design and defend a set of diverse research strategies (e.g., cross-referencing bibliographies, creating annotated bibliographies, researching source credentials) to identify information appropriate to the needs of a research question, hypothesis, or thesis statement

e. Critique and defend evidence relative to its use to address a particular context and purpose

f. Determine and use the appropriate style guide to govern format and documentation of quotations, paraphrases, and other information from a range of research sources

**GLE 2.** Logical arguments distinguish facts from opinions, and evidence defines reasoned judgment

a. Synthesize information to support a logical argument

b. Distinguish between evidence and inferences

c. Identify false premises or assumptions

d. Analyze rhetorical devices used in own and others' appeals

e. Summarize ideas that include alternate views, rich detail, well-developed paragraphs, and logical argumentation

## COLORADO Mathematics
Prepared Graduate Competencies

- Understand the structure and properties of our number system. At the most basic level numbers are abstract symbols that represent real-world quantities
- Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error
- Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency
- Make both relative (multiplicative) and absolute (arithmetic) comparisons between quantities. Multiplicative thinking underlies proportional reasoning
- Recognize and make sense of the many ways that variability, chance, and randomness appear in a variety of contexts
- Solve problems and make decisions that depend on understanding, explaining, and quantifying the variability in data
- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations
- Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data
- Apply transformation to numbers, shapes, functional representations, and data
- Make claims about relationships among numbers, shapes, symbols, and data and defend those claims by relying on the properties that are the structure of mathematics
- Communicate effective logical arguments using mathematical justification and proof. Mathematical argumentation involves making and testing conjectures, drawing valid conclusions, and justifying thinking
- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

## Standard: Number Sense, Properties, and Operations

**GLE 1.** In the real number system, rational and irrational numbers are in one to one correspondence to points on the number line

a. Compare and order sets of integers and rational numbers that are expressed as fractions, decimals, or percents

b. Given a whole number from 0–100, determine whether it is a perfect square or find the two consecutive whole numbers between which its square root lies

c. Approximate the location of square roots between two whole numbers on a number line

**GLE 2.** Formulate, represent, and use algorithms with rational numbers flexibly, accurately, and efficiently

a. Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals

b. Apply computational methods to solve multi-step application problems involving percents and rational numbers

c. Analyze how credit and debt impact personal financial goals

## Standard: Patterns, Functions, and Algebraic Structures

**GLE 1.** Linear functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables

a. Convert from one representation of a linear function to another, including situations, tables, equations (slope-intercept form), and graphs

b. Use representations of linear functions to analyze situations and solve problems

c. Identify the dependent and independent variable in real-world situations

d. Identify and interpret the slope (rate of change) and y-intercept in graphs, in tables, and from equations in slope-intercept form

e. Model and graph two linear equations in slope-intercept form on the same coordinate plane and interpret the point of intersection as the solution to the system of equations

**GLE 2.** Properties of algebra, equality, and inequality are used to solve linear equations and inequalities

a. Use the distributive, associative, and commutative properties to simplify algebraic expressions

b. Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides, and the distributive property

c. Solve inequalities in one variable including negative coefficients and graph the solution on a number line

d. Represent the distributive property in a variety of ways including numerically, geometrically, and algebraically

**GLE 3.** Graphs and tables can be used to distinguish between linear and nonlinear functions

a. Given a table or graph determine if the function is linear

b. Explain the properties of linear functions in tables and graphs

## Standard: Data Analysis, Statistics, and Probability

**GLE 1.** Visual displays and summary statistics of two-variable data condense the information in data sets into usable knowledge

a. Given a scatter plot, calculate quadrant count ratio to quantify the magnitude and strength of the association between two variables for numeric data as positive, negative, or no correlation

b. Given a scatter plot suggesting a linear relationship, draw a line of fit to make predictions

c. Use time series plots (line graphs) to analyze the trend of a set of data over time

## Standard: Shape, Dimension, and Geometric Relationships

**GLE 1.** Objects in the plane and their parts and attributes can be analyzed

a. Classify quadrilaterals and apply angle and side properties, including the sum of the interior angles

b. Apply properties of complementary, supplementary, and vertical angle relationships

c. Apply properties of parallel lines including corresponding angles and alternate interior angles

**GLE 2.** Direct and indirect measurements can be used to describe and make comparisons

a. Use properties of similar triangles to find unknown lengths

b. Use the Pythagorean Theorem to find unknown lengths in right triangles

c. Use proportional reasoning to estimate distance, weight, and capacity

d. Use proportional reasoning to convert among measures including dimensional analysis

## Standard: Number Sense, Properties, and Operations

**GLE 1.** The complex number system includes real numbers and imaginary numbers

a. Show that between any two rational numbers there are an infinite number of rational numbers, and that between any two irrational numbers there are also an infinite number of irrational numbers

b. Express the square root of a negative number using imaginary numbers

**GLE 2.** Formulate, represent, and use algorithms with real numbers flexibly, accurately, and efficiently

a. Use appropriate computation methods that encompass estimation and calculation

b. Use technology to perform operations (addition, subtraction, multiplication, and division) on numbers written in scientific notation

c. Describe factors affecting take-home pay and calculate the impact

d. Design and use a budget, including income (net take-home pay) and expenses (mortgage, car loans, and living expenses) to demonstrate how living within your means is essential for a secure financial future

**GLE 3.** Systematic counting techniques are used to describe and solve problems

a. Use combinatorics (Fundamental Counting Principle, permutations and combinations) to solve problems in real-world contexts

## Standard: Patterns, Functions, and Algebraic Structures

**GLE 1.** Functions model situations where one quantity determines another and can be represented algebraically, graphically, and using tables

a. Determine* when a relation is a function using a table, a graph, or an equation

b. Demonstrate the relationship between all forms of linear functions using point-slope, slope-intercept, and standard form of a line

c. Represent* linear, quadratic, absolute value, power, exponential, logarithmic, rational, trigonometric (sine and cosine), and step functions in a table, graph, and equation and convert from one representation to another

d. Determine the inverse (expressed graphically or in tabular form) of a function from a graph or table

e. Categorize sequences as arithmetic, geometric, or neither and develop formulas for the general terms related to arithmetic and geometric sequences

**GLE 2.** Graphs and tables are used to describe the qualitative behavior of common types of functions

a. Evaluate* a function at a given point in its domain given an equation (including function notation), a table, and a graph

b. Identify* the domain and range of a function given an equation (including function notation), a table, and a graph

c. Identify* intercepts, zeros (or roots), maxima, minima, and intervals of increase and decrease, and asymptotes of a function given an equation (including function notation), a table, and a graph

d. Make qualitative statements about the rate of change of a function, based on its graph or table

**GLE 3.** Parameters influence the shape of the graphs of functions

a. Apply* transformations (translation, reflection, dilation) to a parent function, f(x)

b. Interpret the results of these transformations verbally, graphically, and symbolically

**GLE 4.** Expressions , equations, and inequalities can be expressed in multiple, equivalent forms

a. Perform and justify steps in generating equivalent expressions by identifying properties used including the commutative, associative, inverse, identity, and distributive properties

b. Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions including those involving nth roots

c. Solve equations for one variable in terms of the others

**GLE 5.** Solutions to equations, inequalities and systems of equations are found using a variety of tools

a. Find* solutions to quadratic and cubic equations and linear inequalities by using appropriate algebraic methods such as factoring, completing the square, graphing or using the quadratic formula

b. Find* solutions to equations involving power, exponential, rational and radical functions

c. Solve* systems of linear equations and inequalities with two variables

**GLE 6.** Quantitative relationships in the real world can be modeled and solved using functions

a. Represent, solve*, and interpret problems in various contexts using linear, quadratic, and exponential functions

b. Represent, solve*, and interpret problems involving direct and inverse variations and a combination of direct and inverse variation

c. Analyze* the impact of interest rates on a personal financial plan

d. Evaluate* the costs and benefits of credit

 = Measured by EXPLORE, PLAN, and/or ACT Mathematics tests and/or WorkKeys AM

e. Analyze various lending sources, services, and financial institutions

## Standard: Data Analysis, Statistics, and Probability

**GLE 1.** Statistical methods take variability into account, supporting informed decision-making through quantitative studies designed to answer specific questions

a. Formulate appropriate research questions that can be answered with statistical analysis

b. Determine appropriate data collection methods to answer a research question

c. Explain how data might be analyzed to provide answers to a research question

**GLE 2.** The design of an experiment or sample survey is of critical importance to analyzing the data and drawing conclusions

a. Identify the characteristics of a well-designed and well-conducted survey

b. Identify the characteristics of a well-designed and well-conducted experiment

c. Differentiate between the inferences that can be drawn in experiments versus observational studies

**GLE 3.** Visual displays and summary statistics condense the information in data sets into usable knowledge

a. Identify and choose appropriate ways to summarize numerical or categorical data using tables, graphical displays, and numerical summary statistics (describing shape, center and spread) and accounting for outliers when appropriate

b. Define and explain how sampling distributions (developed through simulation) are used to describe the sample-to-sample variability of sample statistics

c. Describe the relationship between two categorical variables using percents

d. When the relationship between two numerical variables is reasonably linear, apply* the least-squares criterion for line fitting, use Pearson's correlation coefficient as a measure of strength, and interpret the slope and y-intercept in the context of the problem

**GLE 4.** Randomness is the foundation for using statistics to draw conclusions when testing a claim or estimating plausible values for a population characteristic

a. Define and explain the meaning of significance (both practical and statistical)

b. Explain the role of p-values in determining statistical significance

c. Determine the margin of error associated with an estimate of a population characteristic

**GLE 5.** Probability models outcomes for situations in which there is inherent randomness, quantifying the degree of certainty in terms of relative frequency of occurrence

a. Develop* simulations that demonstrate probability as a long-run relative frequency

b. Apply and solve problems using the concepts of independence and conditional probability

c. Apply and solve problems using the concept of mutually exclusive properties when combining probabilities

d. Evaluate* and interpret probabilities using a normal distribution

e. Find* and interpret the expected value and standard deviation of a discrete random variable X

f. Analyze* the cost of insurance as a method to offset the risk of a situation

## Standard: Shape, Dimension, and Geometric Relationships

**GLE 1.** Attributes of two- and three-dimensional objects are measurable and can be quantified

a. Calculate (or estimate when appropriate) the perimeter and area of a two-dimensional irregular shape

b. Justify, interpret, and apply the use of formulas for the surface area, and volume of cones, pyramids, and spheres including real-world situations

c. Solve for unknown quantities in relationships involving perimeter, area, surface area, and volume

d. Apply the effect of dimensional change, utilizing appropriate units and scales in problem-solving situations involving perimeter, area, and volume

**GLE 2.** Objects in the plane and their parts, attributes, and measurements can be analyzed deductively

a. Classify polygons according to their similarities and differences

b. Solve for unknown attributes of geometric shapes based on their congruence, similarity, or symmetry

c. Know and apply properties of angles including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve problems. Justify the results using two-column proofs, paragraph proofs, flow charts, or illustrations

d. Develop conjectures and solve problems about geometric figures including definitions and properties (congruence, similarity, and symmetry). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, or illustrations

**GLE 3.** Objects in the plane can be transformed, and those transformations can be described and analyzed mathematically

a. Make conjectures involving two-dimensional objects represented with Cartesian coordinates. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations

b. Represent transformations (reflection, translation, rotation, and dilation) using Cartesian coordinates

c. Develop arguments to establish what remains invariant and what changes after a transformation (reflection, translation, rotation, and dilations). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations

d. Using construction tools, including technology, make conjectures about relationships among properties of shapes in the plane including those formed through transformation. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations

**GLE 4.** Right triangles are central to geometry and its applications

a. Apply right triangle trigonometry (sine, cosine, and tangent) to find indirect measures of lengths and angles

b. Apply the Pythagorean theorem and its converse to solve real-world problems

c. Determine the midpoint of a line segment and the distance between two points in the Cartesian coordinate plane

Science

**COLORADO Science**
Prepared Graduate Competencies

## Standard 1: Physical Science

- Observe, explain, and predict natural phenomena governed by Newton's laws of motion, acknowledging the limitations of their application to very small or very fast objects
- Apply an understanding of atomic and molecular structure to explain the properties of matter, and predict outcomes of chemical and nuclear reactions
- Apply an understanding that energy exists in various forms, and its transformation and conservation occur in processes that are predictable and measurable

## Standard 2: Life Science

- Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection
- Explain and illustrate with examples how living systems interact with the biotic and abiotic environment
- Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment
- Explain how biological evolution accounts for the unity and diversity of living organisms

## Standard 3: Earth Systems Science

- Describe and interpret how Earth's geologic history and place in space are relevant to our understanding of the processes that have shaped our planet
- Evaluate evidence that Earth's geosphere, atmosphere, hydrosphere, and biosphere interact as a complex system
- Describe how humans are dependent on the diversity of resources provided by Earth and Sun


= Measured by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI
= Content sampled by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

**COLORADO Science**
Grade 8 Academic Standards

## Standard 1: Physical Science

**GLE 1.** Identify and calculate the direction and magnitude of forces that act on an object, and explain the results in the object's change of motion

a. Predict and evaluate the movement of an object by examining the forces applied to it
b. Use mathematical expressions to describe the movement of an object
c. Develop and design a scientific investigation to collect and analyze speed and acceleration data to determine the net forces acting on a moving object

**GLE 2.** There are different forms of energy, and those forms of energy can be changed from one form to another—but total energy is conserved

a. Gather, analyze, and interpret data to describe the different forms of energy and energy transfer
b. Develop a research-based analysis of different forms of energy and energy transfer
c. Use research-based models to describe energy transfer mechanisms, and predict amounts of energy transferred

**GLE 3.** Distinguish between physical and chemical changes, noting that mass is conserved during any change

a. Identify the distinguishing characteristics between a chemical and a physical change
b. Gather, analyze, and interpret data on physical and chemical changes
c. Gather, analyze, and interpret data that show mass is conserved in a given chemical or physical change
d. Identify evidence that suggests that matter is always conserved in physical and chemical changes
e. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate physical and chemical changes

**GLE 4.** Recognize that waves such as electromagnetic, sound, seismic, and water have common characteristics and unique properties

a. Compare and contrast different types of waves
b. Describe for various waves the amplitude, frequency, wavelength, and speed
c. Describe the relationship between pitch and frequency in sound
d. Develop and design a scientific investigation regarding absorption, reflection, and refraction of light

## Standard 2: Life Science

**GLE 1.** Human activities can deliberately or inadvertently alter ecosystems and their resiliency

a. Develop, communicate, and justify an evidence-based scientific example of how humans can alter ecosystems
b. Analyze and interpret data about human impact on local ecosystems
c. Recognize and infer bias in print and digital resources while researching an environmental issue
d. Use technology resources such as online encyclopedias, online databases, and credible websites to locate, organize, analyze, evaluate, and synthesize information about human impact on local ecosystems
e. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate an environmental issue

**GLE 2.** Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals' traits in the next generation

a. Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation
b. Use direct and indirect observations, evidence, and data to support claims about genetic reproduction and traits of individuals
c. Gather, analyze, and interpret data on transmitting genetic information
d. Use models and diagrams to predict the phenotype and genotype of offspring based on the genotype of the parents
e. Use computer simulations to model and predict phenotype and genotype of offspring based on the genotype of the parents

## Standard 3: Earth Systems Science

**GLE 1.** Weather is a result of complex interactions of Earth's atmosphere, land and water, that are driven by energy from the sun, and can be predicted and described through complex models

a. Differentiate between basic and severe weather conditions, and develop an appropriate action plan for personal safety and the safety of others
b. Observe and gather data for various weather conditions and compare to historical data for that date and location
c. Use models to develop and communicate a weather prediction

**GLE 2.** Earth has a variety of climates defined by average temperature, precipitation, humidity, air pressure, and wind that have changed over time in a particular location

a. Develop, communicate and justify an evidence-based scientific explanation to account for Earth's different climates
b. Research and evaluate direct and indirect evidence to explain how climates vary from one location to another on Earth
c. Examine, evaluate, and question information from a variety of sources and media to investigate how climates vary from one location to another on Earth


= Measured by EXPLORE Science Test
= Content sampled by EXPLORE Science Test

**GLE 3.** The solar system is comprised of various objects that orbit the Sun and are classified based on their characteristics

a. Construct a scale model of the solar system, and use it to explain the motion of objects in the system such a planets, Sun, Moons, asteroids, comets, and dwarf planets

b. Describe methods and equipment used to explore the solar system and beyond

c. Design an investigation that involves direct observation of objects in the sky, and analyze and explain results

d. Research, critique, and communicate scientific theories that explain how the solar system was formed

e. Use computer data sets and simulations to explore objects in the solar system

f. Recognize that mathematical models are used to predict orbital paths and events

**GLE 4.** The relative positions and motions of Earth, Moon, and Sun can be used to explain observable effects such as seasons, eclipses, and Moon phases

a. Develop, communicate, and justify an evidence-based explanation using relative positions of Earth, Moon, and Sun to explain the following natural phenomenon:

   1. Tides
   2. Eclipses of the Sun and Moon
   3. Different shapes of the Moon as viewed from Earth

b. Analyze and interpret data to explain why we have seasons

c. Use models to explain the relative motions of Earth, Moon, and Sun over time



= Measured by EXPLORE Science Test

_____ = Content sampled by EXPLORE Science Test

## Standard 1: Physical Science

**GLE 1.** Newton's laws of motion and gravitation describe the relationships among forces acting on and between objects, their masses, and changes in their motion—but have limitations

a. Gather, analyze and interpret data and create graphs regarding position, velocity and acceleration of moving objects

b. Develop, communicate and justify an evidence-based analysis of the forces acting on an object and the resultant acceleration produced by a net force

c. Develop, communicate and justify an evidence-based scientific prediction regarding the effects of the action-reaction force pairs on the motion of two interacting objects

d. Examine the effect of changing masses and distance when applying Newton's law of universal gravitation to a system of two bodies

e. Identify the limitations of Newton's laws in extreme situations

**GLE 2.** Matter has definite structure that determines characteristic physical and chemical properties

a. Develop, communicate, and justify an evidence-based scientific explanation supporting the current model of an atom

b. Gather, analyze and interpret data on chemical and physical properties of elements such as density, melting point, boiling point, and conductivity

c. Use characteristic physical and chemical properties to develop predictions and supporting claims about elements' positions on the periodic table

d. Develop a model that differentiates atoms and molecules, elements and compounds, and pure substances and mixtures

**GLE 3.** Matter can change form through chemical or nuclear reactions abiding by the laws of conservation of mass and energy

a. Recognize, analyze, interpret, and balance chemical equations (synthesis, decomposition, combustion, and replacement) or nuclear equations (fusion and fission)

b. Predict reactants and products for different types of chemical and nuclear reactions

c. Predict and calculate the amount of products produced in a chemical reaction based on the amount of reactants

d. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate the conservation of mass and energy

**GLE 4.** Atoms bond in different ways to form molecules and compounds that have definite properties

a. Develop, communicate, and justify an evidence-based scientific explanation supporting the current models of chemical bonding

b. Gather, analyze, and interpret data on chemical and physical properties of different compounds such as density, melting point, boiling point, pH, and conductivity

c. Use characteristic physical and chemical properties to develop predictions and supporting claims about compounds' classification as ionic, polar or covalent

d. Describe the role electrons play in atomic bonding

e. Predict the type of bonding that will occur among elements based on their position in the periodic table

**GLE 5.** Energy exists in many forms such as mechanical, chemical, electrical, radiant, thermal, and nuclear, that can be quantified and experimentally determined

a. Develop, communicate, and justify an evidence-based scientific explanation regarding the potential and kinetic nature of mechanical energy

b. Use appropriate measurements, equations and graphs to gather, analyze, and interpret data on the quantity of energy in a system or an object

c. Use direct and indirect evidence to develop predictions of the types of energy associated with objects

d. Identify different energy forms, and calculate their amounts by measuring their defining characteristics

**GLE 6.** When energy changes form, it is neither created not destroyed; however, because some is necessarily lost as heat, the amount of energy available to do work decreases

a. Use direct and indirect evidence to develop and support claims about the conservation of energy in a variety of systems, including transformations to heat

b. Evaluate the energy conversion efficiency of a variety of energy transformations

c. Describe energy transformations both quantitatively and qualitatively

d. Differentiate among the characteristics of mechanical and electromagnetic waves that determine their energy

e. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate energy conservation and loss

## Standard 2: Life Science

**GLE 1.** Matter tends to be cycled within an ecosystem, while energy is transformed and eventually exits an ecosystem

a. Analyze how energy flows through trophic levels

b. Evaluate the potential ecological impacts of a plant-based or meat-based diet

c. Analyze and interpret data from experiments on ecosystems where matter such as fertilizer has been added or withdrawn such as through drought

d. Develop, communicate, and justify an evidence-based scientific explanation showing how ecosystems follow the laws of conservation of matter and energy


= Measured by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI
= Content sampled by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

e. Define and distinguish between matter and energy, and how they are cycled or lost through life processes

f. Describe how carbon, nitrogen, phosphorus, and water cycles work

g. Use computer simulations to analyze how energy flows through trophic levels

**GLE 2.** The size and persistence of populations depend on their interactions with each other and on the abiotic factors in an ecosystem

a. Analyze and interpret data about the impact of removing keystone species from an ecosystem or introducing non-native species into an ecosystem

b. Describe or evaluate communities in terms of primary and secondary succession as they progress over time

c. Evaluate data and assumptions regarding different scenarios for future human population growth and their projected consequences

d. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate ecosystem interactions

**GLE 3.** Cellular metabolic activities are carried out by biomolecules produced by organisms

a. Identify biomolecules and their precursors/building blocks

b. Develop, communicate, and justify an evidence-based explanation that biomolecules follow the same rules of chemistry as any other molecule

c. Develop, communicate, and justify an evidence-based explanation regarding the optimal conditions required for enzyme activity

d. Infer the consequences to organisms of suboptimal enzyme function—such as altered blood pH or high fever—using direct and indirect evidence

e. Analyze and interpret data on the body's utilization of carbohydrates, lipids, and proteins

**GLE 4.** The energy for life primarily derives from the interrelated processes of photosynthesis and cellular respiration. Photosynthesis transforms the sun's light energy into the chemical energy of molecular bonds. Cellular respiration allows cells to utilize chemical energy when these bonds are broken.

a. Develop, communicate, and justify an evidence-based scientific explanation the optimal environment for photosynthetic activity

b. Discuss the interdependence of autotrophic and heterotrophic life forms such as depicting the flow of a carbon atom from the atmosphere, to a leaf, through the food chain, and back to the atmosphere

c. Explain how carbon compounds are gradually oxidized to provide energy in the form of adenosine triphosphate (ATP), which drives many chemical reactions in the cell

**GLE 5.** Cells use passive and active transport of substances across membranes to maintain relatively stable intracellular environments

a. Analyze and interpret data to determine the energy requirements and/or rates of substance transport across cell membranes

b. Compare organisms that live in freshwater and marine environments, and identify the challenges of osmotic regulation for these organisms

c. Diagram the cell membrane schematically, and highlight receptor proteins as targets of hormones, neurotransmitters, or drugs that serve as active links between intra and extracellular environments

d. Use tools to gather, view, analyze, and interpret data produced during scientific investigations that involve passive and active transport

e. Use computer simulations and models to analyze cell transport mechanisms

**GLE 6.** Cells, tissues, organs, and organ systems maintain relatively stable internal environments, even in the face of changing external environments

a. Discuss how two or more body systems interact to promote health for the whole organism

b. Analyze and interpret data on homeostatic mechanisms using direct and indirect evidence to develop and support claims about the effectiveness of feedback loops to maintain homeostasis

c. Distinguish between causation and correlation in epidemiological data, such as examining scientifically valid evidence regarding disrupted homeostasis in particular diseases

d. Use computer simulations and models of homeostatic mechanisms

**GLE 7.** Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins

a. Analyze and interpret data that genes are expressed portions of DNA

b. Analyze and interpret data on the processes of DNA replication, transcription, translation, and gene regulation, and show how these processes are the same in all organisms

c. Recognize that proteins carry out most cell activities and mediate the effect of genes on physical and behavioral traits in an organism

d. Evaluate data showing that offspring are not clones of their parents or siblings due to the meiotic processes of independent assortment of chromosomes, crossing over, and mutations

e. Explain using examples how genetic mutations can benefit, harm, or have neutral effects on an organism



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_____ = Content sampled by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

**GLE 8.** Multicellularity makes possible a division of labor at the cellular level through the expression of select genes, but not the entire genome

a. Develop, communicate, and justify an evidence-based scientific explanation of how cells form specialized tissues due to the expression of some genes and not others

b. Analyze and interpret data that show most eukaryotic deoxyribonucleic acid (DNA) does not actively code for proteins within cells

c. Develop, communicate, and justify an evidence-based scientific explanation for how a whole organism can be cloned from a differentiated—or adult—cell

d. Analyze and interpret data on medical problems using direct and indirect evidence in developing and supporting claims that genetic mutations and cancer are brought about by exposure to environmental toxins, radiation, or smoking

**GLE 9.** Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment

a. Develop, communicate, and justify an evidence-based scientific explanation for how Earth's diverse life forms today evolved from common ancestors

b. Analyze and interpret multiple lines of evidence supporting the idea that all species are related by common ancestry such as molecular studies, comparative anatomy, biogeography, fossil record and embryology

c. Analyze and interpret data suggesting that over geologic time, discrete bursts of rapid genetic changes and gradual changes have resulted in speciation

d. Analyze and interpret data on how evolution can be driven by three key components of natural selection—heritability, genetic variation, and differential survival and reproduction

e. Generate a model—an evolutionary tree—showing how a group of organisms is most likely diverged from common ancestry

## Standard 3: Earth Systems Science

**GLE 1.** The history of the universe, solar system and Earth can be inferred from evidence left from past events

a. Develop, communicate, and justify an evidence-based scientific explanation addressing questions about Earth's history

b. Analyze and interpret data regarding Earth's history using direct and indirect evidence

c. Analyze and interpret data regarding the history of the universe using direct and indirect evidence

d. Seek, evaluate, and use a variety of specialized resources available from libraries, the Internet, and the community to find scientific information on Earth's history

e. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate the history of the universe, solar system and Earth

**GLE 2.** As part of the solar system, Earth interacts with various extraterrestrial forces and energies such as gravity, solar phenomena, electromagnetic radiation, and impact events that influence the planet's geosphere, atmosphere, and biosphere in a variety of ways

a. Develop, communicate, and justify an evidence-based scientific explanation addressing questions around the extraterrestrial forces and energies that influence Earth

b. Analyze and interpret data regarding extraterrestrial forces and energies

c. Clearly identify assumptions behind conclusions regarding extraterrestrial forces and energies and provide feedback on the validity of alternative explanations

d. Use specific equipment, technology, and resources such as satellite imagery, global positioning systems (GPS), global information systems (GIS), telescopes, video and image libraries, and computers to explore the universe)

**GLE 3.** The theory of plate tectonics helps explain geological, physical, and geographical features of Earth

a. Develop, communicate, and justify an evidence-based scientific explanation about the theory of plate tectonics and how it can be used to understand geological, physical, and geographical features of Earth

b. Analyze and interpret data on plate tectonics and the geological, physical, and geographical features of Earth

c. Understand the role plate tectonics has had with respect to long-term global changes in Earth's systems such as continental buildup, glaciations, sea-level fluctuations, and climate change

d. Investigate and explain how new conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics

**GLE 4.** Climate is the result of energy transfer among interactions of the atmosphere, hydrosphere, geosphere, and biosphere

a. Develop, communicate, and justify an evidence-based scientific explanation that shows climate is a result of energy transfer among the atmosphere, hydrosphere, geosphere and biosphere

b. Analyze and interpret data on Earth's climate

c. Explain how a combination of factors such as Earth's tilt, seasons, geophysical location, proximity to oceans, landmass location, latitude, and elevation determine a location's climate

d. Identify mechanisms in the past and present that have changed Earth's climate

e. Analyze the evidence and assumptions regarding climate change

f. Interpret evidence from weather stations, buoys, satellites, radars, ice and ocean sediment cores, tree rings, cave deposits, native knowledge, and other sources in relation to climate change


= Measured by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI
= Content sampled by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

**GLE 5.** There are costs, benefits, and consequences of exploration, development, and consumption of renewable and nonrenewable resources

a. Develop, communicate, and justify an evidence-based scientific explanation regarding the costs and benefits of exploration, development, and consumption of renewable and nonrenewable resources

b. Evaluate positive and negative impacts on the geosphere, atmosphere, hydrosphere, and biosphere in regards to resource use

c. Create a plan to reduce environmental impacts due to resource consumption

d. Analyze and interpret data about the effect of resource consumption and development on resource reserves to draw conclusions about sustainable use

**GLE 6.** The interaction of Earth's surface with water, air, gravity, and biological activity causes physical and chemical changes

a. Develop, communicate, and justify an evidence-based scientific explanation addressing questions regarding the interaction of Earth's surface with water, air, gravity, and biological activity

b. Analyze and interpret data, maps, and models concerning the direct and indirect evidence produced by physical and chemical changes that water, air, gravity, and biological activity create

c. Evaluate negative and positive consequences of physical and chemical changes on the geosphere

d. Use remote sensing and geographic information systems (GIS) data to interpret landforms and landform impact on human activity

**GLE 7.** Natural hazards have local, national and global impacts such as volcanoes, earthquakes, tsunamis, hurricanes, and thunderstorms

a. Develop, communicate, and justify an evidence-based scientific explanation regarding natural hazards, and explain their potential local and global impacts

b. Analyze and interpret data about natural hazards using direct and indirect evidence

c. Make predictions and draw conclusions about the impact of natural hazards on human activity—locally and globally



= Measured by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

= Content sampled by EXPLORE, PLAN, and/or ACT Science tests and WorkKeys LI

# Section C: ACT's College Readiness Standards Included in Colorado's Grade 8–12 Academic Standards

In recent years ACT has brought a distinctive voice to the debate on what it means to be truly ready for college. Using a wealth of longitudinal data—data that no one else possesses—ACT has pioneered empirical approaches to assessing students' college readiness. Using thousands of student records and responses, content and measurement experts at ACT have developed detailed statements that describe what students typically know and are able to do at different levels of test performance. These data-driven, empirically derived score descriptors, known as ACT's College Readiness Standards, describe student achievement within various score ranges on the English, Reading, Writing, Mathematics, and Science tests on EXPLORE, PLAN, and the ACT.

**How ACT College Readiness Standards Work with ACT College Readiness Benchmarks**

The ACT College Readiness Benchmarks are the minimum ACT test scores required for students to have a high probability of success in first-year, credit-bearing college courses—English Composition, Algebra, social sciences courses, or Biology. EXPLORE and PLAN Benchmarks provided minimum score targets for eighth- and tenth-grade students to gauge their progress in becoming college ready by the time they graduate from high school.

**ACT's College Readiness Benchmarks**

| Test | College Course | ACT Test Score | PLAN Test Score | EXPLORE Test Score |
|---|---|---|---|---|
| English | English Composition | 18 | 15 | 13 |
| Mathematics | College Algebra | 22 | 19 | 17 |
| Reading | College Social Studies/Humanities | 21 | 17 | 15 |
| Science | College Biology | 24 | 21 | 20 |

Students who meet a Benchmark on the ACT have approximately a 50 percent chance of earning a B or better and approximately a 75 percent chance or better of earning a C or better in the corresponding entry-level college course or courses. Students who meet a Benchmark on EXPLORE or PLAN have a high chance of meeting the College Readiness Benchmarks for the ACT and of being ready for the corresponding college course(s) by the time they graduate from high school.

The knowledge and skills in the score ranges that include these Benchmark scores are shown in the tables on the following pages. Students who master these standards are more likely than those who do not to persist to the second year at the same institution; achieve a grade of B or higher in first-year college courses; achieve a first-year college GPA of 2.5 or higher; progress toward a college degree; and complete a college degree.

Research shows that the academic quality and intensity of the high school curriculum is a key determinant of success in postsecondary education. *States should ensure that high school coursework be of sufficient rigor to prepare their graduates for postsecondary education and workforce training.*

This section (Section C) provides information about the Colorado Academic Standards as they relate to ACT's College Readiness Standards. The ACT College Readiness Standards included in the Colorado Academic Standards are highlighted. College Readiness Standards not highlighted are those that include specific content, complexity, and/or proficiency level descriptors that ACT content experts determined were not included in the Colorado Academic Standards.

| Score Ranges | Table C-1. ACT's College Readiness Standards — English | | |
|---|---|---|---|
| ***Bench-marks*** | **Topic Development in Terms of Purpose and Focus** | **Organization, Unity, and Coherence** | **Word Choice in Terms of Style, Tone, Clarity, and Economy** |
| **13–15**<br>***EXPL: 13***<br>***PLAN: 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<br><br>Revise vague nouns and pronouns that create obvious logic problems |
| **16–19**<br><br>***ACT: 18*** | Identify the basic purpose or role of a specified phrase or sentence<br><br>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<br><br>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<br><br>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*)<br><br>Decide the most logical place to add a sentence in an essay<br><br>Add a sentence that introduces a simple paragraph | Delete redundant material when information is repeated in different parts of speech (e.g., "alarmingly startled")<br><br>Use the word or phrase most consistent with the style and tone of a fairly straightforward essay<br><br>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<br><br>Delete material primarily because it disturbs the flow and development of the paragraph<br><br>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*)<br><br>Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic<br><br>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<br><br>Identify and correct ambiguous pronoun references<br><br>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<br><br>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<br><br>Rearrange sentences to improve the logic and coherence of a complex paragraph<br><br>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")<br><br>Correct vague and wordy or clumsy and confusing writing containing sophisticated language |
| **33–36†** | Determine whether a complex essay has accomplished a specific purpose<br><br>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 |

*** Statements apply to PLAN & ACT only**

**† Statements apply to the ACT only**

| Score Ranges / Bench-marks | Table C-1. ACT's College Readiness Standards — English (continued) | | |
|---|---|---|---|
| | **Sentence Structure and Formation** | **Conventions of Usage** | **Conventions of Punctuation** |
| **13–15**<br>***EXPL: 13***<br>***PLAN: 15*** | Use conjunctions or punctuation to join simple clauses<br><br>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**<br>***ACT: 18*** | Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences<br><br>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<br><br>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)<br><br>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*)<br><br>Ensure that a verb agrees with its subject when there is some text between the two | Use commas to set off simple parenthetical phrases<br><br>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<br><br>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<br><br>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<br><br>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*)<br><br>Use apostrophes to indicate simple possessive nouns<br><br>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<br><br>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*<br><br>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<br><br>Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical)<br><br>Use an apostrophe to show possession, especially with irregular plural nouns<br><br>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<br><br>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 |

*** Statements apply to PLAN & ACT only**

**† Statements apply to the ACT only**

| Score Ranges | Table C-2. ACT's College Readiness Standards — Reading | |
|---|---|---|
| *Bench-marks* | **Main Ideas and Author's Approach** | **Supporting Details** |
| **13–15** *EXPL: 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** *PLAN: 17* | 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<br>Recognize a clear function of a part of an uncomplicated passage |
| **20–23** *ACT: 21* | Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives<br>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<br>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<br>Infer the main idea or purpose of straightforward paragraphs in more challenging passages<br>Summarize basic events and ideas in more challenging passages<br>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<br>Locate and interpret minor or subtly stated details in uncomplicated passages<br>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<br>Summarize events and ideas in virtually any passage<br>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<br>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<br>Understand the function of a part of a passage when the function is subtle or complex |

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**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.

| Score Ranges | Table C-2. ACT's College Readiness Standards — Reading (continued) | | |
|---|---|---|---|
| *Bench-marks* | **Sequential, Comparative, and Cause-Effect Relationships** | **Meanings of Words** | **Generalizations and Conclusions** |
| **13–15**<br>***EXPL: 15*** | Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages<br>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**<br>***PLAN: 17*** | Identify relationships between main characters in uncomplicated literary narratives<br>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**<br>***ACT: 21*** | Order simple sequences of events in uncomplicated literary narratives<br>Identify clear relationships between people, ideas, and so on in uncomplicated passages<br>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<br>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<br>Understand relationships between people, ideas, and so on in uncomplicated passages<br>Identify clear relationships between characters, ideas, and so on in more challenging literary narratives<br>Understand implied or subtly stated cause-effect relationships in uncomplicated passages<br>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<br>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<br>Draw generalizations and conclusions about people, ideas, and so on in more challenging passages |
| **28–32*** | Order sequences of events in more challenging passages<br>Understand the dynamics between people, ideas, and so on in more challenging passages<br>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<br>Understand the subtleties in relationships between people, ideas, and so on in virtually any passage<br>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<br>Understand and generalize about portions of a complex literary narrative |

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**† Statements apply to the ACT only**

***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.

| Score Ranges | 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<br><br>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<br><br>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<br><br>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<br><br>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<br><br>Show some recognition of the complexity of the issue in the prompt by<br>• acknowledging counterarguments to the writer's position<br>• 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<br><br>Present a thesis that establishes focus on the topic | Develop ideas by using some specific reasons, details, and examples<br><br>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<br><br>Show recognition of the complexity of the issue in the prompt by<br>• partially evaluating implications and/or complications of the issue, and/or<br>• 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<br><br>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<br><br>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<br><br>Show understanding of the complexity of the issue in the prompt by<br>• examining different perspectives, and/or<br>• evaluating implications or complications of the issue, and/or<br>• 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<br><br>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<br><br>Show effective movement between general and specific ideas and examples |

*The shaded row in this table shows the minimum level of writing skills needed by students to be ready for college-level writing assignments.

| Score Ranges | Table C-3. ACT's College Readiness Standards — Writing* (continued)<br>Organizing Ideas | Using Language |
|---|---|---|
| 3–4 | Provide a discernible organization with some logical grouping of ideas in parts of the essay<br>Use a few simple and obvious transitions<br>Present a discernible, though minimally developed, introduction and conclusion | Show limited control of language by<br>• correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding<br>• using simple vocabulary<br>• using simple sentence structure |
| 5–6 | Provide a simple organization with logical grouping of ideas in parts of the essay<br>Use some simple and obvious transitional words, though they may at times be inappropriate or misleading<br>Present a discernible, though underdeveloped, introduction and conclusion | Show a basic control of language by<br>• correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding<br>• using simple but appropriate vocabulary<br>• 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<br>Use some simple and obvious, but appropriate, transitional words and phrases<br>Present a discernible introduction and conclusion with a little development | Show adequate use of language to communicate by<br>• correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding<br>• using appropriate vocabulary<br>• 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<br>Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas<br>Present a somewhat developed introduction and conclusion | Show competent use of language to communicate ideas by<br>• correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding<br>• using some precise and varied vocabulary<br>• 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<br>Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas<br>Present a well-developed introduction and conclusion | Show effective use of language to clearly communicate ideas by<br>• correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors<br>• using precise and varied vocabulary<br>• using a variety of kinds of sentence structures to vary pace and to support meaning |

| Score Ranges<br>*Bench-marks* | **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<br>Solve problems in one or two steps using whole numbers<br>Perform common conversions (e.g., inches to feet or hours to minutes) | Calculate the average of a list of positive whole numbers<br>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 $b + g$)<br>Solve equations in the form $x + a = b$, where $a$ and $b$ are whole numbers or decimals |
| **16–19**<br>***EXPL: 17***<br>***PLAN: 19*** | Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent<br>Solve some routine two-step arithmetic problems | Calculate the average of a list of numbers<br>Calculate the average, given the number of data values and the sum of the data values<br>Read tables and graphs<br>Perform computations on data from tables and graphs<br>Use the relationship between the probability of an event and the probability of its complement | Recognize one-digit factors of a number<br>Identify a digit's place value | Substitute whole numbers for unknown quantities to evaluate expressions<br>Solve one-step equations having integer or decimal answers<br>Combine like terms (e.g., $2x + 5x$) |
| **20–23**<br>***ACT: 22*** | 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<br>Translate from one representation of data to another (e.g., a bar graph to a circle graph)<br>Determine the probability of a simple event<br>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<br>Add and subtract simple algebraic expressions<br>Solve routine first-degree equations<br>Perform straightforward word-to-symbol translations<br>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<br>Manipulate data from tables and graphs<br>Compute straightforward probabilities for common situations<br>Use Venn diagrams in counting | Find and use the least common multiple<br>Order fractions<br>Work with numerical factors<br>Work with scientific notation<br>Work with squares and square roots of numbers<br>Work problems involving positive integer exponents<br>Work with cubes and cube roots of numbers<br>Determine when an expression is undefined<br>Exhibit some knowledge of the complex numbers† | Solve real-world problems using first-degree equations<br>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)<br>Identify solutions to simple quadratic equations<br>Add, subtract, and multiply polynomials<br>Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)<br>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<br>Interpret and use information from figures, tables, and graphs<br>Apply counting techniques<br>Compute a probability when the event and/or sample space are not given or obvious | Apply number properties involving prime factorization<br>Apply number properties involving even/odd numbers and factors/multiples<br>Apply number properties involving positive/negative numbers<br>Apply rules of exponents<br>Multiply two complex numbers† | Manipulate expressions and equations<br>Write expressions, equations, and inequalities for common algebra settings<br>Solve linear inequalities that require reversing the inequality sign<br>Solve absolute value equations<br>Solve quadratic equations<br>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<br>Analyze and draw conclusions based on information from figures, tables, and graphs<br>Exhibit knowledge of conditional and joint probability | Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers<br>Exhibit knowledge of logarithms and geometric sequences<br>Apply properties of complex numbers | Write expressions that require planning and/or manipulating to accurately model a situation<br>Write equations and inequalities that require planning, manipulating, and/or solving<br>Solve simple absolute value inequalities |

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**† Statements apply to the ACT only**



= Included in Colorado Standards

| Score Ranges | Table C-4. ACT's College Readiness Standards — Mathematics (continued) | | | |
|---|---|---|---|---|
| *Bench-marks* | **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**<br>***EXPL: 17***<br>***PLAN: 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<br>Compute the area of rectangles when whole number dimensions are given | |
| **20–23**<br>***ACT: 22*** | Locate points in the coordinate plane<br>Comprehend the concept of length on the number line<br>Exhibit knowledge of slope | Find the measure of an angle using properties of parallel lines<br>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<br>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<br>Determine the slope of a line from points or equations<br>Match linear graphs with their equations<br>Find the midpoint of a line segment | Use several angle properties to find an unknown angle measure<br>Recognize Pythagorean triples<br>Use properties of isosceles triangles | Compute the area of triangles and rectangles when one or more additional simple steps are required<br>Compute the area and circumference of circles after identifying necessary information<br>Compute the perimeter of simple composite geometric figures with unknown side lengths | Evaluate polynomial functions, expressed in function notation, at integer values<br>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<br>Match number line graphs with solution sets of linear inequalities<br>Use the distance formula<br>Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point<br>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<br>Use the Pythagorean theorem | Use relationships involving area, perimeter, and volume of geometric figures to compute another measure | Evaluate composite functions at integer values<br>Apply basic trigonometric ratios to solve right-triangle problems |
| **33–36†** | Match number line graphs with solution sets of simple quadratic inequalities<br>Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$<br>Solve problems integrating multiple algebraic and/or geometric concepts<br>Analyze and draw conclusions based on information from graphs in the coordinate plane | Draw conclusions based on a set of conditions<br>Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas<br>Use relationships among angles, arcs, and distances in a circle | Use scale factors to determine the magnitude of a size change<br>Compute the area of composite geometric figures when planning or visualization is required | Write an expression for the composite of two simple functions<br>Use trigonometric concepts and basic identities to solve problems<br>Exhibit knowledge of unit circle trigonometry<br>Match graphs of basic trigonometric functions with their equations |

*** Statements apply to PLAN & ACT only**

**† Statements apply to the ACT only**



= Included in Colorado Standards

| Score Ranges / Bench-marks | Table C-5. ACT's College Readiness Standards — Science<br>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)<br>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<br>Understand basic scientific terminology<br>Find basic information in a brief body of text<br>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**<br>***EXPL: 20***<br>***PLAN: 21*** | Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram)<br>Compare or combine data from a simple data presentation (e.g., order or sum data from a table)<br>Translate information into a table, graph, or diagram | Understand the methods and tools used in a moderately complex experiment<br>Understand a simple experimental design<br>Identify a control in an experiment<br>Identify similarities and differences between experiments | Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model<br>Identify key issues or assumptions in a model |
| **24–27**<br>***ACT: 24*** | Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table)<br>Compare or combine data from a complex data presentation<br>Interpolate between data points in a table or graph<br>Determine how the value of one variable changes as the value of another variable changes in a complex data presentation<br>Identify and/or use a simple (e.g., linear) mathematical relationship between data<br>Analyze given information when presented with new, simple information | Understand the methods and tools used in a complex experiment<br>Understand a complex experimental design<br>Predict the results of an additional trial or measurement in an experiment<br>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<br>Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why<br>Identify strengths and weaknesses in one or more models<br>Identify similarities and differences between models<br>Determine which model(s) is(are) supported or weakened by new information<br>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<br>Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data<br>Extrapolate from data points in a table or graph | Determine the hypothesis for an experiment<br>Identify an alternate method for testing a hypothesis | Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model<br>Determine whether new information supports or weakens a model, and why<br>Use new information to make a prediction based on a model |
| **33–36†** | Compare or combine data from two or more complex data presentations<br>Analyze given information when presented with new, complex information | Understand precision and accuracy issues<br>Predict how modifying the design or methods of an experiment will affect results<br>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<br>Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why |

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**Science College Readiness Standards are measured in the context of science topics students encounter in science courses. These topics may include:**

| Life Science/Biology | Physical Science/Chemistry, Physics | Earth & Space Science |
|---|---|---|
| • Animal behavior<br>• Animal development and growth<br>• Body systems<br>• Cell structure and processes<br>• Ecology<br>• Evolution<br>• Genetics<br>• Homeostasis<br>• Life cycles<br>• Molecular basis of heredity<br>• Origin of life<br>• Photosynthesis<br>• Plant development, growth, structure<br>• Populations<br>• Taxonomy | • Atomic structure<br>• Chemical bonding, equations, nomenclature, reactions<br>• Electrical circuits<br>• Elements, compounds, mixtures<br>• Force and motions<br>• Gravitation<br>• Heat and work<br>• Kinetic and potential energy<br>• Magnetism<br>• Momentum<br>• The Periodic Table<br>• Properties of solutions<br>• Sound and light<br>• States, classes, and properties of matter<br>• Waves | • Earthquakes and volcanoes<br>• Earth's atmosphere<br>• Earth's resources<br>• Fossils and geological time<br>• Geochemical cycles<br>• Groundwater<br>• Lakes, rivers, oceans<br>• Mass movements<br>• Plate tectonics<br>• Rocks, minerals<br>• Solar system<br>• Stars, galaxies, and the universe<br>• Water cycle<br>• Weather and climate<br>• Weathering and erosion |

# Section D: ACT's WorkKeys Skills Included in Colorado's Academic Standards

Working with Charter States, national education organizations, educators, employers, and experts in employment and training requirements, ACT identified workplace skills that help individuals successfully perform a wide range of jobs. These skills form the basis of the WorkKeys assessments.

In this section (Section D), the WorkKeys Skills that are highlighted are those that are included in Colorado's Academic Standards. WorkKeys Skills not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Colorado's Academic Standards.

Because Colorado educators are the experts on the Colorado Academic Standards, we would strongly encourage them to examine this document and offer their interpretations.

## WorkKeys Skills

| Level | Reading for Information | Applied Mathematics | Locating Information |
|---|---|---|---|
| 3 | Identify main ideas and clearly stated details<br>Choose the correct meaning of a word that is clearly defined in the reading<br>Choose the correct meaning of common, everyday and workplace words<br>Choose when to perform each step in a short series of steps<br>Apply instructions to a situation that is the same as the one in the reading materials | Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers<br>Add or subtract negative numbers<br>Change numbers from one form to another using whole numbers, fractions, decimals, or percentages<br>Convert simple money and time units (e.g., hours to minutes) | Find one or two pieces of information in a graphic<br>Fill in one or two pieces of information that are missing from a graphic |
| 4 | Identify important details that may not be clearly stated<br>Use the reading material to figure out the meaning of words that are not defined<br>Apply instructions with several steps to a situation that is the same as the situation in the reading materials<br>Choose what to do when changing conditions call for a different action (follow directions that include "if-then" statements) | Solve problems that require one or two operations<br>Multiply negative numbers<br>Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals<br>Add commonly known fractions, decimals, or percentages (e.g., ½, .75, 25%)<br>Add three fractions that share a common denominator<br>Multiply a mixed number by a whole number or decimal<br>Put the information in the right order before performing calculations | Find several pieces of information in one or two graphics<br>Understand how graphics are related to each other<br>Summarize information from one or two straightforward graphics<br>Identify trends shown in one or two straightforward graphics<br>Compare information and trends shown in one or two straightforward graphics |
| 5 | Figure out the correct meaning of a word based on how the word is used<br>Identify the correct meaning of an acronym that is defined in the document<br>Identify the paraphrased definition of a technical term or jargon that is defined in the document<br>Apply technical terms and jargon and relate them to stated situations<br>Apply straightforward instructions to a new situation that is similar to the one described in the material<br>Apply complex instructions that include conditionals to situations described in the materials | Decide what information, calculations, or unit conversions to use to solve the problem<br>Look up a formula and perform single-step conversions within or between systems of measurement<br>Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes)<br>Divide negative numbers<br>Find the best deal using one- and two-step calculations and then comparing results<br>Calculate perimeters and areas of basic shapes (rectangles and circles)<br>Calculate percentage discounts or markups | Sort through distracting information<br>Summarize information from one or more detailed graphics<br>Identify trends shown in one or more detailed or complicated graphics<br>Compare information and trends from one or more complicated graphics |
| 6 | Identify implied details<br>Use technical terms and jargon in new situations<br>Figure out the less common meaning of a word based on the context<br>Apply complicated instructions to new situations<br>Figure out the principles behind policies, rules, and procedures<br>Apply general principles from the materials to similar and new situations<br>Explain the rationale behind a procedure, policy, or communication | Use fractions, negative numbers, ratios, percentages, or mixed numbers<br>Rearrange a formula before solving a problem<br>Use two formulas to change from one unit to another within the same system of measurement<br>Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement<br>Find mistakes in items that belong at Levels 3, 4, and 5<br>Find the best deal and use the result for another calculation<br>Find areas of basic shapes when it may be necessary to rearrange the formula, convert units of measurement in the calculations, or use the result in further calculations<br>Find the volume of rectangular solids<br>Calculate multiple rates | Draw conclusions based on one complicated graphic or several related graphics<br>Apply information from one or more complicated graphics to specific situations<br>Use the information to make decisions |
| 7 | Figure out the definitions of difficult, uncommon words based on how they are used<br>Figure out the meaning of jargon or technical terms based on how they are used<br>Figure out the general principles behind the policies and apply them to situations that are quite different from any described in the materials | Solve problems that include nonlinear functions and/or that involve more than one unknown<br>Find mistakes in Level 6 items<br>Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages<br>Calculate multiple areas and volumes of spheres, cylinders, or cones<br>Set up and manipulate complex ratios or proportions<br>Find the best deal when there are several choices<br>Apply basic statistical concepts | |