



# STATE MATCH

Montana  
Content Standards  
Communication Arts,  
Mathematics, and Science  
Grades 8–12

and

EXPLORE<sup>®</sup>, PLAN<sup>®</sup>,  
the ACT<sup>®</sup>, and  
WorkKeys<sup>®</sup>

June 2010

©2010 by ACT, Inc.  
All rights reserved.

# About This Report

## EXECUTIVE SUMMARY

(pp. 1–5)

This portion summarizes the findings of the alignment between Montana’s Content 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 Montana.

## SECTION A

(pp. 7–9)

This section provides tables by content area (Communication Arts, Mathematics, and Science), listing the precise number of Montana Content Standards measured by ACT’s EPAS tests and/or WorkKeys assessments by grade level.

## SECTION B

(pp. 11–22)

All Montana Content 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. Montana standards listed here are from the Montana Content Standards Frameworks as presented on the Montana Office of Public Instruction website in April 2010:

Montana Content Standards	Adopted
Communication Arts	January 2010
Mathematics	September 2009
Science	November 2006

## SECTION C

(pp. 23–34)

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



## SECTION D

(pp. 35–36)

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

A supplement that identifies the specific ACT College Readiness Standard(s) and WorkKeys Skill(s) corresponding to each Montana Content Standard in a side-by-side format is available at [www.act.org/education/statematch](http://www.act.org/education/statematch).





# Executive Summary

We at ACT believe our programs offer many advantages to Montana 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 Montana's Content Standards?
2. Can the results from ACT's testing programs be used to meet Montana's NCLB requirement?
3. Why should Montana choose EPAS?
4. Why choose to include WorkKeys assessments?

**ACT'S TESTS MEASURE MOST MONTANA CONTENT STANDARDS IN COMMUNICATION ARTS, 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 Montana Communication Arts, Mathematics, and Science Content Standards. WorkKeys *Locating Information* assessment measures those skills contained in Montana's Science Standards that are associated with a student's ability to interpret and analyze graphic material.

■ **Communication Arts: 3 out of 5 Standards**

Many important Montana Communication Arts Content Standards in Reading, Literature, and Writing are covered by ACT's English, Reading, and Writing tests and WorkKeys *Reading for Information* (RI) assessment.

■ **Mathematics: 4 out of 4 Standards**

All Montana Mathematics Content Standards are covered by ACT's Mathematics tests and WorkKeys *Applied Mathematics* (AM) assessment.

■ **Science: Process Standards: 1 out of 2  
(Content Standards: 3 out of 4)**

Most Montana Science Content Standards are covered by ACT's Science tests and WorkKeys *Locating Information* (LI) assessment.

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

**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

**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.**



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.**<sup>®</sup>

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 Montana Content Standards, but EPAS offers what no other testing program can: an empirically based, time-honored measure of college and career readiness that can help Montana students reach their educational and career goals and help provide Montana High Schools with the information they need to prepare their students for college and career.





**Section A: Number of Montana Content Standards  
Measured by EXPLORE, PLAN, the ACT, and WorkKeys**

**Table A-1. Number of Montana Communication Arts Content Standards  
Measured by EXPLORE, PLAN, the ACT, and WorkKeys**

Montana Standards*	Number of Montana Benchmarks Measured by ACT's tests	Aspects of Montana Content Standards that are Not Measured
Speaking and Listening		
Reading	Grade 8: 7 out of 15 Graduation: 11 out of 15	Adjust fluency based on purpose, complexity, and technical content Recognize when comprehension breaks down Recognize the need for background knowledge Set goals and evaluate reading progress
Literature	Grade 8: 1 out of 6 Graduation: 2 out of 6	Analyze and define the characteristics of literary genres Evaluate how literature reflects a society Analyze diverse literature to compare common human experiences among time periods, literary movements, places, and cultures Create and support critical and emotive responses to ideas and feelings generated as a result of engaging with literature
Media Literacy		
Writing	Grade 8: 4 out of 13 Graduation: 7 out of 13	Articulate and evaluate the purpose and audience, and select and use appropriate format, and tone in one's own writing Write using a variety of forms and genres and evaluate one's own and others' writing for effectiveness of form and genre Use information problem solving process to effectively synthesize information to research a topic Follow copyright laws and fair use guidelines Set goals, seek feedback and evaluate writing progress Select and use forms of writing to clarify thought, to extend learning, and to reflect on experience
<b>TOTALS</b>  3 out of 5 Standards	Grade 8: 12 out of 34 Graduation: 20 out of 34	

\*Refer to Montana's Communication Arts Content Standards on pages 11–14  
 = EPAS tests do not assess this material.



**Table A-2. Number of Montana Mathematics Content Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys**

<b>Montana Standards*</b>	<b>Number of Montana Benchmarks Measured by ACT's tests</b>			<b>Aspects of Montana Content Standards that are Not Measured</b>
Number Sense and Operation	Grade 8:	6 out of	6	
	Graduation:	5 out of	5	
Data Analysis	Grade 8:	3 out of	3	
	Graduation:	5 out of	5	
Geometric Reasoning	Grade 8:	5 out of	5	
	Graduation:	5 out of	5	
Algebraic and Functional Reasoning	Grade 8:	5 out of	5	
	Graduation:	5 out of	5	
<b>TOTALS</b> 4 out of 4 Standards	Grade 8:	19 out of	19	
	Graduation:	20 out of	20	

\*Refer to Montana's Mathematics Content Standards on pages 15–18



**Table A-3. Number of Montana Science Content Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys**

Montana Standards*	Number of Montana Benchmarks Measured by ACT's tests	Aspects of Montana Content Standards that are Not Measured
Standard 1	Grade 8: 5 out of 6 Graduation: 5 out of 6	Explain how observations of nature form an essential base of knowledge among the Montana American Indians
Standard 5	Grade 8: 1 out of 5 Graduation: 0 out of 5	Predict how key factors affect the development and acceptance of scientific thought Give examples of scientific innovation challenging commonly held perceptions Evaluate the ongoing, collaborative scientific process by gathering and critiquing information Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities
<b>TOTALS</b> 1 out of 2 Process Standards	Grade 8: 6 out of 11 Graduation: 5 out of 11	
Standard 2	Grade 8: (7) out of (7) Graduation: (7) out of (7)	
Standard 3	Grade 8: (5) out of (5) Graduation: (5) out of (5)	
Standard 4	Grade 8: (7) out of (7) Graduation: (7) out of (7)	
Standard 6	Grade 8: (0) out of (3) Graduation: (1) out of (3)	Analyze and illustrate the historical impact of scientific and technological advances Describe, explain, and analyze science as a human endeavor and an ongoing process
<b>TOTALS</b> 3 out of 4 Content Standards	Grade 8: (19) out of (22) Graduation: (20) out of (22)	

\*Refer to Montana's Science Content Standards on pages 19–22





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

## Communication Arts

### MONTANA Communication Arts Content Standards End of Grade 8

#### Standard 1: Speaking and Listening

Students know and understand the role of the communication process and demonstrate effective speaking and listening skills.

Students will:

- 1.1. analyze and explain how the components of the communication process affect communication
- 1.2. apply verbal and nonverbal delivery techniques to communicate effectively
- 1.3. apply effective listening strategies to fit the purpose, situation, and setting of the communication
- 1.4. select and narrow topics for specific occasions and develop an appropriate introduction, body and conclusion to deliver speeches
- 1.5. adapt communication to a variety of formal and informal audiences, settings and purposes
- 1.6. use feedback to monitor and adjust speaking and listening effectiveness
- 1.7. compare and contrast the verbal and nonverbal aspects of storytellers, the behaviors of audiences, and the settings and purposes of stories in the oral traditions of different cultures, including Montana American Indians
- 1.8. explain the importance of communicating ethically, including effectively referencing sources and displaying respectful communication to individuals and groups

#### Content Standard 2: Reading

Students read by applying foundational skills and strategies to comprehend, interpret, analyze, and evaluate texts.

Students will:

- 2.1. apply knowledge of word and sentence structure, analysis of word parts and context to decode unknown words
- 2.2. expand and apply general and specialized vocabulary through the use of context clues, analysis of word parts, and reference sources
- 2.3. adjust fluency based on purpose and content
- 2.4. identify when comprehension breaks down, analyze causes and self correct using effective strategies
- 2.5. activate prior knowledge to connect text to self, text to text, and text to world
- 2.6. make, revise, and explain predictions
- 2.7. generate and answer literal, inferential, critical, and interpretive questions
- 2.8. recall and explain a series of events or the sequence of information to draw conclusions
- 2.9. summarize by stating main ideas and supporting details

2.10. make and justify inferences based on context clues and/or background knowledge

2.11. analyze text features to enhance comprehension

2.12. identify and explain the impact of the organizational structure of a selection, including order of importance, spatial, problem-solution, and cause-effect

2.13. compare and contrast information to explain relationships and draw conclusions within and/or across texts

2.14. analyze author's purpose, point of view, language use, and credibility in culturally diverse texts, including those by and about Montana American Indians

2.15. set and monitor goals and reading progress

#### Content Standard 3: Literature

Students select, interpret, and respond to a range of literature.

Students will:

3.1. compare and contrast the literary elements (setting, plot, character, conflict, resolution, point of view, mood) across texts

3.2. analyze how authors' choices of words, uses of figurative language and stylistic devices contribute to the meaning of literary works

3.3. understand and define the characteristics of literary genres

3.4. interpret how literature influences societies and, conversely, how factors such as history and culture influence literature, including works of Montana American Indians

3.5. compare and contrast a variety of perspectives among culturally diverse literary works, including the works of Montana American Indians

3.6. express personal ideas and feelings generated as a result of engaging with literature and offer justification

#### Content Standard 4: Media Literacy

Students effectively evaluate and create media messages.

Students will:

4.1. interpret and differentiate how techniques and technologies impact media messages

4.2. analyze the credibility of the sources of media messages

4.3. analyze the purpose of and recognize the effects of fact, fiction, opinion, bias and stereotypes in media messages on diverse groups of people, including Montana American Indians

- 4.4. apply appropriate norms, rules, laws and etiquette in the use and creation of media messages
- 4.5. analyze the inherent consequences to self and others in the use and creation of media messages
- 4.6. create and analyze media messages for specific audiences and purposes
- 4.7. identify how media messages embed values and influence individuals, cultures and societies

### Content Standard 5: Writing

Students will write to communicate effectively for a variety of purposes and audiences.

Students will:

- 5.1. apply the steps of the writing process in a variety of written work
- 5.2. select appropriate topics and generate thesis statements that indicate the writer's purpose for writing
- 5.3. generate and develop main ideas using a variety of relevant supporting details
- 5.4. organize writing using transitions and a logical progression of ideas

- 5.5. demonstrate knowledge of language choices and their impact on writing through control of voice, strong sentence fluency, and effective word choice
- 5.6. apply conventions of standard written English (e.g., usage, punctuation, spelling) appropriate for purpose, audience, and form
- 5.7. identify and describe the purpose, audience, format, and tone in one's own writing
- 5.8. analyze the characteristics of different writing forms and genres and write in a variety of forms and genres
- 5.9. compose written works demonstrating ability to sustain focus throughout a variety of forms and genres
- 5.10. use information problem solving process to collect and utilize information to research a topic
- 5.11. obtain and use information legally and respectfully, and appropriately credit ideas and works of others, including those of Montana American Indians
- 5.12. set goals, seek feedback and monitor writing progress
- 5.13. use writing as a means of clarifying thought and reflecting on learning



# MONTANA Communication Arts Content Standards

## Upon Graduation

### Standard 1: Speaking and Listening

Students know and understand the role of the communication process and demonstrate effective speaking and listening skills.

Students will:

- 1.1. analyze the complex relationship of the components of the communication process and evaluate their impact on effectiveness
- 1.2. adapt verbal and nonverbal delivery techniques to effectively enhance messages of varying lengths and formats
- 1.3. apply and evaluate effective listening strategies to fit the purpose, situation, and setting of the communication
- 1.4. select, test and refine topics for specific purposes and occasions, choose credible sources for supporting materials, effectively organize and deliver speeches
- 1.5. adapt communication to a variety of public, group and interpersonal audiences, settings and purposes
- 1.6. use feedback to monitor, adjust, and evaluate speaking and listening effectiveness
- 1.7. use appropriate strategies to listen to stories from different cultures; analyze how oral traditions, including Montana American Indian oral traditions, shape culture and influence individuals
- 1.8. analyze the legal and ethical issues associated with responsible communication

### Content Standard 2: Reading

Students read by applying foundational skills and strategies to comprehend, interpret, analyze, and evaluate texts.

Students will:

- 2.1. select and apply knowledge of syntax clues, word origins, roots and affixes, and context to decode unknown words
- 2.2. expand and utilize general and specialized vocabulary through the use of context clues, analysis of word origins, and reference sources
- 2.3. adjust fluency based on purpose, complexity, and technical content
- 2.4. recognize when comprehension breaks down, select strategy to self correct and evaluate effectiveness of the selected strategy
- 2.5. recognize the need for background knowledge and research to enhance comprehension
- 2.6. make, revise, and justify predictions
- 2.7. generate and answer complex literal, inferential, evaluative, and interpretive questions
- 2.8. recall and explain a series of events or the sequence of information to hypothesize and/or justify conclusions
- 2.9. summarize text by determining main idea and analyzing essential and nonessential supporting details
- 2.10. make and justify complex inferences within and among multiple texts and/or forms of media

- 2.11. analyze and evaluate relevant text features of multiple forms of media to enhance comprehension
- 2.12. evaluate and compare the effectiveness of organizational structures within and across complex texts
- 2.13. compare and contrast information, draw conclusions and synthesize ideas within and across texts to synthesize information and draw conclusions
- 2.14. critique author's purpose, point of view, bias, language use, and credibility to deepen understanding within and across culturally diverse texts, including those by and about Montana American Indians
- 2.15. set goals and evaluate reading progress

### Content Standard 3: Literature

Students select, interpret, and respond to a range of literature.

Students will:

- 3.1. analyze the ways in which authors develop literary elements (setting, plot, character, conflict, point of view, mood, tone, theme) to impact works and readers
- 3.2. evaluate how diction, figurative language, imagery, detail, organization, and style shape meaning and impact works and readers
- 3.3. analyze and define the characteristics of literary genres and evaluate the effect of genres on readers
- 3.4. evaluate how literature reflects a society, including literature by and about Montana American Indians
- 3.5. analyze diverse literature to compare common human experiences among time periods, literary movements, places, and cultures, including Montana American Indians
- 3.6. create and support critical and emotive responses to ideas and feelings generated as a result of engaging with literature

### Content Standard 4: Media Literacy

Students effectively evaluate and create media messages.

Students will:

- 4.1. evaluate how techniques and technologies influence the meaning and effectiveness of the media messages
- 4.2. evaluate the credibility of the sources of media messages
- 4.3. evaluate the impact of fact, opinion, bias and stereotypes in media messages about diverse groups of people, including Montana American Indians
- 4.4. apply knowledge and evaluate the impact of norms, rules, laws and etiquette in the use and creation of media messages
- 4.5. evaluate the inherent consequences to individuals and societies in the use and creation of media messages
- 4.6. create and evaluate media messages for a variety of audiences and purposes
- 4.7. analyze the embedded values and evaluate the media's role in shaping perceptions of reality for individuals, cultures, and societies

## Content Standard 5: Writing

Students will write to communicate effectively for a variety of purposes and audiences.

Students will:

**5.1.** apply the steps of the writing process to develop, evaluate, and refine writing

**5.2.** independently select topics and generate complex thesis statements that indicate the writer's purpose for writing

**5.3.** generate, develop and elaborate upon main ideas using relevant and specific supporting details

**5.4.** organize writing using a logical progression of ideas and transitions to effectively convey the relationships among them

**5.5.** demonstrate knowledge of language choices and their impact on writing by showing purposeful control of voice, sentence fluency, and word choice

**5.6.** apply conventions of standard written English (e.g., usage, punctuation, spelling) appropriate for purpose, audience, and form

**5.7.** articulate and evaluate the purpose and audience, and select and use appropriate format, and tone in one's own writing

**5.8.** write using a variety of forms and genres and evaluate one's own and others' writing for effectiveness of form and genre

**5.9.** compose a variety of written works utilizing complex ideas and detailed support that demonstrate the ability to maintain a sustained focus

**5.10.** use information problem solving process to effectively synthesize information to research a topic

**5.11.** follow copyright laws and fair use guidelines when using the intellectual property of others, including that of Montana American Indians, and appropriately credit ideas and words of others

**5.12.** set goals, seek feedback and evaluate writing progress

**5.13.** select and use forms of writing to clarify thought, to extend learning, and to reflect on experience

**MONTANA Mathematics Content Standards**  
End of Grade 8

Content Standard 1: Number Sense and Operation

A student, applying reasoning and problem solving, will use number sense and operations to represent numbers in multiple ways, understand relationships among numbers and number systems, make reasonable estimates, and compute fluently within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**1.1. Rational Number Relationships:** Recognize, model, and compare different forms of integers and rational numbers including percents, fractions, decimals, and numbers using exponents and scientific notation.

**1.2. Estimation and Reasonableness:** Select and apply appropriate estimation strategies to judge the reasonableness of solutions to problems including those computed on a calculator. Demonstrate correct use of order of operations.

**1.3. Number Theory:** Use number theory concepts such as prime factorization, greatest common factor, and least common multiple in problem situations.

**1.4. Rational Number Operations:** Compute fluently and solve multi-step problems using integers, fractions, decimals, and numbers in exponential form.

**1.5. Metric and Standard Measurement:** Use metric and standard units of measurement in relevant scientific and cultural situations, including those of Montana American Indians, compare and convert within systems, and use appropriate technology.

**1.6. Proportional Reasoning:** Understand and apply proportional relationships to model real world situations and to solve problems involving rates, ratios, proportions, percents, and direct variation.

Content Standard 2: Data Analysis

A student, applying reasoning and problem solving, will use data representation and analysis, simulations, probability, statistics, and statistical methods to evaluate information and make informed decisions within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**2.1. Representing and Comparing Data:** Collect data from a variety of contexts (e.g., science, history, and culture, including Montana American Indians). Organize and represent data in box plots, scatter plots, histograms, and circle graphs using technology when appropriate.

**2.2. Evaluating Data and Making Conjectures:** Interpret, analyze, and evaluate data using mean, median, range, and quartiles to identify trends and make decisions and predictions about data within scientific and cultural contexts, including those of Montana American Indians.

**2.3. Finding Probability and Predicting:** Create sample spaces and simulations from events found in different cultures, including those of Montana American Indians, determine experimental and theoretical probabilities, and use probability to make predictions.

Content Standard 3: Geometric Reasoning

A student, applying reasoning and problem solving, will understand geometric properties, spatial relationships, and transformation of shapes, and will use spatial reasoning and geometric models to analyze mathematical situations within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**3.1. Properties of Solids and Figures:** Define, classify and compare properties of solids and plane figures, including lines and angles.

**3.2. Congruence and Similarity:** Use spatial reasoning to determine congruence, similarity, and symmetry of objects in mathematics, art, science, and culture, including Montana American Indians.

**3.3. Transformations including Dilations:** Define, identify, and execute transformations including translations, rotations, reflections, and dilations with appropriate technology.

**3.4. Angles, Surface Area, and Volume:** Measure and compute angles, perimeter, area, surface area, and volume including the use of formulas and choosing appropriate units.

**3.5. Justifying Relationships:** Develop informal arguments to verify geometric relationships and solve problems such as an informal justification of the Pythagorean Theorem in a variety of contexts.

## Content Standard 4: Algebraic and Functional Reasoning

A student, applying reasoning and problem solving, will use algebraic concepts and procedures to understand processes involving number, operation, and variables and will use procedures and function concepts to model the quantitative and functional relationships that describe change within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**4.1. Representing and Generalizing Patterns:** Create and use tables, graphs or diagrams, symbolic expressions, and verbal descriptions to represent, analyze, and generalize a variety of patterns involving numbers and operations.

**4.2. Linear Functions:** Identify linear and non-linear functional relationships and contrast their properties using tables, graphs, or equations with appropriate technology.

**4.3. Multi-step equations and inequalities:** Use number properties and inverse operations to solve multi-step equations and inequalities involving a single variable.

**4.4. Equivalent Algebraic Expressions:** Recognize, simplify, and generate equivalent forms of algebraic expressions, justifying each step with properties of operations.

**4.5. Linear Modeling:** Identify and compute rate of change/slope and intercepts from equations, graphs, and tables; model and solve contextual problems involving linear proportions or direct variation using cultural contexts, including those of Montana American Indians.

# MONTANA Mathematics Content Standards Upon Graduation

## Content Standard 1: Number Sense and Operation

A student, applying reasoning and problem solving, will use number sense and operations to represent numbers in multiple ways, understand relationships among numbers and number systems, make reasonable estimates, and compute fluently within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**1.1. Quantification:** Use multiple notations to perform and interpret the effects of operations on very large and very small numbers with and without technology.

**1.2. Estimation and Accuracy:** Identify situations where estimation is appropriate and determine the degree of accuracy needed for a given problem situation (and the appropriate precision in which to report answers).

**1.3. Equivalence with Multiple Notation:** Given a representation of a number or expression, find equivalent representations using multiple notations (e.g.,  $x^{1/2}$  vs.  $\sqrt{x}$  and visual representation of multiplying binomials).

**1.4. Properties of Numbers and Number Systems:** Analyze and apply the properties of numbers and number systems.

**1.5. Modeling Relationships and Change:** Identify givens and unknowns in familiar and unfamiliar situations (e.g., finance, culture, including Montana American Indians, and nature) and describe relationships between variables.

## Content Standard 2: Data Analysis

A student, applying reasoning and problem solving, will use data representation and analysis, simulations, probability, statistics, and statistical methods to evaluate information and make informed decisions within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**2.1. Representing and Analyzing Data:** Select, create, and compare graphical or numerical representations of data sets using technology when appropriate. Reason about distributions using measures of central tendency and spread (e.g., percentiles, quartiles, inter-quartile range, and standard deviation).

**2.2. Evaluating Validity:** Evaluate the validity of reports based on collected and/or published data by considering the source of the data, the design of the study, and the way data are displayed, analyzed, and interpreted.

**2.3. Rules of Probability and Expected Value:** Make, evaluate, and justify decisions based on probabilities in multicultural situations, including those of Montana American Indians (e.g., finding expected value and using rules of probability).

**2.4. Counting Methods:** Use technology as needed to determine the possible number of outcomes for an event or compound event using the fundamental counting principle, permutations, combinations, and other systematic counting methods.

**2.5. Curve Fitting:** Model two-variable data using curve fitting with and without technology. Write an equation for a given model and decide when or if predictions based on this equation are valid.

## Content Standard 3: Geometric Reasoning

A student, applying reasoning and problem solving, will understand geometric properties, spatial relationships, and transformation of shapes, and will use spatial reasoning and geometric models to analyze mathematical situations within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**3.1. Conjectures and Inductive Reasoning:** Formulate and evaluate conjectures about geometric objects and their properties, with and without technology, applying inductive reasoning when appropriate.

**3.2. Applications of Geometric Models:** Use spatial reasoning and geometric models to solve problems with and without technology in the contexts of art, science, and culture, including Montana American Indians.

**3.3. Multiple Geometric Approaches:** Identify, analyze, and use transformational, coordinate, and synthetic geometric approaches to solve problems.

**3.4. Indirect Measurement:** Determine measures of two- and three-dimensional objects and their elements using trigonometric ratios, proportionality, the Pythagorean Theorem, and angle relationships.

**3.5. Methods of Proof:** Establish the validity of geometric conjectures using deductive reasoning, indirect proof, and counterexamples, and critique arguments made by others.

## Content Standard 4: Algebraic and Functional Reasoning

A student, applying reasoning and problem solving, will use algebraic concepts and procedures to understand processes involving number, operation, and variables and will use procedures and function concepts to model the quantitative and functional relationships that describe change within a variety of relevant cultural contexts, including those of Montana American Indians.

A proficient student will:

**4.1. Representing Functions:** Represent functions in a variety of ways including tables, graphs or diagrams, verbal descriptions, and symbolic expressions in recursive and explicit form. Justify the choice of an appropriate form for solving a given problem.

**4.2. Variables and Parameters:** Determine the appropriate symbolic representation of a given contextual situation (e.g., variables and parameters in equations, inequalities, functions, and matrices).

**4.3. Solving Systems of Equations and Inequalities:** Solve a variety of equations, inequalities and systems of equations and inequalities, justify the solution process, and interpret the solution in context.

**4.4. Families of Functions and Transformations:**

Analyze the effects of transformations on families of functions and recognize their characteristics. Represent and use functions in equivalent forms to identify and perform transformations.

**4.5. Analyzing and Conjecturing with Models:** Given data or a problem situation, select and use an appropriate function model to analyze results or make a prediction with and without technology using cultural contexts, including those of Montana American Indians.

## Science

### MONTANA Science Content Standards End of Grade 8

#### Content Standard 1

Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.

A proficient student will:

**1.1.** identify a question, determine relevant variables and a control, formulate a testable hypothesis, plan and predict the outcome of an investigation, safely conduct scientific investigation, and compare and analyze data

**1.2.** select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations

**1.3.** review, communicate and defend results of investigations, including considering alternative explanations

**1.4.** create models to illustrate scientific concepts and use the model to predict change (e.g., computer simulation, stream table, graphic representation)

**1.5.** identify strengths and weakness in an investigation design

**1.6.** compare how observations of nature form an essential base of knowledge among the Montana American Indians

#### Content Standard 2

Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.

A proficient student will:

**2.1.** classify, describe, and manipulate the physical models of matter in terms of: elements, and compounds, pure substances and mixtures, atoms, and molecules

**2.2.** examine, describe, compare and classify objects and substances based on common physical properties and simple chemical properties

**2.3.** describe energy and compare and contrast the energy transformations and the characteristics of light, heat, motion, magnetism, electricity, sound and mechanical waves

**2.4.** model and explain the states of matter are dependent upon the quantity of energy present in the system and describe what will change and what will remain unchanged at the particulate level when matter experiences an external force or energy change

**2.5.** describe and explain the motion of an object in terms of its position, direction, and speed as well as the forces acting upon it

**2.6.** identify, build, describe, measure, and analyze mechanical systems (e.g., simple and complex compound machines) and describe the forces acting within those systems

**2.7.** give examples and describe how energy is transferred and conserved (e.g.; electric to light and heat [light bulb], chemical to mechanical [fuel to propulsion])

#### Content Standard 3

Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

A proficient student will:

**3.1.** compare the structure and function of prokaryotic cells (bacteria) and eukaryotic cells (plant, animal, etc.) including the levels of organization of the structure and function, particularly with humans

**3.2.** explain how organisms and systems of organisms obtain and use energy resources to maintain stable conditions (e.g., food webs, photosynthesis, respiration)

**3.3.** communicate the differences in the reproductive processes of a variety of plants and animals using the principles of genetic modeling (e.g., Punnett squares)

**3.4.** investigate and explain the interdependent nature of populations and communities in the environment and describe how species in these populations adapt by evolving

**3.5.** create and use a basic classification scheme to identify plants and animals

#### Content Standard 4

Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

A proficient student will:

**4.1.** model and explain the internal structure of the Earth and describe the formation and composition of Earth's external features in terms of the rock cycle and plate tectonics and constructive and destructive forces

**4.2.** differentiate between rock types and mineral types and classify both by how they are formed and the utilization by humans

**4.3.** use fossils to describe the geological timeline

**4.4.** describe the water cycle, the composition and structure of the atmosphere, and the impact of oceans on large-scale weather patterns

4.5. describe and model the motion and tilt of Earth in relation to the sun, and explain the concepts of day, night, seasons, year, and climatic changes

4.6. describe the Earth, moon, planets and other objects in space in terms of size, force of gravity, structure, and movement in relation to the sun

4.7. identify scientific theories about the origin and evolution of the Earth and the solar system

#### Content Standard 5

Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

A proficient student will:

**5.1.** describe the specific fields of science and technology as they relate to occupations within those fields

**5.2.** apply scientific knowledge and process skills to understand issues and everyday events

**5.3.** simulate collaborative problem solving and give examples of how scientific knowledge and technology are shared with other scientists and the public

5.4. use scientific knowledge to investigate problems and their proposed solutions and evaluate those solutions while considering environmental impacts

**5.5.** describe how the knowledge of science and technology influences the development of the Montana American Indian cultures

#### Content Standard 6

Students understand historical developments in science and technology.

A proficient student will:

**6.1.** give examples of scientific discoveries and describe the interrelationship between technological advances and scientific understanding, including Montana American Indian examples

**6.2.** identify major milestones in science that have impacted science, technology, and society

**6.3.** describe and explain science as a human endeavor and an ongoing process



# MONTANA Science Content Standards Upon Graduation

## Content Standard 1

Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.

A proficient student will:

- 1.1. generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze data**
- 1.2. select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation**
- 1.3. review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g., through graphical representation or charts)**
- 1.4. analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)**
- 1.5. identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation**
- 1.6. explain how observations of nature form an essential base of knowledge among the Montana American Indians

## Content Standard 2

Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.

A proficient student will:

- 2.1. describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive decay
- 2.2. explain how the particulate-level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules
- 2.3. describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts

2.4. identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass

2.5. explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces

2.6. explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse

2.7. describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors

## Content Standard 3

Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

A proficient student will:

- 3.1. investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)
- 3.2. describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development
- 3.3. model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life
- 3.4. predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time
- 3.5. generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems

## Content Standard 4

Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.

A proficient student will:

- 4.1. understand the theory of plate tectonics and how it explains the inter-relationship between earthquakes, volcanoes, and sea floor spreading
- 4.2. identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)
- 4.3. explain scientific theories about how fossils are used as evidence of changes over time

**4.4.** collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather and climate; and describe the impact on Earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)

**4.5.** explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns

**4.6.** describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the milky way, the local galactic group, and the universe

**4.7.** relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and space-borne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe

#### Content Standard 5

Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

A proficient student will:

**5.1.** predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought

**5.2.** give examples of scientific innovation challenging commonly held perceptions

**5.3.** evaluate the ongoing, collaborative scientific process by gathering and critiquing information

**5.4.** analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)

**5.5.** explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)

#### Content Standard 6

Students understand historical developments in science and technology.

A proficient student will:

**6.1.** analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples

**6.2.** trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available

**6.3.** describe, explain, and analyze science as a human endeavor and an ongoing process

## Section C: ACT's College Readiness Standards Included in Montana's Grade 8–12 Content 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 Montana Content Standards as they relate to ACT's College Readiness Standards. The ACT College Readiness Standards included in the Montana Content 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 Montana Content Standards.





Score Ranges	Table C-1. ACT's College Readiness Standards — English		
Benchmarks	Topic Development in Terms of Purpose and Focus	Organization, Unity, and Coherence	Word Choice in Terms of Style, Tone, Clarity, and Economy
13–15 <b>EXPL:</b> 13 <b>PLAN:</b> 15		Use conjunctive adverbs or phrases to show time relationships in simple narrative essays (e.g., <i>then, this time</i> )	Revise sentences to correct awkward and confusing arrangements of sentence elements  Revise vague nouns and pronouns that create obvious logic problems
16–19  <b>ACT:</b> 18	Identify the basic purpose or role of a specified phrase or sentence  Delete a clause or sentence because it is obviously irrelevant to the essay	Select the most logical place to add a sentence in a paragraph	Delete obviously synonymous and wordy material in a sentence  Revise expressions that deviate from the style of an essay
20–23	Identify the central idea or main topic of a straightforward piece of writing  Determine relevancy when presented with a variety of sentence-level details	Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., <i>first, afterward, in response</i> )  Decide the most logical place to add a sentence in an essay  Add a sentence that introduces a simple paragraph	Delete redundant material when information is repeated in different parts of speech (e.g., “alarmingly startled”)  Use the word or phrase most consistent with the style and tone of a fairly straightforward essay  Determine the clearest and most logical conjunction to link clauses
24–27	Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal  Delete material primarily because it disturbs the flow and development of the paragraph  Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement	Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., <i>therefore, however, in addition</i> )  Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic  Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward	Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence  Identify and correct ambiguous pronoun references  Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay
28–32*	Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence, or to determine the need to delete plausible but irrelevant material  Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation	Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs  Rearrange sentences to improve the logic and coherence of a complex paragraph  Add a sentence to introduce or conclude a fairly complex paragraph	Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., “an aesthetic viewpoint” versus “the outlook of an aesthetic viewpoint”)  Correct vague and wordy or clumsy and confusing writing containing sophisticated language
33–36†	Determine whether a complex essay has accomplished a specific purpose  Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay	Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay	Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole

\* Statements apply to PLAN & ACT only

† Statements apply to the ACT only

Score Ranges	Table C-1. ACT's College Readiness Standards — English (continued)		
Bench- marks	Sentence Structure and Formation	Conventions of Usage	Conventions of Punctuation
13–15 <i>EXPL:</i> 13 <i>PLAN:</i> 15	<p>Use conjunctions or punctuation to join simple clauses</p> <p>Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences</p>	<p>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</p>	<p>Delete commas that create basic sense problems (e.g., between verb and direct object)</p>
16–19  <i>ACT:</i> 18	<p>Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences</p> <p>Decide the appropriate verb tense and voice by considering the meaning of the entire sentence</p>	<p>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</p> <p>Recognize and use the appropriate word in frequently confused pairs such as <i>there</i> and <i>their</i>, <i>past</i> and <i>passed</i>, and <i>led</i> and <i>lead</i></p>	<p>Provide appropriate punctuation in straightforward situations (e.g., items in a series)</p> <p>Delete commas that disturb the sentence flow (e.g., between modifier and modified element)</p>
20–23	<p>Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers)</p>	<p>Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., <i>long for</i>, <i>appeal to</i>)</p> <p>Ensure that a verb agrees with its subject when there is some text between the two</p>	<p>Use commas to set off simple parenthetical phrases</p> <p>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)</p>
24–27	<p>Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems</p> <p>Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence</p>	<p>Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences</p> <p>Identify the correct past and past participle forms of irregular and infrequently used verbs and form present-perfect verbs by using <i>have</i> rather than <i>of</i></p>	<p>Use punctuation to set off complex parenthetical phrases</p> <p>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 <i>and</i>)</p> <p>Use apostrophes to indicate simple possessive nouns</p> <p>Recognize inappropriate uses of colons and semicolons</p>
28–32*	<p>Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs</p> <p>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</p>	<p>Correctly use reflexive pronouns, the possessive pronouns <i>its</i> and <i>your</i>, and the relative pronouns <i>who</i> and <i>whom</i></p> <p>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)</p>	<p>Use commas to set off a nonessential/nonrestrictive appositive or clause</p> <p>Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical)</p> <p>Use an apostrophe to show possession, especially with irregular plural nouns</p> <p>Use a semicolon to indicate a relationship between closely related independent clauses</p>
33–36†	<p>Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses</p>	<p>Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas</p> <p>Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb</p>	<p>Use a colon to introduce an example or an elaboration</p>

\* 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 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 Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages	Locate important details in uncomplicated passages Make simple inferences about how details are used in passages
24–27	Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages Infer the main idea or purpose of straightforward paragraphs in more challenging passages Summarize basic events and ideas in more challenging passages Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages	Locate important details in more challenging passages Locate and interpret minor or subtly stated details in uncomplicated passages Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages
28–32*	Infer the main idea or purpose of more challenging passages or their paragraphs Summarize events and ideas in virtually any passage Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage	Locate and interpret minor or subtly stated details in more challenging passages Use details from different sections of some complex informational passages to support a specific point or argument
33–36†	Identify clear main ideas or purposes of complex passages or their paragraphs	Locate and interpret details in complex passages Understand the function of a part of a passage when the function is subtle or complex

\* Statements apply to PLAN & ACT only

† Statements apply to the ACT only

### 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 <b>EXPL:</b> 15	Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages Recognize clear cause-effect relationships described within a single sentence in a passage	Understand the implication of a familiar word or phrase and of simple descriptive language	Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives
16–19 <b>PLAN:</b> 17	Identify relationships between main characters in uncomplicated literary narratives Recognize clear cause-effect relationships within a single paragraph in uncomplicated literary narratives	Use context to understand basic figurative language	Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages
20–23 <b>ACT:</b> 21	Order simple sequences of events in uncomplicated literary narratives Identify clear relationships between people, ideas, and so on in uncomplicated passages Identify clear cause-effect relationships in uncomplicated passages	Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages	Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages Draw simple generalizations and conclusions using details that support the main points of more challenging passages
24–27	Order sequences of events in uncomplicated passages Understand relationships between people, ideas, and so on in uncomplicated passages Identify clear relationships between characters, ideas, and so on in more challenging literary narratives Understand implied or subtly stated cause-effect relationships in uncomplicated passages Identify clear cause-effect relationships in more challenging passages	Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages	Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives Draw generalizations and conclusions about people, ideas, and so on in more challenging passages
28–32*	Order sequences of events in more challenging passages Understand the dynamics between people, ideas, and so on in more challenging passages Understand implied or subtly stated cause-effect relationships in more challenging passages	Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts	Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on
33–36†	Order sequences of events in complex passages Understand the subtleties in relationships between people, ideas, and so on in virtually any passage Understand implied, subtle, or complex cause-effect relationships in virtually any passage	Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage	Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage Understand and generalize about portions of a complex literary narrative

\* Statements apply to PLAN & ACT only

† 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.

**Table C-3. ACT’s College Readiness Standards — Writing\***

Score Ranges	Expressing Judgments	Focusing on the Topic	Developing a Position
3–4	<p>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</p> <p>Show limited recognition of the complexity of the issue in the prompt</p>	<p>Maintain a focus on the general topic in the prompt through most of the essay</p>	<p>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</p> <p>Show little or no movement between general and specific ideas and examples</p>
5–6	<p>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</p> <p>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</p>	<p>Maintain a focus on the general topic in the prompt throughout the essay</p>	<p>Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas</p> <p>Show little movement between general and specific ideas and examples</p>
7–8	<p>Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt</p> <p>Show some recognition of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>acknowledging counterarguments to the writer’s position</li> <li>providing some response to counterarguments to the writer’s position</li> </ul>	<p>Maintain a focus on the general topic in the prompt throughout the essay and attempt a focus on the specific issue in the prompt</p> <p>Present a thesis that establishes focus on the topic</p>	<p>Develop ideas by using some specific reasons, details, and examples</p> <p>Show some movement between general and specific ideas and examples</p>
9–10	<p>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</p> <p>Show recognition of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>partially evaluating implications and/or complications of the issue, and/or</li> <li>posing and partially responding to counterarguments to the writer’s position</li> </ul>	<p>Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay</p> <p>Present a thesis that establishes a focus on the writer’s position on the issue</p>	<p>Develop most ideas fully, using some specific and relevant reasons, details, and examples</p> <p>Show clear movement between general and specific ideas and examples</p>
11–12	<p>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</p> <p>Show understanding of the complexity of the issue in the prompt by</p> <ul style="list-style-type: none"> <li>examining different perspectives, and/or</li> <li>evaluating implications or complications of the issue, and/or</li> <li>posing and fully discussing counterarguments to the writer’s position</li> </ul>	<p>Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay</p> <p>Present a critical thesis that clearly establishes the focus on the writer’s position on the issue</p>	<p>Develop several ideas fully, using specific and relevant reasons, details, and examples</p> <p>Show effective movement between general and specific ideas and examples</p>

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

<b>Table C-3. ACT's College Readiness Standards — Writing* (continued)</b>		
<b>Score Ranges</b>	<b>Organizing Ideas</b>	<b>Using Language</b>
3–4	<p>Provide a discernible organization with some logical grouping of ideas in parts of the essay</p> <p>Use a few simple and obvious transitions</p> <p>Present a discernible, though minimally developed, introduction and conclusion</p>	<p>Show limited control of language by</p> <ul style="list-style-type: none"> <li>correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding</li> <li>using simple vocabulary</li> <li>using simple sentence structure</li> </ul>
5–6	<p>Provide a simple organization with logical grouping of ideas in parts of the essay</p> <p>Use some simple and obvious transitional words, though they may at times be inappropriate or misleading</p> <p>Present a discernible, though underdeveloped, introduction and conclusion</p>	<p>Show a basic control of language by</p> <ul style="list-style-type: none"> <li>correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding</li> <li>using simple but appropriate vocabulary</li> <li>using a little sentence variety, though most sentences are simple in structure</li> </ul>
7–8	<p>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</p> <p>Use some simple and obvious, but appropriate, transitional words and phrases</p> <p>Present a discernible introduction and conclusion with a little development</p>	<p>Show adequate use of language to communicate by</p> <ul style="list-style-type: none"> <li>correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding</li> <li>using appropriate vocabulary</li> <li>using some varied kinds of sentence structures to vary pace</li> </ul>
9–10	<p>Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas</p> <p>Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas</p> <p>Present a somewhat developed introduction and conclusion</p>	<p>Show competent use of language to communicate ideas by</p> <ul style="list-style-type: none"> <li>correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding</li> <li>using some precise and varied vocabulary</li> <li>using several kinds of sentence structures to vary pace and to support meaning</li> </ul>
11–12	<p>Provide unity and coherence throughout the essay, often with a logical progression of ideas</p> <p>Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas</p> <p>Present a well-developed introduction and conclusion</p>	<p>Show effective use of language to clearly communicate ideas by</p> <ul style="list-style-type: none"> <li>correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors</li> <li>using precise and varied vocabulary</li> <li>using a variety of kinds of sentence structures to vary pace and to support meaning</li> </ul>

Score Ranges	Table C-4. ACT's College Readiness Standards — Mathematics			
Benchmarks	Basic Operations & Applications	Probability, Statistics, & Data Analysis	Numbers: Concepts & Properties	Expressions, Equations, & Inequalities
13–15	<p>Perform one-operation computation with whole numbers and decimals</p> <p>Solve problems in one or two steps using whole numbers</p> <p>Perform common conversions (e.g., inches to feet or hours to minutes)</p>	<p>Calculate the average of a list of positive whole numbers</p> <p>Perform a single computation using information from a table or chart</p>	<p>Recognize equivalent fractions and fractions in lowest terms</p>	<p>Exhibit knowledge of basic expressions (e.g., identify an expression for a total as <math>b + g</math>)</p> <p>Solve equations in the form <math>x + a = b</math>, where <math>a</math> and <math>b</math> are whole numbers or decimals</p>
16–19 <i>EXPL:</i> 17 <i>PLAN:</i> 19	<p>Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent</p> <p>Solve some routine two-step arithmetic problems</p>	<p>Calculate the average of a list of numbers</p> <p>Calculate the average, given the number of data values and the sum of the data values</p> <p>Read tables and graphs</p> <p>Perform computations on data from tables and graphs</p> <p>Use the relationship between the probability of an event and the probability of its complement</p>	<p>Recognize one-digit factors of a number</p> <p>Identify a digit's place value</p>	<p>Substitute whole numbers for unknown quantities to evaluate expressions</p> <p>Solve one-step equations having integer or decimal answers</p> <p>Combine like terms (e.g., <math>2x + 5x</math>)</p>
20–23 <i>ACT:</i> 22	<p>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</p>	<p>Calculate the missing data value, given the average and all data values but one</p> <p>Translate from one representation of data to another (e.g., a bar graph to a circle graph)</p> <p>Determine the probability of a simple event</p> <p>Exhibit knowledge of simple counting techniques*</p>	<p>Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor</p>	<p>Evaluate algebraic expressions by substituting integers for unknown quantities</p> <p>Add and subtract simple algebraic expressions</p> <p>Solve routine first-degree equations</p> <p>Perform straightforward word-to-symbol translations</p> <p>Multiply two binomials*</p>
24–27	<p>Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour)</p>	<p>Calculate the average, given the frequency counts of all the data values</p> <p>Manipulate data from tables and graphs</p> <p>Compute straightforward probabilities for common situations</p> <p>Use Venn diagrams in counting*</p>	<p>Find and use the least common multiple</p> <p>Order fractions</p> <p>Work with numerical factors</p> <p>Work with scientific notation</p> <p>Work with squares and square roots of numbers</p> <p>Work problems involving positive integer exponents*</p> <p>Work with cubes and cube roots of numbers*</p> <p>Determine when an expression is undefined*</p> <p>Exhibit some knowledge of the complex numbers†</p>	<p>Solve real-world problems using first-degree equations</p> <p>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)</p> <p>Identify solutions to simple quadratic equations</p> <p>Add, subtract, and multiply polynomials*</p> <p>Factor simple quadratics (e.g., the difference of squares and perfect square trinomials)*</p> <p>Solve first-degree inequalities that do not require reversing the inequality sign*</p>
28–32*	<p>Solve word problems containing several rates, proportions, or percentages</p>	<p>Calculate or use a weighted average</p> <p>Interpret and use information from figures, tables, and graphs</p> <p>Apply counting techniques</p> <p>Compute a probability when the event and/or sample space are not given or obvious</p>	<p>Apply number properties involving prime factorization</p> <p>Apply number properties involving even/odd numbers and factors/multiples</p> <p>Apply number properties involving positive/negative numbers</p> <p>Apply rules of exponents</p> <p>Multiply two complex numbers†</p>	<p>Manipulate expressions and equations</p> <p>Write expressions, equations, and inequalities for common algebra settings</p> <p>Solve linear inequalities that require reversing the inequality sign</p> <p>Solve absolute value equations</p> <p>Solve quadratic equations</p> <p>Find solutions to systems of linear equations</p>
33–36†	<p>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)</p>	<p>Distinguish between mean, median, and mode for a list of numbers</p> <p>Analyze and draw conclusions based on information from figures, tables, and graphs</p> <p>Exhibit knowledge of conditional and joint probability</p>	<p>Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers</p> <p>Exhibit knowledge of logarithms and geometric sequences</p> <p>Apply properties of complex numbers</p>	<p>Write expressions that require planning and/or manipulating to accurately model a situation</p> <p>Write equations and inequalities that require planning, manipulating, and/or solving</p> <p>Solve simple absolute value inequalities</p>

Score Ranges	Table C-4. ACT's College Readiness Standards — Mathematics (continued)			
Benchmarks	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 <i>EXPL:</i> 17  <i>PLAN:</i> 19	Locate points on the number line and in the first quadrant	Exhibit some knowledge of the angles associated with parallel lines	Compute the perimeter of polygons when all side lengths are given Compute the area of rectangles when whole number dimensions are given	
20–23  <i>ACT:</i> 22	Locate points in the coordinate plane Comprehend the concept of length on the number line* Exhibit knowledge of slope*	Find the measure of an angle using properties of parallel lines Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	Compute the area and perimeter of triangles and rectangles in simple problems Use geometric formulas when all necessary information is given	Evaluate quadratic functions, expressed in function notation, at integer values
24–27	Identify the graph of a linear inequality on the number line* Determine the slope of a line from points or equations* Match linear graphs with their equations* Find the midpoint of a line segment*	Use several angle properties to find an unknown angle measure Recognize Pythagorean triples* Use properties of isosceles triangles*	Compute the area of triangles and rectangles when one or more additional simple steps are required Compute the area and circumference of circles after identifying necessary information Compute the perimeter of simple composite geometric figures with unknown side lengths*	Evaluate polynomial functions, expressed in function notation, at integer values Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths
28–32*	Interpret and use information from graphs in the coordinate plane Match number line graphs with solution sets of linear inequalities Use the distance formula Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle)†	Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles Use the Pythagorean theorem	Use relationships involving area, perimeter, and volume of geometric figures to compute another measure	Evaluate composite functions at integer values Apply basic trigonometric ratios to solve right-triangle problems
33–36†	Match number line graphs with solution sets of simple quadratic inequalities Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ Solve problems integrating multiple algebraic and/or geometric concepts Analyze and draw conclusions based on information from graphs in the coordinate plane	Draw conclusions based on a set of conditions Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas Use relationships among angles, arcs, and distances in a circle	Use scale factors to determine the magnitude of a size change Compute the area of composite geometric figures when planning or visualization is required	Write an expression for the composite of two simple functions Use trigonometric concepts and basic identities to solve problems Exhibit knowledge of unit circle trigonometry Match graphs of basic trigonometric functions with their equations

\* Statements apply to PLAN & ACT only

ACT's Mathematics College Readiness Standards

† Statements apply to the ACT only

 = Included in Montana Content Standards

Score Ranges	Table C-5. ACT's College Readiness Standards — Science		
Benchmarks	Interpretation of Data	Scientific Investigation	Evaluation of Models, Inferences, and Experimental Results
13–15	Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram) Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels)		
16–19	Select two or more pieces of data from a simple data presentation Understand basic scientific terminology Find basic information in a brief body of text Determine how the value of one variable changes as the value of another variable changes in a simple data presentation	Understand the methods and tools used in a simple experiment	
20–23 <i>EXPL:</i> 20 <i>PLAN:</i> 21	Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram) Compare or combine data from a simple data presentation (e.g., order or sum data from a table) Translate information into a table, graph, or diagram	Understand the methods and tools used in a moderately complex experiment Understand a simple experimental design Identify a control in an experiment Identify similarities and differences between experiments	Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model Identify key issues or assumptions in a model
24–27 <i>ACT:</i> 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) Compare or combine data from a complex data presentation Interpolate between data points in a table or graph Determine how the value of one variable changes as the value of another variable changes in a complex data presentation Identify and/or use a simple (e.g., linear) mathematical relationship between data Analyze given information when presented with new, simple information	Understand the methods and tools used in a complex experiment Understand a complex experimental design Predict the results of an additional trial or measurement in an experiment Determine the experimental conditions that would produce specified results	Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why Identify strengths and weaknesses in one or more models Identify similarities and differences between models Determine which model(s) is(are) supported or weakened by new information Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion
28–32*	Compare or combine data from a simple data presentation with data from a complex data presentation Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data Extrapolate from data points in a table or graph	Determine the hypothesis for an experiment Identify an alternate method for testing a hypothesis	Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model Determine whether new information supports or weakens a model, and why Use new information to make a prediction based on a model
33–36†	Compare or combine data from two or more complex data presentations Analyze given information when presented with new, complex information	Understand precision and accuracy issues Predict how modifying the design or methods of an experiment will affect results Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results	Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why

\* Statements apply to PLAN & ACT only

† Statements apply to the ACT only

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
<ul style="list-style-type: none"> <li>Animal behavior</li> <li>Animal development and growth</li> <li>Body systems</li> <li>Cell structure and processes</li> <li>Ecology</li> <li>Evolution</li> <li>Genetics</li> <li>Homeostasis</li> <li>Life cycles</li> <li>Molecular basis of heredity</li> <li>Origin of life</li> <li>Photosynthesis</li> <li>Plant development, growth, structure</li> <li>Populations</li> <li>Taxonomy</li> </ul>	<ul style="list-style-type: none"> <li>Atomic structure</li> <li>Chemical bonding, equations, nomenclature, reactions</li> <li>Electrical circuits</li> <li>Elements, compounds, mixtures</li> <li>Force and motions</li> <li>Gravitation</li> <li>Heat and work</li> <li>Kinetic and potential energy</li> <li>Magnetism</li> <li>Momentum</li> <li>The Periodic Table</li> <li>Properties of solutions</li> <li>Sound and light</li> <li>States, classes, and properties of matter</li> <li>Waves</li> </ul>	<ul style="list-style-type: none"> <li>Earthquakes and volcanoes</li> <li>Earth's atmosphere</li> <li>Earth's resources</li> <li>Fossils and geological time</li> <li>Geochemical cycles</li> <li>Groundwater</li> <li>Lakes, rivers, oceans</li> <li>Mass movements</li> <li>Plate tectonics</li> <li>Rocks, minerals</li> <li>Solar system</li> <li>Stars, galaxies, and the universe</li> <li>Water cycle</li> <li>Weather and climate</li> <li>Weathering and erosion</li> </ul>

## Section D: **ACT's WorkKeys Skills Included in Montana's Content 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 Montana's Content Standards. WorkKeys Skills not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Montana's Content Standards.

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



## WorkKeys Skills

Level	<i>Reading for Information</i>	<i>Applied Mathematics</i>	<i>Locating Information</i>
<b>3</b>	<p>Identify main ideas and clearly stated details</p> <p>Choose the correct meaning of a word that is clearly defined in the reading</p> <p>Choose the correct meaning of common, everyday and workplace words</p> <p>Choose when to perform each step in a short series of steps</p> <p>Apply instructions to a situation that is the same as the one in the reading materials</p>	<p>Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers</p> <p>Add or subtract negative numbers</p> <p>Change numbers from one form to another using whole numbers, fractions, decimals, or percentages</p> <p>Convert simple money and time units (e.g., hours to minutes)</p>	<p>Find one or two pieces of information in a graphic</p> <p>Fill in one or two pieces of information that are missing from a graphic</p>
<b>4</b>	<p>Identify important details that may not be clearly stated</p> <p>Use the reading material to figure out the meaning of words that are not defined</p> <p>Apply instructions with several steps to a situation that is the same as the situation in the reading materials</p> <p>Choose what to do when changing conditions call for a different action (follow directions that include "if-then" statements)</p>	<p>Solve problems that require one or two operations</p> <p>Multiply negative numbers</p> <p>Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals</p> <p>Add commonly known fractions, decimals, or percentages (e.g., <math>\frac{1}{2}</math>, .75, 25%)</p> <p>Add three fractions that share a common denominator</p> <p>Multiply a mixed number by a whole number or decimal</p> <p>Put the information in the right order before performing calculations</p>	<p>Find several pieces of information in one or two graphics</p> <p>Understand how graphics are related to each other</p> <p>Summarize information from one or two straightforward graphics</p> <p>Identify trends shown in one or two straightforward graphics</p> <p>Compare information and trends shown in one or two straightforward graphics</p>
<b>5</b>	<p>Figure out the correct meaning of a word based on how the word is used</p> <p>Identify the correct meaning of an acronym that is defined in the document</p> <p>Identify the paraphrased definition of a technical term or jargon that is defined in the document</p> <p>Apply technical terms and jargon and relate them to stated situations</p> <p>Apply straightforward instructions to a new situation that is similar to the one described in the material</p> <p>Apply complex instructions that include conditionals to situations described in the materials</p>	<p>Decide what information, calculations, or unit conversions to use to solve the problem</p> <p>Look up a formula and perform single-step conversions within or between systems of measurement</p> <p>Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes)</p> <p>Divide negative numbers</p> <p>Find the best deal using one- and two-step calculations and then comparing results</p> <p>Calculate perimeters and areas of basic shapes (rectangles and circles)</p> <p>Calculate percentage discounts or markups</p>	<p>Sort through distracting information</p> <p>Summarize information from one or more detailed graphics</p> <p>Identify trends shown in one or more detailed or complicated graphics</p> <p>Compare information and trends from one or more complicated graphics</p>
<b>6</b>	<p>Identify implied details</p> <p>Use technical terms and jargon in new situations</p> <p>Figure out the less common meaning of a word based on the context</p> <p>Apply complicated instructions to new situations</p> <p>Figure out the principles behind policies, rules, and procedures</p> <p>Apply general principles from the materials to similar and new situations</p> <p>Explain the rationale behind a procedure, policy, or communication</p>	<p>Use fractions, negative numbers, ratios, percentages, or mixed numbers</p> <p>Rearrange a formula before solving a problem</p> <p>Use two formulas to change from one unit to another within the same system of measurement</p> <p>Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement</p> <p>Find mistakes in items that belong at Levels 3, 4, and 5</p> <p>Find the best deal and use the result for another calculation</p> <p>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</p> <p>Find the volume of rectangular solids</p> <p>Calculate multiple rates</p>	<p>Draw conclusions based on one complicated graphic or several related graphics</p> <p>Apply information from one or more complicated graphics to specific situations</p> <p>Use the information to make decisions</p>
<b>7</b>	<p>Figure out the definitions of difficult, uncommon words based on how they are used</p> <p>Figure out the meaning of jargon or technical terms based on how they are used</p> <p>Figure out the general principles behind the policies and apply them to situations that are quite different from any described in the materials</p>	<p>Solve problems that include nonlinear functions and/or that involve more than one unknown</p> <p>Find mistakes in Level 6 items</p> <p>Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages</p> <p>Calculate multiple areas and volumes of spheres, cylinders, or cones</p> <p>Set up and manipulate complex ratios or proportions</p> <p>Find the best deal when there are several choices</p> <p>Apply basic statistical concepts</p>	