STATE MATCH

South Dakota Standards
Reading/Language Arts,
Mathematics, and Science
Grades 8–12

and

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

March 2008

ACT®

EXECUTIVE SUMMARY
(pp. 1–3)

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

SECTION A
(pp. 5–7)

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

SECTION B
(pp. 9–29)

All South Dakota Standards are listed here; each one highlighted is measured by ACT's EPAS tests and/or WorkKeys assessments. South Dakota standards listed here are from the South Dakota Standards as presented on the South Dakota Department of Education's website in February 2008. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests.

SECTION C
(pp. 31–40)

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

SECTION D
(pp. 41–42)

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

> A supplement is available that identifies the specific ACT College Readiness Standard(s) and WorkKeys Skill(s) corresponding to each South Dakota Standard in a side-by-side format. To request this supplement, please e-mail ACT at **statematch@act.org**.

ACT

Executive Summary

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

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

■ Reading/Language Arts: 2 out of 3 Strands

Most of South Dakota's Reading/Language Arts Standards are covered by ACT's English, Reading, and Writing tests and WorkKeys Reading for Information (RI) assessment.

■ Mathematics: 5 out of 5 Strands

Almost all of South Dakota's Mathematics Standards are covered by ACT's Mathematics tests and WorkKeys Applied Mathematics (AM) assessment.

■ Science: Process Strands: 1 out of 1
       (Content Strands: 4 out of 4)

Almost all of South Dakota's Science 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 South Dakota Science 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 South Dakota 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.)

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Most exceptions to a match between ACT's tests and South Dakota's 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 South Dakota on developing any necessary augmentation.

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

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

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

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

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

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

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

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

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

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

Test takers are most commonly certified in the skills areas of Applied Mathematics, Locating Information, and Reading for Information. Higher scores qualify students for more jobs than do lower scores. 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.

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

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Table A-1. Number of South Dakota Reading/Language Arts Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
South Dakota Strands*	**Number of South Dakota Content Standards Measured by ACT's tests**	**Aspects of South Dakota Standards that are Not Measured**
Reading	8th Grade 6 out of 9 9th Grade 4 out of 7 10th Grade 5 out of 6 11th Grade 4 out of 6 12th Grade 4 out of 6	Comparing and contrasting literature from different time periods and cultures Formulating associations between text and experiences
Writing	8th Grade 3 out of 5 9th Grade 3 out of 5 10th Grade 3 out of 7 11th Grade 4 out of 6 12th Grade 2 out of 4	Using information from multiple sources to support a topic Writing research reports
Listening, Viewing, and Speaking	8th Grade 0 out of 4 9th Grade 0 out of 4 10th Grade 0 out of 8 11th Grade 0 out of 3 12th Grade 0 out of 3	Analyze the use of images, text, and sound in media Making speeches and presentations
TOTALS 2 out of 3 Strands	8th Grade 9 out of 18 9th Grade 7 out of 16 10th Grade 8 out of 21 11th Grade 8 out of 15 12th Grade 6 out of 13	

*Refer to South Dakota's Reading/Language Arts Standards on pages 9–13.

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Table A-2. Number of South Dakota Mathematics Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
South Dakota Strands*	**Number of South Dakota Content Standards Measured by ACT's tests**	**Aspects of South Dakota Standards that are Not Measured**
Algebra	Grade 8 5 out of 5 Core 9-12 6 out of 6 Advanced 9-12 14 out of 14	
Geometry	Grade 8 3 out of 3 Core 9-12 5 out of 5 Advanced 9-12 5 out of 5	
Measurement	Grade 8 2 out of 2 Core 9-12 2 out of 3 Advanced 9-12 2 out of 2	
Number Sense	Grade 8 3 out of 3 Core 9-12 4 out of 5 Advanced 9-12 3 out of 3	
Statistics & Probability	Grade 8 3 out of 3 Core 9-12 4 out of 5 Advanced 9-12 8 out of 8	
TOTALS **5 out of 5 Strands**	Grade 8 16 out of 16 Core 9-12 21 out of 24 Advanced 9-12 32 out of 32	

*Refer to South Dakota's Mathematics Standards on pages 15–20

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Table A-3. Number of South Dakota Science Standards Measured by EXPLORE, PLAN, and the ACT		
South Dakota Strands*	**Number of South Dakota Content Standards Measured by ACT's tests**	**Aspects of South Dakota Standards that are Not Measured**
Nature of Science	Grade 8 1 out of 2 Core 9-12 3 out of 4 Advanced 9-12 3 out of 3	Understanding the nature and origin of scientific knowledge
TOTALS 1 out of 1 Strands	**Process Standards** Grade 8 1 out of 2 Core 9-12 3 out of 4 Advanced 9-12 3 out of 3	
Physical Science	Grade 8 (3) out of (3) Core 9-12 (11) out of (11) Advanced 9-12 (14) out of (14)	
Life Science	Core 9-12 (6) out of (6) Advanced 9-12 (7) out of (7)	
Earth/Space Science	Grade 8 (7) out of (7) Core 9-12 (4) out of (4) Advanced 9-12 (5) out of (5)	
Science, Technology, Environment, and Society	Grade 8 (0) out of (2) Core 9-12 (0) out of (5) Advanced 9-12 (0) out of (2)	Analyze the relationships among science, technology, environment, and society
TOTALS 3 out of 4 Strands	**Content Standards** Grade 8 (10) out of (12) Core 9-12 (21) out of (26) Advanced 9-12 (26) out of (28)	

*Refer to South Dakota's Science Standards on pages 21–29.

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Reading/Language Arts
SOUTH DAKOTA Grade 8 Standards

Reading

Indicator 1: Students can recognize and analyze words.

8.R.1.1 Students can apply contextual knowledge of word origins to extend vocabulary. (Application)

Indicator 2: Students can comprehend and fluently read text.

8.R.2.1 Students can analyze text using comprehension strategies. (Analysis)

8.R.2.2 Students can read fluently to comprehend grade-level text. (Application)

Indicator 3: Students can apply knowledge of text structures, literary devices, and literary elements to develop interpretations and form responses.

8.R.3.1 Students can examine the author's use of literary elements in fiction, nonfiction, drama, and poetry. (Analysis)

8.R.3.2 Students can examine the effects of the author's use of literary devices. (Analysis)

Indicator 4: Students can interpret and respond to diverse, multicultural, and time period texts.

8.R.4.1 Students can compare and contrast literature from different time periods and cultures dealing with similar themes and conflicts. (Analysis)

Indicator 5: Students can access, analyze, synthesize, and evaluate informational texts.

8.R.5.1 Students can evaluate information and author's purpose about a topic gathered from informational text. (Evaluation)

8.R.5.2 Students can recognize expository, persuasive, and procedural text. (Knowledge)

8.R.5.3 Students can combine new information with existing knowledge to enhance understanding. (Synthesis)

Writing

Indicator 1: Students can apply the writing process to compose text.

8.W.1.1 Students can compose narrative, descriptive, expository, and persuasive text of five paragraphs. (Synthesis)

8.W.1.2 Students can revise writing for ideas and content. (Evaluation)

8.W.1.3 Students can compose text using information from multiple sources to support a topic. (Synthesis)

Indicator 2: Students can apply Standard English conventions in their writing.

8.W.2.1 Students can edit text for run-on sentences and fragments. (Application)

8.W.2.2 Students can identify and incorporate adverbs in the writing process. (Application)

Listening, Viewing, and Speaking Standards

Indicator 1: Students can listen, view, and speak to communicate, retrieve, interpret, and evaluate information.

8.LVS.1.1 Students can evaluate information in auditory and visual communication. (Evaluation)

8.LVS.1.2 Students can analyze audio/visual aids in presentations. (Analysis)

8.LVS.1.3 Students can integrate verbal and nonverbal techniques to deliver an oral presentation for a specific audience and purpose. (Application)

8.LVS.1.4 Students can deliver a persuasive presentation. (Synthesis)

Reading/Language Arts
SOUTH DAKOTA Grade 9 Standards

Reading

Indicator 1: Students can recognize and analyze words.

9.R.1.1 Students can apply example clues to extend vocabulary. (Application)

Indicator 2: Students can comprehend and fluently read text.

9.R.2.1 Students can evaluate text by applying comprehension strategies. (Evaluation)

9.R.2.2 Students can read fluently to comprehend grade-level text. (Application)

Indicator 3: Students can apply knowledge of text structures, literary devices, and literary elements to develop interpretations and form responses.

9.R.3.1 Students can analyze an author's use of literary elements in fiction. (Analysis)

Indicator 4: Students can interpret and respond to diverse, multicultural, and time period texts.

9.R.4.1 Students can analyze text to determine the influence of time period, culture, geography, and author's background. (Analysis)

Indicator 5: Students can access, analyze, synthesize, and evaluate informational texts.

9.R.5.1 Students can evaluate primary and secondary sources for credibility. (Evaluation)

9.R.5.2 Students can interpret procedural text to complete a multiple-step task. (Application)

Writing

Indicator 1: Students can apply the writing process to compose text.

9.W.1.1 Students can write a thesis statement for an expository or persuasive document. (Synthesis)

9.W.1.2 Students can revise a document for sentence fluency. (Evaluation)

9.W.1.3 Students can write an informational document using primary and secondary sources that are listed on a reference page. (Synthesis)

Indicator 2: Students can apply Standard English conventions in their writing.

9.W.2.1 Students can revise text for the correct use of phrases. (Application)

9.W.2.2 Students can identify and incorporate prepositional phrases in the writing process. (Application)

Listening, Viewing, and Speaking

Indicator 1: Students can listen, view, and speak to communicate, retrieve, interpret, and evaluate information.

9.LVS.1.1 Students can analyze the use of images, text, and sound in media for accuracy, validity, and influence. (Analysis)

9.LVS.1.2 Students can implement organizational methods for informative presentations. (Synthesis)

9.LVS.1.3 Students can clarify and defend positions with precise and relevant evidence within an informal setting. (Application)

9.LVS.1.4 Students can support a presentation with audio/visual aids and technology considering audience and purpose. (Application)

Reading/Language Arts
SOUTH DAKOTA Grade 10 Standards

Reading

Indicator 1: Students can recognize and analyze words.

10.R.1.1 ==Students can apply contrast clues== to extend vocabulary. (Analysis)

Indicator 2: Students can comprehend and fluently read text.

10.R.2.1 Students can formulate associations between texts and experiences. (Synthesis)

10.R.2.2 ==Students can read fluently to comprehend grade-level text.== (Application)

Indicator 3: Students can apply knowledge of text structures, literary devices, and literary elements to develop interpretations and form responses.

10.R.3.1 ==Students can analyze an author's style.== (Analysis)

Indicator 4: Students can interpret and respond to diverse, multicultural, and time period texts.

10.R.4.1 ==Students can determine the author's purpose== in multicultural, geographical, and historical texts. (Analysis)

Indicator 5: Students can access, analyze, synthesize, and evaluate informational texts.

10.R.5.1 ==Students can recognize logical fallacies== in sources. (Comprehension)

Writing

Indicator 1: Students can apply the writing process to compose text.

10.W.1.1 Students can write text using problem/solution and cause/effect organizational patterns. (Synthesis)

10.W.1.2 Students can revise a document for voice. (Evaluation)

10.W.1.3 Students can write a research document that cites sources to support a thesis. (Synthesis)

Indicator 2: Students can apply Standard English conventions in their writing.

10.W.2.1 ==Students can edit text for the correct use of active and passive voice.== (Application)

10.W.2.2 ==Students can edit text for the correct use of pronouns and pronoun case.== (Evaluation)

10.W.2.3 Students can edit text for the correct use of quotation marks and italics for quoted material, titles, emphasized words, and dialogue. (Evaluation)

10.W.2.4 ==Students can identify and incorporate conjunctions in the writing process.== (Application)

Listening, Viewing, and Speaking

Indicator 1: Students can listen, view, and speak to communicate, retrieve, interpret, and evaluate information.

10.LVS.1.1 Students can analyze visual and auditory impact on the credibility and reliability of the message. (Analysis)

10.LVS.1.2 Students can evaluate the effectiveness of arguments used by speakers. (Evaluation)

10.LVS.1.3 Students can analyze how verbal and nonverbal communication can influence the interpretation of the message. (Analysis)

10.LVS.1.4 Students can clarify and defend positions with precise and relevant evidence in a formal presentation or speech. (Application)

10.LVS.1.5 Students can monitor audience for nonverbal feedback and adjust delivery in a formal presentation or speech. (Synthesis)

10.LVS.1.6 Students can evaluate the relationship among purpose, audience, and content of speeches or presentations. (Evaluation)

10.LVS.1.7 Students can incorporate verbal techniques in formal speeches or presentations. (Application)

10.LVS.1.8 Students can construct and deliver a variety of formal speeches or presentations. (Synthesis)

Reading/Language Arts
SOUTH DAKOTA Grade 11 Standards

Reading

Indicator 1: Students can recognize and analyze words.

11.R.1.1 Students can apply cause and effect clues to extend vocabulary. (Application)

Indicator 2: Students can comprehend and fluently read text.

11.R.2.1 Students can analyze how diction affects the interpretation of text. (Analysis)

11.R.2.2 Students can read fluently to comprehend grade-level text. (Application)

Indicator 3: Students can apply knowledge of text structures, literary devices, and literary elements to develop interpretations and form responses.

11.R.3.1 Students can analyze and explain literary devices within text. (Analysis)

Indicator 4: Students can interpret and respond to diverse, multicultural, and time period texts.

11.R.4.1 Students can analyze a text within cultural, geographical, and historical context. (Analysis)

Indicator 5: Students can access, analyze, synthesize, and evaluate informational texts.

11.R.5.1 Students can analyze factors that influence the credibility of informational sources. (Analysis)

Writing

Indicator 1: Students can apply the writing process to compose text.

11.W.1.1 Students can write text using comparison/contrast organizational patterns. (Synthesis)

11.W.1.2 Students can write a document analyzing how a work of literature mirrors the themes and issues of its historical period. (Synthesis)

Indicator 2: Students can apply Standard English conventions in their writing.

11.W.2.1 Students can edit text for the correct use of independent and subordinate clauses. (Evaluation)

11.W.2.2 Students can edit for correct use of verbals and verbal phrases. (Evaluation)

11.W.2.3 Students can edit for correct use of semicolons and colons. (Evaluation)

11.W.2.4 Students can edit for correct use of parentheses, dashes, hyphens, and ellipses. (Evaluation)

Listening, Viewing, and Speaking

Indicator 1: Students can listen, view, and speak to communicate, retrieve, interpret, and evaluate information.

11.LVS.1.1 Students can evaluate strategies used in auditory and visual communications to inform, to persuade, and to entertain. (Evaluation)

11.LVS.1.2 Students can evaluate logical and critical thinking used in communication. (Evaluation)

11.LVS.1.3 Students can implement rhetorical devices in oral presentations. (Application)

Reading/Language Arts
SOUTH DAKOTA Grade 12 Standards

Reading

Indicator 1: Students can recognize and analyze words.

12.R.1.1 Students can interpret the meaning of unfamiliar words by selecting context clues. (Synthesis)

Indicator 2: Students can comprehend and fluently read text.

12.R.2.1 Students can evaluate how style affects the meaning of text. (Evaluation)

12.R.2.2 Students can read fluently to comprehend grade-level text. (Application)

Indicator 3: Students can apply knowledge of text structures, literary devices, and literary elements to develop interpretations and form responses.

12.R.3.1 Students can evaluate text for the author's style. (Evaluation)

Indicator 4: Students can interpret and respond to diverse, multicultural, and time period texts.

12.R.4.1 Students can evaluate the depiction of human experience in literary works from diverse cultures, locations, and time periods. (Evaluation)

Indicator 5: Students can access, analyze, synthesize, and evaluate informational texts.

12.R.5.1 Students can synthesize information from multiple sources to analyze issues and to make decisions for research. (Synthesis)

Writing

Indicator 1: Students can apply the writing process to compose text.

12.W.1.1 Students can generate correspondence for workplace or academic settings. (Synthesis)

12.W.1.2 Students can write a research document which will defend a position or recommend a plan of action. (Synthesis)

12.W.1.3 Students can revise document for ideas, organization, diction, fluency, voice, and presentation. (Evaluation)

Indicator 2: Students can apply Standard English conventions in their writing.

12.W.2.1 Students can edit a document for all conventions. (Evaluation)

Listening, Viewing, and Speaking

Indicator 1: Students can listen, view, and speak to communicate, retrieve, interpret, and evaluate information.

12.LVS.1.1 Students can evaluate diction, tone, and syntax used in communication. (Evaluation)

12.LVS.1.2 Students can evaluate the interactions between society and media. (Evaluation)

12.LVS.1.3 Students can narrate a multimedia presentation that combines text, images, and sounds to reflect, to inform, to persuade, or to entertain. (Synthesis)

Mathematics
SOUTH DAKOTA Grade 8 Standards

Algebra

Indicator 1: Use procedures to transform algebraic expressions.

8.A.1.1. Students are able to use properties to expand, combine, and simplify 1st degree algebraic expressions with the set of integers. (Application)

- Properties include associative, commutative, distributive, and identity properties.
- Use order of operations with exponents and nested parentheses.
- Determine if two 1st degree algebraic expressions are equivalent.

Indicator 2: Use a variety of algebraic concepts and methods to solve equations and inequalities.

8.A.2.1. Students are able to write and solve two-step 1st degree equations, with one variable, and one-step inequalities, with one variable, using the set of integers. (Application)

- Inverse operations.
- Addition property of equality.
- Multiplication property of equality.

Indicator 3: Interpret and develop mathematical models.

8.A.3.1. Students are able to describe and determine linear relationships. (Comprehension)

- Determine slope from a line or ordered pairs on a graph.
- Identify x and y intercepts from a graph.

Indicator 4: Describe and use properties and behaviors of relations, functions, and inverses.

8.A.4.1. Students are able to create rules to explain the relationship between numbers when a change in the first variable affects the second variable. (Synthesis)

8.A.4.2. Students are able to describe and represent relations using tables, graphs, and rules. (Analysis)

- Represent situations with patterns and relations to find exact or approximate solutions to problems.
- Make predictions relating two variables using a rule or a graph.

Geometry

Indicator 1: Use deductive and inductive reasoning to recognize and apply properties of geometric figures.

8.G.1.1. Students are able to describe and classify prisms, pyramids, cylinders, and cone. (Application)

- Faces, edges, and vertices.

8.G.1.2. Students, when given any two sides of an illustrated right triangle, are able to use the Pythagorean Theorem to find the third side. (Application)

- Given the formula.
- Using whole numbers for the known values.

Indicator 2: Use properties of geometric figures to solve problems from a variety of perspectives.

8.G.2.1. Students are able to write and solve proportions that express the relationships between corresponding parts of similar quadrilaterals and triangles. (Application)

Measurement

Indicator 1: Apply measurement concepts in practical applications.

8.M.1.1. Students are able to apply proportional reasoning to solve measurement problems with rational number measurements. (Application)

- Conversion within measurement systems.
- Use scale drawings to represent situations.
- Indirect measurement.

8.M.1.2. Students are able to find area, volume, and surface area with whole number measurements.

- Use appropriate unit of measure.
- Apply strategies and/or formulas.
- Volume of rectangular prisms, rectangular pyramids, cylinders, and cones.
- Surface area of rectangular prisms and cylinders.
- Area of composite shapes.

Number Sense

Indicator 1: Analyze the structural characteristics of the real number system and its various subsystems. Analyze the concept of value, magnitude, and relative magnitude of real numbers.

8.N.1.1. Students are able to represent numbers in a variety of forms and identify the subsets of rational numbers. (Comprehension)

- Exponents
- Scientific notation
- Absolute value
- Radicals (perfect squares)
- Graph on a number line

= Measured by EXPLORE Mathematics Test

Indicator 2: Apply number operations with real numbers and other number systems.

8.N.2.1. Students are able to read, write, and compute within any subset of rational numbers. (Application)

- Solve problems involving discount, markup, commission, profit, and simple interest.

Indicator 3: Develop conjectures, predictions, or estimations to solve problems and verify or justify the results.

8.N.3.1. Students are able to use various strategies to solve multi-step problems involving rational numbers. (Application)

- Explain strategies and justify answers.
- Formulate rules to solve practical problems involving rational numbers.
- Use estimation strategies to make predictions and test the reasonableness of the answer.

Statistics & Probability

Indicator 1: Use statistical models to gather, analyze, and display data to draw conclusions.

8.S.1.1. Students are able to find the mean, median, mode, and range of a data set from a stem-and-leaf plot and a line plot. (Comprehension)

8.S.1.2. Students are able to use a variety of visual representations to display data to make comparisons and predictions. (Application)

- Double bar graph
- Double line graph
- Scatterplot

Indicator 2: Apply the concepts of probability to predict events/outcomes and solve problems.

8.S.2.1. Students are able to find the sample space and compute probability for two simultaneous independent events. (Comprehension)

- Express probability as a ratio, decimal, or percent.

Core Mathematics
SOUTH DAKOTA Grades 9-12 Standards

Algebra

Indicator 1: Use procedures to transform algebraic expressions.

9-12.A.1.1. Students are able to write equivalent forms of algebraic expressions using properties of the set of real numbers. (Comprehension)

- Evaluate algebraic expressions.
- Use laws of exponents.
- Use conventional order of operations, including grouping and exponents.

Indicator 2: Use a variety of algebraic concepts and methods to solve equations and inequalities.

9-12.A.2.1. Students are able to use algebraic properties to transform multi-step, single-variable, first-degree equations. (Comprehension)

9-12.A.2.2. Students are able to use algebraic properties to transform multi-step, single-variable, first-degree inequalities and represent solutions using a number line. (Application)

Indicator 3: Interpret and develop mathematical models.

9-12.A.3.1. Students are able to create linear models to represent problem situations. (Application)

- Calculate and interpret slope.

9-12.A.3.2. Students are able to distinguish between linear and nonlinear models. (Comprehension)

Indicator 4: Describe and use properties and behaviors of relations, functions, and inverses.

9-12.A.4.1. Students are able to use graphs, tables, and equations to represent linear functions. (Application)

Geometry

Indicator 1: Use deductive and inductive reasoning to recognize and apply properties of geometric figures.

9-12.G.1.1. Students are able to apply the properties of triangles and quadrilaterals to find unknown parts. (Application)

9-12.G.1.2. Students are able to identify and apply relationships among triangles. (Application)

- Definitions and postulates
- Similarity theorems
- Congruence theorems

Indicator 2: Use properties of geometric figures to solve problems from a variety of perspectives.

9-12.G.2.1. Students are able to recognize the relationship between a three-dimensional figure and its two-dimensional representation. (Analysis)

- Interpret floor plans.
- Follow instructions for assembly of a product, e.g., "some assembly required."

9-12.G.2.2. Students are able to reflect across vertical or horizontal lines, and translate two-dimensional figures. (Application)

- Identify lines of symmetry.
- Use the coordinate plane.

9-12.G.2.3. Students are able to use proportions to solve problems. (Application)

Measurement

Indicator 1: Apply measurement concepts in practical applications.

9-12.M.1.1. Students are able to choose appropriate unit label, scale, and precision. (Comprehension)

- Determine appropriate scales for histograms, scatterplots, and other graphs.

9-12.M.1.2. Students are able to use suitable units when describing rate of change. (Comprehension)

9-12.M.1.3. Students are able to use formulas to find perimeter, circumference, and area to solve problems involving common geometric figures. (Application)

- Use algebraic expressions with geometric formulas.

Number Sense

Indicator 1: Analyze the structural characteristics of the real number system and its various subsystems. Analyze the concept of value, magnitude, and relative magnitude of real numbers.

9-12.N.1.1. Students are able to identify multiple representations of a real number. (Comprehension)

- Given a real number identify the subset(s) of real numbers to which it belongs.
- Represent rational and irrational numbers in different forms.

9-12.N.1.2. Students are able to apply the concept of place value, magnitude, and relative magnitude of real numbers. (Comprehension)

- Scientific notation
- Infinitely many solutions
- Completeness of the real numbers (density, i.e. between any two real numbers is another real number)

Indicator 2: Apply number operations with real numbers and other number systems.

9-12.N.2.1. Students are able to add, subtract, multiply, and divide real numbers including integral exponents. (Comprehension)

Indicator 3: Develop conjectures, predictions, or estimations to solve problems and verify or justify the results.

9-12.N.3.1. Students are able to use estimation strategies in problem situations to predict results and to check the reasonableness of results. (Analysis)

- Use rounding as an estimation strategy.
- Use non-routine estimation strategies.

9-12.N.3.2. Students are able to select alternative computational strategies and explain the chosen strategy. (Comprehension)

- Use properties of numbers that allow operational shortcuts for computational procedures.

Statistics & Probability

Indicator 1: Use statistical models to gather, analyze, and display data to draw conclusions.

9-12.S.1.1. Students are able to draw conclusions from a set of data. (Analysis)

- Determine and use appropriate statistical values.
- Determine which questions can or cannot be answered from a given data set.

9-12.S.1.2. Students are able to compare multiple one-variable data sets, using range, interquartile range, mean, mode, and median. (Comprehension)

9-12.S.1.3. Represent a set of data in a variety of graphical forms and draw conclusions. (Analysis)

- Make a scatterplot to draw a regression line and make predictions.
- Make a box-and-whisker plot to model a set of one-variable data.
- Make a histogram from a frequency distribution.

Indicator 2: Apply the concepts of probability to predict events/outcomes and solve problems.

9-12.S.2.1. Students are able to distinguish between experimental and theoretical probability. (Knowledge)

9-12.S.2.2. Students are able to predict outcomes of simple events using given theoretical probabilities. (Comprehension)

- Determine the sample space of an experiment.

Advanced Mathematics
SOUTH DAKOTA Grades 9-12 Standards

Algebra

Indicator 1: Use procedures to transform algebraic expressions.

9-12.A.1.1A. Students are able to write equivalent forms of rational algebraic expressions using properties of real numbers. (Application)

9-12.A.1.2A. Students are able to extend the use of real number properties to expressions involving complex numbers. (Application)

Indicator 2: Use a variety of algebraic concepts and methods to solve equations and inequalities.

9-12.A.2.1A. Students are able to determine solutions of quadratic equations. (Analysis)

- Use the quadratic formula.
- Use the discriminant, $b^2 - 4ac$, to describe the nature of the roots.

9-12.A.2.2A. Students are able to determine the solution of systems of equations and systems of inequalities. (Application)

9-12.A.2.3A. Students are able to determine solutions to absolute value statements. (Application)

Indicator 3: Interpret and develop mathematical models.

9-12.A.3.1A. Students are able to distinguish between linear, quadratic, inverse variation, and exponential models. (Analysis)

9-12.A.3.2A. Students are able to create formulas to model relationships that are algebraic, geometric, trigonometric, and exponential. (Synthesis)

9-12.A.3.3A. Students are able to use sequences and series to model relationships. (Analysis)

Indicator 4: Describe and use properties and behaviors of relations, functions, and inverses.

9-12.A.4.1A. Students are able to determine the domain, range, and intercepts of a function. (Analysis)

9-12.A.4.2A. Students are able to describe the behavior of a polynomial, given the leading coefficient, roots, and degree. (Analysis)

9-12.A.4.3A. Students are able to apply transformations to graphs and describe the results. (Analysis)

- Change coefficients and/or constants.
- Graph the inverse of a function.

9-12.A.4.4A. Students are able to apply properties and definitions of trigonometric, exponential, and logarithmic expressions. (Application)

9-12.A.4.5A. Students are able to describe characteristics of nonlinear functions and relations. (Analysis)

- Conic sections
- Trigonometric functions
- Exponential and logarithmic functions

9-12.A.4.6A. Students are able to graph solutions to linear inequalities. (Application)

Geometry

Indicator 1: Use deductive and inductive reasoning to recognize and apply properties of geometric figures.

9-12.G.1.1A. Students are able to justify properties of geometric figures. (Evaluation)

9-12.G.1.2A. Students are able to determine the values of the sine, cosine, and tangent ratios of right triangles. (Evaluation)

9-12.G.1.3A. Students are able to apply properties associated with circles. (Application)

9-12.G.1.4A. Students are able to use formulas for surface area and volume to solve problems involving three-dimensional figures. (Analysis)

9-12.G.2.1A. Students are able to use Cartesian coordinates to verify geometric properties. (Synthesis)

Measurement

Indicator 1: Apply measurement concepts in practical applications.

9-12.M.1.1A. Students are able to use dimensional analysis to check answers and determine units of a problem solution. (Application)

9-12.M.1.2A. Students are able to use indirect measurement in problem situations that defy direct measurement. (Analysis)

Number Sense

Indicator 1: Analyze the structural characteristics of the real number system and its various subsystems. Analyze the concept of value, magnitude, and relative magnitude of real numbers.

9-12.N.1.1A. Students are able to describe the relationship of the real number system to the complex number system. (Comprehension)

9-12.N.1.2A. Students are able to apply properties and axioms of the real number system to various subsets, e.g., axioms of order, closure. (Application)

Indicator 2: Apply number operations with real numbers and other number systems.

9-12.N.2.1A. Students are able to add, subtract, multiply, and divide real numbers including rational exponents. (Application)

- Simplify numeric expressions with radicals.

Indicator 3: Develop conjectures, predictions, or estimations to solve problems and verify or justify the results.

Statistics & Probability

Indicator 1: Use statistical models to gather, analyze, and display data to draw conclusions.

9-12.S.1.1A. Students are able to analyze and evaluate the design of surveys and experiments. (Evaluation)

9-12.S.1.2A. Students are able to analyze and evaluate graphical displays of data. (Evaluation)

9-12.S.1.3A. Students are able to compare multiple one-variable data sets, using standard deviation and variance. (Analysis)

- Calculate the standard deviation and variance of a data set.

9-12.S.1.4A. Students are able to describe the normal curve and use it to make predictions.

9-12.S.1.5A. Students are able to use scatterplots, best-fit lines, and correlation coefficients to model data and support conclusions. (Application)

Indicator 2: Apply the concepts of probability to predict events/outcomes and solve problems.

9-12.S.2.1A. Students are able to use probabilities to solve problems. (Application)

- Compute combinations, permutations.
- Interpret tables.
- Create and use tree diagrams.

9-12.S.2.2A. Students are able to determine probability of compound, complementary, independent, and mutually exclusive events. (Application)

9-12.S.2.3A. Students are able to generate data and use the data to determine empirical (experimental) probabilities. (Analysis)

Nature of Science

Indicator 1: Understand the nature and origin of scientific knowledge.

8.N.1.1. Students are able to differentiate among facts, predictions, theory, and law/principles in scientific investigations. (Comprehension)

- Define fact, predictions, theory, and law/principle.
- Discuss how theory can become law.

Indicator 2: Apply the skills necessary to conduct scientific investigations.

8.N.2.1. Students are able to design a replicable scientific investigation. (Synthesis)

- Use appropriate supportive technologies.
- Assess the limits of accuracy inherent in a particular measuring device or procedure.
- Control variables to test hypotheses by repeated trials and by identifying sources of experimental error.
- Interpret data to justify predictions or conclusions.
- Use research methods to investigate practical and/or personal scientific problems and questions.
- Select appropriate scientific equipment and technologies for investigations and experiments.
- Use proper safety procedures in all investigations.
- Wear appropriate attire.

Physical Science

Indicator 1: Describe structures and properties of, and changes in, matter.

8.P.1.1. Students are able to classify matter as elements, compounds, or mixtures. (Analysis)

8.P.1.2. Students are able to use the Periodic Table to compare and contrast families of elements and to classify elements as metals, metalloids, or non-metals. (Application)

- Describe the relationship between the organization and the predictive nature of the Periodic Table.
- Use the Bohr model to show the arrangement of the subatomic particles of atomic numbers 1 through 18.

8.P.1.3. Students are able to compare properties of matter resulting from physical and chemical changes. (Comprehension)

Indicator 2: Analyze forces, their forms, and their effects on motions.

Indicator 3: Analyze interactions of energy and matter.

Earth/Space Science

Indicator 1: Analyze the various structures and processes of the Earth system.

8.E.1.1. Students are able to identify and classify minerals and rocks. (Application)

- Rocks as sedimentary, igneous, or metamorphic.
- Rock Cycle
- Minerals as carbonates (CO3) or Silicates (SiO2)

8.E.1.2. Students are able to explain the role of plate tectonics in shaping Earth. (Analysis)

- Plates boundaries
- Volcanoes
- Earthquakes
- Seismic waves
- Mountains
- Convection currents in the mantle
- Changes over time

8.E.1.3. Students are able to explain the factors that create weather and the instruments and technologies that assess it. (Analysis)

- Differentiate between climate and climate zones.

8.E.1.4. Students are able to examine the chemical and physical properties of the ocean to determine causes and effects of currents and waves. (Application)

8.E.1.5. Students are able to explain the impact of weathering and erosion on the Earth. (Analysis)

- Soil formation
- Deposition (deltas)
- Land transformations (Grand Canyon)
- Glaciation

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

Indicator 2: Analyze essential principles and ideas about the composition and structure of the universe.

8.E.2.1. Students are able to compare celestial bodies within the solar system using composition, size, and orbital motion. (Analysis)

- Describe the composition of the Sun, the planets, asteroids, and comets.

8.E.2.2. Students are able to differentiate the influences of the relative positions of the Earth, Moon, and Sun. (Analysis)

- Lunar and solar eclipses, moon phases, tides, seasons

Science, Technology, Environment, and Society

Indicator 1: Analyze various implications/effects of scientific advancement within the environment and society.

8.S.1.1. Students are able to describe how science and technology have been influenced by social needs, attitudes, and values. (Comprehension)

Indicator 2: Analyze the relationships/interactions among science, technology, environment, and society.

8.S.2.1. Students are able, given a scenario, to offer solutions to problems created by human activity on the local, regional, or global environment.

Nature of Science

Indicator 1: Understand the nature and origin of scientific knowledge.

9-12.N.1.1. Students are able to evaluate a scientific discovery to determine and describe how societal, cultural, and personal beliefs influence scientific investigations and interpretations. (Evaluation)

- Recognize scientific knowledge is not merely a set of static facts but is dynamic and affords the best current explanations.

- Discuss how progress in science can be affected by social issues.

9-12.N.1.2. Students are able to describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws. (Synthesis)

- Research, communicate, and support a scientific argument.

- Recognize and analyze alternative explanations and models.

- Evaluate the scientific accuracy of information relevant to a specific issue (pseudo-science).

Indicator 2: Apply the skills necessary to conduct scientific investigations.

9-12.N.2.1. Students are able to apply science process skills to design and conduct student investigations. (Synthesis)

- Identify the questions and concepts to guide the development of hypotheses.

- Analyze primary sources of information to guide the development of the procedure.

- Select and use appropriate instruments to extend observations and measurements.

- Revise explanations and models based on evidence and logic.

- Use technology and mathematic skills to enhance investigations, communicate results, and defend conclusions.

9-12.N.2.2. Students are able to practice safe and effective laboratory techniques. (Application)

- Handle hazardous materials properly.

- Use safety equipment correctly.

- Practice emergency procedure.

- Wear appropriate attire.

- Practice safe behaviors.

Physical Science

Indicator 1: Describe structures and properties of, and changes in, matter

9-12.P.1.1. Students are able to use the Periodic Table to determine the atomic structure of elements, valence number, family relationships, and regions (metals, nonmetals, and metalloids). (Analysis)

- Determine protons, neutrons, electrons, mass number, and atomic number from the Periodic Table.

- Determine the number of valence electrons for elements in the main (s&p) blocks of the Periodic Table.

- Identify the relative metallic character of an element based on its location on the Periodic Table.

9-12.P.1.2. Students are able to describe ways that atoms combine. (Comprehension)

- Name and write formulas for binary ionic and covalent compounds.

- Compare the roles of electrons in covalent, ionic, and metallic bonding.

- Discuss the special nature of carbon covalent bonds.

9-12.P.1.3. Students are able to predict whether reactions will speed up or slow down as conditions change. (Application)

9-12.P.1.4. Students are able to balance chemical equations by applying the Law of Conservation of Matter. (Application)

- Trace number of particles in diagrams and pictures of balanced equations.

9-12.P.1.5. Students are able to distinguish among chemical, physical, and nuclear changes. (Comprehension)

- Differentiate between physical and chemical properties used to describe matter.

- Identify key indicators of chemical and physical changes.

- Describe the effects of changing pressure, volume, or temperature upon gases.

- Identify characteristics of a solution and factors that affect the rate of solution formation.

- Explain the differences among nuclear, chemical, and physical changes at the atomic level.

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

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

Indicator 2: Analyze forces, their forms, and their effects on motions.

9-12.P.2.1. Students are able to apply concepts of distance and time to the quantitative relationships of motion using appropriate mathematical formulas, equations, and units. (Analysis)

- Evaluate speed, velocity, and acceleration both qualitatively and quantitatively.
- Given distance and time, calculate the velocity or speed of an object.
- Create and interpret graphs of linear motion.
- Distinguish between velocity and acceleration as related to force.

9-12.P.2.2. Students are able to predict motion of an object using Newton's Laws. (Application)

- Describe how inertia is related to Newton's First Law.
- Explain the effect of balanced and unbalanced forces.
- Identify the forces at work on action/reaction pairs as distinguished from balanced forces.
- Explain how force, mass, and acceleration are related.

9-12.P.2.3. Students are able to relate concepts of force, distance, and time to the quantitative relationships of work, energy, and power. (Application)

- Apply appropriate mathematical formulas and equations to concepts using appropriate units.

Indicator 3: Analyze interactions of energy and matter.

9-12.P.3.1. Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy. (Application)

- Describe how energy can be transferred and transformed to produce useful work.
- Given the formulas, calculate the mechanical advantage and efficiency of selected systems.
- Explain methods of heat transfer.

9-12.P.3.2. Students are able to describe how characteristics of waves are related to one another. (Comprehension)

- Relate wavelength, speed, and frequency ($v = f$).
- Distinguish between transverse and longitudinal waves.

9-12.P.3.3. Students are able to describe electrical effects in terms of motion and concentrations of charged particles. (Application)

- Relate potential difference to current.
- Describe how static electricity is different from current electricity.
- Interpret and apply Ohm's Law.
- Describe electrical attractions and repulsions.
- Describe how magnetism originates from motion of charged particles.

Life Science

Indicator 1: Understand the fundamental structures, functions, classifications, and mechanisms found in living things.

9-12.L.1.1. Students are able to relate cellular functions and processes to specialized structures within cells. (Analysis)

- Transport
- Photosynthesis and respiration
- Storage and transfer of genetic information
- Cell life cycles

9-12.L.1.2. Students are able to classify organisms using characteristics and evolutionary relationship of major taxa. (Application)

- Kingdoms
- Phyla

9-12.L.1.3. Students are able to identify structures and function relationships within major taxa. (Analysis)

Indicator 2: Analyze various patterns and products of natural and induced biological change.

9-12.L.2.1. Students are able to predict inheritance patterns using a single allele. (Application)

- Solve problems involving simple dominance, co-dominance, and sex-linked traits using Punnett squares for F1 and F2 generations.
- Discuss disorders resulting from alteration of a single gene.

9-12.L.2.2. Students are able to describe how genetic recombination, mutations, and natural selection lead to adaptations, evolution, extinction, or the emergence of new species. (Synthesis)

- Use comparative anatomy to support evolutionary relationships.

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

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

Indicator 3: Analyze how organisms are linked to one another and the environment.

9-12.L.3.1. Students are able to identify factors that can cause changes in stability of populations, communities, and ecosystems. (Comprehension)

- Define populations, communities, ecosystems, niches and symbiotic relationships.
- Predict the results of biotic and abiotic interactions.

Earth/Space Science

Indicator 1: Analyze the various structures and processes of the Earth system.

9-12.E.1.1. Students are able to explain how elements and compounds cycle between living and non-living systems. (Comprehension)

- Diagram and describe the N, C, O and H_2O cycles.
- Describe the importance of the N, C, O and H_2O cycles to life on this planet.

9-12.E.1.2. Students are able to describe how atmospheric chemistry may affect global climate. (Application)

9-12.E.1.3. Students are able to assess how human activity has changed the land, ocean, and atmosphere of Earth. (Analysis)

Indicator 2: Analyze essential principles and ideas about the composition and structure of the universe.

9-12.E.2.1. Students are able to recognize how Newtonian mechanics can be applied to the study of the motions of the solar system. (Comprehension)

- Given a set of possible explanations of orbital motion (revolution), identify those that make use of gravitational forces and inertia.

Science, Technology, Environment, and Society

Indicator 1: Analyze various implications/effects of scientific advancement within the environment and society.

9-12.S.1.1. Students are able to explain ethical roles and responsibilities of scientists and scientific research. (Application)

9-12.S.1.2. Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues. (Evaluation)

Indicator 2: Analyze the relationships/interactions among science, technology, environment, and society.

9-12.S.2.1. Students are able to describe immediate and long-term consequences of potential solutions for technological issues. (Evaluation)

- Describe how the pertinent technological system operates.

9-12.S.2.2. Students are able to analyze factors that could limit technological design. (Analysis)

9-12.S.2.3. Students are able to analyze and describe the benefits, limitations, cost, and consequences involved in using, conserving, or recycling resources. (Synthesis)

Advanced Science
SOUTH DAKOTA Grades 9-12 Standards

Nature of Science

Indicator 1: Understand the nature and origin of scientific knowledge.

Indicator 2: Apply the skills necessary to conduct scientific investigations.

9-12.N.2.1A. Students are able to manipulate multiple variables with repeated trials. (Synthesis)

- Use a control and change one variable at a time.

9-12.N.2.2A. Students are able to use statistical analysis of data to evaluate the validity of results. (Evaluation)

- Use correlation coefficient with graphs.

9-12.N.2.3A. Students are able to demonstrate correct precision in measurements and calculations. (Analysis)

- Use significant digits to illustrate precision in measurement.
- Factor label conversion, scientific notation.

Physical Science

Indicator 1: Describe structures and properties of, and changes in, matter.

9-12.P.1.1A. Students are able to distinguish between the changing models of the atom using the historical experimental evidence. (Analysis)

9-12.P.1.2A. Students are able to predict electron configuration, ion formation, reactivity, compound formation, periodic trends, and types of compounds formed based on location on the Periodic Table. (Synthesis)

9-12.P.1.3A. Students are able to identify five basic types of chemical reactions and predict the products. (Synthesis)

- Single replacement, double replacement, synthesis, decomposition, and combustion reactions
- Describe the properties and interactions of acids, bases, and salts.
- Calculate pH, pOH, $[H_3O^+]$, $[OH^-]$.
- Distinguish between Arrhenius, Bronsted-Lowry, and Lewis definitions of acids and bases.

9-12.P.1.4A. Students are able to describe factors that affect solution interactions. (Synthesis)

- Calculate concentration of solutions.
- "Like dissolves like"
- Vander Waal's forces

9-12.P.1.5A. Students are able to examine energy transfer as matter changes. (Application)

- Describe physical and chemical processes that result in endothermic and exothermic changes.
- Describe energy transfer as matter changes from one phase to another.

9-12.P.1.6A. Students are able to perform stoichiometric calculations. (Application)

- Convert between moles, mass, particles, volume.
- Calculate empirical and molecular formulas from mass percents.
- Determine limiting and excess reactants and percent yield in chemical reactions.

9-12.P.1.7A. Students are able to apply the kinetic molecular theory to solve quantitative problems involving pressure, volume, temperature, and number of moles of gas. (Application)

- Apply Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law, and Ideal Gas Law.

9-12.P.1.8A. Students are able to use models to make predictions about molecular structure, chemical bonds, chemical reactivity, and polarity of molecules. (Synthesis)

- Create Lewis structures for molecules and polyatomic ions.
- Determine molecular shape using VSEPR theory.
- Determine the polarity of a molecule.

9-12.P.1.9A. Students are able to describe the characteristics of equilibria. (Analysis)

- Apply LeChatelier's principle to equilibrium reactions.
- Identify factors that drive reactions toward completion.
- Calculate K_{eq} values for equilibrium reactions.

Indicator 2: Analyze forces, their forms, and their effects on motions.

9-12.P.2.1A. Students are able to solve vector problems graphically and analytically. (Synthesis)

- Define and manipulate vectors and scalars.
- Determine if an object is in equilibrium and distinguish among stable, neutral, and unstable equilibria.

9-12.P.2.2A. Students are able to relate gravitational or centripetal force to projectile or uniform circular motion. (Analysis)

- Analyze and graph projectile motion.

Indicator 3: Analyze interactions of energy and matter.

9-12.P.3.1A. Students are able to explain wave behavior in the fundamental processes of reflection, refraction, diffraction, interference, resonance, and image formation. (Synthesis)

- Construct ray diagrams to show the relationship between image and focal point.
- Compare properties of images (real vs virtual).
- Identify situations when diffraction occurs.
- Identify conditions necessary for refraction to occur.

9-12.P.3.2A. Students are able to describe the relationship between charged particles, static electricity, and electric fields. (Application)

- Use Coulomb's Law to calculate forces.
- Explain methods of transferring charge.
- Describe the direction and general shape of electric fields.

9-12.P.3.3A. Students are able to describe the relationship between changing magnetic and electric fields. (Analysis)

- Explain the properties of magnetic fields.
- Describe how electric and magnetic fields can induce each other.

Life Science

Indicator 1: Understand the fundamental structures, functions, classifications, and mechanisms found in living things.

9-12.L.1.1A. Students are able to explain the physical and chemical processes of photosynthesis and cell respiration and their importance to plant and animal life. (Synthesis)

9-12.L.1.2A. Students are able to describe how living systems use biofeedback mechanisms to maintain homeostasis. (Synthesis)

9-12.L.1.3A. Students are able to explain how gene expression regulates cell growth and differentiation. (Synthesis)

9-12.L.1.4A. Students are able to identify factors that change the rates of enzyme catalyzed reactions. (Application)

9-12.L.1.5A. Students are able to classify organisms using characteristics and evolutionary relationships of domains. (Analysis)

Indicator 2: Analyze various patterns and products of natural and induced biological change.

9-12.L.2.1A. Students are able to predict the results of complex inheritance patterns involving multiple alleles and genes. (Synthesis)

- Relate crossing over to genetic variation.
- Evaluate changes in gene frequencies in populations to see if Hardy-Weinberg equilibrium exists or evolution has occurred.

Indicator 3: Analyze how organisms are linked to one another and the environment.

9-12.L.3.1A. Students are able to relate genetic, instinct, and behavior patterns to biodiversity and survival of species. (Synthesis)

- Compare and contrast learned behavior vs instinct.
- Relate the introduction of non-native species to the disruption of an ecosystem.

Earth/Space Science

Indicator 1: Analyze the various structures and processes of the Earth system.

9-12.E.1.1A. Students are able to explain how elements and compounds cycle between living and non-living systems. (Application)

- Diagram and describe the P, S, and Ca cycles.

9-12.E.1.2A. Students are able to compare, quantitatively and qualitatively, methods used to determine geological time. (Analysis)

- Construct a geologic time scale over the past 4.8 billion years.

Indicator 2: Analyze essential principles and ideas about the composition and structure of the universe.

9-12.E.2.1A. Students are able to describe the evidence supporting the Big Bang theory. (Analysis)

- Describe the four fundamental forces.
- Describe the organization of the solar system, the Milky Way galaxy, and the universe of galaxies.
- Examine the changing model of the universe using historical experimental evidence.

9-12.E.2.2A. Students are able to describe the physical and nuclear dynamics involved in the formation, evolution, and death of a star. (Analysis)

- Use the H-R diagram to determine the life stage of a star.
- Discuss how gravitational forces and the products of nuclear fusion reactions affect the dynamics of a star.

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9-12.E.2.3A. Students are able to describe various ways data about the universe is collected. (Application)

- Describe how information is collected from star light.
- Describe the use of instruments to collect data.
- Describe methods of measuring astronomical distance.

Science, Technology, Environment, and Society

Indicator 1: Analyze various implications/effects of scientific advancement within the environment and society.

Indicator 2: Analyze the relationships/interactions among science, technology, environment, and society.

Section C: ACT's College Readiness Standards Included in South Dakota'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 the EXPLORE, PLAN, and ACT.

In this section (Section C), the ACT College Readiness Standards included in South Dakota's Standards are highlighted. Standards not highlighted are those that include specific content, complexity, and/or proficiency level descriptors that ACT content experts determined were not included in South Dakota's Standards.

Table C-1. ACT's College Readiness Standards — English

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

Table C-1. ACT's College Readiness Standards — English (continued)

	Sentence Structure and Formation	Conventions of Usage	Conventions of Punctuation
13–15	Use conjunctions or punctuation to join simple clauses Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences	Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives	Delete commas that create basic sense problems (e.g., between verb and direct object)
16–19	Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences Decide the appropriate verb tense and voice by considering the meaning of the entire sentence	Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject-verb and pronoun-antecedent agreement, and which preposition to use in simple contexts Recognize and use the appropriate word in frequently confused pairs such as *there* and *their*, *past* and *passed*, and *led* and *lead*	Provide appropriate punctuation in straightforward situations (e.g., items in a series) Delete commas that disturb the sentence flow (e.g., between modifier and modified element)
20–23	Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers)	Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., *long for*, *appeal to*) Ensure that a verb agrees with its subject when there is some text between the two	Use commas to set off simple parenthetical phrases Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause)
24–27	Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence	Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences Identify the correct past and past participle forms of irregular and infrequently used verbs and form present-perfect verbs by using *have* rather than *of*	Use punctuation to set off complex parenthetical phrases Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by *and*) Use apostrophes to indicate simple possessive nouns Recognize inappropriate uses of colons and semicolons
28–32	Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole	Correctly use reflexive pronouns, the possessive pronouns *its* and *your*, and the relative pronouns *who* and *whom* Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject-verb order is inverted or when the subject is an indefinite pronoun)	Use commas to set off a nonessential/nonrestrictive appositive or clause Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical) Use an apostrophe to show possession, especially with irregular plural nouns Use a semicolon to indicate a relationship between closely related independent clauses
33–36	Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses	Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb	Use a colon to introduce an example or an elaboration

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Table C-2. ACT's College Readiness Standards — Reading

	Main Ideas and Author's Approach	Supporting Details
13–15	Recognize a clear intent of an author or narrator in uncomplicated literary narratives	Locate basic facts (e.g., names, dates, events) clearly stated in a passage
16–19	Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives	Locate simple details at the sentence and paragraph level in uncomplicated passages Recognize a clear function of a part of an uncomplicated passage
20–23	Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages	Locate important details in uncomplicated passages Make simple inferences about how details are used in passages
24–27	Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages Infer the main idea or purpose of straightforward paragraphs in more challenging passages Summarize basic events and ideas in more challenging passages Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages	Locate important details in more challenging passages Locate and interpret minor or subtly stated details in uncomplicated passages Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages
28–32	Infer the main idea or purpose of more challenging passages or their paragraphs Summarize events and ideas in virtually any passage Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage	Locate and interpret minor or subtly stated details in more challenging passages Use details from different sections of some complex informational passages to support a specific point or argument
33–36	Identify clear main ideas or purposes of complex passages or their paragraphs	Locate and interpret details in complex passages Understand the function of a part of a passage when the function is subtle or complex

Descriptions of the ACT Reading Passages

Uncomplicated Literary Narratives refers to excerpts from essays, short stories, and novels that tend to use simple language and structure, have a clear purpose and a familiar style, present straightforward interactions between characters, and employ only a limited number of literary devices such as metaphor, simile, or hyperbole.

More Challenging Literary Narratives refers to excerpts from essays, short stories, and novels that tend to make moderate use of figurative language, have a more intricate structure and messages conveyed with some subtlety, and may feature somewhat complex interactions between characters.

Complex Literary Narratives refers to excerpts from essays, short stories, and novels that tend to make generous use of ambiguous language and literary devices, feature complex and subtle interactions between characters, often contain challenging context-dependent vocabulary, and typically contain messages and/or meanings that are not explicit but are embedded in the passage.

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Table C-2. ACT's College Readiness Standards — Reading (continued)

	Sequential, Comparative, and Cause-Effect Relationships	Meanings of Words	Generalizations and Conclusions
13–15	Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages Recognize clear cause-effect relationships described within a single sentence in a passage	Understand the implication of a familiar word or phrase and of simple descriptive language	Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives
16–19	Identify relationships between main characters in uncomplicated literary narratives Recognize clear cause-effect relationships within a single paragraph in uncomplicated literary narratives	Use context to understand basic figurative language	Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages
20–23	Order simple sequences of events in uncomplicated literary narratives Identify clear relationships between people, ideas, and so on in uncomplicated passages Identify clear cause-effect relationships in uncomplicated passages	Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages	Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages Draw simple generalizations and conclusions using details that support the main points of more challenging passages
24–27	Order sequences of events in uncomplicated passages Understand relationships between people, ideas, and so on in uncomplicated passages Identify clear relationships between characters, ideas, and so on in more challenging literary narratives Understand implied or subtly stated cause-effect relationships in uncomplicated passages Identify clear cause-effect relationships in more challenging passages	Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages	Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives Draw generalizations and conclusions about people, ideas, and so on in more challenging passages
28–32	Order sequences of events in more challenging passages Understand the dynamics between people, ideas, and so on in more challenging passages Understand implied or subtly stated cause-effect relationships in more challenging passages	Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts	Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on
33–36	Order sequences of events in complex passages Understand the subtleties in relationships between people, ideas, and so on in virtually any passage Understand implied, subtle, or complex cause-effect relationships in virtually any passage	Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage	Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage Understand and generalize about portions of a complex literary narrative

Uncomplicated Informational Passages refers to materials that tend to contain a limited amount of data, address basic concepts using familiar language and conventional organizational patterns, have a clear purpose, and are written to be accessible.

More Challenging Informational Passages refers to materials that tend to present concepts that are not always stated explicitly and that are accompanied or illustrated by more—and more detailed—supporting data, include some difficult context-dependent words, and are written in a somewhat more demanding and less accessible style.

Complex Informational Passages refers to materials that tend to include a sizable amount of data, present difficult concepts that are embedded (not explicit) in the text, use demanding words and phrases whose meaning must be determined from context, and are likely to include intricate explanations of processes or events.

Table C-3. ACT's College Readiness Standards — Writing

	Expressing Judgments	Focusing on the Topic	Developing a Position
3–4	Show a little understanding of the persuasive purpose of the task but neglect to take or to maintain a position on the issue in the prompt Show limited recognition of the complexity of the issue in the prompt	Maintain a focus on the general topic in the prompt through most of the essay	Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas Show little or no movement between general and specific ideas and examples
5–6	Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position	Maintain a focus on the general topic in the prompt throughout the essay	Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas Show little movement between general and specific ideas and examples
7–8	Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt Show some recognition of the complexity of the issue in the prompt by acknowledging counterarguments to the writer's position providing some response to counter-arguments to the writer's position	Maintain a focus on the general topic in the prompt throughout the essay and attempt a focus on the specific issue in the prompt Present a thesis that establishes focus on the topic	Develop ideas by using some specific reasons, details, and examples Show some movement between general and specific ideas and examples
9–10	Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion Show recognition of the complexity of the issue in the prompt by partially evaluating implications and/or complications of the issue, and/or posing and partially responding to counter-arguments to the writer's position	Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay Present a thesis that establishes a focus on the writer's position on the issue	Develop most ideas fully, using some specific and relevant reasons, details, and examples Show clear movement between general and specific ideas and examples
11–12	Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion Show understanding of the complexity of the issue in the prompt by examining different perspectives, and/or evaluating implications or complications of the issue, and/or posing and fully discussing counter-arguments to the writer's position	Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay Present a critical thesis that clearly establishes the focus on the writer's position on the issue	Develop several ideas fully, using specific and relevant reasons, details, and examples Show effective movement between general and specific ideas and examples

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Table C-3. ACT's College Readiness Standards — Writing (continued)

	Organizing Ideas	Using Language
3–4	Provide a discernible organization with some logical grouping of ideas in parts of the essay Use a few simple and obvious transitions Present a discernible, though minimally developed, introduction and conclusion	Show limited control of language by correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding using simple vocabulary using simple sentence structure
5–6	Provide a simple organization with logical grouping of ideas in parts of the essay Use some simple and obvious transitional words, though they may at times be inappropriate or misleading Present a discernible, though underdeveloped, introduction and conclusion	Show a basic control of language by correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding using simple but appropriate vocabulary using a little sentence variety, though most sentences are simple in structure
7–8	Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas Use some simple and obvious, but appropriate, transitional words and phrases Present a discernible introduction and conclusion with a little development	Show adequate use of language to communicate by correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding using appropriate vocabulary using some varied kinds of sentence structures to vary pace
9–10	Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas Present a somewhat developed introduction and conclusion	Show competent use of language to communicate ideas by correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding using some precise and varied vocabulary using several kinds of sentence structures to vary pace and to support meaning
11–12	Provide unity and coherence throughout the essay, often with a logical progression of ideas Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas Present a well-developed introduction and conclusion	Show effective use of language to clearly communicate ideas by correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors using precise and varied vocabulary using a variety of kinds of sentence structures to vary pace and to support meaning

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Table C-4. ACT's College Readiness Standards — Mathematics

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

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Table C-4. ACT's College Readiness Standards — Mathematics (continued)

	Graphical Representations	Properties of Plane Figures	Measurement	Functions
13–15	Identify the location of a point with a positive coordinate on the number line		Estimate or calculate the length of a line segment based on other lengths given on a geometric figure	
16–19	Locate points on the number line and in the first quadrant	Exhibit some knowledge of the angles associated with parallel lines	Compute the perimeter of polygons when all side lengths are given Compute the area of rectangles when whole number dimensions are given	
20–23	Locate points in the coordinate plane Comprehend the concept of length on the number line Exhibit knowledge of slope	Find the measure of an angle using properties of parallel lines Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	Compute the area and perimeter of triangles and rectangles in simple problems Use geometric formulas when all necessary information is given	Evaluate quadratic functions, expressed in function notation, at integer values
24–27	Identify the graph of a linear inequality on the number line Determine the slope of a line from points or equations Match linear graphs with their equations Find the midpoint of a line segment	Use several angle properties to find an unknown angle measure Recognize Pythagorean triples Use properties of isosceles triangles	Compute the area of triangles and rectangles when one or more additional simple steps are required Compute the area and circumference of circles after identifying necessary information Compute the perimeter of simple composite geometric figures with unknown side lengths	Evaluate polynomial functions, expressed in function notation, at integer values Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths
28–32	Interpret and use information from graphs in the coordinate plane Match number line graphs with solution sets of linear inequalities Use the distance formula Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle)	Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles Use the Pythagorean theorem	Use relationships involving area, perimeter, and volume of geometric figures to compute another measure	Evaluate composite functions at integer values Apply basic trigonometric ratios to solve right-triangle problems
33–36	Match number line graphs with solution sets of simple quadratic inequalities Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$ Solve problems integrating multiple algebraic and/or geometric concepts Analyze and draw conclusions based on information from graphs in the coordinate plane	Draw conclusions based on a set of conditions Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas Use relationships among angles, arcs, and distances in a circle	Use scale factors to determine the magnitude of a size change Compute the area of composite geometric figures when planning or visualization is required	Write an expression for the composite of two simple functions Use trigonometric concepts and basic identities to solve problems Exhibit knowledge of unit circle trigonometry Match graphs of basic trigonometric functions with their equations

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

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

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

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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 South Dakota's Standards. WorkKeys Skills not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in South Dakota's standards.

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

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

ACT's WorkKeys Skills

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