STATE MATCH

Kansas Curricular Standards

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

and

EXPLORE®, PLAN®, and the ACT®

August 2011

ACT®

About This Report

EXECUTIVE SUMMARY
(pp. 1–4)

This portion summarizes the findings of the alignment between Kansas's Curricular 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). It also presents ACT's involvement in meeting NCLB requirements and includes additional information about the unique programs and services ACT can provide to Kansas.

SECTION A
(pp. 5–8)

This section provides tables by content area (Reading and Writing, Mathematics, and Science), listing the precise number of Kansas Curricular Standards measured by ACT's EPAS tests by grade level.

SECTION B
(pp. 9–37)

All Kansas Curricular Standards are listed here; each one highlighted is measured by ACT's EPAS tests. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests. Kansas standards listed here are from the Kansas Curricular Standards as published by the Kansas State Department of Education as follows:

Kansas Curricular Standards	Year
Reading	2003
Writing	2003
Mathematics	2003
Science	2007

SECTION C
(pp. 38–48)

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

A supplement that identifies the specific ACT College Readiness Standard(s) corresponding to each Kansas 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 Kansas students and educators, and this report offers strong evidence for this belief. This alignment analysis clearly answers critical questions:

1. To what extent do ACT's Educational Planning and Assessment System (EPAS®) tests—EXPLORE® (8th and 9th grades), PLAN® (10th grade), and the ACT® (11th and 12th grades)—measure Kansas's Curricular Standards?
2. Can the results from ACT's testing programs be used to meet Kansas's NCLB requirement?
3. Why should Kansas choose EPAS?

ACT'S TESTS MEASURE MOST KANSAS CURRICULAR STANDARDS IN READING AND WRITING, MATHEMATICS, AND SCIENCE.

1. Match Results: Comparisons conducted by our content specialists show that ACT's English, Reading, Writing, Mathematics, and Science tests measure most Kansas Reading and Writing, Mathematics, and Science Curricular Standards.

- Reading and Writing Grade 8: 3 out of 3 Standards; 6 out of 9 Benchmarks
  High School: 3 out of 3 Standards; 6 out of 9 Benchmarks

  Many important Kansas Reading and Writing Benchmarks are covered by ACT's English, Reading, and Writing tests.

- Mathematics Grade 8: 4 out of 4 Standards; 14 out of 14 Benchmarks
  High School: 4 out of 4 Standards; 14 out of 14 Benchmarks

  All Kansas Mathematics Benchmarks are covered by ACT's Mathematics tests.

- Science: Process Standards: 1 out of 1; 1 out of 1 Benchmark
  (Content Standards: 6 out of 7; 21 out of 26 Benchmarks)

  Most Kansas Science Benchmarks are covered by ACT's Science tests.

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

Most exceptions to a match between ACT's tests and the Kansas Curricular 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 Kansas 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.

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.**

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

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

States and school districts choose the EPAS system because student motivation is high, and EPAS is the *only curriculum-based assessment system that measures student readiness along a continuum of empirically derived college readiness benchmarks*. ACT's College Readiness Standards are precise descriptors of the essential skills and knowledge that students need to become ready for college and career, beginning in grade 8 and continuing through grade 12. Various groups claim to describe what students truly need to know and be able to do for college and/or workplace readiness. Such groups typically ask individual experts in education to gather and discuss what they feel is important for students to understand. Not surprisingly, the answers vary. In contrast, ACT defines college readiness through a unique and rigorous empirical process:

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

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

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

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

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

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

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

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

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

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

PLAN helps tenth-grade students build a foundation for future academic and career success and provides information needed to address school districts' high-priority issues. It is a comprehensive guidance resource that helps students measure their current academic development, explore career/training options,

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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.

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

Section A: Number of Kansas Curricular Standards Measured by EXPLORE, PLAN, and the ACT

Table A-1. Number of Kansas Reading and Writing Standards Measured by EXPLORE, PLAN, and the ACT

	Kansas Benchmarks*	Number of Kansas Indicators Measured by ACT's tests	Aspects of Kansas Standards that are Not Measured
Reading	1. Alphabetics to construct meaning	8th: 0 out of 0	
	2. Fluency	8th: 0 out of 5 9–10: 0 out of 1	Read fluently, expressively Use variety of reading strategies Adjust reading rate to support comprehension
	3. Vocabulary	8th: 3 out of 5 9–10: 3 out of 5 11–12: 3 out of 5	Locate/use reference materials Determine meaning through structural analysis and knowledge of Greek, Latin, Anglo-Saxon roots, prefixes
	4. Comprehension	8th: 11 out of 15 9–10: 11 out of 15 11–12: 11 out of 15	Identify narrative, expository, technical, persuasive texts Understand purpose of text features Establish purpose for self-selected reading Follow directions in technical text
Literature	1. Interpretation of and response to text	8th: 5 out of 5 9–10: 4 out of 5 11–12: 4 out of 5	Analyze historical, social, and cultural contextual aspects of settings
	2. Significance and contributions of literature	8th: 0 out of 3 9–10: 0 out of 3 11–12: 0 out of 3	Understand contributions of literature to various cultures
Writing	1. Narrative	8th: 11 out of 18 9–10: 9 out of 18 11–12: 9 out of 18	Use personal experience in text Understand plagiarism
	2. Expository	8th: 12 out of 21 9–10: 11 out of 21 11–12: 11 out of 21	Use personal experience Cite references Construct bibliography
	3. Technical	8th: 0 out of 18 9–10: 0 out of 18 11–12: 0 out of 18	Write technical text
	4. Persuasive	8th: 11 out of 21 9–10: 11 out of 21 11–12: 15 out of 21	Understand plagiarism
	TOTALS 6 out of 9 Benchmarks 3 out of 3 Standards	8th: 53 out of 111 9–10: 49 out of 107 11–12: 53 out of 107	

*Refer to Kansas's Reading and Writing Curricular Standards on pages 9–23

Table A-2. Number of Kansas Mathematics Standards Measured by EXPLORE, PLAN, and the ACT

	Kansas Benchmarks*	Number of Kansas Indicators Measured by ACT's tests	Aspects of Kansas Standards that are Not Measured
Number and Computation	1. Number Sense	8th: 5 out of 6 9–10: 3 out of 3	Explain irrational number pi
	2. Number Systems and Their Properties	8th: 3 out of 3 9–10: 4 out of 4	
	3. Estimation	8th: 1 out of 4 9–10: 1 out of 4	Explain how estimation strategies were used Use various estimation techniques Explain decimal representation as approximate value
	4. Computation	8th: 3 out of 3 9–10: 3 out of 3	
Algebra	1. Patterns	8th: 5 out of 5 9–10: 3 out of 4	
	2. Variables, Equations, and Inequalities	8th: 6 out of 6 9–10: 3 out of 3	
	3. Functions	8th: 5 out of 5 9–10: 9 out of 9	
	4. Models	8th: 1 out of 1 9–10: 1 out of 1	
Geometry	1. Geometric Figures and Their Properties	8th: 10 out of 10 9–10: 8 out of 8	
	2. Measurement and Estimation	8th: 7 out of 7 9–10: 7 out of 7	
	3. Transformational Geometry	8th: 3 out of 4 9–10: 3 out of 4	Draw Determine possible tessellation
	4. Geometry from an Algebraic Perspective	8th: 3 out of 3 9–10: 8 out of 8	
Data	1. Probability	8th: 3 out of 6 9–10: 3 out of 3	
	2. Statistics	8th: 5 out of 6 9–10: 4 out of 6	Recognize valid/invalid data collection techniques
	TOTALS 14 out of 14 Benchmarks 4 out of 4 Standards	8th: 60 out of 69 9–10: 60 out of 67	

*Refer to Kansas's Mathematics Curricular Standards on pages 24–33

Table A-3. Number of Kansas Science Standards Measured by EXPLORE, PLAN, and the ACT

	Kansas Benchmarks*	Number of Kansas Indicators Measured by ACT's tests	Aspects of Kansas Standards that are Not Measured
Science As Inquiry	1. Inquiry	8–12: 5 out of 5	
	TOTALS 1 out of 1 Benchmark 1 out of 1 Process Standard	8–12: 5 out of 5	
Chemistry	1. Atomic Structure	8–12: (2) out of (2)	
	2. Matter	8–12: (3) out of (3)	
	3. Chemical Reactions	8–12: (3) out of (3)	
Physics	1. Force and Motion	8–12: (2) out of (2)	
	2. Thermodynamics	8–12: (3) out of (3)	
	3. Matter/Energy	8–12: (6) out of (6)	
Life Science	1. Cell	8–12: (5) out of (5)	
	2. Genetics	8–12: (5) out of (5)	
	3. Evolution	8–12: (6) out of (6)	
	4. Interdependence	8–12: (5) out of (5)	
	5. Energy in Living Systems	8–12: (4) out of (4)	
	6. Animal Behavior	8–12: (3) out of (3)	
	7. Structure and Function	8–12: (5) out of (5)	
Earth and Space Science	1. Energy and Cycles	8–12: (4) out of (4)	
	2. Earth System	8–12: (1) out of (1)	
	3. Solar System	8–12: (4) out of (4)	
	4. Universe	8–12: (3) out of (3)	
Science & Technology	1. Applied Science/ Technology	8–12: (0) out of (3)	Understand technology is application of science Understand creativity, imagination are required in science Understand science advances technology

*Refer to Kansas's Science Curricular Standards on pages 34–37

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Table A-3. Number of Kansas Science Standards Measured by EXPLORE, PLAN, and the ACT			
	Kansas Benchmarks*	**Number of Kansas Indicators Measured by ACT's tests**	**Aspects of Kansas Standards that are Not Measured**
Science In Personal & Environ-mental Per-spectives	1. Effects on Environment	8–12: (2) out of (4)	Understand some hazards and accidents can be avoided through safety education Understand personal health choices involve an understanding of biology and chemistry
	2. Population Growth	8–12: (3) out of (3)	
	3. Environmental Quality	8–12: (2) out of (2)	
	4. Hazards	8–12: (2) out of (2)	Understand potential Earth hazards
	5. STS	8–12: (0) out of (1)	Understand relationship between science, technology, and society
History & Nature of Science	1. Science as Human Endeavor	8–12: (0) out of (6)	Understand science as a vocation and avocation Recognize influence of personal and cultural beliefs that embed science in society
	2. Scientific Knowledge	8–12: (0) out of (4)	Understand laws, theories, inference, testable hypothesis Understand scientific knowledge is subject to change
	3. Historical Perspective	8–12: (0) out of (2)	Demonstrate understanding of history of science
	TOTALS 21 out of 26 Benchmarks 6 out of 7 Content Standards	8–12: (73) out of (91)	

*Refer to Kansas's Science Curricular Standards on pages 34–37

KANSAS Grade 8 Reading
Curricular Standards

Standard 1: Reading. The student reads and comprehends text across the curriculum.

Benchmark 1: The student uses skills in alphabetics to construct meaning from text.

[No indicators at this grade level.]

Benchmark 2: The student reads fluently.

The student…

1. uses knowledge of conventions and text features to read fluently at instructional or independent reading levels.
2. reads expressively with appropriate pace, phrasing, intonation, and rhythm of speech.
3. uses knowledge of complex sentence structure to read fluently at instructional or independent reading levels.
4. uses a variety of word-recognition strategies (e.g., orthographic patterns, reading and writing text) to read fluently.
5. adjusts reading rate to support comprehension when reading narrative, expository, technical, and persuasive texts.

Benchmark 3: The student expands vocabulary.

The student…

1. ▲ determines meaning of words or phrases using context clues (e.g., definitions, restatements, examples, descriptions, comparison-contrast, clue words, cause-effect) from sentences or paragraphs.
2. locates and uses reference materials available in the classroom, school, and public libraries (e.g., dictionaries, thesauri, atlases, encyclopedias, internet) that are appropriate to the task.
3. ▲ determines 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.
4. ▲ identifies and determines the meaning of figurative language including ▲similes, ▲metaphors, ▲analogies, ▲hyperbole, ▲onomatopoeia, ▲personification, ▲idioms, ▲imagery, and symbolism.
5. distinguishes between connotative and denotative meanings.

Benchmark 4: The student comprehends a variety of texts (narrative, expository, technical, and persuasive).

The student…

1. identifies characteristics of narrative, expository, technical, and persuasive texts.
2. ▲ understands the purpose of text features (e.g., title, graphs/charts and maps, table of contents, pictures/illustrations, boldface type, italics, glossary, index, headings, subheadings, topic and summary sentences, captions, sidebars, underlining, numbered or bulleted lists) and uses such features to locate information in and to gain meaning from appropriate-level texts.
3. uses prior knowledge, content, and text type features to make, to revise, and to confirm predictions.
4. generates and responds logically to literal, inferential, evaluative, synthesizing, and critical thinking questions before, during, and after reading the text.
5. ▲ uses information from the text to make inferences and draw conclusions.
6. ▲ analyzes how text structure (e.g., sequence, problem-solution, comparison-contrast, description, cause-effect) helps support comprehension of text.
7. ▲ compares and contrasts varying aspects (e.g., characters' traits and motives, themes, problem-solution, cause-effect relationships, ideas and concepts, procedures, viewpoints, authors' purposes, persuasive techniques) in one or more appropriate-level texts.
8. ▲ explains cause-effect relationships in appropriate-level narrative, expository, technical, and persuasive texts.
9. ▲ uses paraphrasing and organizational skills to summarize information (e.g., stated and implied main ideas, main events, important details) from appropriate-level narrative, expository, technical, and persuasive texts in logical order.
10. ▲ identifies the topic, main idea(s), supporting details, and theme(s) in text across the content areas and from a variety of sources in appropriate-level texts.
11. ▲ explains the relationship between an author's use of literary devices in a text (e.g., ▲foreshadowing, ▲flashback, ▲irony, symbolism, tone, mood) and his or her purpose for writing the text.
12. establishes purposes for both assigned and self-selected reading (e.g., to be informed, to follow directions, to be entertained, to solve problems).
13. follows directions explained in technical text.
14. ▲ identifies the author's position in a persuasive text and describes techniques the author uses to support that position (e.g., bandwagon approach, glittering generalities, testimonials, citing statistics, other techniques that appeal to reason or emotion).
15. ▲ distinguishes between fact and opinion, and recognizes propaganda (e.g., advertising, media,

politics, warfare), bias, and stereotypes in various types of appropriate-level texts.

Standard 2: Literature. The student responds to a variety of text.

Benchmark 1: The student uses literary concepts to interpret and respond to text.

The student…

1. ▲ describes different aspects of characters (e.g., their physical traits, personality traits, feelings, actions, motives) and analyzes how major characters are developed (e.g., through their thoughts, words, speech patterns, actions) and how they change over time.
2. ▲ identifies and describes the setting (e.g., environment, time of day or year, historical period, situation, place) and analyzes connections between the setting and other story elements (e.g., character, plot).
3. ▲ identifies major and minor elements of the plot (e.g., problem or conflict, climax, resolution, rising action, falling action, subplots, parallel episodes) and explains how these elements relate to one another.
4. recognizes aspects of theme (e.g., moral, lesson, meaning, message, author's ideas about the subject) and recurring themes across works (e.g., bravery, loneliness, loyalty, friendship).
5. identifies the use of literary devices (e.g., foreshadowing, flashback, figurative language, imagery, symbolism) in a text and explains how the author uses such devices to help establish tone and mood.

Benchmark 2: The student understands the significance of literature and its contributions to various cultures

The student…

1. identifies common structures and stylistic elements in literature, folklore, and myths from a variety of cultures.
2. compares and contrasts customs and ideas within literature representing a variety of cultures.
3. analyzes distinctive and shared characteristics of cultures through a variety of texts.

KANSAS Grade 8 Writing
Curricular Standards

Standard 1: Writing. The student writes effectively for a variety of audiences, purposes, and contexts.

Benchmark 1: The student writes narrative text using the writing process.

The student…

1. understands and develops a focused written piece that includes plot elements (e.g., initiating event, rising and falling action, climax, conflict, setting, character development, resolution).
2. uses (1) personal experience (2) observations (3) prior knowledge in written text.
3. clearly defines the main idea with selection of relevant details from a variety of sources.
4. analyzes and understands implications of plagiarism (e.g., ethical, legal).
5. understands and independently uses appropriate strategies to generate narrative text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
6. writes a piece with an inviting introduction, appropriate body, and satisfying conclusion that leaves the reader with a sense of resolution.
7. selects transitions to connect ideas within and between paragraphs.
8. selects original and compelling vocabulary and/or figurative language appropriate for the purpose and audience.
9. selects words that are suitable and precise that create appropriate imagery (e.g., explicit nouns, vivid verbs, natural modifiers).
10. includes vocabulary particular to the topic and provides ease of understanding.
11. varies sentence structures and lengths (e.g., simple, compound, complex, compound-complex).
12. creates a variety of sentence beginnings that build upon previous sentences and guides the reader from one sentence to another.
13. discriminates between the effective and ineffective use of sentence fragments.
14. writes using dialogue effectively, sounding conversational and natural.
15. [No indicator at this grade level]
16. uses correct mechanics and punctuation (e.g., use of hyphens, dashes, ellipsis).
17. uses correct grammar and usage, which may be manipulated for stylistic effect that contributes to clarity.
18. spells familiar and most unfamiliar words correctly utilizing available resources (e.g., dictionary, spell check).
19. uses correct paragraph division to reinforce the organizational structure of the text.

Benchmark 2: The student writes expository text using the writing process.

The student…

1. ▲ develops one main idea and/or a thesis statement.
2. ▲ clearly defines the main idea with selection of relevant, logical details that meet the reader's informational needs.
3. ▲ uses (1) personal experience (2) observations (3) prior knowledge (4) research to provide information using an appropriate point of view for the piece (e.g., 3rd person pronouns in research).
4. ▲ expresses information in own words and uses explicit techniques to appeal to the backgrounds and interests of the audience.
5. ▲ analyzes and understands implications of plagiarism (e.g., ethical, legal).
6. cites references for all information used or reproduced from any source.
7. constructs a bibliography with author, title, publisher, cear, Web site name and address, and copyright date.
8. ▲ understands and independently uses appropriate strategies to generate expository text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
9. ▲ develops a cohesive piece that contains an engaging introduction, a body that provides information, and a conclusion that reinforces the thesis statement and leaves the reader with a sense of completion.
10. ▲ arranges information within each paragraph in a logical and effective sequence to meet the informational needs of the reader (typically 5-8 sentences).
11. ▲ selects appropriate transitions to connect ideas within and between paragraphs.
12. ▲ selects original and compelling vocabulary and/or figurative language to inform the reader.
13. ▲ selects words that are suitable and precise, creating appropriate imagery (e.g., explicit nouns, vivid verbs, natural modifiers).
14. ▲ defines and uses specialized vocabulary particular to the subject/topic providing ease of understanding.
15. ▲ varies sentence structures and lengths making the reading pleasant and natural (e.g., simple, compound, complex, compound-complex).
16. ▲ creates a variety of sentence beginnings that build upon previous sentences and guides the reader from one sentence to another.
17. ▲ discriminates between the effective and ineffective use of sentence fragments.
18. [No indicator at this grade level]
19. ▲ uses correct mechanics and punctuation (e.g., hyphens, dashes, ellipsis).

▲ Assessed indicator

20. ▲ uses correct grammar and usage, which may be manipulated for stylistic effect, contributing to clarity.
21. ▲ spells familiar and most unfamiliar words correctly utilizing available resources (e.g., dictionary, spell check)
22. ▲ uses correct paragraph division to reinforce the organizational structure of the text.

Benchmark 3: The student writes technical text using the writing process.

The student…

1. develops a technical text focused on one main purpose.
2. clearly defines the main idea with selection of concise, logical details that meet the reader's informational needs.
3. analyzes and understands implications of plagiarism (e.g., ethical, legal).
4. cites references for all information used or reproduced from any source.
5. constructs a bibliography with author, title, publisher, year, Web site name and address, and copyright date.
6. understands and independently uses appropriate strategies to generate technical text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
7. organizes information within each section, paragraph, list, or graphic in a logical and effective sequence to meet the reader's informational needs.
8. writes a complete piece with a useful introduction, a relevant or sequential body, and an appropriate conclusion.
9. selects appropriate transitions to connect ideas within the piece (e.g., enumerated list, bullets, headings, subheadings, complex outlining elements).
10. writes with an awareness of purpose and audience (e.g., letters, reports, directions, graphics, charts, maps, tables, brochures, electronic presentation, newsletters, job searches, memos, fliers, e-mails).
11. writes with authority so the voice is not distracting.
12. selects words that convey the writer's message plainly and concisely (e.g., technical terms, jargon).
13. selects words appropriate for the intended task/format (e.g., persuasive, if persuading; informational, if informing, etc.).
14. writes compact sentences or phrases that make the point clear.
15. punctuates correctly (e.g., hyphens, dashes, ellipsis).
16. uses correct grammar and usage, which may be manipulated for stylistic effect and contributes to clarity.
17. spells words correctly and uses available resources (e.g., dictionary, spell check).
18. uses graphic devices that are clear, helpful, visually appealing, and supportive of the text (e.g., charts, graphs, illustrations).

Benchmark 4: The student writes persuasive text using the writing process.

The student…

1. asserts an arguable proposition or opinion (thesis statement).
2. uses (1) personal experience (2) observations (3) prior knowledge (4) research important for the reader to reach a conclusion and use an appropriate point of view for the piece (e.g., 1st person in editorial).
3. develops details necessary to expand the main topic in a balanced format supporting the writer's position.
4. anticipates the reader's question(s) and provides balance with a counter-argument.
5. practices building a focused argument that uses logical thinking and appeals to reason, authority, and/or emotion.
6. analyzes and understands implications of plagiarism (e.g., ethical, legal).
7. understands and independently uses appropriate strategies to generate persuasive text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
8. develops a cohesive piece that contains an engaging introduction, an appropriate body that reinforces the reader's position, and a conclusion that reinforces the thesis statement and the original proposition.
9. arranges information within each paragraph in a logical and effective sequence to persuade the reader (typically 5-8 sentences).
10. selects appropriate transitions to connect ideas within and between paragraphs.
11. selects vocabulary and figurative language that conveys a particular tone and personality (e.g., humor, suspense, cynicism, sarcasm, originality, and liveliness).
12. uses language that is appropriate for persuasive writing and easy for the audience to understand.
13. practices using words that are suitable, precise, and create imagery (e.g., specific nouns, powerful verbs, vivid modifiers).
14. varies sentence structures and lengths, making the reading pleasant and natural (e.g., simple, compound, complex, compound-complex).
15. creates a variety of sentence beginnings that build upon previous sentences and guides the reader from one sentence to another.
16. discriminates between the effective and ineffective use of sentence fragments.
17. includes convincing dialogue, if appropriate.
18. punctuates accurately (e.g., hyphens, dashes, ellipsis).
19. uses correct grammar and usage, which may be manipulated for stylistic effect, which contributes to clarity.

20. spells familiar and most unfamiliar words correctly utilizing available resources (e.g., dictionary, spell check).

21. indents paragraphs to reinforce the organizational structure of the text.

Standard 1: Reading. The student reads and comprehends text across the curriculum.

Benchmark 1: The student uses skills in alphabetics to construct meaning from text.

[No indicator at this grade level.]

Benchmark 2: The student reads fluently.

The student…

1. adjusts reading rate to support comprehension when reading narrative, expository, technical, and persuasive texts.

Benchmark 3: The student expands vocabulary.

The student…

1. ▲ determines meaning of words or phrases using context clues (e.g., definitions, restatements, examples, descriptions, comparison-contrast, clue words, cause-effect) from sentences or paragraphs.
2. locates and uses reference materials available in the classroom, school, and public libraries (e.g., dictionaries, thesauri, atlases, encyclopedias, internet) that are appropriate to the tasks.
3. ▲ determines 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.
4. ▲ identifies, interprets, and analyzes the use of figurative language, including similes, metaphors, analogies, hyperbole, onomatopoeia, personification, idioms, imagery, and symbolism.
5. discriminates between connotative and denotative meanings and interprets the connotative power of words.

Benchmark 4: The student comprehends a variety of texts (narrative, expository, technical, and persuasive).

The student…

1. identifies characteristics of narrative, expository, technical, and persuasive texts.
2. ▲ understands the purpose of text features (e.g., title, graphs/charts and maps, table of contents, pictures/illustrations, boldface type, italics, glossary, index, headings, subheadings, topic and summary sentences, captions, sidebars, underlining, numbered or bulleted lists, footnotes, annotations) and uses such features to locate information in and to gain meaning from appropriate-level texts.
3. uses prior knowledge, content, and text type features to make, to revise, and to confirm predictions.
4. generates and responds logically to literal, inferential, evaluative, synthesizing, and critical thinking questions before, during, and after reading the text.
5. ▲ uses information from the text to make inferences and draw conclusions.
6. ▲ analyzes and evaluates how authors use text structure (e.g., sequence, problem-solution, comparison-contrast, description, cause-effect) to help achieve their purposes.
7. ▲ compares and contrasts varying aspects (e.g., characters' traits and motives, themes, problem-solution, cause-effect relationships, ideas and concepts, procedures, viewpoints, authors' purposes, persuasive techniques, use of literary devices, thoroughness of supporting evidence) in one or more appropriate-level texts.
8. ▲ explains and analyzes cause-effect relationships in appropriate-level narrative, expository, technical, and persuasive texts.
9. ▲ uses paraphrasing and organizational skills to summarize information (stated and implied main ideas, main events, important details, underlying meaning) from appropriate-level narrative, expository, technical, and persuasive texts in logical or sequential order, clearly preserving the author's intent.
10. ▲ identifies the topic, main idea(s), supporting details, and theme(s) in text across the content areas and from a variety of sources in appropriate-level texts.
11. ▲ analyzes and evaluates how an author's style (e.g., word choice, sentence structure) and use of literary devices (e.g., foreshadowing, flashback, irony, symbolism, tone, mood, satire, imagery, point of view, allusion, overstatement, paradox) work together to achieve his or her purpose for writing text.
12. establishes purposes for both assigned and self-selected reading (e.g., to be informed, to follow directions, to be entertained, to solve problems).
13. follows directions presented in technical text.
14. ▲ identifies the author's position in a persuasive text, describes techniques the author uses to support that position (e.g., bandwagon approach, glittering generalities, testimonials, citing authority, statistics, other techniques that appeal to reason or emotion), and evaluates the effectiveness of these techniques and the credibility of the information provided.
15. ▲ distinguishes between fact and opinion, and recognizes propaganda (e.g., advertising, media, politics, warfare), bias, and stereotypes in various types of appropriate-level texts.

Standard 2: Literature. The student responds to a variety of text.

Benchmark 1: The student uses literary concepts to interpret and respond to text.

The student…

1. ▲ identifies and describes different types of characters (e.g., protagonist, antagonist, round, flat, static, dynamic) and analyzes the development of characters.
2. ▲ analyzes the historical, social, and cultural contextual aspects of the setting and their influence on characters and events in the story or literary text.

3. ▲ analyzes and evaluates how the author uses various plot elements (e.g., problem or conflict, climax, resolution, rising action, falling action, subplots, parallel episodes) to advance the plot and make connections between events.
4. analyzes themes, tone, and the author's point-of-view across a variety of literary works and genres using textual evidence and considering audience and purpose.
5. identifies, analyzes, and evaluates the use of literary devices (e.g., foreshadowing, flashback, irony, figurative language, imagery, symbolism, satire, allusion, paradox, dialogue, point of view, overstatement) in a text.

Benchmark 2: The student understands the significance of literature and its contributions to various cultures..

The student…

1. recognizes ways that literature from different cultures presents similar themes differently across genres.
2. compares and contrasts works of literature that deal with similar topics and problems.
3. evaluates distinctive and shared characteristics of cultures through a variety of texts.

Standard 1: Writing. The student writes effectively for a variety of audiences, purposes, and contexts.

Benchmark 1: The student writes narrative text using the writing process.

The student…

1. composes a written piece with plot elements and also experiments with point of view and various narrative techniques.
2. selects and uses (1) personal experience (2) personal observation (3) prior knowledge.
3. writes from experiences and relies on detailed insight, a sense of how events unfold, and how people respond to life and to one another.
4. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
5. applies appropriate strategies to generate narrative text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
6. writes a piece with an inviting introduction, appropriate body, and satisfying conclusion that leaves the reader with a sense of resolution.
7. selects varied transitions to connect ideas within and between paragraphs in the writing piece.
8. selects vocabulary and figurative language that conveys a particular tone and personality (e.g., humor, suspense, originality, and liveliness).
9. incorporates words that are precise and suitable for narrative writing, which create appropriate imagery (e.g., explicit nouns, explicit verbs, natural modifiers).
10. manages vocabulary particular to the topic and provides ease of understanding.
11. uses a variety of sentence structures and lengths.
12. creates a variety of engaging sentence beginnings that relate to and build upon previous sentences that move the reader easily through the text.
13. uses fragments only for stylistic effect.
14. composes and selectively uses dialogue for effect and style.
15. [No indicator at this grade level]
16. uses correct mechanics and punctuation to guide the reader through the text.
17. uses correct grammar and usage, which may be manipulated for stylistic effect and may contribute to clarity.
18. spells familiar and most unfamiliar words and uses available resources (e.g., dictionary, spell check).
19. uses correct paragraph divisions to reinforce the organizational structure of the text.

Benchmark 2: The student writes expository text using the writing process.

The student…

1. develops a thesis statement based upon at least one main idea in response to a prompt.
2. clearly defines the main idea by selecting relevant, logical details that meet the reader's informational needs.
3. selects and uses (1) personal experience (2) personal observations (3) prior knowledge (4) research to meet the reader's needs and to create appropriate point of view.
4. expresses information in own words using appropriate organization, grammar, word choice, and tone sufficient to the audience.
5. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
6. cites references for all sources of information and includes summarized and paraphrased ideas from other authors.
7. constructs a bibliography with a standard style of format (e.g., MLA, APA, etc.).
8. applies appropriate strategies to generate expository text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
9. writes a cohesive piece that includes (1) an introduction that draws the reader in (2) a body that provides information through the logical placement of facts and data (3) a conclusion that reinforces the thesis statement and leaves the reader with a sense of completion.
10. arranges information within each paragraph in a logical and effective sequence to meet the reader's informational needs.
11. uses appropriate transitions to connect ideas within and between paragraphs.
12. selects vocabulary and figurative language that convey a particular tone and personality (e.g., humor, suspense, originality, liveliness).
13. incorporates words that are precise and suitable for expository writing that create appropriate imagery (e.g., explicit nouns, vivid verbs, natural modifiers).
14. manages specialized vocabulary particular to the subject/topic to provide ease of understanding.
15. uses a variety of sentence structures and lengths to make the reading pleasant and natural.
16. creates a variety of engaging sentence beginnings that relate to and build upon previous sentences to move the reader easily through the text.
17. uses fragments only for stylistic effect.
18. [No indicator at this grade level]

19. uses correct mechanics and punctuates to guide the reader through the text.
20. uses correct grammar and usage, which may be manipulated for stylistic effect and may contribute to clarity.
21. spells familiar and most unfamiliar words correctly and uses available resources (e.g., dictionary, spell check).
22. uses correct paragraph divisions to reinforce the organizational structure of the text.

Benchmark 3: The student writes technical text using the writing process.

The student…

1. develops a technical text focused on one main purpose.
2. clearly defines the main idea with selection of concise, logical details that meet the reader's informational needs.
3. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
4. cites references for all sources of information and includes summarized and paraphrased ideas from other authors.
5. constructs a bibliography with a standard style of format (e.g., MLA, APA, etc.).
6. applies appropriate strategies to generate technical text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
7. organizes information within each section, paragraph, list, or graphic in a logical and effective sequence to meet the reader's informational needs.
8. composes a comprehensive piece with a constructive introduction, a relevant or sequential body, and a suitable conclusion.
9. uses appropriate transitions to connect ideas within the piece (e.g., enumerated lists, bullets, headings, subheadings, complex outlining elements).
10. writes with an awareness of purpose and audience (e.g., letters, complex reports, directions, graphics, brochures, electronic presentation, newsletters, memos, job searches, fliers, e-mails, Web pages, pictorials).
11. writes with authority so the voice is not distracting.
12. selects words that convey the writer's message clearly, precisely, and professionally (e.g., technical terms, jargon).
13. selects words that consider appropriate connotation for the intended task/format (e.g., persuasive, if persuading; informational, if informing, etc.).
14. writes compact sentences or phrases that make the point clear.
15. punctuates correctly.
16. uses correct grammar and usage, which may be manipulated for stylistic effect and contributes to clarity.
17. spells words correctly and uses available resources (e.g., dictionary, spell check).
18. uses graphic devices that are clear, helpful, visually appealing, and supportive of the text (e.g., charts, graphs, illustrations.)

Benchmark 4: The student writes persuasive text using the writing process.

The student…

1. ▲ asserts an arguable proposition or opinion (thesis statement).
2. ▲ selects and uses (1) personal experience (2) observations (3) prior knowledge (4) research important for the reader to reach a conclusion and use an appropriate point of view for the piece (e.g., first person in editorial).
3. ▲ develops and differentiates details necessary to expand the main topic in a balanced format to support the writer's position.
4. ▲ anticipates the reader's question(s) and provides balance with a counter-argument.
5. ▲ builds a focused argument that uses logical thinking and appeals to reason, authority, and/or emotion.
6. ▲ analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
7. ▲ applies appropriate strategies to generate persuasive text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
8. ▲ writes a cohesive piece that includes (1) an introduction that engages the reader (2) a body that reinforces the writer's position through the logical placement of evidence (3) a conclusion that reinforces the thesis statement and the original position.
9. ▲ arranges information within each paragraph in a logical and effective sequence to persuade the reader (e.g., typically 5 or more sentences).
10. ▲ uses appropriate transitions to connect ideas within and between paragraphs.
11. ▲ selects vocabulary and figurative language that conveys a particular tone and personality (e.g., humor, suspense, cynicism, sarcasm, originality, and liveliness).
12. ▲ uses language that is appropriate for persuasive writing and easy for the audience to understand.
13. ▲ incorporates words that are precise, suitable for persuasive writing, and create imagery (e.g., precise nouns, powerful verbs, vivid modifiers).
14. ▲ uses a variety of sentence structures and lengths to make the reading pleasant and natural.
15. ▲ creates a variety of engaging sentence beginnings that relate to and build upon previous sentences that move the reader fluidly through the subject matter.
16. ▲ uses fragments only for stylistic effect.
17. ▲ includes convincing dialogue, if appropriate.
18. ▲ punctuates correctly to easily guide the reader through the text.

19. ▲ uses correct grammar and usage, which may be manipulated for stylistic effect, which may contribute to clarity.

20. ▲ spells words correctly and uses available resources (e.g., dictionary, spell check).

21. ▲ uses correct paragraph divisions to reinforce the organizational structure of the text.

Standard 1: Reading. The student reads and comprehends text across the curriculum.

Benchmark 1: The student uses skills in alphabetics to construct meaning from text.

[No indicator at this grade level.]

Benchmark 2: The student reads fluently.

The student…

1. adjusts reading rate to support comprehension when reading narrative, expository, technical, and persuasive texts.

Benchmark 3: The student expands vocabulary.

The student…

1. ▲ determines meaning of words or phrases using context clues (e.g., definitions, restatements, examples, descriptions, comparison-contrast, clue words, cause-effect) from sentences or paragraphs.
2. locates and uses reference materials available in the classroom, school, and public libraries (e.g., dictionaries, thesauri, atlases, encyclopedias, internet) that are appropriate to the tasks.
3. ▲ determines 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.
4. ▲ identifies, interprets, and analyzes the use of figurative language, including similes, metaphors, analogies, hyperbole, onomatopoeia, personification, idioms, imagery, and symbolism.
5. discriminates between connotative and denotative meanings and interprets the connotative power of words.

Benchmark 4: The student comprehends a variety of texts (narrative, expository, technical, and persuasive).

The student…

1. identifies characteristics of narrative, expository, technical, and persuasive texts.
2. ▲ understands the purpose of text features (e.g., title, graphs/charts and maps, table of contents, pictures/illustrations, boldface type, italics, glossary, index, headings, subheadings, topic and summary sentences, captions, sidebars, underlining, numbered or bulleted lists, footnotes, annotations) and uses such features to locate information in and to gain meaning from appropriate-level texts.
3. uses prior knowledge, content, and text type features to make, to revise, and to confirm predictions.
4. generates and responds logically to literal, inferential, evaluative, synthesizing, and critical thinking questions before, during, and after reading the text.
5. ▲ uses information from the text to make inferences and draw conclusions.
6. ▲ analyzes and evaluates how authors use text structure (e.g., sequence, problem-solution, comparison-contrast, description, cause-effect) to help achieve their purposes.
7. ▲ compares and contrasts varying aspects (e.g., characters' traits and motives, themes, problem-solution, cause-effect relationships, ideas and concepts, procedures, viewpoints, authors' purposes, persuasive techniques, use of literary devices, thoroughness of supporting evidence) in one or more appropriate-level texts.
8. ▲ explains and analyzes cause-effect relationships in appropriate-level narrative, expository, technical, and persuasive texts.
9. ▲ uses paraphrasing and organizational skills to summarize information (stated and implied main ideas, main events, important details, underlying meaning) from appropriate-level narrative, expository, technical, and persuasive texts in logical or sequential order, clearly preserving the author's intent.
10. ▲ identifies the topic, main idea(s), supporting details, and theme(s) in text across the content areas and from a variety of sources in appropriate-level texts.
11. ▲ analyzes and evaluates how an author's style (e.g., word choice, sentence structure) and use of literary devices (e.g., foreshadowing, flashback, irony, symbolism, tone, mood, satire, imagery, point of view, allusion, overstatement, paradox) work together to achieve his or her purpose for writing text.
12. establishes purposes for both assigned and self-selected reading (e.g., to be informed, to follow directions, to be entertained, to solve problems).
13. follows directions presented in technical text.
14. ▲ identifies the author's position in a persuasive text, describes techniques the author uses to support that position (e.g., bandwagon approach, glittering generalities, testimonials, citing authority, statistics, other techniques that appeal to reason or emotion), and evaluates the effectiveness of these techniques and the credibility of the information provided.
15. ▲ distinguishes between fact and opinion, and recognizes propaganda (e.g., advertising, media, politics, warfare), bias, and stereotypes in various types of appropriate-level texts.

Standard 2: Literature. The student responds to a variety of text.

Benchmark 1: The student uses literary concepts to interpret and respond to text.

The student…

1. ▲ identifies and describes different types of characters (e.g., protagonist, antagonist, round, flat, static, dynamic) and analyzes the development of characters.
2. ▲ analyzes the historical, social, and cultural contextual aspects of the setting and their influence on characters and events in the story or literary text.

3. ▲ analyzes and evaluates how the author uses various plot elements (e.g., problem or conflict, climax, resolution, rising action, falling action, subplots, parallel episodes) to advance the plot and make connections between events.
4. analyzes themes, tone, and the author's point-of-view across a variety of literary works and genres using textual evidence and considering audience and purpose.
5. identifies, analyzes, and evaluates the use of literary devices (e.g., foreshadowing, flashback, irony, figurative language, imagery, symbolism, satire, allusion, paradox, dialogue, point of view, overstatement) in a text.

Benchmark 2: The student understands the significance of literature and its contributions to various cultures..

The student…

1. recognizes ways that literature from different cultures presents similar themes differently across genres.
2. compares and contrasts works of literature that deal with similar topics and problems.
3. evaluates distinctive and shared characteristics of cultures through a variety of texts.

Standard 1: Writing. The student writes effectively for a variety of audiences, purposes, and contexts.

Benchmark 1: The student writes narrative text using the writing process.

The student…

1. composes a written piece with plot elements and also experiments with point of view and various narrative techniques.
2. selects and uses (1) personal experience (2) personal observation (3) prior knowledge.
3. writes from experiences and relies on detailed insight, a sense of how events unfold, and how people respond to life and to one another.
4. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
5. applies appropriate strategies to generate narrative text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
6. writes a piece with an inviting introduction, appropriate body, and satisfying conclusion that leaves the reader with a sense of resolution.
7. selects varied transitions to connect ideas within and between paragraphs in the writing piece.
8. selects vocabulary and figurative language that conveys a particular tone and personality (e.g., humor, suspense, originality, and liveliness).
9. incorporates words that are precise and suitable for narrative writing, which create appropriate imagery (e.g., explicit nouns, explicit verbs, natural modifiers).
10. manages vocabulary particular to the topic and provides ease of understanding.
11. uses a variety of sentence structures and lengths.
12. creates a variety of engaging sentence beginnings that relate to and build upon previous sentences that move the reader easily through the text.
13. uses fragments only for stylistic effect.
14. composes and selectively uses dialogue for effect and style.
15. [No indicator at this grade level]
16. uses correct mechanics and punctuation to guide the reader through the text.
17. uses correct grammar and usage, which may be manipulated for stylistic effect and may contribute to clarity.
18. spells familiar and most unfamiliar words and uses available resources (e.g., dictionary, spell check).
19. uses correct paragraph divisions to reinforce the organizational structure of the text.

Benchmark 2: The student writes expository text using the writing process.

The student…

1. develops a thesis statement based upon at least one main idea in response to a prompt.
2. clearly defines the main idea by selecting relevant, logical details that meet the reader's informational needs.
3. selects and uses (1) personal experience (2) personal observations (3) prior knowledge (4) research to meet the reader's needs and to create appropriate point of view.
4. expresses information in own words using appropriate organization, grammar, word choice, and tone sufficient to the audience.
5. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
6. cites references for all sources of information and includes summarized and paraphrased ideas from other authors.
7. constructs a bibliography with a standard style of format (e.g., MLA, APA, etc.).
8. applies appropriate strategies to generate expository text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups and identifying information from print sources).
9. writes a cohesive piece that includes (1) an introduction that draws the reader in (2) a body that provides information through the logical placement of facts and data (3) a conclusion that reinforces the thesis statement and leaves the reader with a sense of completion.
10. arranges information within each paragraph in a logical and effective sequence to meet the reader's informational needs.
11. uses appropriate transitions to connect ideas within and between paragraphs.
12. selects vocabulary and figurative language that convey a particular tone and personality (e.g., humor, suspense, originality, liveliness).
13. incorporates words that are precise and suitable for expository writing that create appropriate imagery (e.g., explicit nouns, vivid verbs, natural modifiers).
14. manages specialized vocabulary particular to the subject/topic to provide ease of understanding.
15. uses a variety of sentence structures and lengths to make the reading pleasant and natural.
16. creates a variety of engaging sentence beginnings that relate to and build upon previous sentences to move the reader easily through the text.
17. uses fragments only for stylistic effect.
18. [No indicator at this grade level]

19. uses correct mechanics and punctuates to guide the reader through the text.
20. uses correct grammar and usage, which may be manipulated for stylistic effect and may contribute to clarity.
21. spells familiar and most unfamiliar words correctly and uses available resources (e.g., dictionary, spell check).
22. uses correct paragraph divisions to reinforce the organizational structure of the text.

Benchmark 3: The student writes technical text using the writing process.

The student…

1. develops a technical text focused on one main purpose.
2. clearly defines the main idea with selection of concise, logical details that meet the reader's informational needs.
3. analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
4. cites references for all sources of information and includes summarized and paraphrased ideas from other authors.
5. constructs a bibliography with a standard style of format (e.g., MLA, APA, etc.).
6. applies appropriate strategies to generate technical text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
7. organizes information within each section, paragraph, list, or graphic in a logical and effective sequence to meet the reader's informational needs.
8. composes a comprehensive piece with a constructive introduction, a relevant or sequential body, and a suitable conclusion.
9. uses appropriate transitions to connect ideas within the piece (e.g., enumerated lists, bullets, headings, subheadings, complex outlining elements).
10. writes with an awareness of purpose and audience (e.g., letters, complex reports, directions, graphics, brochures, electronic presentation, newsletters, memos, job searches, fliers, e-mails, Web pages, pictorials).
11. writes with authority so the voice is not distracting.
12. selects words that convey the writer's message clearly, precisely, and professionally (e.g., technical terms, jargon).
13. selects words that consider appropriate connotation for the intended task/format (e.g., persuasive, if persuading; informational, if informing, etc.).
14. writes compact sentences or phrases that make the point clear.
15. punctuates correctly.
16. uses correct grammar and usage, which may be manipulated for stylistic effect and contributes to clarity.
17. spells words correctly and uses available resources (e.g., dictionary, spell check).
18. uses graphic devices that are clear, helpful, visually appealing, and supportive of the text (e.g., charts, graphs, illustrations.)

Benchmark 4: The student writes persuasive text using the writing process.

The student…

1. ▲ asserts an arguable proposition or opinion (thesis statement).
2. ▲ selects and uses (1) personal experience (2) observations (3) prior knowledge (4) research important for the reader to reach a conclusion and use an appropriate point of view for the piece (e.g., first person in editorial).
3. ▲ develops and differentiates details necessary to expand the main topic in a balanced format to support the writer's position.
4. ▲ anticipates the reader's question(s) and provides balance with a counter-argument.
5. ▲ builds a focused argument that uses logical thinking and appeals to reason, authority, and/or emotion.
6. ▲ analyzes and understands implications and consequences of plagiarism (e.g., ethical, legal, professional).
7. ▲ applies appropriate strategies to generate persuasive text (e.g., brainstorming, listing, webbing, working in pairs or cooperative groups, identifying information from print sources).
8. ▲ writes a cohesive piece that includes (1) an introduction that engages the reader (2) a body that reinforces the writer's position through the logical placement of evidence (3) a conclusion that reinforces the thesis statement and the original position.
9. ▲ arranges information within each paragraph in a logical and effective sequence to persuade the reader (e.g., typically 5 or more sentences).
10. ▲ uses appropriate transitions to connect ideas within and between paragraphs.
11. ▲ selects vocabulary and figurative language that conveys a particular tone and personality (e.g., humor, suspense, cynicism, sarcasm, originality, and liveliness).
12. ▲ uses language that is appropriate for persuasive writing and easy for the audience to understand.
13. ▲ incorporates words that are precise, suitable for persuasive writing, and create imagery (e.g., precise nouns, powerful verbs, vivid modifiers).
14. ▲ uses a variety of sentence structures and lengths to make the reading pleasant and natural.
15. ▲ creates a variety of engaging sentence beginnings that relate to and build upon previous sentences that move the reader fluidly through the subject matter.
16. ▲ uses fragments only for stylistic effect.
17. ▲ includes convincing dialogue, if appropriate.
18. ▲ punctuates correctly to easily guide the reader through the text.

19. ▲ uses correct grammar and usage, which may be manipulated for stylistic effect, which may contribute to clarity.

20. ▲ spells words correctly and uses available resources (e.g., dictionary, spell check).

21. ▲ uses correct paragraph divisions to reinforce the organizational structure of the text.

KANSAS Grade 8 Mathematics
Curricular Standards

Standard 1: Number and Computation.
The student uses numerical and computational concepts and procedures in a variety of situations.

Benchmark 1: Number Sense – The student demonstrates number sense for real numbers and simple algebraic expressions in a variety of situations.

The student…

1. knows, explains, and uses equivalent representations for rational numbers and simple algebraic expressions including integers, fractions, decimals, percents, and ratios; rational number bases with integer exponents; rational numbers written in scientific notation with integer exponents; time; and money.
2. compares and orders rational numbers, the irrational number pi, and algebraic expressions, e.g., which expression is greater –3n or 3n? It depends on the value of n. If n is positive, 3n is greater. If n is negative, –3n is greater. If n is zero, they are equal.
3. explains the relative magnitude between rational numbers, the irrational number pi, and algebraic expressions.
4. recognizes and describes irrational numbers, e.g., $\sqrt{2}$ is a non-repeating, non-terminating decimal; or π (pi) is a non-terminating decimal.
5. ▲ knows and explains what happens to the product or quotient when:
   a. a positive number is multiplied or divided by a rational number greater than zero and less than one, e.g., if 24 is divided by 1/3, will the answer be larger than 24 or smaller than 24? Explain.
   b. a positive number is multiplied or divided by a rational number greater than one.
   c. a nonzero real number is multiplied or divided by zero.
6. explains and determines the absolute value of real numbers.

Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties; and extends these properties to algebraic expressions.

The student…

1. explains and illustrates the relationship between the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] using mathematical models, e.g., number lines or Venn diagrams.
2. ▲ identifies all the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] to which a given number belongs. (For the purpose of assessment, irrational numbers will not be included.)
3. names, uses, and describes these properties with the rational number system and demonstrates their meaning including the use of concrete objects:
   a. commutative, associative, distributive, and substitution properties [commutative: a + b = b + a and ab = ba; associative: a + (b + c) = (a + b) + c and a(bc) = (ab)c; distributive: a(b + c) = ab + ac; substitution: if a = 2, then 3a = 3 × 2 = 6];
   b. identity properties for addition and multiplication and inverse properties of addition and multiplication (additive identity: a + 0 = a, multiplicative identity: a · 1 = a, additive inverse: +5 + –5 = 0, multiplicative inverse: 8 × 1/8 = 1);
   c. symmetric property of equality, e.g., 7 + 2 = 9 has the same meaning as 9 = 7 + 2;
   d. addition and multiplication properties of equalities, e.g., if a = b, then a + c = b + c;
   e. addition property of inequalities, e.g., if a > b, then a + c > b + c;
   f. zero product property, e.g., if ab = 0, then a = 0 and/or b = 0.

Benchmark 3: Estimation – The student uses computational estimation with real numbers in a variety of situations.

The student…

1. estimates real number quantities using various computational methods including mental math, paper and pencil, concrete objects, and/or appropriate technology.
2. uses various estimation strategies and explains how they were used to estimate real number quantities and simple algebraic expressions.
3. knows and explains why a decimal representation of the irrational number pi is an approximate value.
4. knows and explains between which two consecutive integers an irrational number lies.

Benchmark 4: Computation – The student models, performs, and explains computation with rational numbers, the irrational number pi, and algebraic expressions in a variety of situations.

The student…

1. computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. performs and explains these computational procedures with rational numbers:
   - **a.** ▲ addition, subtraction, multiplication, and division of integers
   - **b.** ▲ order of operations (evaluates within grouping symbols, evaluates powers to the second or third power, multiplies or divides in order from left to right, then adds or subtracts in order from left to right);
   - **c.** approximation of roots of numbers using calculators;
   - **d.** multiplication or division to find:
     - i. a percent of a number, e.g., what is 0.5% of 10?
     - ii. percent of increase and decrease, e.g., if two coins are removed from ten coins, what is the percent of decrease?
     - iii. percent one number is of another number, e.g., what percent of 80 is 120?
     - iv. a number when a percent of the number is given, e.g., 15% of what number is 30?
   - **e.** addition of polynomials, e.g., $(3x – 5) + (2x + 8)$.
   - **f.** simplifies algebraic expressions in one variable by combining like terms or using the distributive property, e.g., $–3(x – 4)$ is the same as $–3x + 12$.
3. finds factors and common factors of simple monomial expressions, e.g., given the monomials $10m^2n^3$ and $15a^2mn^2$ some common factors would be 5m, $5mn^2$, and n^2.

Standard 2: Algebra. The student uses algebra concepts and procedures in a variety of situations.

Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern from a variety of situations.

The student…

1. identifies, states, and continues a pattern presented in various formats including numeric (list or table), algebraic (symbolic notation), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written using these attributes:
   - **a.** counting numbers including perfect squares, cubes, and factors and multiples with positive rational numbers (number theory),
   - **b.** rational numbers including arithmetic and geometric sequences (arithmetic: sequence of numbers in which the difference of two consecutive numbers is the same, geometric: a sequence of numbers in which each succeeding term is obtained by multiplying the preceding term by the same number), e.g., 1/4, 1/2, 3/4, …;
   - **c.** geometric figures;
   - **d.** measurements;
   - **e.** things related to daily life;
   - **f.** variables and simple expressions, e.g., 1 – x, 2 – x, 3 – x, 4 – x, ...; or x, x^2, x^3, ...
2. generates and explains a pattern.
3. generates a pattern limited to two operations (addition, subtraction, multiplication, division, exponents) when given the rule for the nth term, e.g., the nth term is $n^2 + 1$, find the first 4 terms beginning with n = 1; the terms are 2, 5, 10, and 17.
4. states the rule to find the nth term of a pattern using explicit symbolic notation, e.g., given 2, 5, 8, 11, …; find the rule for the nth term, the rule is 3n – 1.
5. describes the pattern when given a table of linear values and plots the ordered pairs on a coordinate plane, e.g., in the table below, the pattern could be described as the x-coordinates are increasing by three, while the y-coordinates are increasing by 6, or the x is doubled and one is added to find the y.

X	2	5	8	11
Y	5	11	17	23

Benchmark 2: Variable, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

The student…

1. identifies independent and dependent variables within a given situation.
2. simplifies algebraic expressions in one variable by combining like terms or using the distributive property, e.g., $–3(x – 4)$ is the same as $–3x + 12$.
3. solves:
   - **a.** ▲ one- and two-step linear equations in one variable with rational number coefficients and constants intuitively and/or analytically;
   - **b.** one-step linear inequalities in one variable with rational number coefficients and constants intuitively, analytically, and graphically;
   - **c.** systems of given linear equations with whole number coefficients and constants graphically.
4. knows and describes the mathematical relationship between ratios, proportions, and percents and how to solve for a missing monomial or binomial term in a proportion, e.g., 2/5 = 1/(x + 2).
5. represents and solves algebraically:
   - **a.** the number when a percent and a number are given,
   - **b.** what percent one number is of another number,

c. percent of increase or decrease, e.g., the price of a loaf of bread is $2.00. With a coupon, the cost is $1.00. What is the percent of decrease?

6. evaluates formulas using substitution.

Benchmark 3: Functions – The student recognizes, describes, and analyzes constant, linear, and nonlinear relationships in a variety of situations.

The student…

1. recognizes and examines constant, linear, and nonlinear relationships using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or appropriate technology.
2. knows and describes the difference between constant, linear, and nonlinear relationships.
3. explains the concepts of slope and x- and y-intercepts of a line.
4. recognizes and identifies the graphs of constant and linear functions.
5. identifies ordered pairs from a graph, and/or plots ordered pairs using a variety of scales for the x- and y-axis.

Benchmark 4: Models – The student generates and uses mathematical models to represent and justify mathematical relationships found in a variety of situations.

The student…

1. knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
   a. process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate grids) to model computational procedures, algebraic relationships, and mathematical relationships and to solve equations;
   b. place value models (place value mats, hundred charts, base ten blocks, or unifix cubes) to compare, order, and represent numerical quantities and to model computational procedures;
   c. fraction and mixed number models (fraction strips or pattern blocks) and decimal and money models (base ten blocks or coins) to compare, order, and represent numerical quantities;
   d. factor trees to model least common multiple, greatest common factor, and prime factorization;
   e. equations and inequalities to model numerical relationships;
   f. function tables to model numerical and algebraic relationships;
   g. coordinate planes to model relationships between ordered pairs and linear equations and inequalities;
   h. two- and three-dimensional geometric models (geoboards, dot paper, nets, or solids) and real-world objects to model perimeter, area, volume, surface area, and properties of two-and three-dimensional figures;
   i. scale drawings to model large and small real-world objects;
   j. geometric models (spinners, targets, or number cubes), process models (coins, pictures, or diagrams), and tree diagrams to model probability;
   k. frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots, and histograms to organize and display data;
   l. Venn diagrams to sort data and to show relationships.

Standard 3: Geometry. The student uses geometric concepts and procedures in a variety of situations.

Benchmark 1: Geometric Figures and Their Properties – The student recognizes geometric figures and compares their properties in a variety of situations.

The student…

1. recognizes and compares properties of two- and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology.
2. discusses properties of triangles and quadrilaterals related to:
   a. sum of the interior angles of any triangle is 180°;
   b. sum of the interior angles of any quadrilateral is 360°;
   c. parallelograms have opposite sides that are parallel and congruent, opposite angles are congruent;
   d. rectangles have angles of 90°, sides may or may not be equal;
   e. rhombi have all sides equal in length, angles may or may not be equal;
   f. squares have angles of 90°, all sides congruent;
   g. trapezoids have one pair of opposite sides parallel and the other pair of opposite sides are not parallel;
   h. kites have two distinct pairs of adjacent congruent sides.
3. recognizes and describes the rotational symmetries and line symmetries that exist in two-dimensional figures, e.g., draw a picture with a line of symmetry in it. Explain why it is a line of symmetry.
4. recognizes and uses properties of corresponding parts of similar and congruent triangles and quadrilaterals to find side or angle measures using standard notation for similarity (~) and congruence (≅).
5. knows and describes Triangle Inequality Theorem to determine if a triangle exists.
6. ▲ uses the Pythagorean theorem to:
   a. determine if a triangle is a right triangle;
   b. find a missing side of a right triangle where the lengths of all three sides are whole numbers.
7. recognizes and compares the concepts of a point, line, and plane.

8. describes the intersection of plane figures, e.g., two circles could intersect at no point, one point, two points, or all points.
9. describes and explains angle relationships:
   a. when two lines intersect including vertical and supplementary angles;
   b. when formed by parallel lines cut by a transversal including corresponding, alternate interior, and alternate exterior angles.
10. recognizes and describes arcs and semicircles as parts of a circle and uses the standard notation for arc (⌒) and circle (◉).

Benchmark 2: Measurement and Estimation – The student estimates, measures, and uses geometric formulas in a variety of situations.

The student…

1. determines and uses rational number approximations (estimations) for length, width, weight, volume, temperature, time, perimeter, area, and surface area using standard and nonstandard units of measure.
2. selects and uses measurement tools, units of measure, and level of precision appropriate for a given situation to find accurate real number representations for length, weight, volume, temperature, time, perimeter, area, surface area, and angle measurements.
3. converts within the customary system and within the metric system.
4. estimates the measure of a concrete object in one system given the measure of that object in another system and the approximate conversion factor, e.g., a mile is about 2.2 kilometers; how far is 2 miles?
5. uses given measurement formulas to find:
   a. area of parallelograms and trapezoids;
   b. surface area of rectangular prisms, triangular prisms, and cylinders;
   c. volume of rectangular prisms, triangular prisms, and cylinders.
6. recognizes how ratios and proportions can be used to measure inaccessible objects, e.g., using shadows to measure the height of a flagpole.
7. calculates rates of change, e.g., speed or population growth.

Benchmark 3: Transformational Geometry – The student recognizes and applies transformations on geometric figures in a variety of situations.

The student…

1. identifies, describes, and performs single and multiple transformations [reflection, rotation, translation, reduction (contraction/shrinking), enlargement (magnification/growing)] on a two-dimensional figure.
2. describes a reflection of a given two-dimensional figure that moves it from its initial placement (preimage) to its final placement (image) in the coordinate plane over the x- and y-axis.
3. draws:
   a. three-dimensional figures from a variety of perspectives (top, bottom, sides, corners);
   b. a scale drawing of a two-dimensional figure;
   c. a two-dimensional drawing of a three-dimensional figure.
4. determines where and how an object or a shape can be tessellated using single or multiple transformations.

Benchmark 4: Geometry from an Algebraic Perspective – The student uses an algebraic perspective to examine the geometry of two-dimensional figures in a variety of situations.

The student…

1. uses the coordinate plane to:
   a. ▲ list several ordered pairs on the graph of a line and find the slope of the line;
   b. ▲ recognize that ordered pairs that lie on the graph of an equation are solutions to that equation;
   c. ▲ recognize that points that do not lie on the graph of an equation are not solutions to that equation;
   d. ▲ determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x- or y-coordinates;
   e. solve simple systems of linear equations.
2. uses a given linear equation with integer coefficients and constants and an integer solution to find the ordered pairs, organizes the ordered pairs using a T-table, and plots the ordered pairs on a coordinate plane.
3. examines characteristics of two-dimensional figures on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.

Standard 4: Data. The student uses concepts and procedures of data analysis in a variety of situations.

Benchmark 1: Probability – The student applies the concepts of probability to draw conclusions, generate convincing arguments, and make predictions and decisions including the use of concrete objects in a variety of situations.

The student…

1. knows and explains the difference between independent and dependent events in an experiment, simulation, or situation.
2. identifies situations with independent or dependent events in an experiment, simulation, or situation, e.g., there are three marbles in a bag. If you draw one marble and give it to your brother, and another marble and give it to your sister, are these independent events or dependent events?
3. ▲ finds the probability of a compound event composed of two independent events in an experiment, simulation, or situation, e.g., what is the probability of getting two heads, if you toss a dime and a quarter?

4. finds the probability of simple and/or compound events using geometric models (spinners or dartboards).
5. finds the odds of a desired outcome in an experiment or simulation and expresses the answer as a ratio (2/3 or 2:3 or 2 to 3).
6. describes the difference between probability and odds.

Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

The student…

1. organizes, displays and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these data displays:
   - **a.** frequency tables;
   - **b.** bar, line, and circle graphs;
   - **c.** Venn diagrams or other pictorial displays;
   - **d.** charts and tables;
   - **e.** stem-and-leaf plots (single and double);
   - **f.** scatter plots;
   - **g.** box-and-whiskers plots;
   - **h.** histograms.
2. recognizes valid and invalid data collection and sampling techniques.
3. ▲ determines and explains the measures of central tendency (mode, median, mean) for a rational number data set.
4. determines and explains the range, quartiles, and interquartile range for a rational number data set.
5. explains the effects of outliers on the median, mean, and range of a rational number data set.
6. makes a scatter plot and draws a line that approximately represents the data, determines whether a correlation exists, and if that correlation is positive, negative, or that no correlation exists.

Standard 1: Number and Computation. The student uses numerical and computational concepts and procedures in a variety of situations.

Benchmark 1: Number Sense – The student demonstrates number sense for real numbers and algebraic expressions in a variety of situations.

The student…

1. knows, explains, and uses equivalent representations for real numbers and algebraic expressions including integers, fractions, decimals, percents, ratios; rational number bases with integer exponents; rational numbers written in scientific notation; absolute value; time; and money, e.g., –4/2 = (–2); $a^{(-2)}b^{(3)} = b^3/a^2$.
2. compares and orders real numbers and/or algebraic expressions and explains the relative magnitude between them, e.g., will $(5n)^2$ always, sometimes, or never be larger than 5n? The student might respond with $(5n)^2$ is greater than 5n if $n > 1$ and $(5n)^2$ is smaller than 5 if $0 < n < 1$.
3. knows and explains what happens to the product or quotient when a real number is multiplied or divided by:
   a. a rational number greater than zero and less than one,
   b. a rational number greater than one,
   c. a rational number less than zero.

Benchmark 2: Number Systems and Their Properties – The student demonstrates an understanding of the real number system; recognizes, applies, and explains their properties, and extends these properties to algebraic expressions.

The student…

1. explains and illustrates the relationship between the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] using mathematical models, e.g., number lines or Venn diagrams.
2. identifies all the subsets of the real number system [natural (counting) numbers, whole numbers, integers, rational numbers, irrational numbers] to which a given number belongs.
3. ▲ names, uses, and describes these properties with the real number system and demonstrates their meaning including the use of concrete objects:
   a. commutative (a + b = b + a and ab = ba), associative [a + (b + c) = (a + b) + c and a(bc) = (ab)c], distributive [a(b + c) = ab + ac], and substitution properties (if a = 2, then 3a = 3 × 2 = 6);
   b. identity properties for addition and multiplication and inverse properties of addition and multiplication (additive identity: a + 0 = a, multiplicative identity: a · 1 = a, additive inverse: +5 + –5 = 0, multiplicative inverse: 8 × 1/8 = 1);
   c. symmetric property of equality (if a = b, then b = a);
   d. addition and multiplication properties of equality (if a = b, then a + c = b + c and if a = b, then ac = bc) and inequalities (if a > b, then a + c > b + c and if a > b, and c > 0 then ac > bc);
   e. zero product property (if ab = 0, then a = 0 and/or b = 0).
4. uses and describes these properties with the real number system:
   a. transitive property (if a = b and b = c, then a = c),
   b. reflexive property (a = a).

Benchmark 3: Estimation – The student uses computational estimation with real numbers in a variety of situations.

The student…

1. estimates real number quantities using various computational methods including mental math, paper and pencil, concrete objects, and/or appropriate technology.
2. uses various estimation strategies and explains how they were used to estimate real number quantities and algebraic expressions.
3. knows and explains why a decimal representation of an irrational number is an approximate value.
4. knows and explains between which two consecutive integers an irrational number lies.

Benchmark 4: Computation – The student models, performs, and explains computation with real numbers and polynomials in a variety of situations.

The student…

1. computes with efficiency and accuracy using various computational methods including mental math, paper and pencil, concrete objects, and appropriate technology.
2. performs and explains these computational procedures:
   a. addition, subtraction, multiplication, and division using the order of operations;
   b. multiplication or division to find:
      i. a percent of a number, e.g., what is 0.5% of 10?
      ii. percent of increase and decrease, e.g., a college raises its tuition from $1,320 per year to $1,425 per year. What percent is the change in tuition?
      iii. percent one number is of another number, e.g., 89 is what percent of 82?
      iv. a number when a percent of the number is given, e.g., 80 is 32% of what number?
   c. manipulation of variable quantities within an equation or inequality, e.g., 5x – 3y = 20 could be written as 5x – 20 = 3y or 5x(2x + 3) = 8 could be written as 8/(5x) = 2x + 3;

d. simplification of radical expressions (without rationalizing denominators) including square roots of perfect square monomials and cube roots of perfect cubic monomials;

e. simplification or evaluation of real numbers and algebraic monomial expressions raised to a whole number power and algebraic binomial expressions squared or cubed;

f. simplification of products and quotients of real number and algebraic monomial expressions using the properties of exponents;

g. matrix addition, e.g., when computing (with one operation) a building's expenses (data) monthly, a matrix is created to include each of the different expenses; then at the end of the year, each type of expense for the building is totaled;

h. scalar-matrix multiplication, e.g., if a matrix is created with everyone's salary in it, and everyone gets a 10% raise in pay; to find the new salary, the matrix would be multiplied by 1.1.

3. finds prime factors, greatest common factor, multiples, and the least common multiple of algebraic expressions.

Standard 2: Algebra. The student uses algebraic concepts and procedures in a variety of situations.

Benchmark 1: Patterns – The student recognizes, describes, extends, develops, and explains the general rule of a pattern in a variety of situations.

The student…

1. identifies, states, and continues the following patterns using various formats including numeric (list or table), algebraic (symbolic notation), visual (picture, table, or graph), verbal (oral description), kinesthetic (action), and written.

a. arithmetic and geometric sequences using real numbers and/or exponents; e.g., radioactive half-lives;

b. patterns using geometric figures;

c. algebraic patterns including consecutive number patterns or equations of functions, e.g., n, n + 1, n + 2, ... or f(n) = 2n – 1;

d. special patterns, e.g., Pascal's triangle and the Fibonacci sequence.

2. generates and explains a pattern.

3. classifies sequences as arithmetic, geometric, or neither.

4. defines:

a. a recursive or explicit formula for arithmetic sequences and finds any particular term,

b. a recursive or explicit formula for geometric sequences and finds any particular term.

Benchmark 2: Variables, Equations, and Inequalities – The student uses variables, symbols, real numbers, and algebraic expressions to solve equations and inequalities in a variety of situations.

The student…

1. knows and explains the use of variables as parameters for a specific variable situation, e.g., the m and b in $y = mx + b$ or the h, k, and r in $(x – h)^2 + (y – k)^2 = r^2$.

2. manipulates variable quantities within an equation or inequality, e.g., $5x – 3y = 20$ could be written as $5x – 20 = 3y$ or $5x(2x + 3) = 8$ could be written as $8/(5x) = 2x + 3$.

3. solves:

a. linear equations and inequalities both analytically and graphically;

b. quadratic equations with integer solutions (may be solved by trial and error, graphing, quadratic formula, or factoring);

c. ▲ systems of linear equations with two unknowns using integer coefficients and constants;

d. radical equations with no more than one inverse operation around the radical expression;

e. equations where the solution to a rational equation can be simplified as a linear equation with a nonzero denominator, $3/(x + 2) = 5/(x – 3)$.

f. equations and inequalities with absolute value quantities containing one variable with a special emphasis on using a number line and the concept of absolute value;

g. exponential equations with the same base without the aid of a calculator or computer, e.g., $3^{x+2} = 3^5$.

Benchmark 3: Functions – The student analyzes functions in a variety of situations.

The student…

1. evaluates and analyzes functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.

2. matches equations and graphs of constant and linear functions and quadratic functions limited to $y = ax^2 + c$.

3. determines whether a graph, list of ordered pairs, table of values, or rule represents a function.

4. determines x- and y-intercepts and maximum and minimum values of the portion of the graph that is shown on a coordinate plane.

5. identifies domain and range of:

a. relationships given the graph or table,

b. linear, constant, and quadratic functions given the equation(s).

6. ▲ recognizes how changes in the constant and/or slope within a linear function changes the appearance of a graph.

7. uses function notation.

8. evaluates function(s) given a specific domain.

9. describes the difference between independent and dependent variables and identifies independent and dependent variables.

Benchmark 4: Models – The student develops and uses mathematical models to represent and justify mathematical relationships found in a variety of situations involving tenth grade knowledge and skills.

The student…

1. knows, explains, and uses mathematical models to represent and explain mathematical concepts, procedures, and relationships. Mathematical models include:
   - **a.** process models (concrete objects, pictures, diagrams, number lines, hundred charts, measurement tools, multiplication arrays, division sets, or coordinate grids) to model computational procedures, algebraic relationships, and mathematical relationships and to solve equations;
   - **b.** factor trees to model least common multiple, greatest common factor, and prime factorization;
   - **c.** algebraic expressions to model relationships between two successive numbers in a sequence or other numerical patterns;
   - **d.** equations and inequalities to model numerical and geometric relationships;
   - **e.** function tables to model numerical and algebraic relationships;
   - **f.** coordinate planes to model relationships between ordered pairs and equations and inequalities and linear and quadratic functions;
   - **g.** constructions to model geometric theorems and properties;
   - **h.** two- and three-dimensional geometric models (geoboards, dot paper, coordinate plane, nets, or solids) and real-world objects to model perimeter, area, volume, and surface area, properties of two- and three-dimensional figures, and isometric views of three-dimensional figures;
   - **i.** scale drawings to model large and small real-world objects;
   - **j.** Pascal's Triangle to model binomial expansion and probability;
   - **k.** geometric models (spinners, targets, or number cubes), process models (concrete objects, pictures, diagrams, or coins), and tree diagrams to model probability;
   - **l.** frequency tables, bar graphs, line graphs, circle graphs, Venn diagrams, charts, tables, single and double stem-and-leaf plots, scatter plots, box-and-whisker plots, histograms, and matrices to organize and display data;
   - **m.** Venn diagrams to sort data and show relationships.

Standard 3: Geometry. The student uses geometric concepts and procedures in a variety of situations.

Benchmark 1:Geometric Figures and Their Properties – The student recognizes geometric figures and compares and justifies their properties of geometric figures in a variety of situations.

The student…

1. recognizes and compares properties of two-and three-dimensional figures using concrete objects, constructions, drawings, appropriate terminology, and appropriate technology.
2. discusses properties of regular polygons related to:
   - **a.** angle measures,
   - **b.** diagonals.
3. recognizes and describes the symmetries (point, line, plane) that exist in three-dimensional figures.
4. recognizes that similar figures have congruent angles, and their corresponding sides are proportional.
5. uses the Pythagorean Theorem to:
   - **a.** determine if a triangle is a right triangle,
   - **b.** find a missing side of a right triangle.
6. recognizes and describes:
   - **a.** congruence of triangles using: Side-Side-Side (SSS), Angle-Side-Angle (ASA), Side-Angle-Side (SAS), and Angle-Angle-Side (AAS);
   - **b.** the ratios of the sides in special right triangles: 30°-60°-90° and 45°-45°-90°.
7. recognizes, describes, and compares the relationships of the angles formed when parallel lines are cut by a transversal.
8. recognizes and identifies parts of a circle: arcs, chords, sectors of circles, secant and tangent lines, central and inscribed angles.

Benchmark 2: Measurement and Estimation – The student estimates, measures and uses geometric formulas in a variety of situations.

The student…

1. determines and uses real number approximations (estimations) for length, width, weight, volume, temperature, time, distance, perimeter, area, surface area, and angle measurement using standard and nonstandard units of measure.
2. selects and uses measurement tools, units of measure, and level of precision appropriate for a given situation to find accurate real number representations for length, weight, volume, temperature, time, distance, area, surface area, mass, midpoint, and angle measurements.
3. approximates conversions between customary and metric systems given the conversion unit or formula.
4. states, recognizes, and applies formulas for:
   - **a.** perimeter and area of squares, rectangle, and triangles;

   b. circumference and area of circles; volume of rectangular solids.

5. uses given measurement formulas to find perimeter, area, volume, and surface area of two- and three-dimensional figures (regular and irregular).
6. recognizes and applies properties of corresponding parts of similar and congruent figures to find measurements of missing sides.
7. knows, explains, and uses ratios and proportions to describe rates of change, e.g., miles per gallon, meters per second, calories per ounce, or rise over run.

Benchmark 3: Transformational Geometry – The student recognizes and applies transformations on two- and three-dimensional figures in a variety of situations.

The student…

1. describes and performs single and multiple transformations [refection, rotation, translation, reduction (contraction/shrinking), enlargement (magnification/growing)] on two- and three-dimensional figures.
2. recognizes a three-dimensional figure created by rotating a simple two-dimensional figure around a fixed line, e.g., a rectangle rotated about one of its edges generates a cylinder; an isosceles triangle rotated about a fixed line that runs from the vertex to the midpoint of its base generates a cone.
3. generates a two-dimensional representation of a three-dimensional figure.
4. determines where and how an object or a shape can be tessellated using single or multiple transformations and creates a tessellation.

Benchmark 4: Geometry from an Algebraic Perspective – The student uses an algebraic perspective to analyze the geometry of two- and three-dimensional figures in a variety of situations.

The student…

1. recognizes and examines two- and three-dimensional figures and their attributes including the graphs of functions on a coordinate plane using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.
2. determines if a given point lies on the graph of a given line or parabola without graphing and justifies the answer.
3. calculates the slope of a line from a list of ordered pairs on the line and explains how the graph of the line is related to its slope.
4. ▲ finds and explains the relationship between the slopes of parallel and perpendicular lines, e.g., the equation of a line $2x + 3y = 12$. The slope of this line is $-2/3$. What is the slope of a line perpendicular to this line?
5. uses the Pythagorean Theorem to find distance (may use the distance formula).
6. ▲ recognizes the equation of a line and transforms the equation into slope-intercept form in order to identify the slope and y-intercept and uses this information to graph the line.
7. recognizes the equation $y = ax^2 + c$ as a parabola; represents and identifies characteristics of the parabola including opens upward or opens downward, steepness (wide/narrow), the vertex, maximum and minimum values, and line of symmetry; and sketches the graph of the parabola.
8. explains the relationship between the solution(s) to systems of equations and systems of inequalities in two unknowns and their corresponding graphs, e.g., for equations, the lines intersect in either one point, no points, or infinite points; and for inequalities, all points in double-shaded areas are solutions for both inequalities.

Standard 4: Data. The student uses concepts and procedures of data analysis in a variety of situations.

Benchmark 1: Probability – The student applies probability theory to draw conclusions, generate convincing arguments, make predictions and decisions, and analyze decisions including the use of concrete objects in a variety of situations.

The student…

1. finds the probability of two independent events in an experiment, simulation, or situation.
2. finds the conditional probability of two dependent events in an experiment, simulation, or situation.
3. ▲ explains the relationship between probability and odds and computes one given the other.

Benchmark 2: Statistics – The student collects, organizes, displays, explains, and interprets numerical (rational) and non-numerical data sets in a variety of situations.

The student…

1. organizes, displays, and reads quantitative (numerical) and qualitative (non-numerical) data in a clear, organized, and accurate manner including a title, labels, categories, and rational number intervals using these data displays:
   a. frequency tables and line plots;
   b. bar, line, and circle graphs;
   c. Venn diagrams or other pictorial displays;
   d. charts and tables;
   e. stem-and-leaf plots (single and double);
   f. scatter plots;
   g. box-and-whiskers plots;
   h. histograms.
2. explains how the reader's bias, measurement errors, and display distortions can affect the interpretation of data.
3. calculates and explains the meaning of range, quartiles and interquartile range for a real number data set.
4. ▲ explains the effects of outliers on the measures of central tendency (mean, median, mode) and range and interquartile range of a real number data set.

5. ▲ approximates a line of best fit given a scatter plot and makes predictions using the graph or the equation of that line.

6. compares and contrasts the dispersion of two given sets of data in terms of range and the shape of the distribution including:

- **a.** symmetrical (including normal),
- **b.** skew (left or right),
- **c.** bimodal,
- **d.** uniform (rectangular).

KANSAS Grades 8–12 Science
Curricular Standards

STANDARD 1: SCIENCE AS INQUIRY. The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.

Benchmark 1: The student will demonstrate the abilities necessary to do scientific inquiry.

The student…

1. actively engages in asking and evaluating research questions.
2. ▲ actively engages in investigations, including developing questions, gathering and analyzing data, and designing and conducting research.
3. ▲ actively engages in using technological tools and mathematics in their own scientific investigations.
4. actively engages in conducting an inquiry, formulating and revising his or her scientific explanations and models (physical, conceptual, or mathematical) using logic and evidence, and recognizing that potential alternative explanations and models should be considered.
5. actively engages in communicating and defending the design, results, and conclusion of his/her investigation.

STANDARD 2A: CHEMISTRY. The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.

Benchmark 1: The student will understand the structure of the atom.

The student…

1. ▲ understands atoms, the fundamental organizational unit of matter, are composed of subatomic particles. Chemists are primarily interested in the protons, electrons, and neutrons found in the atom.
2. understands isotopes are atoms with the same atomic number (same number of protons) but different numbers of neutrons. The nuclei of some atoms are radioactive isotopes that spontaneously decay, releasing radioactive energy.

Benchmark 2: The student will understand the states and properties of matter.

The student…

1. ▲ understands chemists use kinetic and potential energy to explain the physical and chemical properties of matter on earth that may exist in any of these three states: solids, liquids, and gases.
2. ▲ understands the periodic table lists elements according to increasing atomic number. This table organizes physical and chemical trends by groups, periods, and sub-categories.
3. ▲ understands chemical bonds result when valence electrons are transferred or shared between atoms. Breaking a chemical bond requires energy. Formation of a chemical bond releases energy. Ionic compounds result from atoms transferring electrons. Molecular compounds result from atoms sharing electrons.

Benchmark 3: The student will gain a basic concept of chemical reactions.

The student…

1. ▲ understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products). There are different types of chemical reactions all of which demonstrate the Law of Conservation of Matter and Energy.
2. understands how to perform mathematical calculations regarding the Law of Conservation of Matter, i.e., through stoichiometric relationships.
3. understands the differences and reactions between acids, bases, and salts. Perform calculations to determine the concentration of ions in solutions.

STANDARD 2B: PHYSICS. The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.

Benchmark 1: The student will understand the relationships between force and motion.

The student…

1. ▲understands Newton's Laws and the variables of time, position, velocity, and acceleration can be used to describe the position and motion of particles.
2. understands physicists use conservation laws to analyze the motion of objects.

Benchmark 2: The student will understand the conservation of mass and energy, and the First and Second Laws of Thermodynamics.

The student…

1. understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the type of energy may vary.
2. ▲ understands the first law of thermodynamics states the total internal energy of a substance (the sum of all the kinetic and potential energies of its constituent molecules) will change only if heat is exchanged with the environment or work is done on or by the substance. In any physical interaction, the total energy in the universe is conserved.

3. understands the second law of thermodynamics that states the entropy of the universe is increasing.

Benchmark 3: The student will understand the nature of the fundamental interactions of matter and energy.

The student…

1. there are four fundamental forces in nature: strong nuclear force, weak nuclear force, electromagnetic force, and gravitational force.
2. ▲ understands waves have energy and can transfer energy when they interact with matter.
3. The student understand interference – how waves interact with other waves.
4. The student will understand the principles of reflection and refraction.
5. ▲ understands electromagnetic waves result when a charged particle is accelerated or decelerated.
6. The student understands basic electrostatics and circuits.

STANDARD 3: LIFE SCIENCE. The student will develop an understanding of the cell, molecular basis of heredity, biological evolution, interdependence of organisms, matter, energy, and organization in living systems, and the behavior of organisms.

Benchmark 1: The student will demonstrate an understanding of the structure and function of the cell.

The student…

1. understands cells are composed of a variety of specialized structures that carry out specific functions.
2. ▲ understands cell functions involve specific chemical reactions.
3. understands cells function and replicate as a result of information stored in DNA and RNA molecules.
4. understands some plant cells contain chloroplasts, which are the sites of photosynthesis.
5. understands cells can differentiate, thereby enabling complex multicellular organisms to form.

Benchmark 2: The student will demonstrate an understanding of chromosomes, genes, and the molecular basis of heredity.

The student…

1. ▲ understands living organisms contain DNA or RNA as their genetic material, which provides the instructions that specify the characteristics of organisms.
2. understands organisms usually have a characteristic number of chromosomes; one pair of these may determine the sex of individuals.
3. ▲ understands hereditary information is contained in genes, located in the chromosomes of each cell.
4. understands gametes carry the genetic information to the next generation.
5. understands expressed mutations occur in DNA at very low rates.

Benchmark 3: The student will understand biological evolution.

The student…

1. ▲ understands biological evolution, descent with modification, is a scientific explanation for the history of the diversification of organisms from common ancestors.
2. understands populations of organisms adapt to environmental challenges and changes as a result of natural selection, genetic drift, and various mechanisms of genetic change.
3. ▲ understands biological evolution is used to explain the earth's present day biodiversity: the number, variety and variability of organisms.
4. ▲ understands organisms vary widely within and between populations. Variation allows for natural selection to occur.
5. understands the primary mechanism acting on variation is natural selection.
6. understands biological evolution is used as a broad, unifying theoretical framework for biology.

Benchmark 4: The student will understand the interdependence of organisms and their interaction with the physical environment.

The student…

1. ▲ understands atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.
2. understands energy is received, transformed and expended in ecosystems.
3. ▲ understands the distribution and abundance of organisms and populations in ecosystems are limited by the carrying capacity.
4. understands organisms cooperate and compete in complex, interdependent relationships.
5. understands human beings live within and impact ecosystems.

Benchmark 5: The student will develop an understanding of matter, energy, and organization in living systems.

The student…

1. understands living systems require a continuous input of energy to maintain their chemical and physical organization.
2. ▲ understands the sun is the primary source of energy for life through the process of photosynthesis.
3. ▲ understands food molecules contain biochemical energy, which is then available for cellular respiration.
4. understands the structure and function of an organism serve to acquire, transform, transport, release, and eliminate the matter and energy used to sustain the organism.

Benchmark 6: The student will understand the behavior of animals.

The student…

1. ▲ understands animals have behavioral responses to internal changes and to external stimuli.
2. understands most multicellular animals have nervous systems that underlie behavior.
3. understands behaviors are often adaptive when viewed in terms of survival and reproductive success.

Benchmark 7: The student will demonstrate an understanding of the diversity of structure and function in organisms.

The student…

1. understands differences in structure and function among organisms and can identify the characteristics of relevant life forms.
2. ▲ understands that homeostasis is the dynamic regulation and balance of an organisms internal environment to maintain conditions suitable for survival.
3. ▲ understands that living things change following a specific pattern of developmental stages called life cycles.
4. understands that in complex organisms there is a division of labor into specific body systems; i.e., respiration, digestion, nervous, endocrine, excretion, circulatory, reproductive, immune, skeletal and muscle.
5. understands taxonomy is the systematic way in which organisms are placed into a hierarchical classification system, according to their physical and genetic characteristics and their evolutionary history.

STANDARD 4: EARTH AND SPACE SCIENCE.

The student will develop an understanding of energy in the earth system, geochemical cycles, the formation and organization of the earth system, the dynamics of the earth/moon/sun system, and the organization and development of the universe.

Benchmark 1: The student will develop an understanding of the sources of energy that power the subsystems and cycles of the dynamic earth: the geosphere, hydrosphere, atmosphere and biosphere.

The student…

1. understands constructive and destructive processes dynamically reshape the surface of the earth.
2. ▲ understands the theory of plate tectonics explains that internal energy drives the earth's ever changing structure.
3. understands that the ultimate source of atmospheric and oceanic energy comes from the sun. Energy flow drives global climate and weather. Climate and weather are influenced by geographic features, cloud cover, and the earth's rotation.
4. understands the processes of water cycling through surface water (oceans, lakes, streams, glaciers), ground water (aquifers), and the atmosphere. (hydrological cycle)

Benchmark 2: The student will develop an understanding of the origin and development of the dynamic earth system.

The student…

1. ▲ understands geological time is used to understand the earth's past.

Benchmark 3: The student will develop an understanding of dynamics of our solar system.

The student…

1. understands gravitational attraction of objects in the solar system keeps solar system objects in orbit.
2. ▲ understands the relationship between the earth, moon, and sun explains the seasons, tides and moon phases.
3. understands the relative sizes and distances of objects in the solar system.
4. understands the sun, earth, and other objects in the solar system formed from a nebular cloud of dust and gas.

Benchmark 4: The student will develop an understanding of the organization of the universe and its development.

The student…

1. ▲ understands stellar evolution.
2. understands the current scientific explanation of the origin and structure of the universe.
3. understands how the tools of astronomy have revolutionized the study of the universe.

STANDARD 5: SCIENCE AND TECHNOLOGY.

The student will develop understandings about the relationship between science and technology.

Benchmark 1: The student will develop an understanding that technology is applied science.

The student…

1. ▲ understands technology is the application of scientific knowledge for functional purposes.
2. understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.
3. understands science advances new technologies. New technologies open new areas for scientific inquiry.

STANDARD 6: SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES.

The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality, natural and human-induced hazards, and science and technology in local, national, and global settings.

Benchmark 1: The student will develop an understanding of the overall functioning of human systems and their interaction with the environment in order to understand specific mechanisms and processes related to health issues.

The student…

1. understands some chemical and physical hazards and accidents can be avoided through safety education.

2. understands the severity of disease symptoms is dependent on many factors.
3. understands informed personal choices concerning fitness and health involve an understanding of chemistry and biology.
4. understands selection of foods and eating patterns determine nutritional balance which affects emotional and physical well-being.

Benchmark 2: The student will demonstrate an understanding of population growth.

The student…

1. understands the rate of change in populations is determined by the combined effects of birth, death, emigration, and immigration.
2. understands a variety of factors influence birth rates and fertility rates.
3. understands populations have limits to growth.

Benchmark 3: The student will understand that human populations use natural resources and influence environmental quality.

The student…

1. ▲ understands natural resources from the lithosphere and ecosystems are required to sustain human populations.
2. understands earth does not have infinite resources.

Benchmark 4: The student will understand the effect of natural and human-influenced hazards.

The student…

1. understands natural processes of earth may be hazardous for humans.
2. understands there is a need to assess potential risk and danger from natural and human-induced hazards.

Benchmark 5: The student will develop an understanding of the relationship between science, technology, and society.

The student…

1. understands progress in science and technology can be affected by social issues and challenges. Science and technology indicate what can happen, not what should happen.

STANDARD 7: HISTORY AND NATURE OF SCIENCE.

The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.

Benchmark 1: The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.

The student…

1. demonstrates an understanding of science as both vocation and avocation.
2. explains how science uses peer review, replication of methods, and norms of honesty.
3. recognizes the universality of basic science concepts and the influence of personal and cultural beliefs that embed science in society.
4. recognizes that society helps create the ways of thinking (mindsets) required for scientific advances, both toward training scientists and educating a populace to utilize benefits of science (e.g., standards of hygiene, attitudes toward forces of nature, etc.).
5. understands there are many issues which involve morals, ethics, values or spiritual beliefs that go beyond what science can explain, but for which solid scientific literacy is useful.
6. recognizes society's role in supporting topics of research and determining institutions where research is conducted.

Benchmark 2: The student will develop an understanding of the nature of scientific knowledge.

The student…

1. understands scientific knowledge describes and explains the physical world in terms of matter, energy, and forces. Scientific knowledge is provisional and is subject to change as new evidence becomes available.
2. understands scientific knowledge begins with empirical observations, which are the data (also called facts or evidence) upon which further scientific knowledge is built.
3. understands scientific knowledge consists of hypotheses, inferences, laws, and theories.
4. understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.

Benchmark 3: The student will understand science from historical perspectives.

The student…

1. demonstrates an understanding of the history of science.
2. demonstrates a knowledge that scientific method historically proceeded from an inductive approach rather than a deductive approach.

Section C: ACT's College Readiness Standards Included in Kansas's Grade 8–12 Curricular 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 Kansas Curricular Standards as they relate to ACT's College Readiness Standards. The ACT College Readiness Standards included in the Kansas Curricular 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 Kansas Curricular 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 *EXPL: 13* *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 Revise vague nouns and pronouns that create obvious logic problems
16–19 *ACT: 18*	Identify the basic purpose or role of a specified phrase or sentence Delete a clause or sentence because it is obviously irrelevant to the essay	Select the most logical place to add a sentence in a paragraph	Delete obviously synonymous and wordy material in a sentence Revise expressions that deviate from the style of an essay
20–23	Identify the central idea or main topic of a straightforward piece of writing Determine relevancy when presented with a variety of sentence-level details	Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., *first*, *afterward*, *in response*) Decide the most logical place to add a sentence in an essay Add a sentence that introduces a simple paragraph	Delete redundant material when information is repeated in different parts of speech (e.g., "alarmingly startled") Use the word or phrase most consistent with the style and tone of a fairly straightforward essay Determine the clearest and most logical conjunction to link clauses
24–27	Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal Delete material primarily because it disturbs the flow and development of the paragraph Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement	Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., *therefore*, *however*, *in addition*) Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward	Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence Identify and correct ambiguous pronoun references Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay
28–32	Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence, or to determine the need to delete plausible but irrelevant material Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation	Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs Rearrange sentences to improve the logic and coherence of a complex paragraph Add a sentence to introduce or conclude a fairly complex paragraph	Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., "an aesthetic viewpoint" versus "the outlook of an aesthetic viewpoint") Correct vague and wordy or clumsy and confusing writing containing sophisticated language
33–36	Determine whether a complex essay has accomplished a specific purpose Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay	Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay	Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole

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

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

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

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

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

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

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

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

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

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