STATE MATCH

Ohio Academic Content Standards

English Language Arts,
Mathematics, and Science
Grades 7–12

and

ACT®

EXPLORE, PLAN, and the ACT

May 2006

About This Report

EXECUTIVE SUMMARY
(pp. 1–2)

This portion summarizes the findings of the alignment between ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (7th, 8th, and 9th grades); PLAN® (10th grade); and the ACT® (11th and 12th grades)—and Ohio's Academic Content Standards. It also presents ACT's involvement in meeting NCLB requirements and describes additional critical information that ACT could provide to Ohio.

SECTION A
(pp. 3–7)

This section provides tables by content area (English Language Arts, Mathematics, and Science) listing the precise number of Ohio Academic Content Standards measured by ACT's EPAS tests by grade level.

SECTION B
(pp. 8–52)

All Ohio Academic Content Standards are listed here; each one highlighted is measured by ACT's EPAS tests.

Ohio Academic Content Standards listed here were published by the Joint Council of the State Board of Education and the Ohio Board of Regents as described below, and were retrieved April 2006 from http://www.ode.state.oh.us/academic_content_standards/.

Ohio Academic Content Standards	Adopted by the Ohio State Board of Education
English Language Arts	December 11, 2001
Mathematics	December 11, 2001
Science	December 10, 2002

Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science Tests.

SECTION C
(pp. 53–62)

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

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

Executive Summary

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

1. To what extent do ACT's Educational Planning and Assessment System (EPAS) tests—EXPLORE (7th, 8th, and 9th grades); PLAN (10th grade); and the ACT (11th and 12th grades)—measure Ohio's Academic Content Standards?
2. Can ACT's EPAS test results be used to meet Ohio's NCLB requirement?
3. Why should Ohio choose ACT?

ACT'S TESTS MEASURE MANY IMPORTANT OHIO ACADEMIC CONTENT STANDARDS IN ENGLISH LANGUAGE ARTS, MATHEMATICS, AND SCIENCE.

1. Match Results: Comparisons conducted by our content specialists show that ACT's Reading, English, Writing, Mathematics and Science tests measure many of Ohio's English Language Arts, Mathematics, and Science Academic Content Standards (with Grade-Level Indicator match totals appearing in Section A):

- English Language Arts: 7 out of 11 Standards

  Many of Ohio's English Language Arts Standards are covered by ACT's English, Reading, and Writing tests.

- Mathematics: 5 out of 5 Standards

  All of Ohio's Mathematics Standards are covered by ACT's Mathematics tests.

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

  Many of Ohio's Science standards are covered by ACT's Science tests.

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

  To emphasize the point that content is included, but not necessarily covered in its entirety on every test form, science content match results appear in parentheses in Section A of this document (which describes the number of Ohio standards measured by ACT's tests), and are underlined rather than highlighted in Section B. Our goal here is to clearly communicate that science content will be included, but each specific content topic will not be covered consistently enough for inferences to be made about student proficiency in all areas.)

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

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**

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.

In sum, the ACT's EPAS programs provide abundant data relevant to Ohio's Academic Content Standards and to Ohio students' readiness for college and work.

Section A: Number of Ohio Academic Content Standards Measured by EXPLORE, PLAN, and the ACT

Table A-1. Number of Ohio English Language Arts Academic Content Standards Measured by EXPLORE, PLAN, and the ACT

Ohio Standards*	Number of Ohio Grade-Level Indicators Measured by ACT's tests	Aspects of Not-Measured Ohio Grade-Level Indicators
Acquisition of Vocabulary	7th: 3 out of 8 8th: 3 out of 7 9th: 2 out of 6 10th: 2 out of 6 11th: 1 out of 5 12th: 1 out of 5	Use knowledge of Greek, Latin, and Anglo-Saxon roots Use knowledge of symbols and acronyms to identify whole words Use dictionaries, thesauruses, glossaries, technology Analyze relationships of pairs of words Analyze how historical events influenced the English language
Reading Processes: Print Concepts; Comprehension & Self-Monitoring Strategies	7th: 4 out of 9 8th: 2 out of 5 9th: 2 out of 5 10th: 2 out of 5 11th: 2 out of 5 12th: 2 out of 5	Establish and adjust purposes of reading Use graphic organizers Monitor own comprehension Choose independent reading materials Independently read books for various purposes
Reading Applications: Informational, Technical and Persuasive Text	7th: 2 out of 8 8th: 5 out of 9 9th: 4 out of 8 10th: 3 out of 8 11th: 3 out of 8 12th: 3 out of 8	Use chapter titles, headings, subheadings, index, appendix Contrast sources of information including books, magazines, newspapers Compare treatment, scope, and organization of ideas from different texts on same topic Distinguish characteristics of consumer materials
Reading Applications: Literary Text	7th: 6 out of 7 8th: 7 out of 9 9th: 8 out of 11 10th: 7 out of 11 11th: 4 out of 8 12th: 4 out of 8	Explain defining characteristics of literary forms Explain universal themes across works Identify sound devices Contrast varying characteristics of American, British, world, and multi-cultural literature
Writing Process	7th: 7 out of 17 8th: 7 out of 17 9th: 7 out of 17 10th: 7 out of 17 11th: 9 out of 17 12th: 9 out of 17	Conduct background reading, interviews, or surveys Use resources and reference materials Prepare for publication Apply tools to judge quality of writing
Writing Applications	7th: 3 out of 6 8th: 3 out of 6 9th: 3 out of 6 10th: 3 out of 6 11th: 2 out of 6 12th: 2 out of 6	Write responses to novels, business letters, informal writings

ACT

Table A-1. Number of Ohio English Language Arts Academic Content Standards Measured by EXPLORE, PLAN, and the ACT

	Ohio Standards*	Number of Ohio Grade-Level Indicators Measured by ACT's tests	Aspects of Not-Measured Ohio Grade-Level Indicators
Communi-cation: Oral & Visual	Writing Conventions	7th: 5 out of 8 8th: 6 out of 8 9th: 5 out of 6 10th: 4 out of 5 11th: 3 out of 3 12th: 3 out of 3	Use all eight parts of speech
	Research	7th: 0 out of 8 8th: 0 out of 8 9th: 0 out of 7 10th: 0 out of 7 11th: 0 out of 7 12th: 0 out of 7	Compose open-ended questions for research Determine accuracy of sources Integrate quotations Use variety of communication techniques
	Listening and Viewing	7th: 0 out of 4 8th: 0 out of 3 9th: 0 out of 4 10th: 0 out of 4 11th: 0 out of 4 12th: 0 out of 4	Apply active listening
	Speaking Skills and Strategies	7th: 0 out of 4 8th: 0 out of 3 9th: 0 out of 3 10th: 0 out of 3 11th: 0 out of 3 12th: 0 out of 3	Adjust volume, phrasing, enunciation
	Speaking Applications	7th: 0 out of 3 8th: 0 out of 3 9th: 0 out of 3 10th: 0 out of 3 11th: 0 out of 3 12th: 0 out of 3	Deliver presentations
	TOTALS 7 out of 11 Standards	7th: 30 out of 82 8th: 33 out of 81 9th: 31 out of 76 10th: 25 out of 75 11th: 24 out of 69 12th: 24 out of 69	

*Refer to Ohio's English Language Arts Academic Content Standards on pages 8–25

ACT

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

Ohio Standards*	Number of Ohio Grade-Level Indicators Measured by ACT's tests	Aspects of Not-Measured Ohio Grade-Level Indicators
Number, Number Sense and Operations	7th: 8 out of 9 8th: 7 out of 8 9th: 5 out of 5 10th: 3 out of 4 11th: 9 out of 9 12th: 2 out of 2	Describe differences Determine when an estimate is sufficient
Measurement	7th: 7 out of 9 8th: 8 out of 10 9th: 4 out of 5 10th: 1 out of 5 11th: 4 out of 5 12th: 3 out of 3	Select appropriate units for measuring derived measurements Estimate a measurement Explain the difference between absolute error and relative error Determine the number of significant digits in a measurement
Geometry and Spatial Sense	7th: 3 out of 9 8th: 3 out of 6 9th: 2 out of 3 10th: 8 out of 10 11th: 5 out of 5 12th: 3 out of 4	Derive formulas Construct congruent figures
Patterns, Functions and Algebra	7th: 6 out of 11 8th: 8 out of 16 9th: 11 out of 15 10th: 7 out of 12 11th: 9 out of 11 12th: 8 out of 10	Use graphing calculators or computers Define function formally Translate a recursive function into a closed form expression
Data Analysis and Probability	7th: 6 out of 8 8th: 3 out of 11 9th: 6 out of 10 10th: 5 out of 8 11th: 4 out of 11 12th: 2 out of 6	Identify misuses of statistical data in articles Classify data Describe different kinds of studies Describe limitations of sampling methods Examine decisions involving risk Transform bivariate data Use sampling distributions
TOTALS 5 out of 5 Standards	7th: 30 out of 46 8th: 29 out of 51 9th: 28 out of 38 10th: 24 out of 39 11th: 31 out of 41 12th: 18 out of 25	

*Refer to Ohio's Mathematics Academic Content Standards on pages 26–36

ACT

Table A-3. Number of Ohio Science Academic Content Standards Measured by EXPLORE, PLAN, and the ACT		
Ohio Standards*	**Number of Ohio Grade-Level Indicators Measured by ACT's tests**	**Aspects of Not-Measured Ohio Grade-Level Indicators**
Scientific Inquiry	7th: 7 out of 7 8th: 4 out of 4 9th: 5 out of 6 10th: 5 out of 5 11th: 5 out of 5 12th: 5 out of 5	Decide what degree of precision is adequate
Scientific Ways of Knowing	7th: 0 out of 3 8th: 0 out of 2 9th: 0 out of 9 10th: 0 out of 7 11th: 2 out of 11 12th: 2 out of 11	Show reproducibility of results in science is essential Describe how repetition of an experiment reduces bias Investigations require contributions of women and men from disciplines in and out of science Illustrate that much can be learned about the nature of science by studying scientists Investigate how science classes apply to careers
TOTALS 1 out of 2 Standards	7th: 7 out of 10 8th: 4 out of 6 9th: 5 out of 15 10th: 5 out of 12 11th: 7 out of 16 12th: 7 out of 16	**Science Process Standards**
Earth and Space Sciences	7th: (9) out of (9) 8th: (15) out of (15) 9th: (7) out of (8) 10th: (7) out of (7) 11th: (15) out of (16) 12th: (6) out of (6)	Use historical examples to explain how new ideas are limited by the context in which they are conceived
Life Sciences	7th: (8) out of (8) 8th: (5) out of (5) 10th: (27) out of (28) 11th: (13) out of (14) 12th: (12) out of (12)	Use historical examples to explain how new ideas are limited by the context in which they are conceived Examine human population growth's impact on systems
Physical Sciences	7th: (6) out of (4) 8th: (5) out of (4) 9th: (26) out of (3) 11th: (4) out of (6) 12th: (14) out of (4)	Use historical examples to explain how new ideas are limited by the context in which they are conceived

Table A-3. Number of Ohio Science Academic Content Standards Measured by EXPLORE, PLAN, and the ACT		
Ohio Standards*	**Number of Ohio Grade-Level Indicators Measured by ACT's tests**	**Aspects of Not-Measured Ohio Grade-Level Indicators**
Science and Technology & Abilities to do Technological Design	7th: (0) out of (4) 8th: (0) out of (4) 9th: (0) out of (3) 10th: (0) out of (3) 11th: (0) out of (6) 12th: (0) out of (4)	Design and build a product Describe societal/environmental impact of technology Evaluate the overall effectiveness of a product Investigate that all fuels have advantages and disadvantages Research sources of energy
TOTALS 3 out of 4 Standards	7th: (23) out of (27) 8th: (25) out of (29) 9th: (33) out of (38) 10th: (34) out of (38) 11th: (32) out of (40) 12th: (32) out of (37)	**Science Content Standards**

*Refer to Ohio's Science Academic Content Standards on pages 37–52

English Language Arts

OHIO Grade 7 English Language Arts
Academic Content Standards

Acquisition of Vocabulary

Grade-Level Indicators

1. Define the meaning of unknown words through context clues and the author's use of comparison, contrast, definition, restatement and example.
2. Apply knowledge of connotation and denotation to determine the meaning of words.
3. Infer word meanings through the identification of analogies and other word relationships, including synonyms and antonyms.
4. Interpret metaphors and similes to understand new uses of words and phrases in text.
5. Recognize and use words from other languages that have been adopted into the English language.
6. Use knowledge of Greek, Latin and Anglo-Saxon roots and affixes to understand vocabulary.
7. Use knowledge of symbols and acronyms to identify whole words.
8. Determine the meanings and pronunciations of unknown words by using dictionaries, thesauruses, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Establish and adjust purposes for reading, including to find out, to understand, to interpret, to enjoy and to solve problems.
2. Predict or hypothesize as appropriate from information in the text, substantiating with specific references to textual examples that may be in widely separated sections of text.
3. Make critical comparisons across text, noting author's style as well as literal and implied content of text.
4. Summarize the information in texts, using key ideas, supporting details and referencing gaps or contradictions.
5. Select, create and use graphic organizers to interpret textual information.
6. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
7. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
8. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
9. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Use text features, such as chapter titles, headings and subheadings; parts of books, including index, appendix, table of contents and online tools (search engines) to locate information.
2. Analyze examples of cause and effect and fact and opinion.
3. Compare and contrast different sources of information, including books, magazines, newspapers and online resources, to draw conclusions about a topic.
4. Compare original text to a summary to determine the extent to which the summary adequately reflects the main ideas, critical details and underlying meaning of the original text.
5. Analyze information found in maps, charts, tables, graphs, diagrams, cutaways and overlays.
6. Assess the adequacy, accuracy and appropriateness of an author's details, identifying persuasive techniques and examples of bias and stereotyping.
7. Identify an author's purpose for writing and explain an author's argument, perspective or viewpoint in text.
8. Compare the treatment, scope and organization of ideas from different texts on the same topic.

Reading Applications: Literary Text

Grade-Level Indicators

1. Explain interactions and conflicts (e.g., character vs. self, nature or society) between main and minor characters in literary text and how the interactions affect the plot.
2. Analyze the features of the setting and their importance in a text.
3. Identify the main and minor events of the plot, and explain how each incident gives rise to the next.
4. Identify and compare subjective and objective points of view and how they affect the overall body of a work.
5. Identify recurring themes, patterns and symbols found in literature from different eras and cultures.

6. Explain the defining characteristics of literary forms and genres, including poetry, drama, myths, biographies, autobiographies, science fiction, fiction and non-fiction.
7. Interpret how mood or meaning is conveyed through word choice, figurative language and syntax.

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Conduct background reading, interviews or surveys when appropriate.
3. Establish a thesis statement for informational writing or a plan for narrative writing.
4. Determine a purpose and audience.
5. Use organizational strategies (e.g., rough outlines, diagrams, maps, webs and Venn diagrams) to plan writing.
6. Organize writing with an effective and engaging introduction, body and a conclusion that summarizes, extends or elaborates on points or ideas in the writing.
7. Vary simple, compound and complex sentence structures.
8. Group related ideas into paragraphs, including topic sentences following paragraph form, and maintain a consistent focus across paragraphs.
9. Use precise language, action verbs, sensory details, colorful modifiers and style as appropriate to audience and purpose.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing.
12. Add and delete information and details to better elaborate on a stated central idea and to more effectively accomplish purpose.
13. Rearrange words, sentences and paragraphs, and add transitional words and phrases to clarify meaning.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select more effective vocabulary.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization) and identify and correct fragments and run-ons.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a format appropriate to the purpose, using such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write narratives that maintain a clear focus and point of view and use sensory details and dialogue to develop plot, character and a specific setting.
2. Write responses to novels, stories, poems and plays that provide an interpretation, a critique or a reflection and support judgments with specific references to the text.
3. Write business letters that are formatted to convey ideas, state problems, make requests or give compliments.
4. Write informational essays or reports, including research, that present a literal understanding of the topic, include specific facts, details and examples from multiple sources, and create an organizing structure appropriate to the purpose, audience and context.
5. Write persuasive essays that establish a clear position and include relevant information to support ideas.
6. Produce informal writings (e.g., journals, notes and poems) for various purposes

Writing Conventions

Grade-Level Indicators

1. Spell high-frequency words correctly.
2. Use commas, end marks, apostrophes and quotation marks correctly.
3. Use semicolons, colons, hyphens, dashes and brackets correctly.
4. Use correct capitalization.
5. Use all eight parts of speech (e.g., noun, pronoun, verb, adverb, adjective, conjunction, preposition, interjection).
6. Use dependent and independent clauses.
7. Use subject-verb agreement with collective nouns, indefinite pronouns, compound subjects and prepositional phrases.
8. Conjugate regular and irregular verbs in all tenses correctly.

Research

Grade-Level Indicators

1. Generate a topic, assigned or personal interest, and open-ended questions for research and develop a plan for gathering information.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Identify and explain the importance of validity in sources, including publication date, coverage, language, points of view, and describe primary and secondary sources.
4. Select an appropriate structure for organizing information in a systematic way (e.g., notes, outlines, charts, tables and graphic organizers).

5. Analyze and organize important information, and select appropriate sources to support central ideas, concepts and themes.
6. Integrate quotations and citations into written text to maintain a flow of ideas.
7. Use an appropriate form of documentation, with teacher assistance, to acknowledge sources (e.g., bibliography, works cited).
8. Use a variety of communication techniques, including oral, visual, written or multimedia reports, to present information that supports a clear position with organized and relevant evidence about the topic or research question.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Demonstrate active listening strategies (e.g., asking focused questions, responding to cues, making visual contact).
2. Draw logical inferences from presentations and visual media.
3. Interpret the speaker's purpose in presentations and visual media (e.g., to inform, to entertain, to persuade).
4. Identify and explain the persuasive techniques (e.g., bandwagon, testimonial, glittering generalities, emotional word repetition and bait and switch) used in presentations and media messages.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
    a. demonstrate an understanding of the topic and present events or ideas in a logical sequence;
    b. support the controlling idea or thesis with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
    c. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
    d. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology; and
    e. draw from multiple sources and identify sources used.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish a clear position;
    b. include relevant evidence to support position and to address counter-arguments; and
    c. consistently use common organizational structures as appropriate (e.g., cause-effect, compare-contrast).

Acquisition of Vocabulary

Grade-Level Indicators

1. Define unknown words through context clues and the author's use of comparison, contrast and cause and effect.
2. Apply knowledge of connotation and denotation to determine the meaning of words.
3. Identify the relationships of pairs of words in analogical statements (e.g., synonyms and antonyms) and infer word meanings from these relationships.
4. Infer the literal and figurative meaning of words and phrases and discuss the function of figurative language, including metaphors, similes and idioms.
5. Examine and discuss the ways that different events (e.g., cultural, political, social, technological, and scientific events) impact and change the English language.
6. Use knowledge of Greek, Latin and Anglo-Saxon roots, prefixes and suffixes to understand complex words and new subject-area vocabulary (e.g., unknown words in science, mathematics and social studies).
7. Determine the meanings and pronunciations of unknown words by using dictionaries, thesauruses, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Apply reading comprehension strategies, including making predictions, comparing and contrasting, recalling and summarizing and making inferences and drawing conclusions.
2. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
3. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
4. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
5. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Compare and contrast text features, including format and headers of various informational texts in terms of their structure and purpose.
2. Identify and use the organizational structure of a text, such as chronological, compare-contrast, cause-effect, problem-solution, and evaluate its effectiveness.
3. Compare and contrast the treatment, scope and organization of ideas from different sources on the same topic.
4. Analyze information found in maps, charts, tables, graphs, diagrams, cutaways and overlays.
5. Assess the adequacy, accuracy and appropriateness of an author's details, identifying persuasive techniques (e.g., bandwagon, testimonial and emotional word repetition) and examples of bias and stereotyping.
6. Identify the author's purpose and intended audience for the text.
7. Analyze an author's argument, perspective or viewpoint and explain the development of key points.
8. Recognize how writers cite facts, draw inferences and present opinions in informational text.
9. Distinguish the characteristics of consumer materials (e.g., warranties, product information, instructional materials), functional or workplace documents (e.g., job-related materials, memoranda, instructions) and public documents (e.g., speeches or newspaper editorials).

Reading Applications: Literary Text

Grade-Level Indicators

1. Identify and explain various types of characters (e.g., flat, round, dynamic, static) and how their interactions and conflicts affect the plot.
2. Analyze the influence of setting in relation to other literary elements.
3. Explain how authors pace action and use subplots, parallel episodes and climax.
4. Compare and contrast different points of view (e.g., first person and third person limited, omniscient, objective and subjective), and explain how voice affects literary text.
5. Identify and explain universal themes across different works by the same author and by different authors.
6. Explain how an author's choice of genre affects the expression of a theme or topic.
7. Identify examples of foreshadowing and flashback in a literary text.
8. Explain ways in which the author conveys mood and tone through word choice, figurative language, and syntax.

9. Examine symbols used in literary texts

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Conduct background reading, interviews or surveys when appropriate.
3. Establish a thesis statement for informational writing or a plan for narrative writing.
4. Determine a purpose and audience and plan strategies (e.g., adapting focus, content structure and point of view) to address purpose and audience.
5. Use organizational strategies (e.g., notes and outlines) to plan writing.
6. Organize writing with an effective and engaging introduction, body and a conclusion that summarizes, extends or elaborates on points or ideas in the writing.
7. Vary simple, compound and complex sentence structures.
8. Group related ideas into paragraphs, including topic sentences following paragraph form, and maintain a consistent focus reinforced by parallel structures across paragraphs.
9. Use precise language, action verbs, sensory details, colorful modifiers and style as appropriate to audience and purpose.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing and consistency of point of view.
12. Add and delete information and details to better elaborate on a stated central idea and to more effectively accomplish purpose.
13. Rearrange words, sentences and paragraphs, and add transitional words and phrases to clarify meaning.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select more effective vocabulary.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization) and identify and correct fragments and run-ons.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a manuscript form appropriate for the purpose, which could include such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write narratives that:
   a. sustain reader interest by pacing action and developing an engaging plot (e.g., tension and suspense);
   b. use literary devices to enhance style and tone; and
   c. create complex characters in a definite, believable setting.
2. Write responses to literature that organize an insightful interpretation around several clear ideas, premises or images and support judgments with specific references to the original text, to other texts, authors and to prior knowledge.
3. Write business letters, letters to the editor and job applications that:
   a. address audience needs, stated purpose and context in a clear and efficient manner;
   b. follow the conventional style appropriate to the text using proper technical terms;
   c. include appropriate facts and details;
   d. exclude extraneous details and inconsistencies; and
   e. provide a sense of closure to the writing.
4. Write informational essays or reports, including research, that:
   a. pose relevant and tightly drawn questions that engage the reader;
   b. provide a clear and accurate perspective on the subject;
   c. create an organizing structure appropriate to the purpose, audience and context;
   d. support the main ideas with facts, details, examples and explanations from sources; and
   e. document sources and include bibliographies.
5. Write persuasive compositions that:
   a. establish and develop a controlling idea;
   b. support arguments with detailed evidence;
   c. exclude irrelevant information; and
   d. cite sources of information.
6. Produce informal writings (e.g., journals, notes and poems) for various purposes.

Writing Conventions

Grade-Level Indicators

1. Use correct spelling conventions.
2. Use correct punctuation and capitalization.
3. Use all eight parts of speech (e.g., noun, pronoun, verb, adverb, adjective, conjunction, preposition, interjection).
4. Use clauses (e.g., main, subordinate) and phrases (e.g., gerund, infinitive, participial).
5. Use parallel structure to present items in a series and items juxtaposed for emphasis.
6. Use proper placement of modifiers.
7. Maintain the use of appropriate verb tenses.

8. Conjugate regular and irregular verbs in all tenses correctly.

Research

Grade-Level Indicators

1. Compose open-ended questions for research, assigned or personal interest, and modify questions as necessary during inquiry and investigation.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Explain the usefulness and accuracy of sources by determining their validity (e.g., authority, accuracy, objectivity, publication date and coverage) and define primary and secondary sources.
4. Select an appropriate structure for organizing information in a systematic way (e.g., notes, outlines, charts, tables and graphic organizers).
5. Compile and organize the important information and select appropriate sources to support central ideas, concepts and themes.
6. Integrate quotations and citations into written text to maintain a flow of ideas.
7. Use style guides to produce oral and written reports that give proper credit for sources and include an acceptable format for source acknowledgement.
8. Use a variety of communication techniques, including oral, visual, written or multimedia reports, to present information that supports a clear position about the topic or research question and to maintain an appropriate balance between researched information and original ideas.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Apply active listening strategies (e.g., monitoring message for clarity, selecting and organizing essential information, noting cues such as changes in pace).
2. Identify and analyze the persuasive techniques (e.g., bandwagon, testimonial, glittering generalities, emotional word repetition and bait and switch) used in presentations and media messages.
3. Determine the credibility of the speaker (e.g., hidden agendas, slanted or biased material) and recognize fallacies of reasoning used in presentations and media messages.
4. Identify the speaker's choice of language and delivery styles (e.g., repetition, appeal to emotion, eye contact) and how they contribute to meaning.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
   a. demonstrate an understanding of the topic and present events or ideas in a logical sequence;
   b. support the controlling idea or thesis with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
   c. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
   d. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology; and
   e. draw from multiple sources, including both primary and secondary sources, and identify sources used.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish and develop a logical and controlled argument;
    b. include relevant evidence, differentiating between evidence and opinion to support a position and to address counter-arguments or listener bias; and
    c. consistently use common organizational structures as appropriate (e.g., cause-effect, compare-contrast, problem-solution).

Acquisition of Vocabulary

Grade-Level Indicators

1. Define unknown words through context clues and the author's use of comparison, contrast, and cause and effect.
2. Analyze the relationships of pairs of words in analogical statements (e.g., synonyms and antonyms, connotation and denotation) and infer word meanings from these relationships.
3. Infer the literal and figurative meaning of words and phrases and discuss the function of figurative language, including metaphors, similes, idioms and puns.
4. Examine and discuss ways historical events have influenced the English language.
5. Use knowledge of Greek, Latin and Anglo-Saxon roots, prefixes and suffixes to understand complex words and new subject- area vocabulary (e.g., unknown words in science, mathematics and social studies).
6. Determine the meanings and pronunciations of unknown words by using dictionaries, thesauruses, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Apply reading comprehension strategies, including making predictions, comparing and contrasting, recalling and summarizing and making inferences and drawing conclusions.
2. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
3. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
4. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
5. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Identify and understand organizational patterns (e.g., cause-effect, problem-solution) and techniques, including repetition of ideas, syntax and word choice, that authors use to accomplish their purpose and reach their intended audience.
2. Critique the treatment, scope and organization of ideas from multiple sources on the same topic.
3. Analyze information found in maps, charts, tables, graphs, diagrams, cutaways and overlays.
4. Assess the adequacy, accuracy and appropriateness of an author's details, identifying persuasive techniques (e.g., bandwagon, testimonial, transfer, glittering generalities, emotional word repetition, bait and switch) and examples of propaganda, bias and stereotyping.
5. Analyze an author's implicit and explicit argument, perspective or viewpoint in text.
6. Analyze the author's development of key points to support argument or point of view.
7. Compare and contrast the effectiveness of the features (e.g., format, sequence, headers) used in various consumer documents (e.g., warranties, product information, instructional materials), functional or workplace documents (e.g., job-related materials, memoranda, instructions) and public documents (e.g., speeches or newspaper editorials).
8. Identify the features of rhetorical devices used in common types of public documents, including newspaper editorials and speeches.

Reading Applications: Literary Text

Grade-Level Indicators

1. Identify and explain an author's use of direct and indirect characterization, and ways in which characters reveal traits about themselves, including dialect, dramatic monologues and soliloquies.
2. Analyze the influence of setting in relation to other literary elements.
3. Identify ways in which authors use conflicts, parallel plots and subplots in literary texts.
4. Evaluate the point of view used in a literary text.
5. Interpret universal themes across different works by the same author and different authors.
6. Analyze how an author's choice of genre affects the expression of a theme or topic.
7. Explain how foreshadowing and flashback are used to shape plot in a literary text.
8. Define and identify types of irony, including verbal, situational and dramatic, used in literary texts.
9. Analyze ways in which the author conveys mood and tone through word choice, figurative language and syntax.
10. Explain how authors use symbols to create broader meanings.
11. Identify sound devices, including alliteration, assonance, consonance and onomatopoeia, used in literary texts.

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Determine the usefulness of and apply appropriate pre-writing tasks (e.g., background reading, interviews or surveys).
3. Establish and develop a clear thesis statement for informational writing or a clear plan or outline for narrative writing.
4. Determine a purpose and audience and plan strategies (e.g., adapting focus, content structure and point of view) to address purpose and audience.
5. Use organizational strategies (e.g., notes and outlines) to plan writing.
6. Organize writing to create a coherent whole with an effective and engaging introduction, body and conclusion, and a closing sentence that summarizes, extends or elaborates on points or ideas in the writing.
7. Use a variety of sentence structures and lengths (e.g., simple, compound and complex sentences; parallel or repetitive sentence structure).
8. Use paragraph form in writing, including topic sentences that arrange paragraphs in a logical sequence, using effective transitions and closing sentences and maintaining coherence across the whole through the use of parallel structures.
9. Use precise language, action verbs, sensory details, colorful modifiers and style as appropriate to audience and purpose and use techniques to convey a personal style and voice.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing, consistency of point of view and effectiveness of organizational structure.
12. Add and delete information and details to better elaborate on stated central idea and more effectively accomplish purpose.
13. Rearrange words, sentences and paragraphs, and add transitional words and phrases to clarify meaning and maintain consistent style, tone and voice.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select effective and precise vocabulary that maintains consistent style, tone and voice.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization), identify and correct fragments and run-ons and eliminate inappropriate slang or informal language.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a manuscript form appropriate for the purpose, which could include such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write narratives that:
   a. sustain reader interest by pacing action and developing an engaging plot (e.g., tension and suspense);
   b. use a range of strategies and literary devices including figurative language and specific narration; and,
   c. include an organized, well developed structure.
2. Write responses to literature that organize an insightful interpretation around several clear ideas, premises or images and support judgments with specific references to the original text, to other texts, authors and to prior knowledge.
3. Write business letters, letters to the editor and job applications that:
   a. address audience needs, stated purpose and ncontext in a clear and efficient manner;
   b. follow the conventional style appropriate to the text using proper technical terms;
   c. include appropriate facts and details;
   d. exclude extraneous details and inconsistencies; and
   e. provide a sense of closure to the writing.
4. Write informational essays or reports, including research that:
   a. pose relevant and tightly drawn questions that engage the reader;
   b. provide a clear and accurate perspective on the subject;
   c. create an organizing structure appropriate to the purpose, audience and context;
   d. support the main ideas with facts, details, examples and explanations from sources; and
   e. document sources and include bibliographies.
5. Write persuasive compositions that:
   a. establish and develop a controlling idea;
   b. support arguments with detailed evidence;
   c. exclude irrelevant information; and
   d. cite sources of information.
6. Produce informal writings (e.g., journals, notes and poems) for various purposes.

Writing Conventions

Grade-Level Indicators

1. Use correct spelling conventions.
2. Use correct capitalization and punctuation.

3. Use clauses (e.g., main, subordinate) and phrases (e.g., gerund, infinitive, participial).
4. Use parallel structure to present items in a series and items juxtaposed for emphasis.
5. Use proper placement of modifiers.
6. Maintain the use of appropriate verb tenses.

Research

Grade-Level Indicators

1. Compose open-ended questions for research, assigned or personal interest, and modify questions as necessary during inquiry and investigation to narrow the focus or extend the investigation.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Determine the accuracy of sources and the credibility of the author by analyzing the sources' validity (e.g., authority, accuracy, objectivity, publication date and coverage, etc.).
4. Compile and organize important information and select appropriate sources to support central ideas, concepts and themes.
5. Integrate quotations and citations into written text to maintain a flow of ideas.
6. Use style guides to produce oral and written reports that give proper credit for sources and include an acceptable format for source acknowledgement.
7. Use a variety of communication techniques, including oral, visual, written or multimedia reports, to present information that supports a clear position about the topic or research question and to maintain an appropriate balance between researched information and original ideas.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Apply active listening strategies (e.g., monitoring message for clarity, selecting and organizing essential information, noting cues such as changes in pace) in a variety of settings.
2. Identify types of arguments used by the speaker, such as authority and appeals to emotion.
3. Analyze the credibility of the speaker (e.g., hidden agendas, slanted or biased material) and recognize fallacies of reasoning used in presentations and media messages.
4. Identify the speaker's choice of language and delivery styles (e.g., repetition, appeal to emotion, eye contact) and explain how they contribute to meaning.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
   a. demonstrate an understanding of the topic and present events or ideas in a logical sequence;
   b. support the controlling idea or thesis with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
   c. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
   d. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology to enhance presentation; and
   e. draw from multiple sources, including both primary and secondary sources, and identify sources used.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish and develop a logical and controlled argument;
    b. include relevant evidence, differentiating between evidence and opinion, to support a position and to address counter-arguments or listener bias;
    c. use persuasive strategies, such as rhetorical devices, anecdotes and appeals to emotion, authority and reason;
    d. use common organizational structures as appropriate (e.g., cause-effect, compare-contrast, problem-solution); and
    e. use speaking techniques (e.g., reasoning, emotional appeal, case studies or analogies).

Acquisition of Vocabulary

Grade-Level Indicators

1. Define unknown words through context clues and the author's use of comparison, contrast and cause and effect.
2. Analyze the relationships of pairs of words in analogical statements (e.g., synonyms and antonyms, connotation and denotation) and infer word meanings from these relationships.
3. Infer the literal and figurative meaning of words and phrases and discuss the function of figurative language, including metaphors, similes, idioms and puns.
4. Analyze the ways that historical events influenced the English language.
5. Use knowledge of Greek, Latin and Anglo-Saxon roots, prefixes and suffixes to understand complex words and new subject-area vocabulary (e.g., unknown words in science, mathematics and social studies).
6. Determine the meanings and pronunciations of unknown words by using dictionaries, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Apply reading comprehension strategies, including making predictions, comparing and contrasting, recalling and summarizing and making inferences and drawing conclusions.
2. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
3. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
4. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
5. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Identify and understand organizational patterns (e.g., cause-effect, problem-solution) and techniques, including repetition of ideas, syntax and word choice, that authors use to accomplish their purpose and reach their intended audience.
2. Critique the treatment, scope and organization of ideas from multiple sources on the same topic.
3. Evaluate the effectiveness of information found in maps, charts, tables, graphs, diagrams, cutaways and overlays.
4. Assess the adequacy, accuracy and appropriateness of an author's details, identifying persuasive techniques (e.g., transfer, glittering generalities, bait and switch) and examples of propaganda, bias and stereotyping.
5. Analyze an author's implicit and explicit argument, perspective or viewpoint in text.
6. Identify appeals to authority, reason and emotion.
7. Analyze the effectiveness of the features (e.g., format, graphics, sequence, headers) used in various consumer documents (e.g., warranties, product information, instructional materials), functional or workplace documents (e.g., job-related materials, memoranda, instructions) and public documents (e.g., speeches or newspaper editorials).
8. Describe the features of rhetorical devices used in common types of public documents, including newspaper editorials and speeches.

Reading Applications: Literary Text

Grade-Level Indicators

1. Compare and contrast an author's use of direct and indirect characterization, and ways in which characters reveal traits about themselves, including dialect, dramatic monologues and soliloquies
2. Analyze the features of setting and their importance in a literary text.
3. Distinguish how conflicts, parallel plots and subplots affect the pacing of action in literary text.
4. Interpret universal themes across different works by the same author or by different authors.
5. Analyze how an author's choice of genre affects the expression of a theme or topic.
6. Explain how literary techniques, including foreshadowing and flashback, are used to shape the plot of a literary text.
7. Recognize how irony is used in a literary text.
8. Analyze the author's use of point of view, mood and tone.
9. Explain how authors use symbols to create broader meanings.
10. Describe the effect of using sound devices in literary texts (e.g., to create rhythm, to appeal to the senses or to establish mood).
11. Explain ways in which an author develops a point of view and style (e.g., figurative language, sentence structure and tone), and cite specific examples from the text.

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Determine the usefulness of and apply appropriate pre-writing tasks (e.g., background reading, interviews or surveys).
3. Establish and develop a clear thesis statement for informational writing or a clear plan or outline for narrative writing.
4. Determine a purpose and audience and plan strategies (e.g., adapting focus, content structure, and point of view) to address purpose and audience.
5. Use organizational strategies (e.g., notes, outlines) to plan writing.
6. Organize writing to create a coherent whole with an effective and engaging introduction, body and conclusion, and a closing sentence that summarizes, extends or elaborates on points or ideas in the writing.
7. Use a variety of sentence structures and lengths (e.g., simple, compound and complex sentences; parallel or repetitive sentence structure).
8. Use paragraph form in writing, including topic sentences that arrange paragraphs in a logical sequence, using effective transitions and closing sentences and maintaining coherence across the whole through the use of parallel structures.
9. Use language (including precise language, action verbs, sensory details and colorful modifiers) and style as appropriate to audience and purpose, and use techniques to convey a personal style and voice.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing, consistency of point of view and effectiveness of organizational structure.
12. Add and delete information and details to better elaborate on stated central idea and more effectively accomplish purpose.
13. Rearrange words, sentences and paragraphs, and add transitional words and phrases to clarify meaning and maintain consistent style, tone and voice.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select effective and precise vocabulary that maintains consistent style, tone and voice.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization), identify and correct fragments and run-ons and eliminate inappropriate slang or informal language.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a manuscript form appropriate for the purpose, which could include such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write narratives that:
   a. sustain reader interest by pacing action and developing an engaging plot (e.g., tension and suspense);
   b. use a range of strategies and literary devices including figurative language and specific narration; and
   c. include an organized, well-developed structure.
2. Write responses to literature that organize an insightful interpretation around several clear ideas, premises or images and support judgments with specific references to the original text, to other texts, authors and to prior knowledge.
3. Write business letters, letters to the editor and job applications that:
   a. address audience needs, stated purpose and context in a clear and efficient manner;
   b. follow the conventional style appropriate to the text using proper technical terms;
   c. include appropriate facts and details;
   d. exclude extraneous details and inconsistencies; and
   e. provide a sense of closure to the writing.
4. Write informational essays or reports, including research that:
   a. pose relevant and tightly drawn questions that engage the reader.
   b. provide a clear and accurate perspective on the subject.
   c. create an organizing structure appropriate to the purpose, audience and context.
   d. support the main ideas with facts, details, examples and explanations from sources; and
   e. document sources and include bibliographies.
5. Write persuasive compositions that:
   a. support arguments with detailed evidence;
   b. exclude irrelevant information; and
   c. cite sources of information.
6. Produce informal writings (e.g., journals, notes and poems) for various purposes.

Writing Conventions

Grade-Level Indicators

1. Use correct spelling conventions.
2. Use correct capitalization and punctuation.
3. Use clauses (e.g., main, subordinate) and phrases (e.g., gerund, infinitive, participial).

4. Use parallel structure to present items in a series and items juxtaposed for emphasis.
5. Use proper placement of modifiers.

Research

Grade-Level Indicators

1. Compose open-ended questions for research, assigned or personal interest, and modify questions as necessary during inquiry and investigation to narrow the focus or extend the investigation.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Determine the accuracy of sources and the credibility of the author by analyzing the sources' validity (e.g., authority, accuracy, objectivity, publication date and coverage, etc.).
4. Evaluate and systematically organize important information, and select appropriate sources to support central ideas, concepts and themes.
5. Integrate quotations and citations into written text to maintain a flow of ideas.
6. Use style guides to produce oral and written reports that give proper credit for sources, and include an acceptable format for source acknowledgement.
7. Use a variety of communication techniques, including oral, visual, written or multimedia reports, to present information that supports a clear position about the topic or research question and to maintain an appropriate balance between researched information and original ideas.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Apply active listening strategies (e.g., monitoring message for clarity, selecting and organizing essential information, noting cues such as changes in pace) in a variety of settings.
2. Interpret types of arguments used by the speaker such as authority and appeals to audience.
3. Evaluate the credibility of the speaker (e.g., hidden agendas, slanted or biased material) and recognize fallacies of reasoning used in presentations and media messages.
4. Identify how language choice and delivery styles (e.g., repetition, appeal to emotion, eye contact) contribute to meaning.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
   a. demonstrate an understanding of the topic and present events or ideas in a logical sequence;
   b. support the controlling idea or thesis with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
   c. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
   d. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology to enhance presentation; and
   e. draw from multiple sources, including both primary and secondary sources, and identify sources used.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish and develop a logical and controlled argument;
    b. include relevant evidence, differentiating between evidence and opinion, to support a position and to address counter-arguments or listener bias;
    c. use persuasive strategies, such as rhetorical devices, anecdotes and appeals to emotion, authority and reason; and
    d. consistently use common organizational structures as appropriate (e.g., cause-effect, compare-contrast, problem-solution); and
    e. use speaking techniques (e.g., reasoning, emotional appeal, case studies or analogies).

Acquisition of Vocabulary

Grade-Level Indicators

1. Recognize and identify how authors clarify meanings of words through context and use definition, restatement, example, comparison, contrast and cause and effect to advance word study.
2. Analyze the relationships of pairs of words in analogical statements (e.g., synonyms and antonyms, connotation and denotation) and evaluate the effectiveness of analogous relationships.
3. Examine and explain the influence of the English language on world literature, communications and popular culture.
4. Use knowledge of Greek, Latin and Anglo-Saxon roots, prefixes and suffixes to understand complex words and new subject-area vocabulary (e.g., unknown words in science, mathematics and social studies).
5. Determine the meanings and pronunciations of unknown words by using dictionaries, thesauruses, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Apply reading comprehension strategies, including making predictions, comparing and contrasting, recalling and summarizing and making inferences and drawing conclusions.
2. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
3. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
4. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
5. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Analyze the rhetorical devices used in public documents, including newspaper editorials and speeches.
2. Analyze and critique organizational patterns and techniques including repetition of ideas, appeals to authority, reason and emotion, syntax and word choice that authors use to accomplish their purpose and reach their intended audience.
3. Analyze the content from several sources on a single issue, clarifying ideas and connecting them to other sources and related topics.
4. Distinguish between valid and invalid inferences and provide evidence to support the findings, noting instances of unsupported inferences, fallacious reasoning, propaganda techniques, bias and stereotyping.
5. Examine an author's implicit and explicit philosophical assumptions and beliefs about a subject.
6. Evaluate the effectiveness and validity of arguments in public documents and their appeal to various audiences.
7. Analyze the structure and features of functional and workplace documents, including format, sequence and headers, and how authors use these features to achieve their purposes and to make information accessible and usable.
8. Critique functional and workplace documents (e.g., instructions, technical manuals, travel schedules and business memoranda) for sequencing of information and procedures, anticipation of possible reader misunderstandings and visual appeal.

Reading Applications: Literary Text

Grade-Level Indicators

1. Compare and contrast motivations and reactions of literary characters confronting similar conflicts (e.g., individual vs. nature, freedom vs. responsibility, individual vs. society), using specific examples of characters' thoughts, words and actions.
2. Analyze the historical, social and cultural context of setting.
3. Explain how voice and narrator affect the characterization, plot and credibility.
4. Evaluate the author's use of point of view in a literary text.
5. Analyze variations of universal themes in literary texts.
6. Recognize characteristics of subgenres, including satire, parody and allegory, and explain how choice of genre affects the expression of a theme or topic.
7. Analyze the characteristics of various literary periods and how the issues influenced the writers of those periods.
8. Evaluate ways authors develop point of view and style to achieve specific rhetorical and aesthetic purposes (e.g., through use of figurative language irony, tone, diction, imagery, symbolism and sounds of language), citing specific examples from text to support analysis.

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Determine the usefulness of and apply appropriate pre-writing tasks (e.g., background reading, interviews or surveys).
3. Establish and develop a clear thesis statement for informational writing or a clear plan or outline for narrative writing.
4. Determine a purpose and audience and plan strategies (e.g., adapting formality of style, including explanations or definitions as appropriate to audience needs) to address purpose and audience.
5. Use organizational strategies (e.g., notes and outlines) to plan writing.
6. Organize writing to create a coherent whole with an effective and engaging introduction, body and conclusion, and a closing sentence that summarizes, extends or elaborates on points or ideas in the writing.
7. Use a variety of sentence structures and lengths (e.g., simple, compound and complex sentences; parallel or repetitive sentence structure).
8. Use paragraph form in writing, including topic sentences that arrange paragraphs in a logical sequence, using effective transitions and closing sentences and maintaining coherence across the whole through the use of parallel structures.
9. Use precise language, action verbs, sensory details, colorful modifiers and style as appropriate to audience and purpose, and use techniques to convey a personal style and voice.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing, consistency of point of view and effectiveness of organizational structure.
12. Add and delete examples and details to better elaborate on a stated central idea, to develop more precise analysis or persuasive argument or to enhance plot, setting and character in narrative texts.
13. Rearrange words, sentences and paragraphs, and add transitional words and phrases to clarify meaning and achieve specific aesthetic and rhetorical purposes.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select effective and precise vocabulary that maintains consistent style, tone and voice.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization), identify and correct fragments and run-ons and eliminate inappropriate slang or informal language.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a manuscript form appropriate for the purpose, which could include such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write reflective compositions that:
   a. use personal experiences as a basis for reflection on some aspect of life;
   b. draw abstract comparisons between specific incidents and abstract concepts;
   c. maintain a balance between describing incidents and relating them to more general, abstract ideas that illustrate personal beliefs; and
   d. move from specific examples to generalizations about life.
2. Write responses to literature that:
   a. advance a judgment that is interpretative, analytical, evaluative or reflective;
   b. support key ideas and viewpoints with accurate and detailed references to the text or to other works and authors;
   c. analyze the author's use of stylistic devices and express an appreciation of the effects the devices create;
   d. identify and assess the impact of possible ambiguities, nuances and complexities within text;
   e. anticipate and answer a reader's questions, counterclaims or divergent interpretations; and
   f. provide a sense of closure to the writing.
3. Write functional documents (e.g., requests for information, resumes, letters of complaint, memos and proposals) that:
   a. report, organize and convey information accurately.
   b. use formatting techniques that make a document user-friendly.
   c. anticipate readers' problems, mistakes and misunderstandings.
4. Write informational essays or reports, including research, that:
   a. develop a controlling idea that conveys a perspective on the subject;
   b. create an organizing structure appropriate to purpose, audience and context;
   c. include information on all relevant perspectives, considering the validity and reliability of primary and secondary sources;
   d. make distinctions about the relative value and significance of specific data, facts and ideas;
   e. anticipate and address a reader's potential biases, misunderstandings and expectations; and
   f. provide a sense of closure to the writing.

5. Write persuasive compositions that:
   a. articulate a clear position;
   b. support assertions using rhetorical devices, including appeals to emotion or logic and personal anecdotes; and
   c. develop arguments using a variety of methods (e.g., examples, beliefs, expert opinion, cause-effect reasoning).
6. Produce informal writings (e.g., journals, notes and poems) for various purposes.

Writing Conventions

Grade-Level Indicators

1. Use correct spelling conventions.
2. Use correct capitalization and punctuation.
3. Use correct grammar (e.g, verb tenses, parallel structure, indefinite and relative pronouns).

Research

Grade-Level Indicators

1. Compose open-ended questions for research, assigned or personal interest, and modify questions as necessary during inquiry and investigation to narrow the focus or extend the investigation.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Determine the accuracy of sources and the credibility of the author by analyzing the sources' validity (e.g., authority, accuracy, objectivity, publication date and coverage, etc.).
4. Analyze the complexities and discrepancies in information and systematically organize relevant information to support central ideas, concepts and themes.
5. Integrate quotations and citations into written text to maintain a flow of ideas.
6. Use style guides to produce oral and written reports that give proper credit for sources, and include appropriate in-text documentation, notes and an acceptable format for source acknowledgement.
7. Use a variety of communication techniques (e.g., oral, visual, written or multimedia reports) to present information that supports a clear position about the topic or research question and to maintain an appropriate balance between researched information and original ideas.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Apply active listening strategies (e.g., monitoring message for clarity, selecting and organizing essential information, noting cues such as changes in pace) in a variety of settings.
2. Analyze types of arguments used by a speaker, such as causation, analogy and logic.
3. Critique the clarity, effectiveness and overall coherence of a speaker's key points.
4. Evaluate how language choice, diction, syntax and delivery style (e.g., repetition, appeal to emotion, eye contact) effect the mood and tone and impact the audience.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
   a. present a clear and distinctive perspective on the subject;
   b. present events or ideas in a logical sequence;
   c. support the controlling idea with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
   d. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
   e. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology to enhance presentation; and
   f. draw from and cite multiple sources including both primary and secondary sources and consider the validity and reliability of sources.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish and develop a logical and controlled argument;
    b. include relevant evidence, differentiating between evidence and opinion, to support a position and to address counter-arguments or listener bias;
    c. use persuasive strategies, such as rhetorical devices, anecdotes and appeals to emotion, authority, reason, pathos and logic;
    d. consistently use common organizational structures as appropriate (e.g., cause-effect, compare-contrast, problem-solution); and
    e. use speaking techniques (e.g., reasoning, emotional appeal, case studies or analogies).

Acquisition of Vocabulary

Grade-Level Indicators

1. Recognize and identify how authors clarify meanings of words through context and use definition, restatement, example, comparison, contrast and cause and effect to advance word study
2. Analyze the relationships of pairs of words in analogical statements (e.g., synonyms and antonyms, connotation and denotation) and evaluate the effectiveness of analogous relationships.
3. Examine and explain the influence of the English language on world literature, communications and popular cultures.
4. Use knowledge of Greek, Latin and Anglo-Saxon roots, prefixes and suffixes to understand complex words and new subject-area vocabulary (e.g., unknown words in science, mathematics and social studies).
5. Determine the meanings and pronunciations of unknown words by using dictionaries, thesauruses, glossaries, technology and textual features, such as definitional footnotes or sidebars.

Reading Processes: Concepts of Print, Comprehension Strategies and Self-Monitoring Strategies

Grade-Level Indicators

1. Apply reading comprehension strategies, including making predictions, comparing and contrasting, recalling and summarizing and making inferences and drawing conclusions.
2. Answer literal, inferential, evaluative and synthesizing questions to demonstrate comprehension of grade-appropriate print texts and electronic and visual media.
3. Monitor own comprehension by adjusting speed to fit the purpose, or by skimming, scanning, reading on, looking back, note taking or summarizing what has been read so far in text.
4. Use criteria to choose independent reading materials (e.g., personal interest, knowledge of authors and genres or recommendations from others).
5. Independently read books for various purposes (e.g., for enjoyment, for literary experience, to gain information or to perform a task).

Reading Applications: Informational, Technical and Persuasive Text

Grade-Level Indicators

1. Analyze the rhetorical devices used in public documents, including state or school policy statements, newspaper editorials and speeches.
2. Analyze and critique organizational patterns and techniques including repetition of ideas, appeals to authority, reason and emotion, syntax and word choice that authors use to accomplish their purpose and reach their intended audience.
3. Analyze and compile information from several sources on a single issue or written by a single author, clarifying ideas and connecting them to other sources and related topics.
4. Distinguish between valid and invalid inferences and provide evidence to support the findings, noting instances of unsupported inferences, fallacious reasoning, propaganda techniques, bias and stereotyping.
5. Examine an author's implicit and explicit philosophical assumptions and beliefs about a subject.
6. Evaluate the effectiveness and validity of arguments in public documents and their appeal to various audiences.
7. Analyze the structure and features of functional and workplace documents, including format, sequence and headers, and how authors use these features to achieve their purposes and to make information accessible and usable.
8. Critique functional and workplace documents (e.g., instructions, technical manuals, travel schedules and business memoranda) for sequencing of information and procedures, anticipation of possible reader misunderstandings and visual appeal.

Reading Applications: Literary Text

Grade-Level Indicators

1. Compare and contrast motivations and reactions of literary characters confronting similar conflicts (e.g., individual vs. nature, freedom vs. responsibility, individual vs. society), using specific examples of characters' thoughts, words and actions.
2. Analyze the historical, social and cultural context of setting.
3. Explain how voice and narrator affect the characterization, plot and credibility.
4. Evaluate an author's use of point of view in a literary text.
5. Analyze variations of universal themes in literary texts.
6. Recognize and differentiate characteristics of subgenres, including satire, parody and allegory, and explain how choice of genre affects the expression of theme or topic.
7. Compare and contrast varying characteristics of American, British, world and multi-cultural literature.
8. Evaluate ways authors develop point of view and style to achieve specific rhetorical and aesthetic purposes (e.g., through use of figurative language, irony, tone, diction, imagery, symbolism and sounds of language), citing specific examples from text to support analysis.

Writing Process

Grade-Level Indicators

1. Generate writing ideas through discussions with others and from printed material, and keep a list of writing ideas.
2. Determine the usefulness of and apply appropriate pre-writing tasks (e.g., background reading, interviews or surveys).
3. Establish and develop a clear thesis statement for informational writing or a clear plan or outline for narrative writing.
4. Determine a purpose and audience and plan strategies (e.g., adapting formality of style, including explanations or definitions as appropriate to audience needs) to address purpose and audience.
5. Use organizational strategies (e.g., notes and outlines) to plan writing.
6. Organize writing to create a coherent whole with an effective and engaging introduction, body and conclusion and a closing sentence that summarizes, extends or elaborates on points or ideas in the writing.
7. Use a variety of sentence structures and lengths (e.g., simple, compound and complex sentences; parallel or repetitive sentence structure).
8. Use paragraph form in writing, including topic sentences that arrange paragraphs in a logical sequence, using effective transitions and closing sentences and maintaining coherence across the whole through the use of parallel structures.
9. Use precise language, action verbs, sensory details, colorful modifiers and style as appropriate to audience and purpose, and use techniques to convey a personal style and voice.
10. Use available technology to compose text.
11. Reread and analyze clarity of writing, consistency of point of view and effectiveness of organizational structure.
12. Add and delete examples and details to better elaborate on a stated central idea, to develop more precise analysis or persuasive argument or to enhance plot, setting and character in narrative texts.
13. Rearrange words, sentences and paragraphs and add transitional words and phrases to clarify meaning and achieve specific aesthetic and rhetorical purposes.
14. Use resources and reference materials (e.g., dictionaries and thesauruses) to select effective and precise vocabulary that maintains consistent style, tone and voice.
15. Proofread writing, edit to improve conventions (e.g., grammar, spelling, punctuation and capitalization), identify and correct fragments and run-ons and eliminate inappropriate slang or informal language.
16. Apply tools (e.g., rubric, checklist and feedback) to judge the quality of writing.
17. Prepare for publication (e.g., for display or for sharing with others) writing that follows a manuscript form appropriate for the purpose, which could include such techniques as electronic resources, principles of design (e.g., margins, tabs, spacing and columns) and graphics (e.g., drawings, charts and graphs) to enhance the final product.

Writing Applications

Grade-Level Indicators

1. Write reflective compositions that:
   a. use personal experiences as a basis for reflection on some aspect of life;
   b. draw abstract comparisons between specific incidents and abstract concepts;
   c. maintain a balance between describing incidents and relating them to more general, abstract ideas that illustrate personal beliefs; and
   d. move from specific examples to generalizations about life.
2. Write responses to literature that:
   a. advance a judgment that is interpretative, analytical, evaluative or reflective;
   b. support key ideas and viewpoints with accurate and detailed references to the text or to other works and authors;
   c. analyze the author's use of stylistic devices and express an appreciation of the effects the devices create;
   d. identify and assess the impact of possible ambiguities, nuances and complexities within text;
   e. anticipate and answer a reader's questions, counterclaims or divergent interpretations; and
   f. provide a sense of closure to the writing.
3. Write functional documents (e.g., requests for information, resumes, letters of complaint, memos, proposals) that:
   a. report, organize and convey information accurately;
   b. use formatting techniques that make a document user-friendly; and
   c. anticipate readers' problems, mistakes and misunderstandings.
4. Write informational essays or reports, including research, that:
   a. develop a controlling idea that conveys a perspective on the subject;
   b. create an organizing structure appropriate to purpose, audience and context;
   c. include information on all relevant perspectives, considering the validity and reliability of primary and secondary sources;
   d. make distinctions about the relative value and significance of specific data, facts and ideas;
   e. anticipate and address a reader's potential biases, misunderstandings and expectations; and
   f. provide a sense of closure to the writing.

5. Write persuasive compositions that:
   a. articulate a clear position;
   b. support assertions using rhetorical devices, including appeals to emotion or logic and personal anecdotes; and
   c. develop arguments using a variety of methods (e.g., examples, beliefs, expert opinion, cause-effect reasoning).
6. Produce informal writings (e.g., journals, notes and poems) for various purposes.

Writing Conventions

Grade-Level Indicators

1. Use correct spelling conventions.
2. Use correct capitalization and punctuation.
3. Use correct grammar (e.g, verb tenses, parallel structure, indefinite and relative pronouns).

Research

Grade-Level Indicators

1. Compose open-ended questions for research, assigned or personal interest, and modify questions as necessary during inquiry and investigation to narrow the focus or extend the investigation.
2. Identify appropriate sources and gather relevant information from multiple sources (e.g., school library catalogs, online databases, electronic resources and Internet-based resources).
3. Determine the accuracy of sources and the credibility of the author by analyzing the sources' validity (e.g., authority, accuracy, objectivity, publication date and coverage, etc.).
4. Analyze the complexities and discrepancies in information and systematically organize relevant information to support central ideas, concepts and themes.
5. Integrate quotations and citations into written text to maintain a flow of ideas.
6. Use style guides to produce oral and written reports that give proper credit for sources and include appropriate in-text documentation, notes and an acceptable format for source acknowledgement.
7. Use a variety of communication techniques including oral, visual, written or multimedia report to present information that supports a clear position about the topic or research question and defend the credibility and validity of the information presented.

Communication: Oral and Visual

Listening and Viewing

Grade-Level Indicators

1. Apply active listening strategies (e.g., monitoring message for clarity, selecting and organizing essential information, noting cues such as changes in pace).
2. Analyze types of arguments used by the speaker, such as causation, analogy and logic.
3. Critique the clarity, effectiveness and overall coherence of a speaker's key points.
4. Evaluate how language choice, diction, syntax and delivery style (e.g., repetition, appeal to emotion, eye contact) affect the mood and tone and impact the audience.

Speaking Skills and Strategies

Grade-Level Indicators

5. Demonstrate an understanding of the rules of the English language and select language appropriate to purpose and audience.
6. Adjust volume, tempo, phrasing, enunciation, voice modulation and inflection to stress important ideas and impact audience response.
7. Vary language choices as appropriate to the context of the speech.

Speaking Applications

Grade-Level Indicators

8. Deliver informational presentations (e.g., expository, research) that:
   a. present a clear and distinctive perspective on the subject;
   b. present events or ideas in a logical sequence;
   c. support the controlling idea or thesis with well-chosen and relevant facts, details, examples, quotations, statistics, stories and anecdotes;
   d. include an effective introduction and conclusion and use a consistent organizational structure (e.g., cause-effect, compare-contrast, problem-solution);
   e. use appropriate visual materials (e.g., diagrams, charts, illustrations) and available technology to enhance presentation; and
   f. draw from and cite multiple sources, including both primary and secondary sources, and consider the validity and reliability of sources.
9. Deliver formal and informal descriptive presentations that convey relevant information and descriptive details.
10. Deliver persuasive presentations that:
    a. establish and develop a logical and controlled argument;
    b. include relevant evidence, differentiating between evidence and opinion, to support position and to address counter-arguments or listener biases;
    c. use persuasive strategies such as rhetorical devices; anecdotes and appeals to emotion, authority, reason, pathos and logic;
    d. consistently use common organizational structures as appropriate (e.g., cause-effect, compare-contrast, problem-solution); and
    e. use speaking techniques (e.g., reasoning, emotional appeal, case studies or analogies).

Mathematics

OHIO Grade 7 Mathematics
Academic Content Standards

Number, Number Sense and Operations

Grade-Level Indicators

1. Demonstrate an understanding of place value using powers of 10 and write large numbers in scientific notation.
2. Explain the meaning of exponents that are negative or 0.
3. Describe differences between rational and irrational numbers; e.g., use technology to show that some numbers (rational) can be expressed as terminating or repeating decimals and others (irrational) as non-terminating and non-repeating decimals.
4. Use order of operations and properties to simplify numerical expressions involving integers, fractions and decimals.
5. Explain the meaning and effect of adding, subtracting, multiplying and dividing integers; e.g., how adding two integers can result in a lesser value.
6. Simplify numerical expressions involving integers and use integers to solve real-life problems.
7. Solve problems using the appropriate form of a rational number (fraction, decimal or percent).
8. Develop and analyze algorithms for computing with percents and integers, and demonstrate fluency in their use.
9. Represent and solve problem situations that can be modeled by and solved using concepts of absolute value, exponents and square roots (for perfect squares).

Measurement

Grade-Level Indicators

1. Select appropriate units for measuring derived measurements; e.g., miles per hour, revolutions per minute.
2. Convert units of area and volume within the same measurement system using proportional reasoning and a reference table when appropriate; e.g., square feet to square yards, cubic meters to cubic centimeters.
3. Estimate a measurement to a greater degree of precision than the tool provides.
4. Solve problems involving proportional relationships and scale factors; e.g., scale models that require unit conversions within the same measurement system.
5. Analyze problem situations involving measurement concepts, select appropriate strategies, and use an organized approach to solve narrative and increasingly complex problems.
6. Use strategies to develop formulas for finding area of trapezoids and volume of cylinders and prisms.
7. Develop strategies to find the area of composite shapes using the areas of triangles, parallelograms, circles and sectors.
8. Understand the difference between surface area and volume and demonstrate that two objects may have the same surface area, but different volumes or may have the same volume, but different surface areas.
9. Describe what happens to the surface area and volume of a three-dimensional object when the measurements of the object are changed; e.g., length of sides are doubled.

Geometry and Spatial Sense

Grade-Level Indicators

1. Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.
2. Determine sufficient (not necessarily minimal) properties that define a specific two-dimensional figure or three-dimensional object. For example:
   a. Determine when one set of figures is a subset of another; e.g., all squares are rectangles.
   b. Develop a set of properties that eliminates all but the desired figure; e.g., only squares are quadrilaterals with all sides congruent and all angles congruent.
3. Use and demonstrate understanding of the properties of triangles. For example:
   a. Use Pythagorean Theorem to solve problems involving right triangles.
   b. Use triangle angle sum relationships to solve problems.
4. Determine necessary conditions for congruence of triangles.
5. Apply properties of congruent or similar triangles to solve problems involving missing lengths and angle measures.
6. Determine and use scale factors for similar figures to solve problems using proportional reasoning.
7. Identify the line and rotation symmetries of two-dimensional figures to solve problems.
8. Perform translations, reflections, rotations and dilations of two-dimensional figures using a variety of methods (paper folding, tracing, graph paper).
9. Draw representations of three-dimensional geometric objects from different views.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Represent and analyze patterns, rules and functions with words, tables, graphs and simple variable expressions.
2. Generalize patterns by describing in words how to find the next term.
3. Recognize and explain when numerical patterns are linear or nonlinear progressions; e.g., 1,3,5,7... is linear and 1,3,4,8,16... is nonlinear.
4. Create visual representations of equation-solving processes that model the use of inverse operations.
5. Represent linear equations by plotting points in the coordinate plane.
6. Represent inequalities on a number line or a coordinate plane.
7. Justify that two forms of an algebraic expression are equivalent, and recognize when an expression is simplified; e.g., $4m = m + m + m + m$ or $a \cdot 5 + 4 = 5a + 4$.
8. Use formulas in problem-solving situations.
9. Recognize a variety of uses for variables; e.g., placeholder for an unknown quantity in an equation, generalization for a pattern, formula.
10. Analyze linear and simple nonlinear relationships to explain how a change in one variable results in the change of another.
11. Use graphing calculators or computers to analyze change; e.g., distance-time relationships.

Data Analysis and Probability

Grade-Level Indicators

1. Read, create and interpret box-and-whisker plots, stem-and-leaf plots, and other types of graphs, when appropriate.
2. Analyze how decisions about graphing affect the graphical representation; e.g., scale, size of classes in a histogram, number of categories in a circle graph.
3. Analyze a set of data by using and comparing combinations of measures of center (mean, mode, median) and measures of spread (range, quartile, interquartile range), and describe how the inclusion or exclusion of outliers affects those measures.
4. Construct opposing arguments based on analysis of the same data, using different graphical representations.
5. Compare data from two or more samples to determine how sample selection can influence results.
6. Identify misuses of statistical data in articles, advertisements, and other media.
7. Compute probabilities of compound events; e.g., multiple coin tosses or multiple rolls of number cubes, using such methods as organized lists, tree diagrams and area models.
8. Make predictions based on theoretical probabilities, design and conduct an experiment to test the predictions, compare actual results to predicted results, and explain differences.

Number, Number Sense and Operations

Grade-Level Indicators

1. Use scientific notation to express large numbers and small numbers between 0 and 1.
2. Recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.
3. Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.
4. Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.
5. Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.
6. Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.
7. Find the square root of perfect squares, and approximate the square root of non-perfect squares as consecutive integers between which the root lies; e.g., $\sqrt{130}$ is between 11 and 12.
8. Add, subtract, multiply, divide and compare numbers written in scientific notation.

Measurement

Grade-Level Indicators

1. Compare and order the relative size of common U.S. customary units and metric units; e.g., mile and kilometer, gallon and liter, pound and kilogram.
2. Use proportional relationships and formulas to convert units from one measurement system to another; e.g., degrees Fahrenheit to degrees Celsius.
3. Use appropriate levels of precision when calculating with measurements.
4. Derive formulas for surface area and volume and justify them using geometric models and common materials. For example, find:
   a. the surface area of a cylinder as a function of its height and radius;
   b. that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.
5. Determine surface area for pyramids by analyzing their parts.
6. Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.
7. Apply proportional reasoning to solve problems involving indirect measurements or rates.
8. Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.
9. Demonstrate understanding of the concepts of perimeter, circumference and area by using established formula for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)
10. Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.

Geometry and Spatial Sense

Grade-Level Indicators

1. Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.
2. Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.
3. Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).
4. Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.
5. Draw the results of translations, reflections, rotations and dilations of objects in the coordinate plane, and determine properties that remain fixed; e.g., lengths of sides remain the same under translations.
6. Draw nets for a variety of prisms, pyramids, cylinders and cones.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Relate the various representations of a relationship; i.e., relate a table to graph, description and symbolic form.
2. Generalize patterns and sequences by describing how to find the *n*th term.
3. Identify functions as linear or nonlinear based on information given in a table, graph or equation.
4. Extend the uses of variables to include covariants where *y* depends on *x*.
5. Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.
6. Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and *y*-intercept in real-world problems.

7. Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
8. Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.
9. Solve linear equations and inequalities graphically, symbolically and using technology.
10. Solve 2 by 2 systems of linear equations graphically and by simple substitution.
11. Interpret the meaning of the solution of a 2 by 2 system of equations; i.e., point, line, no solution.
12. Solve simple quadratic equations graphically; e.g., $y = x^2 - 16$.
13. Compute and interpret slope, midpoint and distance given a set of ordered pairs.
14. Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, continuous vs. noncontinuous, direct variation vs. inverse variation.
15. Describe and compare how changes in an equation affects the related graphs; e.g., for a linear equation changing the coefficient of x affects the slope and changing the constant affects the intercepts.
16. Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.

Data Analysis and Probability

Grade-Level Indicators

1. Use, create and interpret scatterplots and other types of graphs as appropriate.
2. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part-to-whole comparison, scatterplot for relationship between two variants.
3. Differentiate between discrete and continuous data and appropriate ways to represent each.
4. Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).
5. Explain the mean's sensitivity to extremes and its use in comparison with the median and mode.
6. Make conjectures about possible relationship in a scatterplot and approximate line of best fit.
7. Identify different ways of selecting samples, such as survey response, random sample, representative sample and convenience sample.
8. Describe how the relative size of a sample compared to the target population affects the validity of predictions.
9. Construct convincing arguments based on analysis of data and interpretation of graphs.
10. Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.
11. Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.

Number, Number Sense and Operations

Grade-Level Indicators

1. Identify and justify whether properties (closure, identity, inverse, commutative and associative) hold for a given set and operations; e.g., even integers and multiplication.
2. Compare, order and determine equivalent forms for rational and irrational numbers.
3. Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.
4. Demonstrate fluency in computations using real numbers.
5. Estimate the solutions for problem situations involving square and cube roots.

Measurement

Grade-Level Indicators

1. Convert rates within the same measurement system; e.g., miles per hour to feet per second; kilometers per hour to meters per second.
2. Use unit analysis to check computations involving measurement.
3. Use the ratio of lengths in similar two-dimensional figures or three-dimensional objects to calculate the ratio of their areas or volumes respectively.
4. Use scale drawings and right triangle trigonometry to solve problems that include unknown distances and angle measures.
5. Solve problems involving unit conversion for situations involving distances, areas, volumes and rates within the same measurement system.

Geometry and Spatial Sense

Grade-Level Indicators

1. Define the basic trigonometric ratios in right triangles: sine, cosine and tangent.
2. Apply proportions and right triangle trigonometric ratios to solve problems involving missing lengths and angle sizes in similar figures.
3. Analyze two-dimensional figures in a coordinate plane; e.g., use slope and distance formulas to show that a quadrilateral is a parallelogram.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Define function with ordered pairs in which each domain element is assigned exactly one range element.
2. Generalize patterns using functions or relationships (linear, quadratic and exponential), and freely translate among tabular, graphical and symbolic representations.
3. Describe problem situations (linear, quadratic and exponential) by using tabular, graphical and symbolic representations.
4. Demonstrate the relationship among zeros of a function, roots of equations, and solutions of equations graphically and in words.
5. Describe and compare characteristics of the following families of functions: linear, quadratic and exponential functions; e.g., general shape, number of roots, domain, range, rate of change, maximum or minimum.
6. Write and use equivalent forms of equations and inequalities in problem situations; e.g., changing a linear equation to the slope-intercept form.
7. Use formulas to solve problems involving exponential growth and decay.
8. Find linear equations that represent lines that pass through a given set of ordered pairs, and find linear equations that represent lines parallel or perpendicular to a given line through a specific point.
9. Solve and interpret the meaning of 2 by 2 systems of linear equations graphically, by substitution and by elimination, with and without technology.
10. Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula and with technology.
11. Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only).
12. Simplify rational expressions by eliminating common factors and applying properties of integer exponents.
13. Model and solve problems involving direct and inverse variation using proportional reasoning.
14. Describe the relationship between slope and the graph of a direct variation and inverse variation.
15. Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs.

Data Analysis and Probability

Grade-Level Indicators

1. Classify data as univariate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data.
2. Create a scatterplot for a set of bivariate data, sketch the line of best fit, and interpret the slope of the line of best fit.
3. Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers.
4. Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data.
5. Describe characteristics and limitations of sampling methods, and analyze the effects of random versus biased sampling; e.g., determine and justify whether the sample is likely to be representative of the population.

6. Make inferences about relationships in bivariate data, and recognize the difference between evidence of relationship (correlation) and causation.
7. Use counting techniques and the Fundamental Counting principle to determine the total number of possible outcomes for mathematical situations.
8. Describe, create and analyze a sample space and use it to calculate probability.
9. Identify situations involving independent and dependent events, and explain differences between and common misconceptions about probabilities associated with those events.
10. Use theoretical and experimental probability, including simulations or random numbers, to estimate probabilities and to solve problems dealing with uncertainty; e.g., compound events, independent events, simple dependent events.

Number, Number Sense and Operations

Grade-Level Indicators

1. Connect physical, verbal and symbolic representations of irrational numbers; e.g., construct $\sqrt{2}$ as a hypotenuse or on a number line.
2. Explain the meaning of the *n*th root.
3. Use factorial notation and computations to represent and solve problem situations involving arrangements.
4. Approximate the *n*th root of a given number greater than zero between consecutive integers when *n* is an integer; e.g., the 4th root of 50 is between 2 and 3.

Measurement

Grade-Level Indicators

1. Explain how a small error in measurement may lead to a large error in calculated results.
2. Calculate relative error.
3. Explain the difference between absolute error and relative error in measurement.
4. Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare "accurate to the nearest foot" when measuring the height of a person versus when measuring the height of a mountain.
5. Determine the measures of central and inscribed angles and their associated major and minor arcs.

Geometry and Spatial Sense

Grade-Level Indicators

1. Formally define and explain key aspects of geometric figures, including:
   a. Interior and exterior angles of polygons;
   b. Segments related to triangles (median, altitude, midsegment);
   c. Points of concurrency related to triangles (centroid, incenter, orthocenter, and circumcenter);
   d. Circles (radius, diameter, chord, circumference, major arc, minor arc, sector, segment, inscribed angle).
2. Recognize and explain the necessity for certain terms to remain undefined, such as point, line and plane.
3. Make, test and establish the validity of conjectures about geometric properties and relationships using counterexample, inductive and deductive reasoning, and paragraph or two-column proof, including:
   a. Prove the Pythagorean Theorem;
   b. Prove theorems involving triangle similarity and congruence;
   c. Prove theorems involving properties of lines, angles, triangles and quadrilaterals;
   d. Test a conjecture using basic constructions made with a compass and straightedge or technology.
4. Construct right triangles, equilateral triangles, parallelograms, trapezoids, rectangles, rhombuses, squares and kites, using compass and straightedge or dynamic geometry software.
5. Construct congruent figures and similar figures using tools, such as compass, straightedge, and protractor or dynamic geometry software.
6. Identify the reflection and rotation symmetries of two- and three-dimensional figures.
7. Perform reflections and rotations using compass and straightedge constructions and dynamic geometry software.
8. Derive coordinate rules for translations, reflections and rotations of geometric figures in the coordinate plane.
9. Show and describe the results of combinations of translations, reflections and rotations (compositions); e.g., perform compositions and specify the result of a composition as the outcome of a single motion, when applicable.
10. Solve problems involving chords, radii, and arcs within the same circle.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Define function formally and with f(*x*) notation.
2. Describe and compare characteristics of the following families of functions: square root, cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.
3. Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.
4. Use algebraic representations and functions to describe and generalize geometric properties and relationships.
5. Solve simple linear and nonlinear equations and inequalities having square roots as coefficients and solutions.
6. Solve equations and inequalities having rational expressions as coefficients and solutions.
7. Solve systems of linear inequalities.
8. Graph the quadratic relationship that defines circles.
9. Recognize and explain that the slopes of parallel lines are equal and the slopes of perpendicular lines are negative reciprocals.
10. Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.
11. Solve real-world problems that can be modeled, using systems of linear equations and inequalities.
12. Describe the relationship between slope of a line through the origin and the tangent function of the angle created by the line and the positive *x*-axis.

Data Analysis and Probability

Grade-Level Indicators

1. Describe measures of center and the range verbally, graphically and algebraically.
2. Represent and analyze bivariate data using appropriate graphical displays (scatterplots, parallel box-and-whisker plots, histograms with more than one set of data, tables, charts, spreadsheets) with and without technology.
3. Display bivariate data where at least one variable is categorical.
4. Identify outliers on a data display; e.g., use the interquartile range to identify outliers on a box-and-whisker plot.
5. Provide examples and explain how a statistic may or may not be an attribute of the entire population; e.g., intentional or unintentional bias may be present.
6. Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatterplots, parallel box-and-whisker plots, and measures of center and spread.
7. Model problems dealing with uncertainty with area models (geometric probability).
8. Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other.

OHIO Grade 11 Mathematics
Academic Content Standards

Number, Number Sense and Operations

Grade-Level Indicators

1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.
2. Determine what properties hold for vector addition and multiplication, and scalar multiplication.
3. Represent complex numbers on complex plane.
4. Use matrices to represent given information in a problem situation.
5. Model, using the coordinate plane, vector addition and scalar multiplication.
6. Compute sums, differences and products of matrices using paper and pencil calculations for simple cases, and technology for more complicated cases.
7. Compute sums, differences, products and quotients of complex numbers.
8. Use fractional and negative exponents as optional ways of representing and finding solutions for problem situations; e.g., $27^{2/3} = (27^{1/3})^2 = 9$.
9. Use vector addition and scalar multiplication to solve problems.

Measurement

Grade-Level Indicators

1. Determine the number of significant digits in a measurement.
2. Use radian and degree angle measures to solve problems and perform conversions as needed.
3. Derive a formula for the surface area of a cone as a function of its slant height and the circumference of its base.
4. Calculate distances, areas, surface areas and volumes of composite three-dimensional objects to a specified number of significant digits.
5. Solve real-world problems involving area, surface area, volume and density to a specified degree of precision.

Geometry and Spatial Sense

Grade-Level Indicators

1. Use polar coordinates to specify locations on a plane.
2. Represent translations using vectors.
3. Describe multiplication of a vector and a scalar graphically and algebraically, and apply to problem situations.
4. Use trigonometric relationships to determine lengths and angle measures; i.e., Law of Sines and Law of Cosines.
5. Identify, sketch and classify the cross sections of three-dimensional objects.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Identify and describe problem situations involving an iterative process that can be represented as a recursive function; e.g., compound interest.
2. Translate a recursive function into a closed form expression or formula for the *n*th term to solve a problem situation involving an iterative process; e.g., find the value of an annuity after 7 years.
3. Describe and compare the characteristics of the following families of functions: quadratics with complex roots, polynomials of any degree, logarithms, and rational functions; e.g., general shape, number of roots, domain and range, asymptotic behavior.
4. Identify the maximum and minimum points of polynomial, rational and trigonometric functions graphically and with technology.
5. Identify families of functions with graphs that have rotation symmetry or reflection symmetry about the *y*-axis, *x*-axis or $y = x$.
6. Represent the inverse of a function symbolically and graphically as a reflection about $y = x$.
7. Model and solve problems with matrices and vectors.
8. Solve equations involving radical expressions and complex roots.
9. Solve 3 by 3 systems of linear equations by elimination and using technology, and interpret graphically what the solution means (a point, line, plane, or no solution).
10. Describe the characteristics of the graphs of conic sections.
11. Describe how a change in the value of a constant in an exponential, logarithmic or radical equation affects the graph of the equation.

Data Analysis and Probability

Grade-Level Indicators

1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation.
2. Describe the role of randomization in a well-designed study, especially as compared to a convenience sample, and the generalization of results from each.
3. Describe how a linear transformation of univariate data affects range, mean, mode, and median.
4. Create a scatterplot of bivariate data, identify trends, and find a function to model the data.
5. Use technology to find the Least Squares Regression Line, the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation.

6. Use technology to compute the standard deviation for a set of data, and interpret standard deviation in relation to the context or problem situation.
7. Describe the standard normal curve and its general properties, and answer questions dealing with data assumed to be normal.
8. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.
9. Valuate validity of results of a study based on characteristics of the study design, including sampling method, summary statistics and data analysis techniques.
10. Understand and use the concept of random variable, and compute and interpret the expected value for a random variable in simple cases.
11. Examine statements and decisions involving risk; e.g., insurance rates and medical decisions.

OHIO Grade 12 Mathematics
Academic Content Standards

Number, Number Sense and Operations

Grade-Level Indicators

1. Determine what properties (closure, identity, inverse, commutative and associative) hold for operations with complex numbers.
2. Apply combinations as a method to create coefficients for the Binomial Theorem, and make connections to everyday and workplace problem situations.

Measurement

Grade-Level Indicators

1. Solve problems involving derived measurements; e.g., acceleration and pressure.
2. Use radian measures in the solution of problems involving angular velocity and acceleration.
3. Apply informal concepts of successive approximation, upper and lower bounds, and limits in measurement situations; e.g., measurement of some quantities, such as volume of a cone, can be determined by sequences of increasingly accurate approximations.

Geometry and Spatial Sense

Grade-Level Indicators

1. Use matrices to represent translations, reflections, rotations, dilations and their compositions.
2. Derive and apply the basic trigonometric identities; i.e., angle addition, angle subtraction, and double angle.
3. Relate graphical and algebraic representations of lines, simple curves and conic sections.
4. Recognize and compare specific shapes and properties in multiple geometries; e.g., plane, spherical and hyperbolic.

Patterns, Functions and Algebra

Grade-Level Indicators

1. Analyze the behavior of arithmetic and geometric sequences and series as the number of terms increases.
2. Translate between the numeric and symbolic form of a sequence or series.
3. Describe and compare the characteristics of transcendental and periodic functions; e.g., general shape, number of roots, domain and range, asymptotic behavior, extrema, local and global behavior.
4. Represent the inverse of a transcendental function symbolically.
5. Set up and solve systems of equations using matrices and graphs, with and without technology.
6. Make arguments about mathematical properties using mathematical induction.
7. Make mathematical arguments using the concepts of limit.
8. Compare estimates of the area under a curve over a bounded interval by partitioning the region with rectangles; e.g., make successive estimates using progressively smaller rectangles.
9. Translate freely between polar and Cartesian coordinate systems.
10. Use the concept of limit to find instantaneous rate of change for a point on a graph as the slope of a tangent at a point.

Data Analysis and Probability

Grade-Level Indicators

1. Identify and use various sampling methods (voluntary response, convenience sample, random sample, stratified random sample, census) in a study.
2. Transform bivariate data so it can be modeled by a function; e.g., use logarithms to allow nonlinear relationship to be modeled by linear function.
3. Describe the shape and find all summary statistics for a set of univariate data, and describe how a linear transformation affects shape, center and spread.
4. Apply the concept of a random variable to generate and interpret probability distributions, including binomial, normal and uniform.
5. Use sampling distributions as the basis for informal inference.
6. Use theoretical or experimental probability, including simulations, to determine probabilities in real-world problem situations involving uncertainty, such as mutually exclusive events, complementary events and conditional probability.

Science

OHIO Grade 7 Science
Academic Content Standards

Earth and Space Sciences

Earth Systems

Grade-Level Indicators

1. Explain the biogeochemical cycles which move materials between the lithosphere (land), hydrosphere (water) and atmosphere (air).
2. Explain that Earth's capacity to absorb and recycle materials naturally (e.g., smoke, smog and sewage) can change the environmental quality depending on the length of time involved (e.g. global warming).
3. Describe the water cycle and explain the transfer of energy between the atmosphere and hydrosphere.
4. Analyze data on the availability of fresh water that is essential for life and for most industrial and agricultural processes. Describe how rivers, lakes and groundwater can be depleted or polluted becoming less hospitable to life and even becoming unavailable or unsuitable for life.
5. Make simple weather predictions based on the changing cloud types associated with frontal systems.
6. Determine how weather observations and measurements are combined to produce weather maps and that data for a specific location at one point in time can be displayed in a station model.
7. Read a weather map to interpret local, regional and national weather.
8. Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra and alpine).
9. Describe the connection between the water cycle and weather-related phenomenon (e.g., tornadoes, floods, droughts and hurricanes).

Life Sciences

Characteristics and Structure of Life

Grade-Level Indicators

1. Investigate the great variety of body plans and internal structures found in multicellular organisms.

Diversity and Interdependence of Life

Grade-Level Indicators

2. Investigate how organisms or populations may interact with one another through symbiotic relationships and how some species have become so adapted to each other that neither could survive without the other (e.g., predator-prey, parasitism, mutualism and commensalism).
3. Explain how the number of organisms an ecosystem can support depends on adequate biotic (living) resources (e.g., plants, animals) and abiotic (non-living) resources (e.g., light, water and soil).
4. Investigate how overpopulation impacts an ecosystem.
5. Explain that some environmental changes occur slowly while others occur rapidly (e.g., forest and pond succession, fires and decomposition).
6. Summarize the ways that natural occurrences and human activity affect the transfer of energy in Earth's ecosystems (e.g., fire, hurricanes, roads and oil spills).
7. Explain that photosynthetic cells convert solar energy into chemical energy that is used to carry on life functions or is transferred to consumers and used to carry on their life functions.

Evolutionary Theory

Grade-Level Indicators

8. Investigate the great diversity among organisms.

Physical Sciences

Nature of Matter

Grade-Level Indicators

1. Investigate how matter can change forms but the total amount of matter remains constant.

Nature of Energy

Grade-Level Indicators

2. Describe how an object can have potential energy due to its position or chemical composition and can have kinetic energy due to its motion.
3. Identify different forms of energy (e.g., electrical, mechanical, chemical, thermal, nuclear, radiant and acoustic).
4. Explain how energy can change forms but the total amount of energy remains constant.
5. Trace energy transformation in a simple closed system (e.g., a flashlight).

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Explain how needs, attitudes and values influence the direction of technological development in various cultures.
2. Describe how decisions to develop and use technologies often put environmental and economic concerns in direct competition with each other.

3. Recognize that science can only answer some questions and technology can only solve some human problems.

Abilities To Do Technological Design

Grade-Level Indicators

4. Design and build a product or create a solution to a problem given two constraints (e.g., limits of cost and time for design and production or supply of materials and environmental effects).

Scientific Inquiry

Grade-Level Indicators

1. Explain that variables and controls can affect the results of an investigation and that ideally one variable should be tested at a time; however it is not always possible to control all variables.
2. Identify simple independent and dependent variables.
3. Formulate and identify questions to guide scientific investigations that connect to science concepts and can be answered through scientific investigations.
4. Choose the appropriate tools and instruments and use relevant safety procedures to complete scientific investigations.
5. Analyze alternative scientific explanations and predictions and recognize that there may be more than one good way to interpret a given set of data.
6. Identify faulty reasoning and statements that go beyond the evidence or misinterpret the evidence.
7. Use graphs, tables and charts to study physical phenomena and infer mathematical relationships between variables (e.g., speed and density).

Scientific Ways of Knowing

Grade-Level Indicators

1. Show that the reproducibility of results is essential to reduce bias in scientific investigations.
2. Describe how repetition of an experiment may reduce bias.
3. Describe how the work of science requires a variety of human abilities and qualities that are helpful in daily life (e.g., reasoning, creativity, skepticism and openness).

OHIO Grade 8 Science
Academic Content Standards

Earth and Space Sciences

The Universe

Grade-Level Indicators

1. Describe how objects in the solar system are in regular and predictable motions that explain such phenomena as days, years, seasons, eclipses, tides and moon cycles.
2. Explain that gravitational force is the dominant force determining motions in the solar system and in particular keeps the planets in orbit around the sun.
3. Compare the orbits and composition of comets and asteroids with that of Earth.
4. Describe the effect that asteroids or meteoroids have when moving through space and sometimes entering planetary atmospheres (e.g., meteor-"shooting star" and meteorite).
5. Explain that the universe consists of billions of galaxies that are classified by shape.
6. Explain interstellar distances are measured in light years (e.g., the nearest star beyond the sun is 4.3 light years away).
7. Examine the life cycle of a star and predict the next likely stage of a star.
8. Name and describe tools used to study the universe (e.g., telescopes, probes, satellites and spacecraft).

Earth Systems

Grade-Level Indicators

9. Describe the interior structure of Earth and Earth's crust as divided into tectonic plates riding on top of the slow moving currents of magma in the mantle.
10. Explain that most major geological events (e.g., earthquakes, volcanic eruptions, hot spots and mountain building) result from plate motion.
11. Use models to analyze the size and shape of Earth, its surface and its interior (e.g., globes, topographic maps, satellite images).
12. Explain that some processes involved in the rock cycle are directly related to thermal energy and forces in the mantle that drive plate motions.
13. Describe how landforms are created through a combination of destructive (e.g., weathering and erosion) and constructive processes (e.g., crustal deformation, volcanic eruptions and deposition of sediment).
14. Explain that folding, faulting and uplifting can rearrange the rock layers so the youngest is not always found on top.
15. Illustrate how the three primary types of plate boundaries (transform, divergent and convergent) cause different landforms (e.g., mountains, volcanoes and ocean trenches).

Life Sciences

Heredity

Grade-Level Indicators

1. Describe that asexual reproduction limits the spread of detrimental characteristics through a species and allows for genetic continuity.
2. Recognize that in sexual reproduction new combinations of traits are produced which may increase or decrease an organism's chances for survival.

Evolutionary Theory

Grade-Level Indicators

3. Explain how variations in structure, behavior or physiology allow some organisms to enhance their reproductive success and survival in a particular environment.
4. Explain that diversity of species is developed through gradual processes over many generations (e.g., fossil record).
5. Investigate how an organism adapted to a particular environment may become extinct if the environment, as shown by the fossil record, changes.

Physical Sciences

Forces and Motion

Grade-Level Indicators

1. Describe how the change in the position (motion) of an object is always judged and described in comparison to a reference point.
2. Explain that motion describes the change in the position of an object (characterized by a speed and direction) as time changes.
3. Explain that an unbalanced force acting on an object changes that object's speed and/or direction.

Nature of Energy

Grade-Level Indicators

4. Demonstrate that waves transfer energy.
5. Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves).

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Examine how science and technology have advanced through the contributions of many different people, cultures and times in history.
2. Examine how choices regarding the use of technology are influenced by constraints caused by various unavoidable factors (e.g., geographic location, limited resources, social, political and economic considerations).

Abilities To Do Technological Design

Grade-Level Indicators

3. Design and build a product or create a solution to a problem given more than two constraints (e.g., limits of cost and time for design and production, supply of materials and environmental effects).
4. Evaluate the overall effectiveness of a product design or solution.

Scientific Inquiry

Grade-Level Indicators

1. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.
2. Describe the concepts of sample size and control and explain how these affect scientific investigations.
3. Read, construct and interpret data in various forms produced by self and others in both written and oral form (e.g., tables, charts, maps, graphs, diagrams and symbols).
4. Apply appropriate math skills to interpret quantitative data (e.g., mean, median and mode).

Scientific Ways of Knowing

Grade-Level Indicators

1. Identify the difference between description (e.g., observation and summary) and explanation (e.g., inference, prediction, significance and importance).
2. Explain why it is important to examine data objectively and not let bias affect observations.

Earth and Space Sciences

The Universe

Grade-Level Indicators

1. Describe that stars produce energy from nuclear reactions and that processes in stars have led to the formation of all elements beyond hydrogen and helium.
2. Describe the current scientific evidence that supports the theory of the explosive expansion of the universe, the Big Bang, over 10 billion years ago.
3. Explain that gravitational forces govern the characteristics and movement patterns of the planets, comets and asteroids in the solar system.

Earth Systems

Grade-Level Indicators

4. Explain the relationships of the oceans to the lithosphere and atmosphere (e.g., transfer of energy, ocean currents and landforms).

Processes That Shape Earth

Grade-Level Indicators

5. Explain how the slow movement of material within Earth results from:
   a. thermal energy transfer (conduction and convection) from the deep interior;
   a. the action of gravitational forces on regions of different density.
6. Explain the results of plate tectonic activity (e.g., magma generation, igneous intrusion, metamorphism, volcanic action, earthquakes, faulting and folding).
7. Explain sea-floor spreading and continental drift using scientific evidence (e.g., fossil distributions, magnetic reversals and radiometric dating).

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

8. Use historical examples to explain how new ideas are limited by the context in which they are conceived; are often initially rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., heliocentric theory and plate tectonics theory).

Life Sciences

No Grade-Level Indicators present for this standard.

Physical Sciences

Nature of Matter

Grade-Level Indicators

1. Recognize that all atoms of the same element contain the same number of protons, and elements with the same number of protons may or may not have the same mass. Those with different masses (different numbers of neutrons) are called isotopes.
2. Illustrate that atoms with the same number of positively charged protons and negatively charged electrons are electrically neutral.
3. Describe radioactive substances as unstable nuclei that undergo random spontaneous nuclear decay emitting particles and/or high energy wavelike radiation.
4. Show that when elements are listed in order according to the number of protons (called the atomic number), the repeating patterns of physical and chemical properties identify families of elements. Recognize that the periodic table was formed as a result of the repeating pattern of electron configurations.
5. Describe how ions are formed when an atom or a group of atoms acquire an unbalanced charge by gaining or losing one or more electrons.
6. Explain that the electric force between the nucleus and the electrons hold an atom together. Relate that on a larger scale, electric forces hold solid and liquid materials together (e.g., salt crystals and water).
7. Show how atoms may be bonded together by losing, gaining or sharing electrons and that in a chemical reaction, the number, type of atoms and total mass must be the same before and after the reaction (e.g., writing correct chemical formulas and writing balanced chemical equations).
8. Demonstrate that the pH scale (0-14) is used to measure acidity and classify substances or solutions as acidic, basic, or neutral.
9. Investigate the properties of pure substances and mixtures (e.g., density, conductivity, hardness, properties of alloys, superconductors and semiconductors).
10. Compare the conductivity of different materials and explain the role of electrons in the ability to conduct electricity.

Nature of Energy

Grade-Level Indicators

11. Explain how thermal energy exists in the random motion and vibrations of atoms and molecules. Recognize that the higher the temperature, the greater the average atomic or molecular motion, and during changes of state the temperature remains constant.
12. Explain how an object's kinetic energy depends on its mass and its speed (KE=½mv 2).
13. Demonstrate that near Earth's surface an object's gravitational potential energy depends upon its weight (mg where m is the object's mass and g is the acceleration due to gravity) and height (h) above a reference surface (PE=mgh).
14. Summarize how nuclear reactions convert a small amount of matter into a large amount of energy. (Fission involves the splitting of a large nucleus into

smaller nuclei; fusion is the joining of two small nuclei into a larger nucleus at extremely high energies.)

15. Trace the transformations of energy within a system (e.g., chemical to electrical to mechanical) and recognize that energy is conserved. Show that these transformations involve the release of some thermal energy.
16. Illustrate that chemical reactions are either endothermic or exothermic (e.g., cold packs, hot packs and the burning of fossil fuels).
17. Demonstrate that thermal energy can be transferred by conduction, convection or radiation (e.g., through materials by the collision of particles, moving air masses or across empty space by forms of electromagnetic radiation).
18. Demonstrate that electromagnetic radiation is a form of energy. Recognize that light acts as a wave. Show that visible light is a part of the electromagnetic spectrum (e.g., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays).
19. Show how the properties of a wave depend on the properties of the medium through which it travels. Recognize that electromagnetic waves can be propagated without a medium.
20. Describe how waves can superimpose on one another when propagated in the same medium. Analyze conditions in which waves can bend around corners, reflect off surfaces, are absorbed by materials they enter, and change direction and speed when entering a different material.

Forces and Motion

Grade-Level Indicators

21. Demonstrate that motion is a measurable quantity that depends on the observer's frame of reference and describe the object's motion in terms of position, velocity, acceleration and time.
22. Demonstrate that any object does not accelerate (remains at rest or maintains a constant speed and direction of motion) unless an unbalanced (net) force acts on it.
23. Explain the change in motion (acceleration) of an object. Demonstrate that the acceleration is proportional to the net force acting on the object and inversely proportional to the mass of the object. (Fnet=ma. Note that weight is the gravitational force on a mass.)
24. Demonstrate that whenever one object exerts a force on another, an equal amount of force is exerted back on the first object.
25. Demonstrate the ways in which frictional forces constrain the motion of objects (e.g., a car traveling around a curve, a block on an inclined plane, a person running, an airplane in flight).

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

26. Use historical examples to explain how new ideas are limited by the context in which they are conceived; are often initially rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., atomic theory, quantum theory and Newtonian mechanics).
27. Describe advances and issues in physical science that have important, long-lasting effects on science and society (e.g., atomic theory, quantum theory, Newtonian mechanics, nuclear energy, nanotechnology, plastics, ceramics and communication technology).

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Describe means of comparing the benefits with the risks of technology and how science can inform public policy.

Abilities To Do Technological Design

Grade-Level Indicators

2. Identify a problem or need, propose designs and choose among alternative solutions for the problem.
3. Explain why a design should be continually assessed and the ideas of the design should be tested, adapted and refined.

Scientific Inquiry

Grade-Level Indicators

1. Distinguish between observations and inferences given a scientific situation.
2. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, Material Safety Data Sheets [MSDS], eyewash, goggles and ventilation).
3. Construct, interpret and apply physical and conceptual models that represent or explain systems, objects, events or concepts.
4. Decide what degree of precision based on the data is adequate and round off the results of calculator operations to the proper number of significant figures to reasonably reflect those of the inputs.
5. Develop oral and written presentations using clear language, accurate data, appropriate graphs, tables, maps and available technology.
6. Draw logical conclusions based on scientific knowledge and evidence from investigations.

Scientific Ways of Knowing

Grade-Level Indicators

1. Comprehend that many scientific investigations require the contributions of women and men from different disciplines in and out of science. These people study different topics, use different techniques and have different standards of evidence but share a common purpose – to better understand a portion of our universe.

2. Illustrate that the methods and procedures used to obtain evidence must be clearly reported to enhance opportunities for further investigations.
3. Demonstrate that reliable scientific evidence improves the ability of scientists to offer accurate predictions.
4. Explain how support of ethical practices in science (e.g., individual observations and confirmations, accurate reporting, peer review and publication) are required to reduce bias.
5. Justify that scientific theories are explanations of large bodies of information and/or observations that withstand repeated testing.
6. Explain that inquiry fuels observation and experimentation that produce data that are the foundation of scientific disciplines. Theories are explanations of these data.
7. Recognize that scientific knowledge and explanations have changed over time, almost always building on earlier knowledge.
8. Illustrate that much can be learned about the internal workings of science and the nature of science from the study of scientists, their daily work and their efforts to advance scientific knowledge in their area of study.
9. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

Earth and Space Sciences

Earth Systems

Grade-Level Indicators

1. Summarize the relationship between the climatic zone and the resultant biomes. (This includes explaining the nature of the rainfall and temperature of the mid-latitude climatic zone that supports the deciduous forest.)
2. Explain climate and weather patterns associated with certain geographic locations and features (e.g., tornado alley, tropical hurricanes and lake effect snow).
3. Explain how geologic time can be estimated by multiple methods (e.g., rock sequences, fossil correlation and radiometric dating).
4. Describe how organisms on Earth contributed to the dramatic change in oxygen content of Earth's early atmosphere.
5. Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life.
6. Describe ways that human activity can alter biogeochemical cycles (e.g., carbon and nitrogen cycles) as well as food webs and energy pyramids (e.g., pest control, legume rotation crops vs. chemical fertilizers).

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

7. Describe advances and issues in Earth and space science that have important long-lasting effects on science and society (e.g., geologic time scales, global warming, depletion of resources and exponential population growth).

Life Sciences

Characteristics and Structure of Life

Grade-Level Indicators

1. Explain that living cells
   a. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur)
   b. are the basic unit of structure and function of all living things
   c. come from pre-existing cells after life originated, and
   d. are different from viruses
2. Compare the structure, function and interrelatedness of cell organelles in eukaryotic cells (e.g., nucleus, chromosome, mitochondria, cell membrane, cell wall, chloroplast, cilia, flagella) and prokaryotic cells.
3. Explain the characteristics of life as indicated by cellular processes including
   a. homeostasis
   b. energy transfers and transformation
   c. transportation of molecules
   d. disposal of wastes
   e. synthesis of new molecules
4. Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells.

Heredity

Grade-Level Indicators

5. Illustrate the relationship of the structure and function of DNA to protein synthesis and the characteristics of an organism.
6. Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short).
7. Describe that spontaneous changes in DNA are mutations, which are a source of genetic variation. When mutations occur in sex cells, they may be passed on to future generations; mutations that occur in body cells may affect the functioning of that cell or the organism in which that cell is found.
8. Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits and jumping genes) to explain inheritance.

Diversity and Interdependence of Life

Grade-Level Indicators

9. Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids).
10. Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation).
11. Explain that living organisms use matter and energy to synthesize a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g., growth, reacting to the environment, reproduction and movement).
12. Describe that biological classification represents how organisms are related with species being the most fundamental unit of the classification system. Relate how biologists arrange organisms into a hierarchy of groups and subgroups based on similarities and differences that reflect their evolutionary relationships.
13. Explain that the variation of organisms within a species increases the likelihood that at least some members of

a species will survive under gradually changing environmental conditions.

14. Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation).
15. Explain how living things interact with biotic and abiotic components of the environment (e.g., predation, competition, natural disasters and weather).
16. Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy.
17. Conclude that ecosystems tend to have cyclic fluctuations around a state of approximate equilibrium that can change when climate changes, when one or more new species appear as a result of immigration or when one or more species disappear.
18. Describe ways that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. Explain how changes in technology/biotechnology can cause significant changes, either positive or negative, in environmental quality and carrying capacity.
19. Illustrate how uses of resources at local, state, regional, national, and global levels have affected the quality of life (e.g., energy production and sustainable vs. nonsustainable agriculture).

Evolutionary Theory

Grade-Level Indicators

20. Recognize that a change in gene frequency (genetic composition) in a population over time is a foundation of biological evolution.
21. Explain that natural selection provides the following mechanism for evolution; undirected variation in inherited characteristics exist within every species. These characteristics may give individuals an advantage or disadvantage compared to others in surviving and reproducing. The advantaged offspring are more likely to survive and reproduce. Therefore, the proportion of individuals that have advantageous characteristics will increase. When an environment changes, the survival value of some inherited characteristics may change.
22. Describe historical scientific developments that occurred in evolutionary thought (e.g., Lamarck and Darwin, Mendelian Genetics and modern synthesis).
23. Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (The intent of this indicator does not mandate the teaching or testing of intelligent design.)
24. Analyze how natural selection and other evolutionary mechanisms (e.g. genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms.
25. Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved.

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

26. Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology and discovering germs).
27. Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology and discovering germs).
28. Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning).

Physical Sciences

No Grade-Level Indicators present for this standard.

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Cite examples of ways that scientific inquiry is driven by the desire to understand the natural world and how technology is driven by the need to meet human needs and solve human problems.
2. Describe examples of scientific advances and emerging technologies and how they may impact society.

Abilities To Do Technological Design

Grade-Level Indicators

3. Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the design.

Scientific Inquiry

Grade-Level Indicators

1. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation).
2. Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.
3. Use mathematical models to predict and analyze natural phenomena.
4. Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations.

5. Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected.

Scientific Ways of Knowing

Grade-Level Indicators

1. Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines.
2. Describe that scientists may disagree about explanations of phenomena, about interpretation of data or about the value of rival theories, but they do agree that questioning, response to criticism and open communication are integral to the process of science.
3. Recognize that science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena.
4. Recognize that ethical considerations limit what scientists can do.
5. Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws.
6. Recognize that animal-based research must be conducted according to currently accepted professional standards and laws.
7. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue.

OHIO Grade 11 Science
Academic Content Standards

Earth and Space Sciences

The Universe

Grade-Level Indicators

1. Describe how the early Earth was different from the planet we live on today, and explain the formation of the sun, Earth and the rest of the solar system from a nebular cloud of dust and gas approximately 4.5 billion years ago.

Earth Systems

Grade-Level Indicators

2. Analyze how the regular and predictable motions of Earth, sun and moon explain phenomena on Earth (e.g., seasons, tides, eclipses and phases of the moon).
3. Explain heat and energy transfers in and out of the atmosphere and its involvement in weather and climate (radiation, conduction, convection and advection).
4. Explain the impact of oceanic and atmospheric currents on weather and climate.
5. Use appropriate data to analyze and predict upcoming trends in global weather patterns (e.g., el Niño and la Niña, melting glaciers and icecaps and changes in ocean surface temperatures).
6. Explain how interactions among Earth's lithosphere, hydrosphere, atmosphere and biosphere have resulted in the ongoing changes of Earth's system.
7. Describe the effects of particulates and gases in the atmosphere including those originating from volcanic activity.
8. Describe the normal adjustments of Earth, which may be hazardous for humans. Recognize that humans live at the interface between the atmosphere driven by solar energy and the upper mantle where convection creates changes in Earth's solid crust. Realize that as societies have grown, become stable and come to value aspects of the environment, vulnerability to natural processes of change has increased.
9. Explain the effects of biomass and human activity on climate (e.g., climatic change and global warming).
10. Interpret weather maps and their symbols to predict changing weather conditions worldwide (e.g., monsoons, hurricanes and cyclones).
11. Analyze how materials from human societies (e.g., radioactive waste and air pollution) affect both physical and chemical cycles of Earth.
12. Explain ways in which humans have had a major effect on other species (e.g., the influence of humans on other organisms occurs through land use, which decreases space available to other species and pollution, which changes the chemical composition of air, soil and water).
13. Explain how human behavior affects the basic processes of natural ecosystems and the quality of the atmosphere, hydrosphere and lithosphere.
14. Conclude that Earth has finite resources and explain that humans deplete some resources faster than they can be renewed.

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

15. Use historical examples to show how new ideas are limited by the context in which they are conceived; are often rejected by the social establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., global warming, Heliocentric Theory and Theory of Continental Drift).
16. Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory and Plate Tectonics Theory).

Life Sciences

Characteristics and Structure of Life

Grade-Level Indicators

1. Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens.
2. Recognize that chemical bonds of food molecules contain energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Some of this energy is released as thermal energy.
3. Relate how birth rates, fertility rates and death rates are affected by various environmental factors.
4. Examine the contributing factors of human population growth that impact natural systems such as levels of education, children in the labor force, education and employment of women, infant mortality rates, costs of raising children, birth control methods, and cultural norms.
5. Investigate the impact on the structure and stability of ecosystems due to changes in their biotic and abiotic components as a result of human activity.

Diversity and Interdependence of Life

Grade-Level Indicators

6. Predict some possible impacts on an ecosystem with the introduction of a non-native species.
7. Show how populations can increase through linear or exponential growth with corresponding effects on resource use and environmental pollution.
8. Recognize that populations can reach or temporarily exceed the carrying capacity of a given environment. Show that the limitation is not just the availability of space but the number of organisms in relation to resources and the capacity of earth systems to support life.

9. Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences.
10. Explain how environmental factors can influence heredity or development of organisms.
11. Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view the earth.

Evolutionary Theory

Grade-Level Indicators

12. Recognize that ecosystems change when significant climate changes occur or when one or more new species appear as a result of immigration or speciation.
13. Describe how the process of evolution has changed the physical world over geologic time.
14. Describe how geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Recognize that current methods include using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed.

Physical Sciences

Nature of Matter

Grade-Level Indicators

1. Explain that elements with the same number of protons may or may not have the same mass and those with different masses (different numbers of neutrons) are called isotopes. Some of these are radioactive.
2. Explain that humans have used unique bonding of carbon atoms to make a variety of molecules (e.g., plastics).

Forces and Motion

Grade-Level Indicators

3. Describe real world examples showing that all energy transformations tend toward disorganized states (e.g., fossil fuel combustion, food pyramids and electrical use).
4. Explain how electric motors and generators work (e.g., relate that electricity and magnetism are two aspects of a single electromagnetic force). Investigate that electric charges in motion produce magnetic fields and a changing magnetic field creates an electric field.

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge.
2. Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans.
3. Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics).
4. Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges.
5. Investigate that all fuels (e.g., fossil, solar and nuclear) have advantages and disadvantages; therefore society must consider the trade-offs among them (e.g., economic costs and environmental impact).
6. Research sources of energy beyond traditional fuels and the advantages, disadvantages and trade-offs society must consider when using alternative sources (e.g., biomass, solar, hybrid engines, wind and fuel cells).

Scientific Inquiry

Grade-Level Indicators

1. Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation.
2. Evaluate assumptions that have been used in reaching scientific conclusions.
3. Design and carry out scientific inquiry (investigation), communicate and critique results through peer review.
4. Explain why the methods of an investigation are based on the questions being asked.
5. Summarize data and construct a reasonable argument based on those data and other known information.

Scientific Ways of Knowing

Grade-Level Indicators

1. Analyze a set of data to derive a hypothesis and apply that hypothesis to a similar phenomenon (e.g., biome data).
2. Apply scientific inquiry to evaluate results of scientific investigations, observations, theoretical models and the explanations proposed by other scientists.
3. Demonstrate that scientific explanations adhere to established criteria, for example a proposed explanation must be logically consistent, it must abide by the rules of evidence and it must be open to questions and modifications.
4. Explain why scientists can assume that the universe is a vast single system in which the basic rules are the same everywhere.
5. Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept

evidence that supports their beliefs. Scientists attempt to avoid bias in their work.

6. Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior.
7. Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings.
8. Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations.
9. Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks.
10. Describe costs and trade-offs of various hazards - ranging from those with minor risk to a few people, to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.
11. Research the role of science and technology in careers that students plan to pursue.

OHIO Grade 12 Science
Academic Content Standards

Earth and Space Sciences

The Universe

Grade-Level Indicators

1. Explain how scientists obtain information about the universe by using technology to detect electromagnetic radiation that is emitted, reflected or absorbed by stars and other objects.
2. Explain how the large-scale motion of objects in the universe is governed by gravitational forces and detected by observing electromagnetic radiation.
3. Explain how information about the universe is inferred by understanding that stars and other objects in space emit, reflect or absorb electromagnetic radiation, which we then detect.
4. Explain how astronomers infer that the whole universe is expanding by understanding how light seen from distant galaxies has longer apparent wavelengths than comparable light sources close to Earth.

Earth Systems

Grade-Level Indicators

5. Investigate how thermal energy transfers in the world's oceans impact physical features (e.g., ice caps, oceanic and atmospheric currents) and weather patterns.
6. Describe how scientists estimate how much of a given resource is available on Earth.

Life Sciences

Characteristics and Structure of Life

Grade-Level Indicators

1. Recognize that information stored in DNA provides the instructions for assembling protein molecules used by the cells that determine the characteristics of the organism.
2. Explain why specialized cells/structures are useful to plants and animals (e.g., stoma, phloem, xylem, blood, nerve, muscle, egg and sperm).
3. Explain that the sun is essentially the primary source of energy for life. Plants capture energy by absorbing light and using it to form strong (covalent) chemical bonds between the atoms of carbon-containing (organic) molecules.
4. Explain that carbon-containing molecules can be used to assemble larger molecules with biological activity (including proteins, DNA, sugars and fats). In addition, the energy stored in bonds between the atoms (chemical energy) can be used as sources of energy for life processes.

Heredity

Grade-Level Indicators

5. Examine the inheritance of traits through one or more genes and how a single gene can influence more than one trait.
6. Explain how developmental differentiation is regulated through the expression of different genes.

Diversity and Interdependence of Life

Grade-Level Indicators

7. Relate diversity and adaptation to structures and functions of living organisms at various levels of organization.
8. Based on the structure and stability of ecosystems and their nonliving components, predict the biotic and abiotic changes in such systems when disturbed (e.g. introduction of non-native species, climatic change, etc.).
9. Explain why and how living systems require a continuous input of energy to maintain their chemical and physical organization. Explain that with death and the cessation of energy input, living systems rapidly disintegrate toward more disorganized states.

Evolutionary Theory

Grade-Level Indicators

10. Explain additional components of the evolution theory, including genetic drift, immigration, emigration and mutation.

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

11. Trace the historical development of a biological theory or idea (e.g., genetics, cytology and germ theory).
12. Describe advances in life sciences that have important, long-lasting effects on science and society (e.g., biotechnology).

Physical Sciences

Nature of Matter

Grade-Level Indicators

1. Explain how atoms join with one another in various combinations in distinct molecules or in repeating crystal patterns.
2. Describe how a physical, chemical or ecological system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.
3. Explain how all matter tends toward more disorganized states and describe real world examples (e.g., erosion of rocks and expansion of the universe).
4. Recognize that at low temperatures some materials become superconducting and offer little or no resistance to the flow of electrons.

Forces and Motion

Grade-Level Indicators

5. Use and apply the laws of motion to analyze, describe and predict the effects of forces on the motions of objects mathematically.
6. Recognize that the nuclear forces that hold the nucleus of an atom together, at nuclear distances, are stronger than the electric forces that would make it fly apart.
7. Recognize that nuclear forces are much stronger than electromagnetic forces, and electromagnetic forces are vastly stronger than gravitational forces. The strength of the nuclear forces explains why greater amounts of energy are released from nuclear reactions (e.g., from atomic and hydrogen bombs and in the sun and other stars).
8. Describe how the observed wavelength of a wave depends upon the relative motion of the source and the observer (Doppler effect). If either is moving towards the other, the observed wavelength is shorter; if either is moving away, the observed wavelength is longer (e.g., weather radar, bat echoes and police radar).
9. Describe how gravitational forces act between all masses and always create a force of attraction. Recognize that the strength of the force is proportional to the masses and weakens rapidly with increasing distance between them.

Nature of Energy

Grade-Level Indicators

10. Explain the characteristics of isotopes. The nuclei of radioactive isotopes are unstable and spontaneously decay emitting particles and/or wavelike radiation. It cannot be predicted exactly when, if ever, an unstable nucleus will decay, but a large group of identical nuclei decay at a predictable rate.
11. Use the predictability of decay rates and the concept of half-life to explain how radioactive substances can be used in estimating the age of materials.
12. Describe how different atomic energy levels are associated with the electron configurations of atoms and electron configurations (and/or conformations) of molecules.
13. Explain how atoms and molecules can gain or lose energy in particular discrete amounts (quanta or packets); therefore they can only absorb or emit light at the wavelengths corresponding to these amounts.

Historical Perspectives and Scientific Revolutions

Grade-Level Indicators

14. Use historical examples to explain how new ideas are limited by the context in which they are conceived; are often initially rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., nuclear energy, quantum theory and theory of relativity).
1. 15. Describe concepts/ideas in physical sciences that have important, long-lasting effects on science and society (e.g., quantum theory, theory of relativity, age of the universe).

Science and Technology

Understanding Technology

Grade-Level Indicators

1. Explain how science often advances with the introduction of new technologies and how solving technological problems often results in new scientific knowledge.
2. Describe how new technologies often extend the current levels of scientific understanding and introduce new areas of research.
3. Research how scientific inquiry is driven by the desire to understand the natural world and how technological design is driven by the need to meet human needs and solve human problems.
4. Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges.

Scientific Inquiry

Grade-Level Indicators

1. Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation.
2. Derive simple mathematical relationships that have predictive power from experimental data (e.g., derive an equation from a graph and vice versa, determine whether a linear or exponential relationship exists among the data in a table).
3. Research and apply appropriate safety precautions when designing and/or conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation).
4. Create and clarify the method, procedures, controls and variables in complex scientific investigations.
5. Use appropriate summary statistics to analyze and describe data.

Scientific Ways of Knowing

Grade-Level Indicators

1. Give examples that show how science is a social endeavor in which scientists share their knowledge with the expectation that it will be challenged continuously by the scientific community and others.
2. Evaluate scientific investigations by reviewing current scientific knowledge and the experimental procedures used, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence and suggesting alternative explanations for the same observations.
3. Select a scientific model, concept or theory and explain how it has been revised over time based on new knowledge, perceptions or technology.

4. Analyze a set of data to derive a principle and then apply that principle to a similar phenomenon (e.g., predator-prey relationships and properties of semiconductors).
5. Describe how individuals and teams contribute to science and engineering at different levels of complexity (e.g., an individual may conduct basic field studies, hundreds of people may work together on major scientific questions or technical problems).
6. Explain that scientists may develop and apply ethical tests to evaluate the consequences of their research when appropriate.
7. Describe the current and historical contributions of diverse peoples and cultures to science and technology and the scarcity and inaccessibility of information on some of these contributions.
8. Recognize that individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs and benefits and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them.
9. Recognize the appropriateness and value of basic questions "What can happen?" "What are the odds?" and "How do scientists and engineers know what will happen?"
10. Recognize that social issues and challenges can affect progress in science and technology. (e.g., Funding priorities for specific health problems serve as examples of ways that social issues influence science and technology.)
11. Research how advances in scientific knowledge have impacted society on a local, national or global level.

Section C: ACT's College Readiness Standards Included in Ohio's Grades 7–12 Academic Content Standards

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

Because Ohio educators are the experts on the Ohio Academic Content Standards, 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