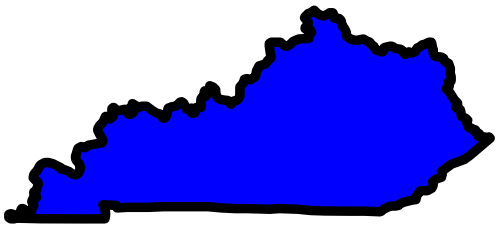

STATE MATCH

Kentucky Core Content for Assessment

Version 4.1
Reading, Writing, Mathematics, and Science
Grades 8–12

and

ACT®

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

November 2006

About This Report

EXECUTIVE SUMMARY
(pp. 1–3)

This portion summarizes the findings of the alignment between Kentucky's Core Content for Assessment Version 4.1 and ACT's WorkKeys® assessments (Reading for Information, Applied Mathematics, and Locating Information) 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 describes additional critical information that ACT could provide to Kentucky.

SECTION A
(pp. 5–9)

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

SECTION B
(pp. 11–30)

All Kentucky Core Content Standards for Assessment are listed here; each one highlighted is measured by ACT's EPAS tests and WorkKeys assessments. Kentucky standards listed here are from the *Kentucky Core Content for Assessment Version 4.1* (August 2006) as presented on the Kentucky Department of Education's website in September 2006. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science Tests.

SECTION C
(pp. 31–40)

ACT's College Readiness Standards appear here. Highlighting indicates that a statement reflects one or more statements in the Kentucky Core Content for Assessment. College Readiness Standards not highlighted are not addressed in the Kentucky Core Content for Assessment.

SECTION D
(pp. 41–42)

WorkKeys Level Skills appear here. Highlighting indicates that a statement reflects one or more statements in the Kentucky Core Content for Assessment. Level Skills not highlighted are not addressed in the Kentucky Core Content for Assessment.

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

ACT

Executive Summary

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

1. To what extent do ACT's WorkKeys® assessments 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)—measure Kentucky's Core Content for Assessment?
2. Can the results from ACT's testing programs be used to meet Kentucky's NCLB requirement?
3. Why should Kentucky choose ACT?
4. Why choose WorkKeys assessments?

ACT'S TESTS MEASURE NEARLY ALL OF KENTUCKY CORE CONTENT STANDARDS IN READING, WRITING, MATHEMATICS, AND SCIENCE.

1. Match Results: Comparisons conducted by our content specialists show that ACT's Reading, English, Writing, Mathematics and Science tests and WorkKeys Reading for Information and Applied Mathematics measure nearly all of Kentucky's Reading, Writing, Mathematics, and Science Core Content Standards:

- Reading: 21 out of 31 Grade 11 Content Standards

  Many of Kentucky's Reading Content Standards are covered by ACT's EPAS Reading tests and WorkKeys Reading for Information assessment.

- Writing: 6 out of 6 High School Content Standards

  All of Kentucky's Writing Content Standards are covered by ACT's EPAS English and/or Writing tests.

- Mathematics: 30 out of 30 High School Content Standards

  All of Kentucky's Mathematics Content Standards are covered by ACT's Mathematics tests and WorkKeys Applied Mathematics assessment.

- Science: (46) out of (46) High School Content Standards

  All of Kentucky's Science Content Standards are covered by ACT's EPAS 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 Kentucky Science Core Content for Assessment.

  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 Kentucky 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.)

ACT

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.**

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™**

Most exceptions to a match between ACT's tests and Kentucky's Core Content for Assessment 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 Kentucky on developing any necessary augmentation.

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

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

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

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

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

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

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

  Using thousands of student records and responses, content and measurement experts worked backwards to develop data-driven, empirically derived statements of what students typically know and are able to do in various score ranges on ACT's English, Reading, Writing, Mathematics, and Science tests. These statements provide specific details about students' college readiness and can be used to identify next steps for improvement.

ACT

4. Why choose to include WorkKeys assessments? States and communities nationwide are using WorkKeys to create credentials for job applicants through cooperation between businesses and schools. These credentials are based on the same skills assessments no matter where they are used. Thus they are portable. Test takers in one state can show prospective employers in another state that they have the skills needed for jobs. And the employers, looking at job applicants, know that WorkKeys Level Scores will have the same meaning regardless of where the tests were administered. These employers know that prospective employees have attained a certain level of performance in the essential skills required for most jobs.

Test takers can most commonly be certified in the skills areas of Applied Mathematics, Locating Information, and Reading for Information. Higher scores qualify test takers for more jobs than do lower scores. Virginia, Louisiana, Kentucky, Indiana, North Carolina, and New Mexico already have initiated certificate programs. Many other states have similar programs in the development stages.

In sum, ACT's EPAS and WorkKeys programs provide abundant data relevant to Kentucky's Core Content for Assessment and to Kentucky students' readiness for college and work.

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

Table A-1. Number of Kentucky Reading Core Content Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

Kentucky Subdomains*	Number of Kentucky Content Standards Measured by ACT's tests	Aspects of Not-Measured Kentucky Content Standards
Forming a Foundation for Reading	8th: 6 out of 8 9th: 3 out of 4 10th: 3 out of 4 11th: 3 out of 4 12th: 3 out of 4	Apply meanings of word parts to comprehend unfamiliar words Formulate questions to guide reading
Developing an Initial Understanding	8th: 6 out of 7 9th: 6 out of 7 10th: 5 out of 7 11th: 7 out of 7 12th: 7 out of 7	Explain the characteristics of short stories, novels, poetry, plays
Interpreting Text	8th: 7 out of 7 9th: 7 out of 9 10th: 7 out of 9 11th: 6 out of 9 12th: 6 out of 9	Explain appropriateness of an argument Evaluate an argument
Reflecting and Responding to Text	8th: 0 out of 2 9th: 0 out of 2 10th: 0 out of 2 11th: 2 out of 2 12th: 2 out of 2	Connect information from passage to students' lives Use evidence from passage to form opinion
Demonstrating a Critical Stance	8th: 6 out of 9 9th: 3 out of 9 10th: 3 out of 9 11th: 3 out of 9 12th: 3 out of 9	Explain interrelationships developed in more than one work Evaluate the effectiveness of organization Explain or analyze how text features enhance reader's understanding Critique author's word choice, style, tone, content
Reading Totals 5 out of 5 Subdomains	8th: 25 out of 33 9th: 19 out of 31 10th: 18 out of 31 11th: 21 out of 31 12th: 21 out of 31	

*Refer to Kentucky's Reading Core Content for Assessment on pages 11–16

Table A-2. Kentucky Grade 11 and 12 Reading Core Content Standards		
Kentucky Subdomains*	**Measured by ACT Reading Test**	**Measured by WorkKeys Reading for Information**
Forming a Foundation for Reading	11th: 3 out of 4 12th: 3 out of 4	11th: 3 out of 4 12th: 3 out of 4
Developing an Initial Understanding	11th: 5 out of 7 12th: 5 out of 7	11th: 6 out of 7 12th: 6 out of 7
Interpreting Test	11th: 6 out of 9 12th: 6 out of 9	11th: 0 out of 9 12th: 0 out of 9
Reflecting and Responding to Text	11th: 0 out of 2 12th: 0 out of 2	11th: 2 out of 2 12th: 2 out of 2
Demonstrating a Critical Stance	11th: 3 out of 9 12th: 3 out of 9	11th: 0 out of 9 12th: 0 out of 9
TOTALS ACT: 4 out of 5 Subdomains WorkKeys: 3 out of 5 Subdomains	11th: 17 out of 31 12th: 17 out of 31	11th: 11 out of 31 12th: 11 out of 31

*Refer to Kentucky's Reading Core Content for Assessment on pages 11–16

ACT

Table A-3. Number of Kentucky Writing Core Content Standards Measured by EXPLORE, PLAN, and the ACT		
Kentucky Subdomains*	**Number of Kentucky Content Standards Measured by ACT's tests**	**Aspects of Not-Measured Kentucky Content Standards**
Writing Content	8th: 2 out of 2 HS: 2 out of 2	
Writing Structure	8th: 2 out of 2 HS: 2 out of 2	
Writing Conventions	8th: 2 out of 2 HS: 2 out of 2	
Writing Process	8th: 22 out of 36	Compose topic sentence Spelling Capitalization Document use of sources
Writing Totals 4 out of 4 Subdomains	8th: 28 out of 42 HS: 6 out of 6	

Table A-4. Kentucky High School Writing Core Content Standards		
Kentucky Subdomains*	**Measured by ACT English Test**	**Measured by ACT Writing Test**
Writing Content	HS: 2 out of 2	HS: 2 out of 2
Writing Structure	HS: 2 out of 2	HS: 2 out of 2
Writing Conventions	HS: 2 out of 2	HS: 2 out of 2
TOTALS 3 out of 3 Subdomains	HS: 6 out of 6	HS: 6 out of 6

*Refer to Kentucky's Writing Core Content for Assessment on pages 17–19

ACT

Table A-5. Number of Kentucky Mathematics Core Content for Assessment Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
Kentucky Subdomains*	**Number of Kentucky Content Standards Measured by ACT's tests**	**Aspects of Not-Measured Kentucky Content Standards**
Number Properties and Operations	8th: 6 out of 6 HS: 3 out of 3	
Measurement	8th: 5 out of 5 HS: 3 out of 3	
Geometry	8th: 5 out of 5 HS: 8 out of 8	
Data Analysis and Probability	8th: 5 out of 5 HS: 6 out of 6	
Algebraic Thinking	8th: 4 out of 4 HS: 10 out of 10	
TOTALS 5 out of 5 Subdomains	8th: 25 out of 25 HS: 30 out of 30	

Table A-6. Kentucky High School Mathematics Core Content Standards		
Kentucky Subdomains*	**Measured by ACT Mathematics Test**	**Measured by WorkKeys Applied Mathematics**
Number Properties and Operations	HS: 3 out of 3	HS: 3 out of 3
Measurement	HS: 3 out of 3	HS: 1 out of 3
Geometry	HS: 8 out of 8	HS: 1 out of 8
Data Analysis and Probability	HS: 6 out of 6	HS: 1 out of 6
Algebraic Thinking	HS: 10 out of 10	HS: 2 out of 10
TOTALS 5 out of 5 Subdomains	HS: 30 out of 30	HS: 8 out of 30

*Refer to Kentucky's Mathematics Core Content for Assessment on pages 20–23

Table A-7. Number of Kentucky Science Core Content for Assessment Measured by EXPLORE, PLAN, and the ACT		
Kentucky Subdomains*	**Number of Kentucky Content Standards Measured by ACT's tests**	**Aspects of Not-Measured Kentucky Content Standards**
Structure and Transformation of Matter	8th: (4) out of (4) 9–12: (8) out of (8)	
Motion and Forces	8th: (1) out of (1) 9–12: (3) out of (3)	
The Earth and the Universe	8th: (4) out of (4) 9–12: (8) out of (8)	
Unity and Diversity	8th: (5) out of (5) 9–12: (8) out of (8)	
Biological Change	8th: (1) out of (1) 9–12: (2) out of (2)	
Energy Transformations	8th: (5) out of (5) 9–12:(12) out of (12)	
Interdependence	8th: (2) out of (2) 9–12: (5) out of (5)	
TOTALS 7 out of 7 Subdomains	8th: (22) out of (22) 9–12:(46) out of (46)	

*Refer to Kentucky's Science Core Content for Assessment on pages 24–30

Reading

KENTUCKY Grade 8 Reading

Core Content for Assessment, Version 4.1

FORMING A FOUNDATION FOR READING

Requires readers to develop and apply basic reading skills and strategies across genres to read and understand texts at the appropriate grade level. This involves reading at the word, sentence and connected text levels across content areas that include multicultural texts.

RD-08-1.0.1. Students will apply knowledge of synonyms or antonyms to comprehend a passage.

RD-08-1.0.2. Students will select, based on context, the appropriate meaning for a word that has multiple meanings.

RD-08-1.0.3. Students will apply the meanings of word parts (prefixes, suffixes, roots) to comprehend unfamiliar words in a passage.

RD-08-1.0.4. Students will formulate questions to guide reading.

RD-08-1.0.5. Students will scan to find key information.

RD-08-1.0.6. Students will skim to get the general meaning of a passage.

RD-08-1.0.7. Students will interpret literal and non-literal meanings of words or phrases based on context.

RD-08-1.0.8. Students will interpret the meaning of jargon, dialect, or specialized vocabulary used in a passage.

DEVELOPING AN INITIAL UNDERSTANDING

Requires readers to consider the text as a whole or in a broader perspective to develop an initial understanding.

RD-08-2.0.1. Students will explain the main idea of a passage.

RD-08-2.0.2. Students will identify and explain the characteristics of short stories, novels, poetry, or plays.

RD-08-2.0.4. Students will locate key ideas or information in a passage.

RD-08-2.0.5. Students will paraphrase information from a paragraph, a section of a passage, or an entire passage.

RD-08-2.0.6. Students will apply the information contained in a passage to accomplish a task/procedure or answer questions about a passage.

RD-08-2.0.7. Students will make predictions, draw conclusions, make generalizations, or make inferences based on what is read.

RD-08-2.0.8. Students will interpret the meaning of concrete and abstract terms, based on the context from a passage (e.g., "loaded" words, connotation and denotation).

INTERPRETING TEXT

Requires readers to extend their initial impressions to develop a more complete understanding of what is read. This involves linking information across parts of a text as well as focusing on specific information.

RD-08-3.0.1. Students will analyze the relationship between a speaker's or character's motivation and behavior in a passage, as revealed by the dilemmas.

RD-08-3.0.2. Students will identify or explain an author's purpose in a passage.

RD-08-3.0.3. Students will explain or analyze how a conflict in a passage is resolved.

RD-08-3.0.4. Students will analyze the use of details that support the main idea or explain their importance in a passage.

RD-08-3.0.7. Students will identify or explain an author's position based on evidence in a passage.

RD-08-3.0.8. Students will explain an author's argument or identify evidence from the passage to support the author's argument.

RD-08-3.0.9. Students will identify persuasive techniques (e.g., expert opinion, logical/emotional/ethical appeal, repetition, rhetorical question, allusion) or propaganda techniques (e.g., testimonial, bandwagon, personal attack) or explain how each is used.

REFLECTING AND RESPONDING TO TEXT

Requires readers to connect knowledge from the text with their own background knowledge. The focus is on how the text relates to personal knowledge.

RD-08-4.0.1. Students will connect information from a passage to students' lives (text-to-self), real world issues (text-to-world) and other texts (text-to-text—e.g., novel, short story, song, film, website, etc.).

RD-08-4.0.2. Students will use evidence from a passage to formulate opinions in response to a reading passage.

DEMONSTRATING A CRITICAL STANCE

Requires readers to consider the text objectively. It involves a range of tasks, including critical evaluation, comparing and contrasting and understanding the impact of features such as irony, humor and organization.

RD-08-5.0.1. Students will explain the interrelationships (themes, ideas, concepts) that are developed in more than one literary work.

RD-08-5.0.2. Students will interpret the use of literary elements (e.g., characterization, setting, plot, theme, point of view) in a passage.

RD-08-5.0.3. Students will identify and explain the use of literary devices (e.g., symbolism, irony, analogies, imagery, foreshadowing, figurative language).

RD-08-5.0.4. Students will analyze the author's use of literary devices in a passage (e.g., symbolism, irony, analogies, imagery, figurative language).

RD-08-5.0.5. Students will evaluate the author's word choice, style, content, or use of literary elements.

RD-08-5.0.6. Students will compare and contrast elements, views, ideas, or events presented in one or more passages.

RD-08-5.0.7. Students will evaluate the effectiveness of organization or format in fulfilling the purpose of a passage.

RD-08-5.0.8. Students will explain or analyze how the use of text features (e.g., subheadings, bullets, fonts, white space, layout, charts, diagrams, labels, pictures and captions) enhances the reader's understanding of a passage.

RD-08-5.0.9. Students will analyze the organizational patterns (cause and effect, comparison or contrast, sequence, generalizations) in a passage.

FORMING A FOUNDATION FOR READING

Requires readers to develop and apply basic reading skills and strategies across genres to read and understand texts at the appropriate grade level. This involves reading at the word, sentence and connected text levels across content areas that include multicultural texts.

RD-09-1.0.1. Students will interpret literal or non-literal meanings of words in a passage.

RD-09-1.0.2. Students will make predictions based on what is read.

RD-09-1.0.3. Students will formulate questions to guide reading.

RD-09-1.0.4. Students will interpret the meaning of jargon, dialect, or specialized vocabulary found in a passage.

DEVELOPING AN INITIAL UNDERSTANDING

Requires readers to consider the text as a whole or in a broader perspective to develop an initial understanding.

RD-09-2.0.1. Students will paraphrase information in a passage.

RD-09-2.0.2. Students will identify essential information from a passage needed to accomplish a task.

RD-09-2.0.3. Students will apply the information contained in a passage to accomplish a task/procedure or to answer questions about a passage.

RD-09-2.0.4. Students will follow the sequence of information from a passage.

RD-09-2.0.5. Students will interpret concrete or abstract terms using context from the passage.

RD-09-2.0.6. Students will explain the main ideas of a passage and identify the key ideas or information that support them.

RD-09-2.0.7. Students will make inferences, draw conclusions or make generalizations based on evidence from a passage.

INTERPRETING TEXT

Requires readers to extend their initial impressions to develop a more complete understanding of what is read. This involves linking information across parts of a text as well as focusing on specific information.

RD-09-3.0.1. Students will explain or analyze how a conflict in a passage is resolved.

RD-09-3.0.2. Students will identify or explain an author's purpose in a passage.

RD-09-3.0.3. Students will explain an author's position based on evidence in a passage.

RD-09-3.0.4. Students will accept or reject an argument, giving supporting evidence from the passage.

RD-09-3.0.5. Students will analyze an argument, giving supporting evidence from the passage.

RD-09-3.0.6. Students will analyze the relationship between a speaker's or character's motivation and behavior in a passage, as revealed by the dilemmas.

RD-09-3.0.7. Students will analyze or evaluate the use of supporting details as they relate to the author's message.

RD-09-3.0.8. Students will analyze or evaluate the use of persuasive or propaganda techniques within a passage.`

RD-09-3.0.9. Students will explain the appropriateness of the author's content for an intended audience.

REFLECTING AND RESPONDING TO TEXT

Requires readers to connect knowledge from the text with their own background knowledge. The focus is on how the text relates to personal knowledge.

RD-09-4.0.1. Students will analyze the content or make connections as it applies to students' lives (text-to-self), real-world issues (text-to-world) or other texts (text-to-text).

RD-09-4.0.2. Students will use evidence from a passage to formulate opinions in response to a reading passage.

DEMONSTRATING A CRITICAL STANCE

Requires readers to consider the text objectively. It involves a range of tasks, including critical evaluation, comparing and contrasting and understanding the impact of features such as irony, humor and organization.

RD-09-5.0.1. Students will compare and contrast the characteristics of a variety of literary genres.

RD-09-5.0.2. Students will analyze or evaluate the effectiveness of literary elements (e.g., theme, characterization, setting, point of view, conflict and resolution, plot, structure) within a passage.

RD-09-5.0.3. Students will analyze the author's use of literary devices in a passage (e.g., symbolism, irony, analogies, imagery, figurative language).

RD-09-5.0.4. Students will critique the author's word choice, style, tone, or content.

RD-09-5.0.5. Students will compare or contrast elements, views, ideas, or events presented in one or more passages.

RD-09-5.0.6. Students will analyze the ways in which similar themes or ideas are developed in more than one text.

RD-09-5.0.7. Students will evaluate the effectiveness of organization or format in fulfilling the purpose of a passage.

RD-09-5.0.8. Students will explain how the use of text features (e.g., illustrations, charts, lists, tables, graphs, tables of contents, indexes, glossaries, headings, captions), format, or layout enhances the reader's understanding of a passage.

RD-09-5.0.9. Students will analyze the effectiveness of the organizational patterns in a passage (e.g., cause and effect, repetition, comparison and contrast, sequence, generalizations) for fulfilling the purpose of the passage.

FORMING A FOUNDATION FOR READING

Requires readers to develop and apply basic reading skills and strategies across genres to read and understand texts at the appropriate grade level. This involves reading at the word, sentence and connected text levels across content areas that include multicultural texts.

RD-10-1.0.1. Students will interpret literal or nonliteral meanings of words in a passage.

RD-10-1.0.2. Students will make predictions based on what is read.

RD-10-1.0.3. Students will formulate questions to guide reading.

RD-10-1.0.4. Students will interpret the meaning of jargon, dialect, or specialized vocabulary found in a passage.

DEVELOPING AN INITIAL UNDERSTANDING

Requires readers to consider the text as a whole or in a broader perspective to develop an initial understanding.

RD-10-2.0.1. Students will paraphrase information in a passage.

RD-10-2.0.2. Students will identify essential information from a passage needed to accomplish a task.

RD-10-2.0.3. Students will apply the information contained in a passage to accomplish a task/procedure or to answer questions about a passage.

RD-10-2.0.4. Students will follow the sequence of information from a passage.

RD-10-2.0.5. Students will interpret concrete or abstract terms using context from the passage.

RD-10-2.0.6. Students will explain the main ideas of a passage and identify the key ideas or information that support them.

RD-10-2.0.7. Students will make inferences, draw conclusions or make generalizations based on evidence from a passage.

INTERPRETING TEXT

Requires readers to extend their initial impressions to develop a more complete understanding of what is read. This involves linking information across parts of a text as well as focusing on specific information.

RD-10-3.0.1. Students will explain or analyze how a conflict in a passage is resolved.

RD-10-3.0.2. Students will identify or explain an author's purpose in a passage.

RD-10-3.0.3. Students will explain an author's position based on evidence in a passage.

RD-10-3.0.4. Students will accept or reject an argument, giving supporting evidence from the passage.

RD-10-3.0.5. Students will analyze an argument, giving supporting evidence from the passage.

RD-10-3.0.6. Students will analyze the relationship between a speaker's or character's motivation and behavior in a passage, as revealed by the dilemmas.

RD-10-3.0.7. Students will analyze or evaluate the use of supporting details as they relate to the author's message.

RD-10-3.0.8. Students will analyze or evaluate the use of persuasive or propaganda techniques within a passage.

RD-10-3.0.9. Students will explain the appropriateness of the author's content for an intended audience.

REFLECTING AND RESPONDING TO TEXT

Requires readers to connect knowledge from the text with their own background knowledge. The focus is on how the text relates to personal knowledge.

RD-10-4.0.1. Students will analyze the content or make connections as it applies to students' lives (text-to-self), real-world issues (text-to-world) or other texts (text-to-text).

RD-10-4.0.2. Students will use evidence from a passage to formulate opinions in response to a reading passage.

DEMONSTRATING A CRITICAL STANCE

Requires readers to consider the text objectively. It involves a range of tasks, including critical evaluation, comparing and contrasting and understanding the impact of features such as irony, humor and organization.

RD-10-5.0.1. Students will compare and contrast the characteristics of a variety of literary genres.

RD-10-5.0.2. Students will analyze or evaluate the effectiveness of literary elements (e.g., theme, characterization, setting, point of view, conflict and resolution, plot, structure) within a passage.

RD-10-5.0.3. Students will analyze the author's use of literary devices in a passage (e.g., symbolism, irony, analogies, imagery, figurative language).

RD-10-5.0.4. Students will critique the author's word choice, style, tone, or content.

RD-10-5.0.5. Students will compare or contrast elements, views, ideas, or events presented in one or more passages.

RD-10-5.0.6. Students will analyze the ways in which similar themes or ideas are developed in more than one text.

RD-10-5.0.7. Students will evaluate the effectiveness of organization or format in fulfilling the purpose of a passage.

RD-10-5.0.8. Students will explain how the use of text features (e.g., illustrations, charts, lists, tables, graphs, tables of contents, indexes, glossaries, headings, captions), format, or layout enhances the reader's understanding of a passage.

RD-10-5.0.9. Students will analyze the effectiveness of the organizational patterns in a passage (e.g., cause and effect, repetition, comparison and contrast, sequence, generalizations) for fulfilling the purpose of the passage.

FORMING A FOUNDATION FOR READING

Requires readers to develop and apply basic reading skills and strategies across genres to read and understand texts at the appropriate grade level. This involves reading at the word, sentence and connected text levels across content areas that include multicultural texts.

RD-11-1.0.1. Students will interpret literal or non-literal meanings of words in a passage.

RD-11-1.0.2. Students will make predictions based on what is read.

RD-11-1.0.3. Students will formulate questions to guide reading.

RD-11-1.0.4. Students will interpret the meaning of jargon, dialect, or specialized vocabulary found in a passage.

DEVELOPING AN INITIAL UNDERSTANDING

Requires readers to consider the text as a whole or in a broader perspective to develop an initial understanding.

RD-11-2.0.1. Students will paraphrase information in a passage.

RD-11-2.0.2. Students will identify essential information from a passage needed to accomplish a task.

RD-11-2.0.3. Students will apply the information contained in a passage to accomplish a task/procedure or to answer questions about a passage.

RD-11-2.0.4. Students will follow the sequence of information from a passage.

RD-11-2.0.5. Students will interpret concrete or abstract terms using context from the passage.

RD-11-2.0.6. Students will explain the main ideas of a passage and identify the key ideas or information that support them.

RD-11-2.0.7. Students will make inferences, draw conclusions or make generalizations based on evidence from a passage.

INTERPRETING TEXT

Requires readers to extend their initial impressions to develop a more complete understanding of what is read. This involves linking information across parts of a text as well as focusing on specific information.

RD-11-3.0.1. Students will analyze how a conflict in a passage is resolved.

RD-11-3.0.2. Students will analyze an author's purpose in a passage.

RD-11-3.0.3. Students will explain an author's position based on evidence in a passage.

RD-11-3.0.4. Students will accept or reject an argument, giving supporting evidence from the passage.

RD-11-3.0.5. Students will evaluate an argument, giving supporting evidence from the passage.

RD-11-3.0.6. Students will analyze the relationship between a speaker's or character's motivation and behavior in a passage, as revealed by the dilemmas.

RD-11-3.0.7. Students will analyze or evaluate the use of supporting details as they relate to the author's message.

RD-11-3.0.8. Students will analyze or evaluate the use of persuasive or propaganda techniques within a passage.

RD-11-3.0.9. Students will explain the appropriateness of the author's content for an intended audience.

REFLECTING AND RESPONDING TO TEXT

Requires readers to connect knowledge from the text with their own background knowledge. The focus is on how the text relates to personal knowledge.

RD-11-4.0.1. Students will evaluate the content or make connections as it applies to students' lives (text-to-self), real-world issues (text-to-world) or other texts (text-to-text).

RD-11-4.0.2. Students will use evidence from a passage to formulate opinions in response to a reading passage.

DEMONSTRATING A CRITICAL STANCE

Requires readers to consider the text objectively. It involves a range of tasks, including critical evaluation, comparing and contrasting and understanding the impact of features such as irony, humor and organization.

RD-11-5.0.1. Students will compare and contrast the characteristics of a variety of literary genres.

RD-11-5.0.2. Students will analyze or evaluate the effectiveness of literary elements (e.g., theme, characterization, setting, point of view, conflict and resolution, plot, structure) within a passage.

RD-11-5.0.3. Students will analyze the author's use of literary devices in a passage (e.g., symbolism, irony, analogies, imagery, figurative language).

RD-11-5.0.4. Students will critique the author's word choice, style, tone, or content.

RD-11-5.0.5. Students will compare or contrast elements, views, ideas, or events presented in one or more passages.

RD-11-5.0.6. Students will analyze the ways in which similar themes or ideas are developed in more than one text.

RD-11-5.0.7. Students will evaluate the effectiveness of organization or format in fulfilling the purpose of a passage.

RD-11-5.0.8. Students will explain how the use of text features (e.g., illustrations, charts, lists, tables, graphs, tables of contents, indexes, glossaries, headings, captions), format, or layout enhances the reader's understanding of a passage.

RD-11-5.0.9. Students will analyze the effectiveness of the organizational patterns in a passage (e.g., cause and effect, repetition, comparison and contrast, sequence, generalizations) for fulfilling the purpose of the passage.

FORMING A FOUNDATION FOR READING

Requires readers to develop and apply basic reading skills and strategies across genres to read and understand texts at the appropriate grade level. This involves reading at the word, sentence and connected text levels across content areas that include multicultural texts.

RD-12-1.0.1. Students will interpret literal or non-literal meanings of words in a passage.

RD-12-1.0.2. Students will make predictions based on what is read.

RD-12-1.0.3. Students will formulate questions to guide reading.

RD-12-1.0.4. Students will interpret the meaning of jargon, dialect, or specialized vocabulary found in a passage.

DEVELOPING AN INITIAL UNDERSTANDING

Requires readers to consider the text as a whole or in a broader perspective to develop an initial understanding.

RD-12-2.0.1. Students will paraphrase information in a passage.

RD-12-2.0.2. Students will identify essential information from a passage needed to accomplish a task.

RD-12-2.0.3. Students will apply the information contained in a passage to accomplish a task/procedure or to answer questions about a passage.

RD-12-2.0.4. Students will follow the sequence of information from a passage.

RD-12-2.0.5. Students will interpret concrete or abstract terms using context from the passage.

RD-12-2.0.6. Students will explain the main ideas of a passage and identify the key ideas or information that support them.

RD-12-2.0.7. Students will make inferences, draw conclusions or make generalizations based on evidence from a passage.

INTERPRETING TEXT

Requires readers to extend their initial impressions to develop a more complete understanding of what is read. This involves linking information across parts of a text as well as focusing on specific information.

RD-12-3.0.1. Students will analyze how a conflict in a passage is resolved.

RD-12-3.0.2. Students will analyze an author's purpose in a passage.

RD-12-3.0.3. Students will explain an author's position based on evidence in a passage.

RD-12-3.0.4. Students will accept or reject an argument, giving supporting evidence from the passage.

RD-12-3.0.5. Students will evaluate an argument, giving supporting evidence from the passage.

RD-12-3.0.6. Students will analyze the relationship between a speaker's or character's motivation and behavior in a passage, as revealed by the dilemmas.

RD-12-3.0.7. Students will analyze or evaluate the use of supporting details as they relate to the author's message.

RD-12-3.0.8. Students will analyze or evaluate the use of persuasive or propaganda techniques within a passage.

RD-12-3.0.9. Students will explain the appropriateness of the author's content for an intended audience.

REFLECTING AND RESPONDING TO TEXT

Requires readers to connect knowledge from the text with their own background knowledge. The focus is on how the text relates to personal knowledge.

RD-12-4.0.1. Students will evaluate the content or make connections as it applies to students' lives (text-to-self), real-world issues (text-to-world) or other texts (text-to-text).

RD-12-4.0.2. Students will use evidence from a passage to formulate opinions in response to a reading passage.

DEMONSTRATING A CRITICAL STANCE

Requires readers to consider the text objectively. It involves a range of tasks, including critical evaluation, comparing and contrasting and understanding the impact of features such as irony, humor and organization.

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RD-12-5.0.7. Students will evaluate the effectiveness of organization or format in fulfilling the purpose of a passage.

RD-12-5.0.8. Students will explain how the use of text features (e.g., illustrations, charts, lists, tables, graphs, tables of contents, indexes, glossaries, headings, captions), format, or layout enhances the reader's understanding of a passage.

RD-12-5.0.9. Students will analyze the effectiveness of the organizational patterns in a passage (e.g., cause and effect, repetition, comparison and contrast, sequence, generalizations) for fulfilling the purpose of the passage.

KENTUCKY Grade 8 Writing
Core Content for Assessment, Version 4.1

WRITING CONTENT

WR-M-1.1.0. Purpose/Audience

Students will establish and maintain a focused purpose to communicate with an authentic audience by

- Narrowing the topic to present an idea or theme
- Choosing a perspective authentic to the writer
- Analyzing and addressing the needs of the intended audience
- Adhering to the characteristics of the form
- Applying a suitable tone
- Allowing voice to emerge when appropriate

WR-M-1.2.0. Idea Development/Support

Students will support main ideas and deepen the audience's understanding of purpose by

- Developing logical, justified and suitable explanations
- Providing relevant elaboration
- Explaining related connections or reflections
- Applying idea development strategies appropriate to the form

WRITING STRUCTURE

WR-M-2.3.0. Organization

Students will create unity and coherence to accomplish the focused purpose by

- Engaging the audience
- Establishing a context for reading when appropriate
- Communicating ideas and support in a meaningful order
- Applying transitions and transitional elements to guide the reader through the piece
- Developing effective closure

WR-M-2.4.0. Sentence Structure

Students will create effective sentences by

- Applying a variety of structures and lengths
- Developing complete and correct sentences unless using unconventional structures for effect when appropriate

WRITING CONVENTIONS

WR-M-3.5.0. Language

Students will exemplify effective language choices by

- Applying correct grammar and usage
- Applying concise use of language
- Incorporating strong verbs, precise nouns, concrete details and sensory details
- Applying language appropriate to the content, purpose and audience

WR-M-3.6.0. Correctness

Students will communicate clearly by

- Applying correct spelling
- Applying correct punctuation
- Applying correct capitalization
- Incorporating acceptable departure from standard correctness to enhance meaning when appropriate
- Incorporating appropriate documentation of ideas and information from outside sources (e.g., citing authors or titles within the text, listing sources)

WRITING PROCESS

WR-M-4.10.0. Revising (Content/Ideas)

Revising Skills

Idea Development

WR-08-4.10.05. Students will identify a topic sentence of a paragraph

WR-08-4.10.06. Students will select appropriate supporting details.

WR-08-4.10.07. Students will identify extraneous/irrelevant materials.

Organization

WR-08-4.10.08. Students will correct sentences that are out of chronological/sequential order or insert new sentences in the correct chronological/sequential position.

WR-08-4.10.09. Students will apply the most effective transitions.

WR-08-4.10.10. Students will develop effective introductions and closures for writing.

Word Choice

WR-08-4.10.11. Students will eliminate redundant words and phrases.

WR-08-4.10.12. Students will choose the most specific word for use in a sentence.

WR-M-4.11.0. Editing (Conventions and Mechanics)

Editing Skills

Language Usage

WR-08-4.11.13. Students will apply knowledge of subject/verb agreement with both singular and plural subjects.

WR-08-4.11.14. Students will apply knowledge of present, past and future verb tenses.

WR-08-4.11.15. Students will apply knowledge of comparative and superlative forms of adjectives and adverbs.

WR-08-4.11.16. Students will apply knowledge of special problems in usage (a/an, to/two/too, their/there/they're), pronoun references and double negatives

WR-08-4.11.17. Students will apply knowledge of idiomatic expressions

Sentence Structure

WR-08-4.11.18. Students will correct sentences that are run-ons or awkward.

WR-08-4.11.19. Students will correct sentence fragments.

WR-08-4.11.20. Students will combine short choppy sentences effectively.

WR-08-4.11.21. Students will combine simple sentences by using subordination and coordination.

WR-08-4.11.22 Students will correct sentences with misplaced/and or dangling modifiers.

Spelling

WR-08-4.11.23. Students will apply knowledge of spelling patterns, generalizations and rules to commonly used words.

WR-08-4.11.24. Students will apply knowledge of spelling patterns, generalizations and rules to plural forms of words.

WR-08-4.11.25. Students will apply knowledge of spelling patterns, generalizations and rules to contractions.

WR-08-4.11.26. Students will apply knowledge of spelling patterns, generalizations and rules to change verb endings.

Capitalization

WR-08-4.11.27. Students will capitalize proper nouns (e.g., names, days, months).

WR-08-4.11.28. Students will capitalize the beginning of sentences.

WR-08-4.11.29. Students will capitalize the pronoun "I".

WR-08-4.11.30. Students will capitalize proper adjectives.

WR-08-4.11.31. Students will capitalize first word in a quote when appropriate.

WR-08-4.11.32. Students will capitalize the first word and every succeeding main word in a title.

Punctuation

WR-08-4.11.33. Students will correctly punctuate declarative, exclamatory, interrogative and imperative sentences.

WR-08-4.11.34. Students will use commas in a series, a date, a compound sentence and the greeting and closing of a letter.

WR-08-4.11.35. Students will correctly apply the rules of punctuation for commas in appositives, direct address, and introductory phrases and clauses.

WR-08-4.11.36. Students will correctly apply the rules of punctuation for apostrophes in possessives and contractions.

WR-08-4.11.37. Students will correctly apply the rules of punctuation for periods in abbreviations and acronyms

WR-08-4.11.38. Students will correctly apply the rules of punctuation for semicolons in items in a series and combined sentences.

WR-08-4.11.39. Students will correctly apply the rules of punctuation for colons in introducing a list and the business letter greeting.

WR-08-4.11.40. Students will correctly apply the rules of punctuation for quotation marks in dialogue, titles and direct/indirect quotes.

WRITING CONTENT

WR-HS-1.1.0. Purpose/Audience

Students will establish and maintain a focused purpose to communicate with an authentic audience by

- Narrowing the topic to present an idea or theme
- Choosing a perspective authentic to the writer
- Analyzing and addressing the needs of the intended audience
- Adhering to the characteristics of the form
- Applying a suitable tone
- Allowing voice to emerge when appropriate

WR-HS-1.2.0. Idea Development/Support

Students will support main ideas and deepen the audience's understanding of purpose by

- Developing logical, justified and suitable explanations
- Providing relevant elaboration
- Explaining related connections or reflections
- Applying idea development strategies appropriate to the form

WRITING STRUCTURE

WR-HS-2.3.0. Organization

Students will create unity and coherence to accomplish the focused purpose by

- Engaging the audience
- Establishing a context for reading when appropriate
- Communicating ideas and support in a meaningful order
- Applying transitions and transitional elements to guide the reader through the piece
- Developing effective closure

WR-HS-2.4.0. Sentence Structure

Students will create effective sentences by

- Applying a variety of structures and lengths
- Maintaining parallel structure
- Developing complete and correct sentences unless using unconventional structures for an intentional effect when appropriate

WRITING CONVENTIONS

WR-HS-3.5.0. Language

Students will exemplify effective language choices by

- Applying correct grammar and usage
- Applying concise use of language
- Incorporating strong verbs, precise nouns, concrete details and sensory details
- Applying language appropriate to the content, purpose and audience

WR-HS-3.6.0. Correctness

Students will communicate clearly by

- Applying correct spelling
- Applying correct punctuation
- Applying correct capitalization
- Incorporating acceptable departure from standard correctness to enhance meaning when appropriate
- Incorporating appropriate documentation of ideas and information from outside sources (e.g., citing authors or titles within the text, listing sources, documenting sources in text and/or on a Works Cited page)

KENTUCKY Grade 8 Mathematics

Core Content for Assessment, Version 4.1

NUMBER PROPERTIES AND OPERATIONS

Middle grades students understand fractions, decimals, percents and integers, compare them and locate their relative positions on a number line. They develop and use proportional reasoning to solve problems. They work with large numbers and small numbers. They use factors, multiples and prime factorizations. They perform arithmetic operations with fractions, decimals and integers, use properties in computation, develop fluency and develop strategies to estimate the result of operations on rational numbers.

Number Sense

MA-08-1.1.1. Students will provide examples of and identify rational numbers and irrational numbers (square roots and π only).

MA-08-1.1.3. Students will convert, compare and order multiple numerical representations (e.g., fractions, decimals, percentages) of rational numbers and irrational numbers (square roots and π only).

Estimation

MA-08-1.2.1. Students will estimate to solve real-world and mathematical problems with rational numbers, checking for reasonable and appropriate computational results.

Number Operations

MA-08-1.3.1. Students will add, subtract, multiply and divide rational numbers to solve real-world problems and apply order of operations (including positive whole number exponents) to simplify numerical expressions.

Ratios and Proportional Reasoning

MA-08-1.4.1. Students will apply ratios and proportional reasoning to solve real-world problems (e.g., percents, constant rate of change, unit pricing, percent of increase or decrease).

Properties of Numbers and Operations

MA-08-1.5.2. Students will identify the use of properties (the commutative properties of addition and multiplication, the associative properties of addition and multiplication, the identity properties for addition and multiplication, inverse properties and the distributive property of multiplication over addition and subtraction) to justify a given step in solving problems.

MEASUREMENT

Students continue to measure and estimate measurements including fractions and decimals. They use formulas to find perimeter, area, circumference and volume. They use rulers and protractors. They use US Customary and metric units of measurement.

Measuring Physical Attributes

MA-08-2.1.1. Students will measure lengths (to the nearest sixteenth of an inch or the nearest millimeter) and will determine and use in real-world or mathematical problems:

- area and perimeter of triangles and quadrilaterals;
- area and circumference of circles;
- area and perimeter of compound figures composed of triangles, quadrilaterals and circles;
- area from circumference or perimeter and
- circumference or perimeter from area.

MA-08-2.1.3. Students will evaluate the measures of angles by estimation, measurement with a protractor or angle ruler and determine angle measures in mathematical and/or real-world situations (e.g., supplementary, external, vertical).

MA-08-2.1.4. Students will apply formulas to determine the volume of right rectangular prisms in real-world problems.

MA-08-2.1.6. Students will apply the Pythagorean theorem to determine the length of a hypotenuse.

Systems of Measurements

MA-08-2.2.1. Students will convert units within the same measurement system and use these units to solve real-world problems.

GEOMETRY

Middle grade students expand analysis of two-dimensional shapes and three-dimensional shapes. They translate shapes in a coordinate plane. They extend work with congruent and similar figures, including proportionality. They use the Pythagorean theorem.

Shapes and Relationships

MA-08-3.1.2. Students will identify and compare properties of two-dimensional figures (circles, triangles [acute, right, obtuse, scalene, isosceles, equilateral], quadrilaterals [square, rectangle, rhombus, parallelogram, trapezoid], regular/irregular polygons), and will apply these properties and figures to solve real-world and mathematical problems.

MA-08-3.1.3. Students will compare properties of three-dimensional figures (spheres, cones, cylinders, prisms, pyramids), and will apply these properties and figures to solve real-world and mathematical problems.

MA-08-3.1.4. Students will:

- provide examples of congruent and similar figures;
- apply congruent and similar figures to solve real-world and mathematical problems and
- apply proportional reasoning to solve problems involving scale drawings and proportional figures.

Transformations of Shapes

MA-08-3.2.2. Students will transform (translations, reflections, and dilations with the center of dilation at the origin) figures in a coordinate plane and determine the new coordinates of the image after the transformation.

Coordinate Geometry

MA-08-3.3.1. Students will identify and graph ordered pairs on a coordinate system, correctly identifying the origin, axes and ordered pairs; and will apply graphing in the coordinate system to solve real-world and mathematical problems.

DATA ANALYSIS AND PROBABILITY

Middle grades students extend the early development of data representations and examine the appropriateness of graphs and representations of data. They examine central tendencies and dispersion. They develop organized approaches to counting and use experimental and theoretical probabilities.

Representations of Data Sets

MA-08-4.1.1. Students will analyze and make inferences from data displays (drawings, tables/charts, pictographs, bar graphs, circle graphs, line plots, Venn diagrams, line graphs, stem-and-leaf plots, scatter plots, histograms, box-and-whiskers plots).

MA-08-4.1.4. Students will:

- construct data displays (Venn diagrams, tables, line graphs, stem-and-leaf plots, circle graphs, scatter plots);
- explain why the type of display is appropriate for the data and
- explain how misleading representations affect interpretations and conclusions about data (e.g., changing the scale on a graph).

Characteristics of Data Sets

MA-08-4.2.1. Students will:

- determine the mean, median, mode, and range of a set of data;
- identify clusters, gaps, and outliers and
- apply these concepts to compare sets of data.

Experiments and Samples

[no statement at this level]

Probability

MA-08-4.4.1. Students will apply counting techniques to determine the size of a sample space for a real-world or mathematical situation.

MA-08-4.4.2. Students will:

- determine theoretical probabilities of events, including compound events (e.g. dependent, independent);
- determine probabilities based on the results of an experiment and
- make inferences from probability data.

ALGEBRAIC THINKING

Middle grade students extend pattern work to include arithmetic sequences. They use linear functions and linear equations. They plot rational number pairs in the Cartesian plane. They simplify algebraic and numeric expressions. They explore the effects of change on related variables. They use and solve two-step single variable equations and inequalities.

Patterns, Relations and Functions

MA-08-5.1.2. Students will represent, analyze and generalize simple first and second degree functional relationships using tables, graphs, words and algebraic notations and will apply the first degree relationships to solve real-world and mathematical problems.

MA-08-5.1.5. Students will explain how the change in one variable affects the change in another variable (e.g., if rate remains constant, an increase in time results in an increase in distance).

Variables, Expressions and Operations

MA-08-5.2.1. Students will evaluate and simplify algebraic expressions applying the order of operations.

Equations and Inequalities

MA-08-5.3.1. Students will model and solve single variable, first-degree real-world and mathematical problems (e.g., $5x + 2 = x + 22$, $x - 4 < -60$).

NUMBER PROPERTIES AND OPERATIONS

High school students should enter high school with a strong background in rational numbers and numerical operations and expand this to real numbers. This becomes the foundation for algebra and working with algebraic symbols. They understand large and small numbers and their representations, powers and roots. They compare and contrast properties of numbers and number systems and develop strategies to estimate the results of operations on real numbers. Students will use, and understand the limitations of, graphing calculators and computer spreadsheets appropriately as learning tools.

Number Sense

[no statement at this level]

Estimation

[no statement at this level]

Number Operations

MA-HS-1.3.1. Students will solve real-world and mathematical problems to specified accuracy levels by simplifying expressions with real numbers involving addition, subtraction, multiplication, division, absolute value, integer exponents, roots (square, cube) and factorials.

MA-HS-1.3.2. Students will:

- describe and extend arithmetic and geometric sequences;
- determine a specific term of a sequence given an explicit formula;
- determine an explicit rule for the nth term of an arithmetic sequence and
- apply sequences to solve real-world problems.

Ratios and Proportional Reasoning

MA-HS-1.4.1. Students will apply ratios, percents and proportional reasoning to solve real-world problems (e.g., those involving slope and rate, percent of increase and decrease) and will explain how slope determines a rate of change in linear functions representing real-world problems.

Properties of Numbers and Operations

[no statement at this level]

MEASUREMENT

High school students continue to measure and estimate measurements including fractions and decimals. They use formulas to find surface area and volume. They use US Customary and metric units of measurement. They use the Pythagorean theorem and other right triangle relationships to solve real-world problems.

Measuring Physical Attributes

MA-HS-2.1.1. Students will determine the surface area and volume of right rectangular prisms, pyramids, cylinders, cones and spheres in real-world and mathematical problems.

MA-HS-2.1.2. Students will describe how a change in one or more dimensions of a geometric figure affects the perimeter, area and volume of the figure.

MA-HS-2.1.3. Students will apply definitions and properties of right triangle relationships (right triangle trigonometry and the Pythagorean theorem) to determine length and angle measures to solve real-world and mathematical problems.

Systems of Measurements

[no statement at this level]

GEOMETRY

High school students expand analysis of two-dimensional shapes and three-dimensional shapes. They translate shapes in a coordinate plane. They extend work with congruent and similar figures, including proportionality.

Shapes and Relationships

MA-HS-3.1.1. Students will analyze and apply spatial relationships (not using Cartesian coordinates) among points, lines and planes (e.g., betweenness of points, midpoint, segment length, collinear, coplanar, parallel, perpendicular, skew).

MA-HS-3.1.3. Students will analyze and apply angle relationships (e.g., linear pairs, vertical, complementary, supplementary, corresponding and alternate interior angles) in real-world or mathematical problems.

MA-HS-3.1.5. Students will classify and apply properties of two-dimensional geometric figures (e.g., number of sides, vertices, length of sides, sum of interior and exterior angle measures).

MA-HS-3.1.7. Students will solve real-world and mathematical problems by applying properties of triangles (e.g., Triangle Sum theorem and Isosceles Triangle theorems).

MA-HS-3.1.9. Students will classify and apply properties of three-dimensional geometric figures (e.g., number of edges, faces, vertices).

MA-HS-3.1.12. Students will apply the concepts of congruence and similarity to solve real-world and mathematical problems.

Transformations of Shapes

MA-HS-3.2.1. Students will identify and describe properties of and apply geometric transformations within a plane to solve real-world and mathematical problems.

Coordinate Geometry

MA-HS-3.3.1. Students will apply algebraic concepts and graphing in the coordinate plane to analyze and solve problems (e.g., finding the final coordinates for a specified polygon, midpoints, betweenness of points, parallel and perpendicular lines, the distance between two points, the slope of a segment).

Foundational Statements

[no statement at this level]

DATA ANALYSIS AND PROBABILITY

High school students extend data representations, interpretations and conclusions. They describe data distributions in multiple ways and connect data gathering issues with data interpretation issues. They relate curve of best fit with two variable data and determine line of best fit for a given set of data. They distinguish between combinations and permutations and compare and contrast theoretical and experimental probability.

Data Representations

MA-HS-4.1.1. Students will analyze and make inferences from a set of data with no more than two variables and will analyze problems for the use and misuse of data representations.

MA-HS-4.1.2. Students will construct data displays for data with no more than two variables.

Characteristics of Data Sets

MA-HS-4.2.1. Students will describe and compare data distributions and make inferences from the data based on the shapes of graphs, measures of center (mean, median, mode) and measures of spread (range, standard deviation).

MA-HS-4.2.3. Students will:

- identify an appropriate curve of best fit (linear, quadratic, exponential) for a set of two-variable data;
- determine a line of best fit equation for a set of linear two-variable data and
- apply a line of best fit to make predictions within and beyond a given set of two-variable data.

Experiments and Samples

MA-HS-4.3.1. Students will recognize potential for bias resulting from the misuse of sampling methods (e.g., non-random sampling, polling only a specific group of people, using limited or extremely small sample sizes) and explain why these samples can lead to inaccurate inferences.

Probability

MA-HS-4.4.1. Students will:

- determine theoretical and experimental (from given data) probabilities;
- make predictions and draw inferences from probabilities;
- compare theoretical and experimental probabilities and
- determine probabilities involving replacement and non-replacement.

ALGEBRAIC THINKING

High school students extend analysis and use of functions and focus on linear, quadratic, absolute value and exponential functions. They explore parametric changes on graphs of functions. They use rules and properties to simplify algebraic expressions. They combine simple rational expressions and combine simple polynomial expressions. They factor polynomial expressions and quadratics of the form $1x^2 + bx + c$.

Patterns, Relations and Functions

MA-HS-5.1.1. Students will identify and apply multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) to solve real-world or mathematical problems.

MA-HS-5.1.5. Students will:

- determine if a relation is a function;
- determine the domain and range of a function (linear and quadratic);
- determine the slope and intercepts of a linear function;
- determine the maximum, minimum, and intercepts (roots/zero) of quadratic function and
- evaluate a function written in function notation for a specified rational number.

MA-HS-5.1.8. Students will identify the changes and explain how changes in parameters affect graphs of functions (linear, quadratic, absolute value, exponential) (e.g., compare $y = x^2$, $y = 2x^2$, $y = (x - 4)^2$, and $y = x^2 + 3$).

Variables, Expressions, and Operations

MA-HS-5.2.1. Students will apply order of operations, real number properties (identity, inverse, commutative, associative, distributive, closure) and rules of exponents (integer) to simplify algebraic expressions.

MA-HS-5.2.3. Students will:

- add, subtract and multiply polynomial expressions;
- factor polynomial expressions using the greatest common monomial factor and
- factor quadratic polynomials of the form $ax^2 + bx + c$, when a = 1 and b and c are integers.

MA-HS-5.2.5. Students will add, subtract, multiply and divide simple rational expressions with monomial first-degree denominators and integer numerators (e.g., $\frac{3}{5x} + \frac{4}{3y}; \frac{9}{2a} - \frac{-7}{4b}; \frac{3}{-5x} \times \frac{-4}{7y}; \frac{5}{2c} \div \frac{9}{-11d}$) and will express the results in simplified form.

Equations and Inequalities

MA-HS-5.3.1. Students will model, solve and graph first degree, single variable equations and inequalities, including absolute value, based in real-world and mathematical problems and graph the solutions on a number line.

MA-HS-5.3.3. Students will model, solve and graph first degree, two-variable equations and inequalities in real-world and mathematical problems.

MA-HS-5.3.4. Students will model, solve and graph systems of two linear equations in real-world and mathematical problems.

MA-HS-5.3.6. Students will model, solve and graph quadratic equations in real-world and mathematical problems.

KENTUCKY Grade 8 Science

Core Content for Assessment, Version 4.1

STRUCTURE AND TRANSFORMATION OF MATTER

A basic understanding of matter is essential to the conceptual development of other big ideas in science. In the elementary years of conceptual development, students will be studying properties of matter and physical changes of matter at the macro level through direct observations, forming the foundation for subsequent learning. During the middle years, physical and chemical changes in matter are observed, and students begin to relate these changes to the smaller constituents of matter—namely, atoms and molecules. By high school, students will be dealing with evidence from both direct and indirect observations (microscopic level and smaller) to consider theories related to change and conservation of matter. The use of models (and an understanding of their scales and limitations) is an effective means of learning about the structure of matter. Looking for patterns in properties is also critical to comparing and explaining differences in matter.

Physical Science

SC-08-1.1.1. Students will:

- interpret models/representations of atoms of elements;
- classify elements based upon patterns in their physical (e.g., density, boiling point, solubility) and chemical (e.g., flammability, reactivity) properties.

SC-08-1.1.2. Students will understand that matter is made of minute particles called atoms, and atoms are composed of even smaller components. The components of an atom have measurable properties such as mass and electrical charge. Each atom has a positively charged nucleus surrounded by negatively charged electrons. The electric force between the nucleus and the electrons holds the atom together.

SC-08-1.1.3. Students will understand that the atom's nucleus is composed of protons and neutrons that are much more massive than electrons.

SC-08-1.1.4. Students will describe interactions which cause the movement of each element among the solid Earth, oceans, atmosphere and organisms (biogeochemical cycles).

MOTION AND FORCES

Whether observing airplanes, baseballs, planets, or people, the motion of all bodies is governed by the same basic rules. In the elementary years of conceptual development, students need multiple opportunities to experience, observe and describe (in words and pictures) motion, including factors (pushing and pulling) that affect motion. At the middle level, qualitative descriptions of the relationship between forces and motion will provide the foundation for quantitative applications of Newton's Laws. These ideas are more fully developed at the high school level along with the use of models to support evidence of motion in abstract or invisible phenomena such as electromagnetism.

Physical Science

SC-08-1.2.1. Students will describe and explain the effects of balanced and unbalanced forces on motion as found in real-life phenomena.

THE EARTH AND THE UNIVERSE

The Earth system is in a constant state of change. These changes affect life on earth in many ways. Development of conceptual understandings about processes that shape the Earth begin at the elementary level with understanding what Earth materials are and that change occurs. At the middle level, students investigate how these changes occur. Finally, at the high school level, most of the emphasis is on why these changes occur. An understanding of systems and their interacting components will enable students to evaluate supporting theories of earth changes. At the heart of elementary students' initial understanding of the Earth's place in the universe is direct observation of the earth-sun-moon system. Students can derive important conceptual understandings about the system as they describe interactions resulting in shadows, moon phases and day and night. The use of models and observance of patterns to explain common phenomena is essential to building a conceptual foundation and supporting ideas with evidence at all levels. In middle school, students begin to look beyond what can be directly observed as they explore the earth-sun-moon system, as well as the rest of our solar system, employing the concept of scale within their models. Patterns play an important role as students seek to develop a conceptual understanding of gravity in their world and in the universe. High school is the time to bring all of the ideas together to look at the universe as a whole. Students will use evidence to evaluate and analyze theories related to the origin of the universe and all components of the universe.

Earth/Space Science

SC-08-2.3.1. Students will describe various techniques for estimating geological time (radioactive dating, observing rock sequences, comparing fossils);

SC-08-2.3.2. Students will understand that earthquakes and volcanic eruptions can be observed on a human time scale, but many processes, such as mountain building and plate movements, take place over hundreds of millions of years.

SC-08-2.3.3. Students will

- explain the transfer of Earth's internal heat in the mantle (crustal movement, hotspots, geysers);
- describe the interacting components (convection currents) within the Earth's system.

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

SC-08-2.3.4. Students will understand that the Sun, Earth and the rest of the solar system formed approximately 4.6 billion years ago.

UNITY AND DIVERSITY

All matter is comprised of the same basic elements, goes through the same kinds of energy transformations, and uses the same kinds of forces to move. Living organisms are no exception. Elementary students begin to observe the macroscopic features of organisms in order to make comparisons and classifications based upon likenesses and differences. Looking for patterns in the appearance and behavior of an organism leads to the notion that offspring are much like the parents, but not exactly alike. In middle school, students begin to compare, contrast and classify the microscopic features of organisms—the cells, as well as investigate reproduction as the essential process to the continuation of all species. Expected patterns of genetic traits are predicted. Distinctions are made between learned behaviors and inherited traits. At the high school level, an in-depth study of the specialization and chemical changes occurring at the cellular level builds upon the foundational ideas developed earlier to investigate DNA and effects of alterations in DNA for an individual organism as well as for a species. Emphasis at every level should be placed upon the understanding that while every living thing is composed of similar small constituents that combine in predictable ways, it is the subtle variations within these small building blocks that account for both the likenesses and differences in form and function that create the diversity of life.

Biological Science

SC-08-3.4.1. Students will explain the relationship between structure and function of the cell components using a variety of representations.

SC-08-3.4.2. Students will understand that in the development of multicellular organisms, cells multiply (mitosis) and differentiate to form many specialized cells, tissues and organs. This differentiation is regulated through the expression of different genes.

SC-08-3.4.3. Students will form or justify conclusions as to whether a response is innate or learned using data/evidence on behavioral responses to internal and external stimuli.

SC-08-3.4.4. Students will describe and explain patterns found within groups of organisms in order to make biological classifications of those organisms.

SC-08-3.4.5. Students will understand that multicellular animals have nervous systems that generate behavior. Nerve cells communicate with each other by secreting specific molecules.

BIOLOGICAL CHANGE

The only thing certain is that everything changes. Elementary students build a foundational knowledge of change by observing slow and fast changes caused by nature in their own environment, noting changes that humans and other organisms cause in their environment and observing fossils found in or near their environment. At the middle school level, students study relationships among populations and ecosystems that contribute to the success or demise of a specific population or species. Students construct basic explanations that can account for the great diversity among organisms. The stage is set for high school students to evaluate the role natural selection plays in the diversity of species. Modern ideas of evolution provide a scientific explanation for three main sets of observable facts about life on earth: the enormous number of different life forms we see about us, the systematic similarities in anatomy and molecular chemistry we see within that diversity and the sequence of changes in fossils found in successive layers of rock that have been formed over more than a billion years.

Biological Science

SC-08-3.5.1. Students will draw conclusions and make inferences about the consequences of change over time that can account for the similarities among diverse species.

ENERGY TRANSFORMATIONS

Energy transformations are inherent in almost every system in the universe—from tangible examples at the elementary level, such as heat production in simple earth and physical systems to more abstract ideas beginning at middle school, such as those transformations involved in the growth, dying and decay of living systems. The use of models to illustrate the often invisible and abstract notions of energy transfer will aid in conceptualization, especially as students move from the macroscopic level of observation and evidence (primarily elementary school) to the microscopic interactions at the atomic level (middle and high school levels). Students in high school expand their understanding of constancy through the study of a variety of phenomena. Conceptual understanding and application of the laws of thermodynamics connect ideas about matter with energy transformations within all living, physical and earth systems.

Unifying Ideas

SC-08-4.6.1. Students will

- explain the cause and effect relationships between global climate and energy transfer;
- use evidence to make inferences or predictions about global climate issues.

SC-08-4.6.2. Students will

- describe or explain energy transfer and energy conservation;
- evaluate alternative solutions to energy problems.

SC-08-4.6.3. Students will understand that all energy can be considered to be kinetic energy, potential energy, or energy contained by a field (e.g., electric, magnetic, gravitational).

SC-08-4.6.4. Students will

- analyze information/data about waves and energy transfer;
- describe the transfer of energy via waves in real life phenomena.

SC-08-4.6.5. Students will

- describe the relationships between organisms and energy flow in ecosystems (food chains and energy pyramids);

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

- explain the effects of change to any component of the ecosystem.

INTERDEPENDENCE

It is not difficult for students to grasp the general notion that species depend on one another and on the environment for survival. But their awareness must be supported by knowledge of the kinds of relationships that exist among organisms, the kinds of physical conditions that organisms must cope with, the kinds of environments created by the interaction of organisms with one another and their physical surroundings and the complexity of such systems. Elementary learners need to become acquainted with ecosystems that are easily observable to them by beginning to study the habitats of many types of local organisms. Students begin to investigate the survival needs of different organisms and how the environment affects optimum conditions for survival. In middle school, students should be guided from specific examples of the interdependency of organisms to a more systematic view of the interactions that take place among organisms and their surroundings. At the high school level, the concept of an ecosystem should bring coherence to the complex array of relationships among organisms and environments that students have encountered. Students growing understanding of systems in general will reinforce the concept of ecosystems. Stability and change in ecosystems can be considered in terms of variables such as population size, number and kinds of species, productivity and the effect of human intervention.

Unifying Ideas

SC-08-4.7.1. Students will describe the interrelationships and interdependencies within an ecosystem and predict the effects of change on one or more components within an ecosystem.

SC-08-4.7.2. Students will

- explain the interactions of the components of the Earth system (e.g., solid Earth, oceans, atmosphere, living organisms);
- propose solutions to detrimental interactions.

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STRUCTURE AND TRANSFORMATION OF MATTER

A basic understanding of matter is essential to the conceptual development of other big ideas in science. In the elementary years of conceptual development, students will be studying properties of matter and physical changes of matter at the macro level through direct observations, forming the foundation for subsequent learning. During the middle years, physical and chemical changes in matter are observed and students begin to relate these changes to the smaller constituents of matter—namely, atoms and molecules. By high school, students will be dealing with evidence from both direct and indirect observations (microscopic level and smaller) to consider theories related to change and conservation of matter. The use of models (and an understanding of their scales and limitations) is an effective means of learning about the structure of matter. Looking for patterns in properties is also critical to comparing and explaining differences in matter.

Physical Science

SC-HS-1.1.1. Students will classify or make generalizations about elements from data of observed patterns in atomic structure and/or position on the periodic table.

SC-HS-1.1.2. Students will understand that the atom's nucleus is composed of protons and neutrons that are much more massive than electrons. When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.

SC-HS-1.1.3. Students will understand that solids, liquids and gases differ in the distances between molecules or atoms and therefore the energy that binds them together. In solids, the structure is nearly rigid; in liquids, molecules or atoms move around each other but do not move apart; and in gases, molecules or atoms move almost independently of each other and are relatively far apart. The behavior of gases and the relationship of the variables influencing them can be described and predicted.

SC-HS-1.1.4. Students will understand that in conducting materials, electrons flow easily; whereas, in insulating materials, they can hardly flow at all. Semiconducting materials have intermediate behavior. At low temperatures, some materials become superconductors and offer no resistance to the flow of electrons.

SC-HS-1.1.5. Students will explain the role of intermolecular or intramolecular interactions on the physical properties (solubility, density, polarity, conductivity, boiling/melting points) of compounds.

SC-HS-1.1.6. Students will

- identify variables that affect reaction rates;
- predict effects of changes in variables (concentration, temperature, properties of reactants, surface area and catalysts) based on evidence/data from chemical reactions.

SC-HS-1.1.7. Students will

- construct diagrams to illustrate ionic or covalent bonding;
- predict compound formation and bond type as either ionic or covalent (polar, nonpolar) and represent the products formed with simple chemical formulas.

SC-HS-1.1.8. Students will

- explain the importance of chemical reactions in a real-world context;
- justify conclusions using evidence/data from chemical reactions.

MOTION AND FORCES

Whether observing airplanes, baseballs, planets, or people, the motion of all bodies is governed by the same basic rules. In the elementary years of conceptual development, students need multiple opportunities to experience, observe and describe (in words and pictures) motion, including factors (pushing and pulling) that affect motion. At the middle level, qualitative descriptions of the relationship between forces and motion will provide the foundation for quantitative applications of Newton's Laws. These ideas are more fully developed at the high school level along with the use of models to support evidence of motion in abstract or invisible phenomena such as electromagnetism.

Physical Science

SC-HS-1.2.1. Students will

- select or construct accurate and appropriate representations for motion (visual, graphical and mathematical);
- defend conclusions/explanations about the motion of objects and real-life phenomena from evidence/data.

SC-HS-1.2.2. Students will

- explain the relationship between electricity and magnetism;
- propose solutions to real life problems involving electromagnetism.

SC-HS-1.2.3. Students will understand that the electric force is a universal force that exists between any two charged objects. Opposite charges attract while like charges repel.

THE EARTH AND THE UNIVERSE

The Earth system is in a constant state of change. These changes affect life on earth in many ways. Development of conceptual understandings about processes that shape the Earth begin at the elementary level with understanding what Earth materials are and that change occurs. At the middle level, students investigate how these changes occur. Finally, at the high school level, most of the emphasis is on why these changes occur. An understanding of systems and their interacting components will enable students to evaluate supporting theories of earth changes. At the heart of elementary students' initial understanding of the Earth's place in the universe is direct observation of the earth-sun-moon system. Students can derive important conceptual understandings about the system as they describe

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interactions resulting in shadows, moon phases and day and night. The use of models and observance of patterns to explain common phenomena is essential to building a conceptual foundation and supporting ideas with evidence at all levels. In middle school, students begin to look beyond what can be directly observed as they explore the earth-sun-moon system, as well as the rest of our solar system, employing the concept of scale within their models. Patterns play an important role as students seek to develop a conceptual understanding of gravity in their world and in the universe. High school is the time to bring all of the ideas together to look at the universe as a whole. Students will use evidence to evaluate and analyze theories related to the origin of the universe and all components of the universe.

Earth/Space Science

SC-HS-2.3.1. Students will

- explain phenomena (falling objects, planetary motion, satellite motion) related to gravity;
- describe the factors that affect gravitational force.

SC-HS-2.3.2. Students will

- describe the current scientific theory of the formation of the universe (Big Bang) and its evidence;
- explain the role of gravity in the formation of the universe and its components.

SC-HS-2.3.3. Students will explain the origin of the heavy elements in planetary objects (planets, stars).

SC-HS-2.3.4. Students will understand that stars have life cycles of birth through death that are analogous to those of living organisms. During their lifetimes, stars generate energy from nuclear fusion reactions that create successively heavier chemical elements.

SC-HS-2.3.5. Students will understand that the Sun, Earth and the rest of the solar system formed approximately 4.6 billion years ago from a nebular cloud of dust and gas.

SC-HS-2.3.6. Students will

- compare the limitations/benefits of various techniques (radioactive dating, observing rock sequences and comparing fossils) for estimating geological time;
- justify deductions about age of geologic features.

SC-HS-2.3.7. Students will

- explain real-life phenomena caused by the convection of the Earth's mantle;
- predict the consequences of this motion on humans and other living things on the planet.

SC-HS-2.3.8. Students will predict consequences of both rapid (volcanoes, earthquakes) and slow (mountain building, plate movement) earth processes from evidence/data and justify reasoning.

UNITY AND DIVERSITY

All matter is comprised of the same basic elements, goes through the same kinds of energy transformations, and uses the same kinds of forces to move. Living organisms are no exception. Elementary students begin to observe the macroscopic features of organisms in order to make comparisons and classifications based upon likenesses and differences. Looking for patterns in the appearance and behavior of an organism leads to the notion that offspring are much like the parents, but not exactly alike. In middle school, students begin to compare, contrast and classify the microscopic features of organisms—the cells, as well as investigate reproduction as the essential process to the continuation of all species. Expected patterns of genetic traits are predicted. Distinctions are made between learned behaviors and inherited traits. At the high school level, an in-depth study of the specialization and chemical changes occurring at the cellular level builds upon the foundational ideas developed earlier to investigate DNA and effects of alterations in DNA for an individual organism as well as for a species. Emphasis at every level should be placed upon the understanding that while every living thing is composed of similar small constituents that combine in predictable ways, it is the subtle variations within these small building blocks that account for both the likenesses and differences in form and function that create the diversity of life.

Biological Science

SC-HS-3.4.1. Students will explain the role of DNA in protein synthesis.

SC-HS-3.4.2. Students will understand that most cell functions involve chemical reactions. Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.

SC-HS-3.4.3. Students will

- describe cell regulation (enzyme function, diffusion, osmosis, homeostasis);
- predict consequences of internal/external environmental change on cell function/regulation.

SC-HS-3.4.4. Students will understand that plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms (e.g., Euglena) use solar energy to combine molecules of carbon dioxide and water into complex, energy-rich organic compounds and release oxygen to the environment. This process of photosynthesis provides a vital link between the Sun and energy needs of living systems.

SC-HS-3.4.5. Students will

- explain the relationship between sexual reproduction (meiosis) and the transmission of genetic information;
- draw conclusions/make predictions based on hereditary evidence/data (pedigrees, punnet squares).

SC-HS-3.4.6. Students will understand that in all organisms and viruses, the instructions for specifying the characteristics are carried in nucleic acids. The chemical and structural properties of nucleic acids determine how the genetic information that underlies heredity is both encoded in genes and replicated.

SC-HS-3.4.7. Students will

- classify organisms into groups based on similarities;

- infer relationships based on internal and external structures and chemical processes.

SC-HS-3.4.8. Students will understand that multicellular animals have nervous systems that generate behavior. Nerve cells communicate with each other by secreting specific molecules. Specialized cells in sense organs detect light, sound and specific chemicals enabling animals to monitor what is going on in the world around them.

BIOLOGICAL CHANGE

The only thing certain is that everything changes. Elementary students build a foundational knowledge of change by observing slow and fast changes caused by nature in their own environment, noting changes that humans and other organisms cause in their environment and observing fossils found in or near their environment. At the middle school level, students study relationships among populations and ecosystems that contribute to the success or demise of a specific population or species. Students construct basic explanations that can account for the great diversity among organisms. The stage is set for high school students to evaluate the role natural selection plays in the diversity of species. Modern ideas of evolution provide a scientific explanation for three main sets of observable facts about life on earth: the enormous number of different life forms we see about us, the systematic similarities in anatomy and molecular chemistry we see within that diversity and the sequence of changes in fossils found in successive layers of rock that have been formed over more than a billion years.

Biological Change

SC-HS-3.5.1. Students will

- predict the impact on species of changes to 1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, or (4) natural selection;
- propose solutions to real-world problems of endangered and extinct species.

SC-HS-3.5.2. Students will

- predict the success of patterns of adaptive behaviors based on evidence/data;
- justify explanations of organism survival based on scientific understandings of behavior.

ENERGY TRANSFORMATIONS

Energy transformations are inherent in almost every system in the universe—from tangible examples at the elementary level, such as heat production in simple earth and physical systems to more abstract ideas beginning at middle school, such as those transformations involved in the growth, dying and decay of living systems. The use of models to illustrate the often invisible and abstract notions of energy transfer will aid in conceptualization, especially as students move from the macroscopic level of observation and evidence (primarily elementary school) to the microscopic interactions at the atomic level (middle and high school levels). Students in high school expand their understanding of constancy through the study of a variety of phenomena. Conceptual understanding and application of the laws of thermodynamics connect ideas about matter with energy transformations within all living, physical and earth systems.

Unifying Ideas

SC-HS-4.6.1. Students will

- explain the relationships and connections between matter, energy, living systems and the physical environment;
- give examples of conservation of matter and energy.

SC-HS-4.6.2. Students will

- predict wave behavior and energy transfer;
- apply knowledge of waves to real life phenomena/investigations.

SC-HS-4.6.3. Students will understand that electromagnetic waves, including radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays and gamma rays, result when a charged object is accelerated.

SC-HS-4.6.4. Students will

- describe the components and reservoirs involved in biogeochemical cycles (water, nitrogen, carbon dioxide and oxygen);
- explain the movement of matter and energy in biogeochemical cycles and related phenomena.

SC-HS-4.6.5. Students will describe and explain the role of carbon-containing molecules and chemical reactions in energy transfer in living systems.

SC-HS-4.6.6. Students will understand that heat is the manifestation of the random motion and vibrations of atoms.

SC-HS-4.6.7. Students will

- explain real world applications of energy using information/data;
- evaluate explanations of mechanical systems using current scientific knowledge about energy.

SC-HS-4.6.8. Students will

- describe the connections between the functioning of the Earth system and its sources of energy (internal and external);
- predict the consequences of changes to any component of the Earth system.

SC-HS-4.6.9. Students will

- explain the cause and effect relationship between global climate and weather patterns and energy transfer (cloud cover, location of mountain ranges, oceans);
- predict the consequences of changes to the global climate and weather patterns.

SC-HS-4.6.10. Students will

- identify the components and mechanisms of energy stored and released from food molecules (photosynthesis and respiration);
- apply information to real-world situations.

SC-HS-4.6.11. Students will

- explain the difference between alpha and beta decay, fission and fusion;

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_____ = Content sampled by the PLAN and ACT Science tests

- identify the relationship between nuclear reactions and energy.

SC-HS-4.6.12. Students will understand that the forces that hold the nucleus together, at nuclear distances, are usually stronger than the forces that would make it fly apart.

INTERDEPENDENCE

It is not difficult for students to grasp the general notion that species depend on one another and on the environment for survival. But their awareness must be supported by knowledge of the kinds of relationships that exist among organisms, the kinds of physical conditions that organisms must cope with, the kinds of environments created by the interaction of organisms with one another and their physical surroundings and the complexity of such systems. Elementary learners need to become acquainted with ecosystems that are easily observable to them by beginning to study the habitats of many types of local organisms. Students begin to investigate the survival needs of different organisms and how the environment affects optimum conditions for survival. In middle school, students should be guided from specific examples of the interdependency of organisms to a more systematic view of the interactions that take place among organisms and their surroundings. At the high school level, the concept of an ecosystem should bring coherence to the complex array of relationships among organisms and environments that students have encountered. Students growing understanding of systems in general will reinforce the concept of ecosystems. Stability and change in ecosystems can be considered in terms of variables such as population size, number and kinds of species, productivity and the effect of human intervention.

Unifying Ideas

SC-HS-4.7.1. Students will

- analyze relationships and interactions among organisms in ecosystems;
- predict the effects on other organisms of changes to one or more components of the ecosystem.

SC-HS-4.7.2. Students will

- evaluate proposed solutions from multiple perspectives to environmental problems caused by human interaction;
- justify positions using evidence/data.

SC-HS-4.7.3. Students will

- predict the consequences of changes to any component (atmosphere, solid Earth, oceans, living things) of the Earth System;
- propose justifiable solutions to global problems.

SC-HS-4.7.4. Students will understand that evidence for one-celled forms of life, the bacteria, extends back more than 3.5 billion years. The changes in life over time caused dramatic changes in the composition of the Earth's atmosphere, which did not originally contain oxygen.

SC-HS-4.7.5. Students will

- predict the consequences of changes in resources to a population;
- select or defend solutions to real-world problems of population control.

= Measured by the PLAN and ACT Science tests
_____ = Content sampled by the PLAN and ACT Science tests

Section C: ACT's College Readiness Standards Included in Kentucky's Grades 8–12 Core Content for Assessment

Using thousands of student records and responses, content and measurement experts worked backwards to develop data-driven, empirically derived statements of what students know and are typically able to do in various score ranges on the English, Reading, Writing, Mathematics, and Science tests on the EXPLORE, PLAN, and ACT tests. These empirically derived score descriptors are called **ACT's College Readiness Standards**. Because of this unique way the ACT Standards were derived, ACT's Standards contain specific descriptions of proficiency and content, including descriptions of the complexity of the test material. The ACT standards prove to be an effective way to communicate the skills and knowledge measured by our EXPLORE, PLAN, and ACT tests.

> In this section (Section C), the ACT Standards that are highlighted are those that are included in Kentucky's Standards. ACT Standards not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Kentucky's standards.

Because Kentucky educators are the experts on the Kentucky Core Content for Assessment, we would strongly encourage them to examine this document and offer their interpretations.

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

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

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

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

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

Descriptions of the ACT Reading Passages

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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	Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram) Compare or combine data from a simple data presentation (e.g., order or sum data from a table) Translate information into a table, graph, or diagram	Understand the methods and tools used in a moderately complex experiment Understand a simple experimental design Identify a control in an experiment Identify similarities and differences between experiments	Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model Identify key issues or assumptions in a model
24–27	Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table) Compare or combine data from a complex data presentation Interpolate between data points in a table or graph Determine how the value of one variable changes as the value of another variable changes in a complex data presentation Identify and/or use a simple (e.g., linear) mathematical relationship between data Analyze given information when presented with new, simple information	Understand the methods and tools used in a complex experiment Understand a complex experimental design Predict the results of an additional trial or measurement in an experiment Determine the experimental conditions that would produce specified results	Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a simple hypothesis or conclusion, and why Identify strengths and weaknesses in one or more models Identify similarities and differences between models Determine which model(s) is(are) supported or weakened by new information Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion
28–32	Compare or combine data from a simple data presentation with data from a complex data presentation Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data Extrapolate from data points in a table or graph	Determine the hypothesis for an experiment Identify an alternate method for testing a hypothesis	Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model Determine whether new information supports or weakens a model, and why Use new information to make a prediction based on a model
33–36	Compare or combine data from two or more complex data presentations Analyze given information when presented with new, complex information	Understand precision and accuracy issues Predict how modifying the design or methods of an experiment will affect results Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results	Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models Determine whether given information supports or contradicts a complex hypothesis or conclusion, and why

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

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

Section D: ACT's WorkKeys Skills Included in Kentucky's Grades 8–12 Core Content for Assessment

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

In this section (Section D), the WorkKeys Skills that are highlighted are those that are included in Kentucky's Core Content for Assessment. WorkKeys Skills not highlighted are those statements that include specific content, complexity and/or proficiency level descriptions that were not described in Kentucky's standards.

Because Kentucky educators are the experts on the Kentucky Core Content for Assessment, we would strongly encourage them to examine this document and offer their interpretations.

WorkKeys Skills

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

= Included in Kentucky Core Content for Assessment