# STATE MATCH

## Nebraska Academic Standards

Language Arts, Mathematics, and Science
Grades 8–12

and

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

September 2010



ACT®

# About This Report

## EXECUTIVE SUMMARY
(pp. 1–5)

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

## SECTION A
(pp. 7–9)

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

## SECTION B
(pp. 11–26)

All Nebraska Academic Standards are listed here; each one highlighted is measured by ACT's EPAS tests and/or WorkKeys assessments. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests. Nebraska standards listed here are from the Nebraska Academic Standards as follows:

| Nebraska Academic Standards | Version |
|---|---|
| Language Arts | As approved by The State Board April 2, 2009 |
| Mathematics | As approved by The State Board October 8, 2009 |
| Science | Draft standards dated August 3, 2010 |

## SECTION C
(pp. 27–38)

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

## SECTION D
(pp. 39–40)

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

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

# Executive Summary

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

**ACT'S TESTS MEASURE MOST NEBRASKA ACADEMIC STANDARDS IN LANGUAGE ARTS, MATHEMATICS, AND SCIENCE.**

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

- Language Arts Grade 8: 2 out of 4 Strands
  Grades 9–12: 2 out of 4 Strands

  Most Nebraska Academic Standards in Reading Comprehension and Writing are covered by ACT's English, Reading, and Writing tests and WorkKeys Reading for Information (RI) assessment.

- Mathematics Grade 8: 4 out of 4 Strands
  High School: 4 out of 4 Strands

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

- Science Process: Grade 8: 1 out of 1 Strand
  High School: 1 out of 1 Strand
  (Content: Grade 8: 3 out of 3 Strands
  High School: 3 out of 3 Strands)

  Most Nebraska Science Academic 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 Nebraska Science Academic Standards.

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

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

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

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

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

States and school districts choose the EPAS system because student motivation is high, and EPAS is the *only curriculum-based assessment system that measures student readiness along a continuum of empirically derived college readiness benchmarks*. ACT's College Readiness Standards are precise descriptors of the essential skills and knowledge that students need to become ready for college and career, beginning in grade 8 and continuing through grade 12. Vari-

**STATES CHOOSE ACT BECAUSE:**

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

ous groups claim to describe what students truly need to know and be able to do for college and/or workplace readiness. Such groups typically ask individual experts in education to gather and discuss what they feel is important for students to understand. Not surprisingly, the answers vary. In contrast, ACT defines college readiness through a unique and rigorous empirical process:

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

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

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

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

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

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

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

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

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

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

for college and career readiness in eighth grade are more beneficial than any high school-level achievement enhancement.

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

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

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

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

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

The NCRC, composed of three WorkKeys assessments (*Reading for Information*, *Applied Mathematics*, and *Locating Information*) measures skills critical to on-the-job success. Higher scores qualify students for more jobs than do lower scores. New Jersey, Virginia, Louisiana, Kentucky, North Carolina, and New Mexico have already initiated certificate programs, and many other states are in the process of developing similar programs.

If the goal of high school education is to prepare students for college and career readiness, then we should be educating all high school students according to a common academic expectation, one that prepares them for both postsecondary education and the workforce. Only then—whether they are among the two-thirds

who enter college directly after graduation or those who enter workforce training programs—will they be ready for life after high school.

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

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

**Table A-1. Number of Nebraska Language Arts Standards Measured by EXPLORE, PLAN, and the ACT**

| Nebraska Strands* | Number of Nebraska Standards Measured by ACT's tests | Aspects of Nebraska Standards that are Not Measured |
|---|---|---|
| Reading | Gr 8: 2 out of 3<br>Gr 9–12: 2 out of 3 | Read a variety of grade level texts fluently<br>Determine meaning of words through structural analysis<br>Relate new grade level vocabulary to prior knowledge and use in new situations<br>Determine meaning using print and digital reference materials |
| Writing | Gr 8: 1 out of 2<br>Gr 9–12: 2 out of 2 | Use prewriting activities and inquiry tools<br>Publish a legible document<br>Write in a variety of genres |
| Speaking and Listening | | |
| Multiple Literacies | | |
| **TOTALS**<br>2 out of 4 Strands | Gr 8: 3 out of 5<br>Gr 9–12: 4 out of 5 | |

*Refer to Nebraska's Language Arts Standards on pages 11–14

= EPAS tests do not assess this material.

| Table A-2. Number of Nebraska Mathematics Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys | | |
|---|---|---|
| **Nebraska Strands*** | **Number of Nebraska Standards Measured by ACT's tests** | **Aspects of Nebraska Standards that are Not Measured** |
| Number Sense | Grade 8: 4 out of 4<br>Grades 9–12: 4 out of 4 | |
| Geometry/Measurement | Grade 8: 5 out of 5<br>Grades 9–12: 5 out of 5 | Recognize that there are geometries, other than Euclidean geometry, in which the parallel postulate is not true |
| Algebra | Grade 8: 3 out of 3<br>Grades 9–12: 3 out of 3 | |
| Data Analysis/Probability | Grade 8: 3 out of 3<br>Grades 9–12: 3 out of 3 | Formulate a question and design a survey or an experiment in which data is collected and displayed in a variety of formats<br>Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection and the conclusions that can rightfully be made<br>Explain the differences between randomized experiment and observational studies |
| **TOTALS**<br>4 out of 4 Strands | Grade 8: 15 out of 15<br>Grades 9–12: 15 out of 15 | |

*Refer to Nebraska's Mathematics Academic Standards on pages 15–19

| Table A-3. Number of Nebraska Science Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys | | |
|---|---|---|
| **Nebraska Strands*** | **Number of Nebraska Standards Measured by ACT's tests** | **Aspects of Nebraska Standards that are Not Measured** |
| Inquiry, the Nature of Science, and Technology | Grade 8: 1 out of 3<br>Grades 9–12: 1 out of 3 | Students will apply the nature of scientific knowledge to their own investigations and in the evaluation of scientific explanations<br>Students will solve a complex design problem |
| **TOTALS**<br>1 out of 1 Process Strands | Grade 8: 1 out of 3<br>Grades 9–12: 1 out of 3 | |
| Physical Science | Grade 8: (3) out of (3)<br>Grades 9–12: (3) out of (3) | |
| Life Science | Grade 8: (4) out of (4)<br>Grades 9–12: (4) out of (4) | |
| Earth and Space Science | Grade 8: (4) out of (4)<br>Grades 9–12: (4) out of (4) | |
| **TOTALS**<br>3 out of 3 Content Strands | Grade 8: (11) out of (11)<br>Grades 9–12: (11) out of (11) | |

*Refer to Nebraska's Science Academic Standards on pages 20–26

Language Arts

## NEBRASKA Grade 8 Language Arts
Academic Standards

### LA 8.1. Reading

Students will learn and apply reading skills and strategies to comprehend text.

**LA 8.1.1. Knowledge of Print**

[Concept mastered at a previous grade level]

**LA 8.1.2. Phonological Awareness**

[Concept mastered at a previous grade level]

**LA 8.1.3. Word Analysis**

[Concept mastered at a previous grade level]

**LA 8.1.4. Fluency:** Students will read a variety of grade level texts fluently with accuracy, appropriate pace, phrasing, and expression.

**LA 8.1.4.a.** Incorporate elements of prosodic reading to communicate text

**LA 8.1.4.b.** Adjust oral or silent reading pace based on purpose, text difficulty, form, and style

**LA 8.1.4.c.** Recognize and represent writer's tone and style while reading individually or in groups (e.g., choral reading, reader's theatre performances)

**LA 8.1.5. Vocabulary:** Students will build literary, general academic, and content specific grade level vocabulary.

**LA 8.1.5.a.** Determine meaning of words through structural analysis, using knowledge of Greek, Latin, and Anglo-Saxon roots, prefixes, and suffixes to understand complex words, including words in science, mathematics, and social studies

**LA 8.1.5.b.** Relate new grade level vocabulary to prior knowledge and use in new situations

**LA 8.1.5.c.** Select a context clue strategy to determine meaning of unknown word appropriate to text (e.g., restatement, example, gloss, annotation, sidebar)

**LA 8.1.5.d.** Analyze semantic relationships (e.g., figurative language, connotations, subtle distinctions)

**LA 8.1.5.e.** Determine meaning using print and digital reference materials

**LA 8.1.6. Comprehension:** Students will extract and construct meaning using prior knowledge, applying text information, and monitoring comprehension while reading grade level text.

**LA 8.1.6.a.** Analyze the meaning, reliability, and validity of the text considering author's purpose, perspective, and information from additional sources

**LA 8.1.6.b.** Identify and analyze elements of narrative text (e.g., character development, setting, plot development, conflict, point of view, inferred and recurring themes)

**LA 8.1.6.c.** Analyze author's use of literary devices (e.g., foreshadowing, personification, idiom, oxymoron, hyperbole, flashback, suspense, symbolism, irony, transitional devices)

**LA 8.1.6.d.** Summarize, analyze, and synthesize informational text using main idea and supporting details

**LA 8.1.6.e.** Apply knowledge of organizational patterns found in informational text (e.g., sequence, description, cause and effect, compare/contrast, fact/opinion, proposition/support)

**LA 8.1.6.f.** Analyze and evaluate information from text features (e.g., index, annotations, maps, charts, tables, graphs, headings, subheadings, lists)

**LA 8.1.6.g.** Analyze and make inferences based on the characteristics of narrative and informational genres

**LA 8.1.6.h.** Analyze a variety of genres for the social, historical, cultural, and biographical influences

**LA 8.1.6.i.** Use narrative and informational text to develop a national and global multi-cultural perspective

**LA 8.1.6.j.** Generate and/or answer literal, inferential, critical, and interpretive questions, analyzing and synthesizing prior knowledge, information from the text and additional sources, to support answers

**LA 8.1.6.k.** Select text for a particular purpose (e.g., understand, interpret, enjoy, solve problems, form an opinion, answer a specific question, discover models for own writing)

**LA 8.1.6.l.** Build and activate prior knowledge in order to clarify text, deepen understanding, and make connections while reading

**LA 8.1.6.m.** Self-monitor comprehension for accuracy and understanding when errors detract from meaning by applying appropriate strategies to self-correct

**LA 8.1.6.n.** Make complex or abstract inferences or predictions by synthesizing information while previewing and reading text

**LA 8.1.6.o.** Respond to text verbally, in writing, or artistically

### LA 8.2. Writing

Students will learn and apply writing skills and strategies to communicate.

**LA 8.2.1. Writing Process:** Students will apply the writing process to plan, draft, revise, edit and publish writing using correct spelling, grammar, punctuation, and other standard conventions appropriate for grade level.

**LA 8.2.1.a.** Use prewriting activities and inquiry tools to generate and organize information, guide writing, answer questions, and synthesize information

**LA 8.2.1.b.** Generate a draft by:

Defining and stating a thesis

Structuring ideas and arguments in an effective and sustained way, following an organizational pattern appropriate to the purpose and intended audience

Identifying and using parallelism to present items in a series and items juxtaposed for emphasis

**LA 8.2.1.c.** Revise to improve writing (e.g., quality of ideas, organization, sentence fluency, word choice, voice)

**LA 8.2.1.d.** Provide oral, written, and electronic feedback to other writers; utilize others' feedback to improve own writing

**LA 8.2.1.e.** Edit writing for format and conventions (e.g., spelling, capitalization, grammar, punctuation)

**LA 8.2.1.f.** Publish a legible document that applies formatting techniques to contribute to the readability and impact of the document (e.g., fonts, spacing, highlighting, images, style conventions, manuscript requirements)

**LA 8.2.2. Writing Genres:** Students will write for a variety of purposes and audiences in multiple genres.

**LA 8.2.2.a.** Write in a variety of genres, considering purpose and audience

**LA 8.2.2.b.** Write considering typical characteristics of the selected genre (e.g., business letter, report, email, class notes, research paper, play, web page/blog)

**LA 8.2.2.c.** Select and apply an organizational structure appropriate to the task (e.g., problem/solution, persuasion)

**LA 8.2.2.d.** Analyze models and examples (own and others') of various genres in order to create a similar piece

## LA 8.3. Speaking & Listening

Students will learn and apply speaking and listening skills and strategies to communicate.

**LA 8.3.1. Speaking Skills:** Students will develop, apply, and refine speaking skills to communicate key ideas in a variety of situations.

**LA 8.3.1.a.** Communicate ideas and information in a manner appropriate for the purpose and setting

**LA 8.3.1.b.** Demonstrate and adjust speaking techniques for a variety of purposes and situations

**LA 8.3.1.c.** Utilize available media to enhance communication

**LA 8.3.2. Listening Skills:** Students will develop, apply, and refine active listening skills across a variety of situations.

**LA 8.3.2.a.** Apply listening skills needed for multiple situations and modalities (e.g., video, audio, distance, one-to-one, group)

**LA 8.3.2.b.** Listen and ask questions concerning the speaker's content, delivery and purpose

**LA 8.3.2.c.** Listen to, analyze, and evaluate thoughts, ideas, and credibility of information being communicated

**LA 8.3.3. Reciprocal Communication:** Students will develop, apply, and adapt reciprocal communication skills.

**LA 8.3.3.a.** Demonstrate sensitivity to the use of words (e.g., stereotypes, connotations, subtleties of language)

**LA 8.3.3.b.** Interact and collaborate with others in learning situations by contributing questions, information, opinions, and ideas using a variety of media and formats

**LA 8.3.3.c.** Respect diverse perspectives while collaborating and participating as a member of the community

## LA 8.4. Multiple Literacies

Students will identify, locate, and evaluate information.

**LA 8.4.1. Multiple Literacies:** Students will research, synthesize, evaluate and communicate information in a variety of media and formats (textual, visual, and digital).

**LA 8.4.1.a.** Select and use multiple resources to answer questions and support conclusions using valid information (e.g., print, subscription databases, web resources)

**LA 8.4.1.b.** Demonstrate ethical and legal use of information by citing sources using prescribed formats and tools (e.g., online citation assistance, publication guidelines)

**LA 8.4.1.c.** Practice safe and ethical behaviors when communicating and interacting with others (e.g., safe information to share online, appropriate language use, utilize appropriate sites and materials, respect diverse perspectives)

**LA 8.4.1.d.** Engage in activities with learners from a variety of cultures through electronic means (e.g., podcasts, video chats, distance learning)

**LA 8.4.1.e.** While reading, listening, and viewing, evaluate the message for bias, commercialism and hidden agendas (e.g., product placement, television ad, radio ad, movie, body image, sexism)

**LA 8.4.1.f.** Gather and share information and opinions as a result of communication with others (e.g., video/audio chat, interview, podcast, multi-media presentations)

**LA 8.4.1.g.** Use social networks and information tools to gather and share information (e.g., social bookmarking, online collaborative tools)

## LA 12.1. Reading

Students will learn and apply reading skills and strategies to comprehend text.

**LA 12.1.1. Knowledge of Print**

[Concept mastered at a previous grade level]

**LA 12.1.2. Phonological Awareness**

[Concept mastered at a previous grade level]

**LA 12.1.3. Word Analysis**

[Concept mastered at a previous grade level]

**LA 12.1.4. Fluency:** Students will read a variety of grade level texts fluently with accuracy, appropriate pace, phrasing, and expression.

**LA 12.1.4.a.** Independently incorporate elements of prosodic reading to interpret text in a variety of situations

**LA 12.1.4.b.** Adjust oral or silent reading pace based on purpose, text difficulty, form, and style

**LA 12.1.4.c.** Recognize and represent writer's tone and style while reading individually or in groups (e.g., change genre of text to perform orally)

**LA 12.1.5. Vocabulary:** Students will build literary, general academic, and content specific grade level vocabulary.

**LA 12.1.5.a.** Determine meaning of words through structural analysis, using knowledge of Greek, Latin, and Anglo-Saxon roots, prefixes, and suffixes to understand complex words, including words in science, mathematics, and social studies

**LA 12.1.5.b.** Relate new grade level vocabulary to prior knowledge and use in new situations

**LA 12.1.5.c.** Independently apply appropriate strategy to determine meaning of unknown words in text

**LA 12.1.5.d.** Use semantic relationships to evaluate, defend, and make judgments

**LA 12.1.5.e.** Determine meaning using print and digital reference materials

**LA 12.1.6. Comprehension:** Students will extract and construct meaning using prior knowledge, applying text information, and monitoring comprehension while reading grade level text.

**LA 12.1.6.a.** Evaluate the meaning, reliability, and validity of the text considering author's purpose, perspective, and information from additional sources

**LA 12.1.6.b.** Analyze and evaluate narrative text (e.g., characterization, setting, plot development, internal and external conflict, inferred and recurring themes, point of view, tone, mood)

**LA 12.1.6.c.** Analyze the function and critique the effects of the author's use of stylistic and literary devices (e.g., allusion, symbolism, irony, foreshadowing, flashback, metaphor, personification, epiphany, oxymoron, dialect, tone, mood, transitional devices)

**LA 12.1.6.d.** Summarize, analyze, synthesize, and evaluate informational text

**LA 12.1.6.e.** Apply knowledge of organizational patterns found in informational text (e.g., sequence, description, cause and effect, compare/contrast, fact/opinion, proposition/support, concept definition, question/answer)

**LA 12.1.6.f.** Analyze and evaluate information from text features (e.g., index, annotations, photographs, charts, tables, graphs, headings, subheadings, lists)

**LA 12.1.6.g.** Analyze and evaluate and make inferences based on the characteristics of narrative and informational genres and provide evidence from the text to support understanding

**LA 12.1.6.h.** Critique the effects of historical, cultural, political, and biographical influences in a variety of genres

**LA 12.1.6.i.** Use narrative and informational text to develop a national and global multi-cultural perspective

**LA 12.1.6.j.** Generate and/or answer literal, inferential, critical, and interpretive questions, analyzing, synthesizing, and evaluating prior knowledge, information from the text and additional sources, to support answers

**LA 12.1.6.k.** Select a text for a particular purpose (e.g., understand a specific viewpoint, enjoy, solve problems, form an opinion, discover models for own writing, predict outcomes, accomplish a task)

**LA 12.1.6.l.** Build and activate prior knowledge in order to clarify text, deepen understanding, and make connections while reading

**LA 12.1.6.m.** Self-monitor comprehension for accuracy and understanding when errors detract from meaning by applying appropriate strategies to self-correct

**LA 12.1.6.n.** Make complex or abstract inferences or predictions by synthesizing information while previewing and reading text

**LA 12.1.6.o.** Respond to text verbally, in writing, or artistically

## LA 12.2. Writing

Students will learn and apply writing skills and strategies to communicate.

**LA 12.2.1. Writing Process:** Students will apply the writing process to plan, draft, revise, edit and publish writing using correct spelling, grammar, punctuation, and other standard conventions appropriate for grade level.

**LA 12.2.1.a.** Select and use appropriate prewriting tools to generate and organize information, guide writing, answer questions, and synthesize information

**LA 12.2.1.b.** Generate a draft by:

Constructing clearly worded and effectively placed thesis statements that convey a clear perspective on the subject

Structuring ideas and arguments in an effective and sustained way, following an organizational pattern appropriate to the purpose and intended audience

Applying standard rules of sentence formation, including parallel structure and subordination

**LA 12.2.1.c.** Revise to improve writing (e.g., quality of ideas, organization, sentence fluency, word choice, voice)

**LA 12.2.1.d.** Provide oral, written and/or electronic feedback to other writers; utilize others' feedback to improve own writing

**LA 12.2.1.e.** Edit writing for format and conventions (e.g., spelling, capitalization, grammar, punctuation)

**LA 12.2.1.f.** Publish a legible document that applies formatting techniques to contribute to the readability and impact of the document (e.g., fonts, spacing, highlighting, images, style conventions, manuscript requirements)

**LA 12.2.2. Writing Genres:** Students will write for a variety of purposes and audiences in multiple genres.

**LA 12.2.2.a.** Write in a variety of genres, considering purpose, audience, medium, and available technology

**LA 12.2.2.b.** Write considering typical characteristics of the selected genre (e.g., resume, brochure, web page/blog, news article, job application and accompanying cover letter, senior project, college application essay)

**LA 12.2.2.c.** Select and apply an organizational structure appropriate to the task

**LA 12.2.2.d.** Analyze models and examples (own and others') of various genres in order to create a similar piece

## LA 12.3. Speaking & Listening

Students will learn and apply speaking and listening skills and strategies to communicate.

**LA 12.3.1. Speaking Skills:** Students will develop, apply, and refine speaking skills to communicate key ideas in a variety of situations.

**LA 12.3.1.a.** Communicate ideas and information in a manner appropriate for the purpose and setting

**LA 12.3.1.b.** Demonstrate and adjust speaking techniques for a variety of purposes and situations

**LA 12.3.1.c.** Utilize available media to enhance communication

**LA 12.3.2. Listening Skills:** Students will develop, apply, and refine active listening skills across a variety of situations.

**LA 12.3.2.a.** Apply listening skills needed to summarize and evaluate information given in multiple situations and modalities (e.g., video, audio, distance, one-to-one, group)

**LA 12.3.2.b.** Listen and respond to messages by expressing a point of view on the topic using questions, challenges, or affirmations

**LA 12.3.2.c.** Listen to and evaluate the clarity, quality and effectiveness of important points, arguments, and evidence being communicated

**LA 12.3.3. Reciprocal Communication:** Students will develop, apply, and adapt reciprocal communication skills.

**LA 12.3.3.a.** Interact and collaborate with others in learning situations by contributing questions, information, opinions, and ideas using a variety of media and formats

**LA 12.3.3.b.** Solicit and respect diverse perspectives while searching for information, collaborating, and participating as a member of the community (e.g., sensitivity to the use of words)

## LA 12.4. Multiple Literacies

Students will identify, locate, and evaluate information.

**LA 12.4.1. Multiple Literacies:** Students will research, synthesize, evaluate and communicate information in a variety of media and formats (textual, visual, and digital).

**LA 12.4.1.a.** Select and use multiple resources to answer questions and defend conclusions using valid information (e.g., print, subscription databases, web resources)

**LA 12.4.1.b.** Demonstrate ethical and legal use of information by citing sources using prescribed formats and tools (e.g., online citation assistance, publication guidelines)

**LA 12.4.1.c.** Practice safe and ethical behaviors when communicating and interacting with others (e.g., safe information to share on-line, appropriate language use, utilize appropriate sites and materials, respect diverse perspectives)

**LA 12.4.1.d.** Engage in activities with learners from a variety of cultures through electronic means (e.g., podcasts, video chats, distance learning)

**LA 12.4.1.e.** While reading, listening, and viewing, evaluate the message for bias, commercialism and hidden agendas (e.g., product placement, television ad, radio ad, movie, body image, sexism)

**LA 12.4.1.f.** Gather and share information and opinions as a result of communication with others (e.g., video/audio chat, interview, podcast, multi-media presentations)

**LA 12.4.1.g.** Use social networks and information tools to gather and share information (e.g., social bookmarking, online collaborative tools, web page/blog

# NEBRASKA Grade 8 Mathematics
Academic Standards

## MA 8.1. Number Sense

Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.1.1. Number System:** Students will represent and show relationships among real numbers.

- **MA 8.1.1.a.** Compare and order real numbers
- **MA 8.1.1.b.** Demonstrate relative position of real numbers on the number line (e.g., square root of 2 is left of 1.5)
- **MA 8.1.1.c.** Represent small numbers using scientific notation
- **MA 8.1.1.d.** Classify numbers as natural, whole, integer, rational, irrational, or real

**MA 8.1.2. Operations:** Students will demonstrate the meaning of arithmetic operations with integers.

- **MA 8.1.2.a.** Use drawings, words, and symbols to explain the meaning of addition, subtraction, multiplication, and division of integers.
- **MA 8.1.2.b.** Use words and symbols to explain the zero property of multiplication (e.g., if ab = 0 then a or b or both must be zero)
- **MA 8.1.2.c.** Use words and symbols to explain why division by zero is undefined

**MA 8.1.3. Computation:** Students will compute fluently and accurately using appropriate strategies and tools.

- **MA 8.1.3.a.** Compute accurately with rational numbers
- **MA 8.1.3.b.** Evaluate expressions involving absolute value of integers
- **MA 8.1.3.c.** Calculate squares of integers, the square roots of perfect squares, and the square roots of whole numbers using technology
- **MA 8.1.3.d.** Select, apply, and explain the method of computation when problem solving using rational numbers (e.g., models, mental computation, paper-pencil, technology, divisibility rules)
- **MA 8.1.3.e.** Solve problems involving ratios and proportions (e.g., $\frac{x}{5} = \frac{10}{17}$)

**MA 8.1.4. Estimation:** Students will estimate and check reasonableness of answers using appropriate strategies and tools.

- **MA 8.1.4.a.** Use estimation methods to check the reasonableness of solutions for problems involving rational numbers

## MA 8.2. Geometry/Measurement

Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.2.1. Characteristics:** Students will describe, compare, and contrast characteristics, properties, and relationships of geometric shapes and objects.

- **MA 8.2.1.a.** Identify and describe similarity of three-dimensional objects
- **MA 8.2.1.b.** Compare and contrast relationships between similar and congruent objects
- **MA 8.2.1.c.** Identify geometric properties of parallel lines cut by a transversal and related angles (e.g., perpendicular and parallel lines with transversals) and angles (e.g., corresponding, alternate interior, alternate exterior)
- **MA 8.2.1.d.** Identify pairs of angles (e.g., adjacent, complementary, supplementary, vertical)
- **MA 8.2.1.e.** Examine the relationships of the interior angles of a triangle (e.g., the sum of the angles is 180 degrees)

**MA 8.2.2. Coordinate Geometry:** Students will specify locations and describe relationships using coordinate geometry.

- **MA 8.2.2.a.** Use coordinate geometry to represent and examine the properties of rectangles and squares using horizontal and vertical segments

**MA 8.2.3. Transformations:** Students will perform transformations and use them to analyze the orientation and size of geometric shapes.

- **MA 8.2.3.a.** Identify the similarity of dilated shapes
- **MA 8.2.3.b.** Perform and describe positions and sizes of shapes under dilations (e.g., scale factor, ratios)

**MA 8.2.4. Spatial Modeling:** Students will use visualization, spatial reasoning, and geometric modeling to solve problems.

- **MA 8.2.4.a.** Draw geometric objects with specified properties (e.g., parallel sides, number of sides, angle measures, number of faces)

**MA 8.2.5. Measurement:** Students will select and apply appropriate procedures, tools, and formulas to determine measurements.

- **MA 8.2.5.a.** Use strategies to find the perimeter and area of complex shapes
- **MA 8.2.5.b.** Determine surface area and volume of three-dimensional objects (e.g., rectangular prisms, cylinders)
- **MA 8.2.5.c.** Apply the Pythagorean theorem to find missing lengths in right triangles and to solve problems

**MA 8.2.5.d.** Use scale factors to find missing lengths in similar shapes

**MA 8.2.5.e.** Convert between metric and standard units of measurement, given conversion factors (e.g., meters to yards)

## MA 8.3. Algebra

Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.3.1. Relationships:** Students will represent and analyze relationships using algebraic symbols.

**MA 8.3.1.a.** Represent and analyze a variety of patterns with tables, graphs, words, and algebraic equations

**MA 8.3.1.b.** Describe relationships using algebraic expressions, equations, and inequalities (e.g., two-step, one variable)

**MA 8.3.1.c.** Identify constant slope from tables and graphs

**MA 8.3.2. Modeling in Context:** Students will create, use, and interpret models of quantitative relationships.

**MA 8.3.2.a.** Model contextualized problems using various representations (e.g., two-step/one-variable equations)

**MA 8.3.2.b.** Represent a variety of quantitative relationships using algebraic expressions and two-step/one-variable equations

**MA 8.3.3. Procedures:** Students will apply properties to solve equations and inequalities.

**MA 8.3.3.a.** Explain the multiplicative inverse (e.g., $4 * \frac{1}{4} = 1$)

**MA 8.3.3.b.** Evaluate numerical expressions containing whole number exponents (e.g., if $x = 4$, then $(x + 3)^2 + 5x = ?$)

**MA 8.3.3.c.** Solve multi-step equations involving rational numbers

**MA 8.3.3.d.** Solve two-step inequalities involving rational numbers

**MA 8.3.3.e.** Identify and explain the properties used in solving two-step inequalities and multi-step equations

## MA 8.4. Data Analysis/Probability

Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 8.4.1. Display and Analysis:** Students will formulate questions that can be addressed with data, and then organize, display, and analyze the relevant data to answer their questions.

**MA 8.4.1.a.** Represent data using circle graphs and box plots with and without the use of technology

**MA 8.4.1.b.** Compare characteristics between sets of data or within a given set of data

**MA 8.4.1.c.** Find, interpret, and compare measures of central tendency (mean, median, mode) and the quartiles for sets of data

**MA 8.4.1.d.** Select the most appropriate unit of central tendency for sets of data

**MA 8.4.1.e.** Identify misrepresentation and misinterpretation of data represented in circle graphs and box plots

**MA 8.4.2. Predictions and Inferences:** Students will evaluate predictions and make inferences based on data.

**MA 8.4.2.a.** Evaluate predictions to formulate new questions and plan new studies

**MA 8.4.2.b.** Compare and contrast two sets of data to make inferences

**MA 8.4.3. Probability:** Students will apply and interpret basic concepts of probability.

**MA 8.4.3.a.** Identify complementary events and calculate their probabilities

**MA 8.4.3.b.** Compute probabilities for independent compound events

## MA 12.1. Number Sense

Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 12.1.1. Number System:** Students will represent and show relationships among complex numbers.

**MA 12.1.1.a.** Demonstrate multiple equivalent forms of irrational numbers (e.g., $\sqrt{8} = 8^{\frac{1}{2}} = 2\sqrt{2}$)

**MA 12.1.1.b.** Compare, contrast and apply the properties of numbers and the real number system, including rational, irrational, imaginary, and complex numbers

**MA 12.1.2. Operations:** Students will demonstrate the meaning and effects of arithmetic operations with real numbers.

**MA 12.1.2.a.** Use drawings, words, and symbols to explain the effects of such operations as multiplication and division, and computing positive powers and roots on the magnitude of quantities (e.g., if you take the square root of a number, will the result always be smaller than the original number? (e.g., $\sqrt{\frac{1}{4}} = \frac{1}{2}$))

**MA 12.1.2.b.** Use drawings, words, and symbols to explain that the distance between two numbers on the number line is the absolute value of their difference

**MA 12.1.3. Computation:** Students will compute fluently and accurately using appropriate strategies and tools.

**MA 12.1.3.a.** Compute accurately with real numbers

**MA 12.1.3.b.** Simplify exponential expressions (e.g., powers of –1, 0, ½, $3^2 * 3^2 = 3^4$)

**MA 12.1.3.c.** Multiply and divide numbers using scientific notation

**MA 12.1.3.d.** Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology)

**MA 12.1.4. Estimation:** Students will estimate and check reasonableness of answers using appropriate strategies and tools.

**MA 12.1.4.a.** Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation or an exact number (e.g., 10π (pi) is approximately 31.4, square and cube roots)

**MA 12.1.4.b.** Distinguish relevant from irrelevant information, identify missing information and either find what is needed or make appropriate estimates

## MA 12.2. Geometry/Measurement

Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 12.2.1. Characteristics:** Students will analyze characteristics, properties, and relationships among geometric shapes and objects.

**MA 12.2.1.a.** Identify and explain the necessity of and give examples of definitions and theorems

**MA 12.2.1.b.** Analyze properties and relationships among classes of two and three-dimensional geometric objects using inductive reasoning and counterexamples

**MA 12.2.1.c.** State and prove geometric theorems using deductive reasoning (e.g., parallel lines with transversals, congruent triangles, similar triangles)

**MA 12.2.1.d.** Apply geometric properties to solve problems (e.g., parallel lines, line transversals, similar triangles, congruent triangles, proportions)

**MA 12.2.1.e.** Identify and apply right triangle relationships (e.g., sine, cosine, tangent, special right triangles, converse of Pythagorean Theorem)

**MA 12.2.1.f.** Recognize that there are geometries, other than Euclidean geometry, in which the parallel postulate is not true

**MA 12.2.1.g.** Know the definitions and basic properties of a circle and use them to prove basic theorems and solve problems

**MA 12.2.2. Coordinate Geometry:** Student will use coordinate geometry to analyze and describe relationships in the coordinate plane.

**MA 12.2.2.a.** Use coordinate geometry to analyze geometric situations (e.g., parallel lines, perpendicular lines, circle equations)

**MA 12.2.2.b.** Apply the midpoint formula

**MA 12.2.2.c.** Apply the distance formula

**MA 12.2.2.d.** Prove special types of triangles and quadrilaterals (e.g., right triangles, isosceles trapezoid, parallelogram, rectangle, square)

**MA 12.2.3. Transformations:** Students will apply and analyze transformations.

**MA 12.2.3.a.** Explain and justify the effects of simple transformations on the ordered pairs of two-dimensional shapes

**MA 12.2.3.b.** Perform and describe multiple transformations

**MA 12.2.4. Spatial Modeling:** Students will use visualization, spatial reasoning, and geometric modeling to solve problems.

**MA 12.2.4.a.** Sketch and draw appropriate representations of geometric objects using ruler, protractor, or technology

**MA 12.2.4.b.** Use geometric models to visualize, describe, and solve problems (e.g., find the height of a tree; find the amount of paint needed for a room; scale model)

**MA 12.2.5. Measurement:** Students will apply the units, systems, and formulas to solve problems.

**MA 12.2.5.a.** Use strategies to find surface area and volume of complex objects

**MA 12.2.5.b.** Apply appropriate units and scales to solve problems involving measurement

**MA 12.2.5.c.** Convert between various units of area and volume, such as square feet to square yards

**MA 12.2.5.d.** Convert equivalent rates (e.g., feet/second to miles/hour)

**MA 12.2.5.e.** Find arc length and area of sectors of a circle

**MA 12.2.5.f.** Determine surface area and volume of three-dimensional objects (e.g., spheres, cones, pyramids)

**MA 12.2.5.g.** Know that the effect of a scale factor k on length, area and volume is to multiply each by k, $k^2$ and $k^3$, respectively

## MA 12.3. Algebra

Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 12.3.1. Relationships:** Students will generalize, represent, and analyze relationships using algebraic symbols.

**MA 12.3.1.a.** Represent, interpret, and analyze functions with graphs, tables, and algebraic notation and convert among these representations (e.g., linear, non-linear*)

**MA 12.3.1.b.** Identify domain and range of functions represented in either symbolic or graphical form (e.g., linear, non-linear*)

**MA 12.3.1.c.** Identify the slope and intercepts of a linear relationship from an equation or graph

**MA 12.3.1.d.** Identify characteristics of linear and non-linear functions*

**MA 12.3.1.e.** Graph linear and non-linear functions*

**MA 12.3.1.f.** Compare and analyze the rate of change by using ordered pairs, tables, graphs, and equations

**MA 12.3.1.g.** Graph and interpret linear inequalities

**MA 12.3.1.h.** Represent, interpret, and analyze functions and their inverses

**MA 12.3.1.i.** Determine if a relation is a function

**MA 12.3.2. Modeling in Context:** Students will model and analyze quantitative relationships.

**MA 12.3.2.a.** Model contextualized problems† using various representations (e.g., graphs, tables, one-variable equalities, one-variable inequalities, linear equations in slope-intercept form, inequalities in slope-intercept form, system of linear equations with two variables)

**MA 12.3.2.b.** Represent a variety of quantitative relationships using linear equations and one variable inequalities

**MA 12.3.2.c.** Analyze situations to determine the type of algebraic relationship (e.g., linear, non-linear)

**MA 12.3.2.d.** Model contextualized problems† using various representations for non-linear functions (e.g., quadratic, exponential, square root, and absolute value)

**MA 12.3.3. Procedures:** Students will represent and solve equations and inequalities.

**MA 12.3.3.a.** Explain/apply the reflexive, symmetric, and transitive properties of equality

**MA 12.3.3.b.** Simplify algebraic expressions involving exponents (e.g., $(3x^4)^2$)

**MA 12.3.3.c.** Add and subtract polynomials

**MA 12.3.3.d.** Multiply and divide polynomials (e.g., divide $x^3 - 8$ by $x - 2$, divide $x^4 - 5x^3 - 2x$ by $x^2$)

**MA 12.3.3.e.** Factor polynomials

**MA 12.3.3.f.** Identify and generate equivalent forms of linear equations

**MA 12.3.3.g.** Solve linear equations and inequalities including absolute value

**MA 12.3.3.h.** Identify and explain the properties used in solving equations and inequalities

**MA 12.3.3.i.** Solve quadratic equations (e.g., factoring, graphing, quadratic formula)

**MA 12.3.3.j.** Add, subtract, and simplify rational expressions

**MA 12.3.3.k.** Multiply, divide, and simplify rational expressions

**MA 12.3.3.l.** Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables

**MA 12.3.3.m.** Derive and use the formulas for the general term and summation of finite arithmetic and geometric series

**MA 12.3.3.n.** Combine functions by composition, as well as by addition, subtraction, multiplication, and division

**MA 12.3.3.o.** Solve an equation involving several variables for one variable in terms of the others

**MA 12.3.3.p.** Analyze and solve systems of two linear equations in two variables algebraically and graphically

## MA 12.4. Data Analysis/Probability

Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**MA 12.4.1. Display and Analysis:** Students will formulate a question and design a survey or an experiment in which data is collected and displayed in a variety of formats, then select and use appropriate statistical methods to analyze the data.

**MA 12.4.1.a.** Interpret data represented by the normal distribution and formulate conclusions

**MA 12.4.1.b.** Compute, identify, and interpret measures of central tendency (mean, median, mode) when provided a graph or data set

**MA 12.4.1.c.** Explain how sample size and transformations of data affect measures of central tendency

**MA 12.4.1.d.** Describe the shape and determine spread (variance, standard deviation) and outliers of a data set

**MA 12.4.1.e.** Explain how statistics are used or misused in the world

**MA 12.4.1.f.** Create scatter plots, analyze patterns, and describe relationships in paired data

**MA 12.4.1.g.** Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection and the conclusions that can rightfully be made

**MA 12.4.1.h.** Explain the differences between randomized experiment and observational studies

**MA 12.4.2. Predictions and Inferences:** Students will develop and evaluate inferences to make predictions.

**MA 12.4.2.a.** Compare data sets and evaluate conclusions using graphs and summary statistics

**MA 12.4.2.b.** Support inferences with valid arguments

**MA 12.4.2.c.** Develop linear equations for linear models to predict unobserved outcomes using regression line and correlation coefficient

**MA 12.4.2.d.** Recognize when arguments based on data confuse correlation with causation

**MA 12.4.3. Probability:** Students will apply and analyze concepts of probability.

**MA 12.4.3.a.** Construct a sample space and a probability distribution

**MA 12.4.3.b.** Identify dependent and independent events and calculate their probabilities

**MA 12.4.3.c.** Use the appropriate counting techniques to determine the probability of an event (e.g., combinations, permutations)

**MA 12.4.3.d.** Analyze events to determine if they are mutually exclusive

**MA 12.4.3.e.** Determine the relative frequency of a specified outcome of an event to estimate the probability of the outcome

**NEBRASKA Grade 8 Science**
Academic Standards

## SC 8.1. Inquiry, the Nature of Science, and Technology

Students will combine scientific processes and knowledge with scientific reasoning and critical thinking to ask questions about phenomena and propose explanations based on gathered evidence.

**SC 8.1.1. Abilities to do Scientific Inquiry:** Students will design and conduct investigations that will lead to descriptions of relationships between evidence and explanations.

***Scientific Questioning***

**SC 8.1.1.a.** Formulate testable questions that lead to predictions and scientific investigations

***Scientific Investigations***

**SC 8.1.1.b.** Design and conduct logical and sequential investigations including repeated trials

***Scientific Controls and Variables***

**SC 8.1.1.c.** Determine controls and use dependent (responding) and independent (manipulated) variables

***Scientific Tools***

**SC 8.1.1.d.** Select and use equipment appropriate to the investigation, demonstrate correct techniques, and apply appropriate mathematical concepts

***Scientific Observations***

**SC 8.1.1.e.** Make qualitative and quantitative observations

***Scientific Data Collection***

**SC 8.1.1.f.** Record and represent data appropriately and review for quality, accuracy, and relevancy

***Scientific Interpretations, Reflections, and Applications***

**SC 8.1.1.g.** Evaluate predictions, draw logical inferences based on observed patterns/relationships, and account for non-relevant information

***Scientific Communication***

**SC 8.1.1.h.** Share information, procedures, results, and conclusions with appropriate audiences

**SC 8.1.1.i.** Analyze and provide appropriate critique of scientific investigations

***Mathematics***

**SC 8.1.1.j.** Use appropriate mathematics in all aspects of scientific inquiry

**SC 8.1.2. Nature of Science:** Students will apply the nature of science to their own investigations.

***Scientific Knowledge***

**SC 8.1.2.a.** Recognize science is an ongoing process and the scientific community accepts and uses explanations until they encounter new experimental evidence not matching existing explanations

***Science and Society***

**SC 8.1.2.b.** Describe how scientific discoveries influence and change society

***Science as a Human Endeavor***

**SC 8.1.2.c.** Recognize scientists from various cultures have made many contributions to explain the natural world

**SC 8.1.3. Technology:** Students will solve a design problem which involves one or two science concepts.

***Abilities to do Technical Design***

**SC 8.1.3.a.** Identify problems for technological design

**SC 8.1.3.b.** Design a solution or product

**SC 8.1.3.c.** Implement the proposed design

**SC 8.1.3.d.** Evaluate completed technological designs or products

**SC 8.1.3.e.** Communicate the process of technological design

***Understanding of Technical Design***

**SC 8.1.3.f.** Distinguish between scientific inquiry (asking questions about the natural world) and technological design (using science to solve practical problems)

**SC 8.1.3.g.** Describe how science and technology are reciprocal

**SC 8.1.3.h.** Recognize that solutions have intended and unintended consequences

**SC 8.1.3.i.** Compare and contrast the reporting of scientific knowledge and the reporting of technological knowledge

## SC 8.2. Physical Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Physical Sciences to make connections with the natural and engineered world.

**SC 8.2.1. Matter:** Students will identify and describe the particulate nature of matter including physical and chemical interactions.

***Properties and Structure of Matter***

**SC 8.2.1.a.** Compare and contrast elements, compounds, and mixtures

**SC 8.2.1.b.** Describe physical and chemical properties of matter

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***States of Matter***

**SC 8.2.1.c.** Recognize most substances can exist as a solid, liquid, or gas depending on temperature

**SC 8.2.1.d.** Compare and contrast solids, liquids, and gasses based on properties of these states of matter

***Physical and Chemical Changes***

**SC 8.2.1.e.** Distinguish between physical and chemical changes (phase changes, dissolving, burning, rusting)

**SC 8.2.1.f.** Recognize conservation of matter in physical and chemical changes

***Atomic Structure***

[No Curricular Indicator at this grade level]

***Classification of Matter***

**SC 8.2.1.g.** Classify substances into similar groups based on physical properties

**SC 8.2.2. Force and Motion:** Students will investigate and describe forces and motion.

***Motion***

**SC 8.2.2.a.** Describe motion of an object by its position and velocity

***Inertia/Newton's 1st law***

**SC 8.2.2.b.** Recognize an object that is not being subjected to a force will continue to move at a constant speed in a straight line or stay at rest (Newton's 1st law)

***Forces/Newton's 2nd law***

**SC 8.2.2.c.** Describe the motion of objects related to the effects of balanced and unbalanced forces

***Newton's 3rd law***

[No Curricular Indicator at this grade level]

***Universal Forces***

**SC 8.2.2.d.** Recognize that everything on or around the Earth is pulled toward the Earth's center by gravitational force

**SC 8.2.3. Energy:** Students will identify and describe how energy systems and matter interact.

***Sound/Mechanical Waves***

**SC 8.2.3.a.** Recognize that vibrations set up wave-like disturbances that spread away from the source (sound, seismic, water waves)

**SC 8.2.3.b.** Identify that waves move at different speeds in different materials

***Light***

**SC 8.2.3.c.** Recognize that light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection)

**SC 8.2.3.d.** Recognize that to see an object, light from the surface of the object must enter the eye; the color seen depends on the properties of the surface and the color of the available light sources

***Heat***

**SC 8.2.3.e.** Recognize that heat moves from warmer objects to cooler objects until both reach the same temperature

***Electricity/Magnetism***

[No Curricular Indicator at this grade level]

***Nuclear***

[No Curricular Indicator at this grade level]

***Conservation***

**SC 8.2.3.f.** Describe transfer of energy from electrical and magnetic sources to different energy forms (heat, light, sound, and chemical)

**SC 8.2.3.g.** Recognize all energy is neither created nor destroyed

***Mechanical Energy***

[No Curricular Indicator at this grade level]

***Chemical Energy***

[No Curricular Indicator at this grade level]

## SC 8.3. Life Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Life Sciences to make connections with the natural and engineered world.

**SC 8.3.1. Structure and Function of Living Systems:** Students will investigate and describe the structure and function of living organisms.

***Characteristics of Life***

**SC 8.3.1.a.** Recognize the levels of organization in living organisms (cells, tissues, organs, organ systems, and organisms)

***Cellular Composition of Organisms***

**SC 8.3.1.b.** Recognize that all organisms are composed of one or many cells; that these cells must grow, divide, and use energy; and that all cells function similarly

**SC 8.3.1.c.** Recognize specialized cells perform specialized functions in multicellular organisms

**SC 8.3.1.d.** Identify the functions of the major systems of the human body and describe ways that these systems interact with each other

***Characteristics of Living Organisms***

[No Curricular Indicator at this grade level]

***Behavior***

**SC 8.3.1.e.** Describe how plants and animals respond to environmental stimuli

**SC 8.3.2. Heredity:** Students will investigate and describe the relationship between reproduction and heredity.

***Inherited Traits***

**SC 8.3.2.a.** Recognize that hereditary information is contained in genes within the chromosomes of each cell

***Reproduction***

**SC 8.3.2.b.** Compare and contrast sexual and asexual reproduction

**SC 8.3.3. Flow of Matter and Energy in Ecosystems:** Students will describe populations and ecosystems.



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***Flow of Energy***

**SC 8.3.3.a.** Diagram and explain the flow of energy through a simple food web

**SC 8.3.3.b.** Compare the roles of producers, consumers, and decomposers in an ecosystem

***Ecosystems***

**SC 8.3.3.c.** Recognize that producers transform sunlight into chemical energy through photosynthesis

**SC 8.3.3.d.** Determine the biotic and abiotic factors that impact the number of organisms an ecosystem can support

**SC 8.3.3.e.** Recognize a population is all the individuals of a species at a given place and time

**SC 8.3.3.f.** Compare and contrast symbiotic relationships among organisms

***Impact on Ecosystems***

**SC 8.3.3.g.** Identify positive and negative effects of natural and human activity on an ecosystem

**SC 8.3.4. Biodiversity:** Students will identify characteristics of organisms that help them survive.

***Biological Adaptations***

**SC 8.3.4.a.** Describe how an inherited characteristic enables an organism to improve its survival rate

***Biological Evolution***

**SC 8.3.4.b.** Recognize the extinction of a species is caused by the inability to adapt to an environmental change

**SC 8.3.4.c.** Recognize that anatomical features of an organism can be used to infer similarities among other organisms

## SC 8.4. Earth and Space Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Earth and Space Science to make connections with the natural and engineered world.

**SC 8.4.1. Earth in Space:** Students will investigate and describe the Earth and the solar system.

***Objects in the Sky and Universe***

**SC 8.4.1.a.** Describe the components of the solar system (Sun, planets, moons, asteroids, comets)

***Motion of Objects in the Solar System***

**SC 8.4.1.b.** Describe the relationship between motion of objects in the solar system and the phenomena of day, year, eclipses, phases of the Moon and seasons

***Gravitational Effects***

**SC 8.4.1.c.** Describe the effects of gravity on Earth (tides) and the effect of gravity on objects in the solar system

**SC 8.4.2. Earth Structures and Processes:** Students will investigate and describe the Earth's structure, systems, and processes.

***Properties of Earth Materials***

**SC 8.4.2.a.** Describe the layers of Earth (core, mantle, crust, atmosphere)

**SC 8.4.2.b.** Describe the physical composition of soil

**SC 8.4.2.c.** Describe the mixture of gasses in the Earth's atmosphere and how the atmosphere's properties change at different elevations

**SC 8.4.2.d.** Describe evidence of the Earth's magnetic field

***Earth's Processes***

**SC 8.4.2.e.** Compare and contrast constructive and destructive forces (deposition, erosion, weathering, plate motion causing uplift, volcanoes, and earthquakes) that impact the Earth's surface

**SC 8.4.2.f.** Describe the rock cycle

**SC 8.4.2.g.** Describe the water cycle (evaporation, condensation, precipitation)

***Use of Earth Materials***

**SC 8.4.2.h.** Classify Earth materials as renewable or nonrenewable

**SC 8.4.3. Energy in Earth's Systems:** Students will investigate and describe energy in Earth's systems.

***Energy Sources***

**SC 8.4.3.a.** Describe how energy from the Sun influences the atmosphere and provides energy for plant growth

***Weather and Climate***

**SC 8.4.3.b.** Identify factors that influence daily and seasonal changes on Earth (tilt of the Earth, humidity, air pressure, air masses)

**SC 8.4.3.c.** Describe atmospheric movements that influence weather and climate (air masses, jet stream)

**SC 8.4.4. Earth's History:** Students will use evidence to draw conclusions about changes in the Earth.

***Past/Present Earth***

**SC 8.4.4.a.** Recognize the earth processes we see today are similar to those that occurred in the past (uniformity of processes)

**SC 8.4.4.b.** Describe how environmental conditions have changed through use of the fossil record



= Measured by EXPLORE Science Test

_____ = Content sampled by EXPLORE Science Test

## SC 12.1. Inquiry, the Nature of Science, and Technology

Students will combine scientific processes and knowledge with scientific reasoning and critical thinking to ask questions about phenomena and propose explanations based on gathered evidence.

**SC 12.1.1. Abilities to do Scientific Inquiry:** Students will design and conduct investigations that lead to the use of logic and evidence in the formulation of scientific explanations and models.

***Scientific Questioning***

**SC 12.1.1.a.** Formulate a testable hypothesis supported by prior knowledge to guide an investigation

***Scientific Investigations***

**SC 12.1.1.b.** Design and conduct logical and sequential scientific investigations with repeated trials and apply findings to new investigations

***Scientific Controls and Variables***

**SC 12.1.1.c.** Identify and manage variables and constraints

***Scientific Tools***

**SC 12.1.1.d.** Select and use lab equipment and technology appropriately and accurately

***Scientific Observations***

**SC 12.1.1.e.** Use tools and technology to make detailed qualitative and quantitative observations

***Scientific Data Collection***

**SC 12.1.1.f.** Represent and review collected data in a systematic, accurate, and objective manner

***Scientific Interpretations, Reflections, and Applications***

**SC 12.1.1.g.** Analyze and interpret data, synthesize ideas, formulate and evaluate models, and clarify concepts and explanations

**SC 12.1.1.h.** Use results to verify or refute a hypothesis

**SC 12.1.1.i.** Propose and/or evaluate possible revisions and alternate explanations

***Scientific Communication***

**SC 12.1.1.j.** Share information, procedures, results, conclusions, and defend findings to a scientific community (peers, science fair audience, policy makers)

**SC 12.1.1.k.** Evaluate scientific investigations and offer revisions and new ideas as appropriate

***Mathematics***

**SC 12.1.1.l.** Use appropriate mathematics in all aspects of scientific inquiry

**SC 12.1.2. Nature of Science:** Students will apply the nature of scientific knowledge to their own investigations and in the evaluation of scientific explanations.

***Scientific Knowledge***

**SC 12.1.2.a.** Recognize that scientific explanations must be open to questions, possible modifications, and must be based upon historical and current scientific knowledge

***Science and Society***

**SC 12.1.2.b.** Describe how society influences the work of scientists and how science, technology, and current scientific discoveries influence and change society

***Science as a Human Endeavor***

**SC 12.1.2.c.** Recognize that the work of science results in incremental advances, almost always building on prior knowledge, in our understanding of the world

**SC 12.1.2.d.** Research and describe the difficulties experienced by scientific innovators who had to overcome commonly held beliefs of their times to reach conclusions that we now take for granted

**SC 12.1.3. Technology:** Students will solve a complex design problem.

***Abilities to do Technical Design***

**SC 12.1.3.a.** Propose designs and choose between alternative solutions of a problem

**SC 12.1.3.b.** Implement the selected solution

**SC 12.1.3.c.** Evaluate the solution and its consequences

**SC 12.1.3.d.** Communicate the problem, process, and solution

***Understanding of Technical Design***

**SC 12.1.3.e.** Explain how science advances with the introduction of new technology

**SC 12.1.3.f.** Compare and contrast the reasons for the pursuit of science and the pursuit of technology

**SC 12.1.3.g.** Assess the limits of a technological design

**SC 12.1.3.h.** Understand creativity, imagination, and a good knowledge base are all needed to advance the work of science and engineering

## SC 12.2. Physical Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Physical Sciences to make connections with the natural and engineered world.

**SC 12.2.1. Matter:** Students will investigate and describe matter in terms of its structure, composition and conservation.

***Properties and Structure of Matter***

**SC 12.2.1.a.** Recognize bonding occurs when outer electrons are transferred (ionic) or shared (covalent)

***States of Matter***

**SC 12.2.1.b.** Describe the energy transfer associated with phase changes between solids, liquids, and gasses



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

**SC 12.2.1.c.** Describe the three normal states of matter (solid, liquid, gas) in terms of energy, particle arrangement, particle motion, and strength of bond between molecules

***Physical and Chemical Changes***

**SC 12.2.1.d.** Recognize a large number of chemical reactions involve the transfer of either electrons (oxidation/reduction) or hydrogen ions (acid/base) between reacting ions, molecules, or atoms

**SC 12.2.1.e.** Identify factors affecting rates of chemical reactions (temperature, particle size, surface area)

***Atomic Structure***

**SC 12.2.1.f.** Recognize the charges and relative locations of subatomic particles (neutrons, protons, electrons)

**SC 12.2.1.g.** Describe properties of atoms, ions, and isotopes

***Classification of Matter***

**SC 12.2.1.h.** Describe the organization of the periodic table of elements with respect to patterns of physical and chemical properties

**SC 12.2.2. Force and Motion:** Students will investigate and describe the nature of field forces and their interactions with matter.

***Motion***

**SC 12.2.2.a.** Describe motion with respect to displacement and acceleration

***Inertia/Newton's 1st law***

**SC 12.2.2.b.** Describe how the law of inertia (Newton's 1st law) is evident in a real-world event

***Forces/Newton's 2nd law***

**SC 12.2.2.c.** Make predictions based on relationships among net force, mass, and acceleration (Newton's 2nd law)

***Newton's 3rd law***

**SC 12.2.2.d.** Recognize that all forces occur in equal and opposite pairs (Newton's 3rd law)

**SC 12.2.2.e.** Describe how Newton's 3rd law of motion is evident in a real-world event

***Universal Forces***

**SC 12.2.2.f.** Recognize gravity is a force each mass exerts on another mass, which is proportional to the masses and the distance between them

**SC 12.2.2.g.** Recognize that an attractive or repulsive electric force exists between two charged particles and that this force is proportional to the magnitude of the charges and the distance between

**SC 12.2.3. Energy:** Students will describe and investigate energy systems relating to the conservation and interaction of energy and matter.

***Sound/Mechanical Waves***

**SC 12.2.3.a.** Describe mechanical wave properties (speed, wavelength, frequency, amplitude) and how waves travel through a medium

**SC 12.2.3.b.** Recognize that the energy in waves can be changed into other forms of energy

***Light***

**SC 12.2.3.c.** Recognize light can behave as a wave (diffraction and interference)

***Heat***

**SC 12.2.3.d.** Distinguish between temperature (a measure of the average kinetic energy of atomic or molecular motion) and heat (the quantity of thermal energy that transfers due to a change in temperature)

**SC 12.2.3.e.** Compare and contrast methods of heat transfer and the interaction of heat with matter via conduction, convection, and radiation

***Electricity/Magnetism***

**SC 12.2.3.f.** Recognize that the production of electromagnetic waves is a result of changes in the motion of charges or by a changing magnetic field

**SC 12.2.3.g.** Compare and contrast segments of the electromagnetic spectrum (radio, micro, infrared, visible, ultraviolet, x-rays, gamma) based on frequency and wavelength

***Nuclear***

**SC 12.2.3.h.** Recognize that nuclear reactions (fission, fusion, and radioactive decay) convert a fraction of the mass of interacting particles into energy, and this amount of energy is much greater than the energy in chemical interactions

***Conservation***

**SC 12.2.3.i.** Interpret the law of conservation of energy to make predictions for the outcome of an event

***Mechanical Energy***

**SC 12.2.3.j.** Identify that all energy can be considered to be either kinetic, potential, or energy contained by a field (e.g. electromagnetic waves)

***Chemical Energy***

**SC 12.2.3.k.** Identify endothermic and exothermic reactions

## SC 12.3. Life Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Life Sciences to make connections with the natural and engineered world.

**SC 12.3.1. Structure and Function of Living Systems:** Students will investigate and describe the chemical basis of the growth, development, and maintenance of cells.

***Characteristics of Life***

**SC 12.3.1.a.** Identify the complex molecules (carbohydrates, lipids, proteins, and nucleic acids) that make up living organisms

***Cellular Composition of Organisms***

**SC 12.3.1.b.** Identify the form and function of sub-cellular structures that regulate cellular activities



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**SC 12.3.1.c.** Describe the cellular functions of photosynthesis, respiration, cell division, protein synthesis, transport of materials, and energy capture/release

***Characteristics of Living Organisms***

[No Curricular Indicator at this grade level]

***Behavior***

**SC 12.3.1.d.** Describe how an organism senses changes in its internal or external environment and responds to ensure survival

**SC 12.3.2. Heredity:** Students will describe the molecular basis of reproduction and heredity.

***Inherited Traits***

**SC 12.3.2.a.** Identify that information passed from parents to offspring is coded in DNA molecules

**SC 12.3.2.b.** Describe the basic structure of DNA and its function in genetic inheritance

**SC 12.3.2.c.** Recognize how mutations could help, harm, or have no effect on individual organisms

***Reproduction***

**SC 12.3.2.d.** Describe that sexual reproduction results in a largely, predictable, variety of possible gene combinations in the offspring of any two parents

**SC 12.3.3. Flow of Matter and Energy in Ecosystems:** Students will describe, on a molecular level, the cycling of matter and the flow of energy between organisms and their environment.

***Flow of Energy***

**SC 12.3.3.a.** Explain how the stability of an ecosystem is increased by biological diversity

***Ecosystems***

**SC 12.3.3.b.** Recognize atoms and molecules cycle among living and nonliving components of the biosphere

**SC 12.3.3.c.** Explain how distribution and abundance of different organisms in ecosystems are limited by the availability of matter and energy and the ability of the ecosystem to recycle materials

***Impact on Ecosystems***

**SC 12.3.3.d.** Analyze factors which may influence environmental quality

**SC 12.3.4. Biodiversity:** Students will describe the theory of biological evolution.

***Biological Adaptations***

**SC 12.3.4.a.** Identify different types of adaptations necessary for survival (morphological, physiological, behavioral)

***Biological Evolution***

**SC 12.3.4.b.** Recognize that the concept of biological evolution is a theory which explains the consequence of the interactions of: (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring

**SC 12.3.4.c.** Explain how natural selection provides a scientific explanation of the fossil record and the molecular similarities among the diverse species of living organisms

**SC 12.3.4.d.** Apply the theory of biological evolution to explain diversity of life over time

## SC 12.4. Earth and Space Science

Students will integrate and communicate the information, concepts, principles, processes, theories, and models of the Earth and Space Science to make connections with the natural and engineered world.

**SC 12.4.1. Earth in Space:** Students will investigate and describe the known universe.

***Objects in the Sky and Universe***

**SC 12.4.1.a.** Describe the formation of the universe using the Big Bang Theory

**SC 12.4.1.b.** Recognize that stars, like the Sun, transform matter into energy by nuclear reactions which leads to the formation of other elements

**SC 12.4.1.c.** Describe stellar evolution

***Motion of Objects in the Solar System***

[No Curricular Indicator at this grade level]

***Gravitational Effects***

[No Curricular Indicator at this grade level]

**SC 12.4.2. Earth Structures and Processes:** Students will investigate the relationships among Earth's structure, systems, and processes.

***Properties of Earth Materials***

**SC 12.4.2.a.** Recognize how Earth materials move through geochemical cycles (carbon, nitrogen, oxygen) resulting in chemical and physical changes in matter

***Earth's Processes***

**SC 12.4.2.b.** Describe how heat convection in the mantle propels the plates comprising the Earth's surface across the face of the globe (plate tectonics)

***Use of Earth Materials***

**SC 12.4.2.c.** Evaluate the impact of human activity and natural causes on Earth's resources (groundwater, rivers, land, fossil fuels)

**SC 12.4.3. Energy in Earth's Systems:** Students will investigate and describe the relationships among the sources of energy and their effects on Earth's systems.

***Energy Sources***

**SC 12.4.3.a.** Identify internal and external sources of heat energy in Earth's systems



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**SC 12.4.3.b.** Describe how radiation, conduction, and convection transfer heat in the Earth's systems

**SC 12.4.3.c.** Compare and contrast benefits of renewable and nonrenewable energy sources

***Weather and Climate***

**SC 12.4.3.d.** Describe natural influences (Earth's rotation, mountain ranges, oceans, differential heating) on global climate

**SC 12.4.4. Earth's History:** Students will explain the history and evolution of the Earth.

***Past/Present Earth***

**SC 12.4.4.a.** Recognize in any sequence of sediments or rocks that has not been overturned, the youngest sediments or rocks are at the top of the sequence and the oldest are at the bottom (law of superposition)

**SC 12.4.4.b.** Interpret Earth's history by observing rock sequences, using fossils to correlate the sequences at various locations, and using data from radioactive dating methods

**SC 12.4.4.c.** Compare and contrast the physical and biological differences of the early Earth with the planet we live on today



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

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

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

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

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

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

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

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

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

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

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

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

| Score Ranges | Table C-2. ACT's College Readiness Standards — Reading | |
|---|---|---|
| *Bench-marks* | **Main Ideas and Author's Approach** | **Supporting Details** |
| **13–15** *EXPL: 15* | Recognize a clear intent of an author or narrator in uncomplicated literary narratives | Locate basic facts (e.g., names, dates, events) clearly stated in a passage |
| **16–19** *PLAN: 17* | Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives | Locate simple details at the sentence and paragraph level in uncomplicated passages<br>Recognize a clear function of a part of an uncomplicated passage |
| **20–23** *ACT: 21* | Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives<br>Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages | Locate important details in uncomplicated passages<br>Make simple inferences about how details are used in passages |
| **24–27** | Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages<br>Infer the main idea or purpose of straightforward paragraphs in more challenging passages<br>Summarize basic events and ideas in more challenging passages<br>Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages | Locate important details in more challenging passages<br>Locate and interpret minor or subtly stated details in uncomplicated passages<br>Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages |
| **28–32** | Infer the main idea or purpose of more challenging passages or their paragraphs<br>Summarize events and ideas in virtually any passage<br>Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage | Locate and interpret minor or subtly stated details in more challenging passages<br>Use details from different sections of some complex informational passages to support a specific point or argument |
| **33–36** | Identify clear main ideas or purposes of complex passages or their paragraphs | Locate and interpret details in complex passages<br>Understand the function of a part of a passage when the function is subtle or complex |

**Descriptions of the ACT Reading Passages**

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

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

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

| Score Ranges | Table C-2. ACT's College Readiness Standards — Reading (continued) | | |
|---|---|---|---|
| *Bench-marks* | **Sequential, Comparative, and Cause-Effect Relationships** | **Meanings of Words** | **Generalizations and Conclusions** |
| **13–15**<br>*EXPL: 15* | Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages<br>Recognize clear cause-effect relationships described within a single sentence in a passage | Understand the implication of a familiar word or phrase and of simple descriptive language | Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives |
| **16–19**<br>*PLAN: 17* | Identify relationships between main characters in uncomplicated literary narratives<br>Recognize clear cause-effect relationships within a single paragraph in uncomplicated literary narratives | Use context to understand basic figurative language | Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages |
| **20–23**<br>*ACT: 21* | Order simple sequences of events in uncomplicated literary narratives<br>Identify clear relationships between people, ideas, and so on in uncomplicated passages<br>Identify clear cause-effect relationships in uncomplicated passages | Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages | Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages<br>Draw simple generalizations and conclusions using details that support the main points of more challenging passages |
| **24–27** | Order sequences of events in uncomplicated passages<br>Understand relationships between people, ideas, and so on in uncomplicated passages<br>Identify clear relationships between characters, ideas, and so on in more challenging literary narratives<br>Understand implied or subtly stated cause-effect relationships in uncomplicated passages<br>Identify clear cause-effect relationships in more challenging passages | Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages<br>Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages | Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives<br>Draw generalizations and conclusions about people, ideas, and so on in more challenging passages |
| **28–32** | Order sequences of events in more challenging passages<br>Understand the dynamics between people, ideas, and so on in more challenging passages<br>Understand implied or subtly stated cause-effect relationships in more challenging passages | Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts | Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on |
| **33–36** | Order sequences of events in complex passages<br>Understand the subtleties in relationships between people, ideas, and so on in virtually any passage<br>Understand implied, subtle, or complex cause-effect relationships in virtually any passage | Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage | Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage<br>Understand and generalize about portions of a complex literary narrative |

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## WorkKeys Skills

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