STATE MATCH

New Jersey Core Content Curriculum Standards

Language Arts Literacy, Mathematics, and Science
Grades 8–12

and

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

May 2008

ACT®

EXECUTIVE SUMMARY

(pp. 1–3)

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

SECTION A

(pp. 5–7)

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

SECTION B

(pp. 9–31)

All New Jersey Core Content Curriculum Standards are listed here; each one highlighted is measured by ACT's EPAS tests and/or WorkKeys assessments. New Jersey standards listed here are from the New Jersey Core Content Curriculum Standards as presented on the New Jersey Department of Education's website in November 2007. Underlined science content indicates that the content topics are included in, but not directly measured by, ACT's EPAS Science tests.

SECTION C

(pp. 33–42)

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

SECTION D
(pp. 43–44)

WorkKeys skill levels appear here. Highlighting indicates that a statement reflects one or more statements in the New Jersey Core Content Curriculum Standards. Skills not highlighted are not addressed in the New Jersey Core Content Curriculum Standards.

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

ACT

Executive Summary

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

1. To what extent do ACT's Educational Planning and Assessment System (EPAS™) tests—EXPLORE® (8th and 9th grades), PLAN® (10th grade), and the ACT® (11th and 12th grades)—and ACT's WorkKeys® assessments (Reading for Information, Applied Mathematics, and Locating Information) measure New Jersey's Core Content Curriculum Standards?
2. Can the results from ACT's testing programs be used to meet New Jersey's NCLB requirement?
3. Why should New Jersey choose EPAS?
4. Why choose to include WorkKeys assessments?

ACT'S TESTS MEASURE MANY IMPORTANT NEW JERSEY CORE CONTENT CURRICULUM STANDARDS IN LANGUAGE ARTS LITERACY, MATHEMATICS, AND SCIENCE.

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

- Language Arts Literacy: 2 out of 5 Standards

  New Jersey's Reading and Writing Standards are covered by ACT's English, Reading, and Writing tests and WorkKeys Reading for Information (RI) assessment.

- Mathematics: 5 out of 5 Standards

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

- Science: Process Standards: 2 out of 4
  (Content Standards: 6 out of 6)

  All of New Jersey's Science standards are covered by ACT's Science tests and WorkKeys Locating Information (LI) assessment.

  (A note about science content: ACT's Science tests present content from biology, chemistry, physics, and Earth/space sciences. Although content knowledge in these content areas is needed to answer some of the test questions, the test questions emphasize scientific reasoning and are based in experimental science contexts. Factual content knowledge, although needed to answer some of the test questions, is not systematically sampled from the full content knowledge domain. Therefore, each ACT Science Test covers some, but not all, of the discrete science content knowledge specifically described in the New Jersey Science Core Content Curriculum 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 New Jersey standards measured by ACT's tests), and are underlined rather than highlighted in Section B. Our goal here is to clearly communicate that science content will be included, but each specific content topic will not be covered consistently enough for inferences to be made about student proficiency in all areas.)

ACT®

STATES CHOOSE ACT BECAUSE:

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

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

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

Most exceptions to a match between ACT's tests and New Jersey's Core Content Curriculum 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 New Jersey on developing any necessary augmentation.

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

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

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

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

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

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

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

  Using thousands of student records and responses, content and measurement experts at ACT have developed detailed statements that describe what students typically know and are able to do at different levels of test performance. These data-driven, empirically derived score descriptors articulate student achievement within various score ranges on the English, Reading, Writing, Mathematics, and Science tests on the EXPLORE, PLAN,

and ACT. These statements provide specific details about students' college readiness and can be used to identify next steps for improvement.

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

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

Test takers are most commonly certified in the skills areas of Applied Mathematics, Locating Information, and Reading for Information. Higher scores qualify students for more jobs than do lower scores. New Jersey, Virginia, Louisiana, Kentucky, North Carolina, and New Mexico have already initiated certificate programs, and many other states are in the process of developing similar programs.

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

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

Table A-1. Number of New Jersey Language Arts Literacy Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys

New Jersey Standards*	Number of New Jersey Cumulative Progress Indicators Measured by ACT's tests	Aspects of New Jersey Standards that are Not Measured
Reading	Grade 8: 5 out of 8 Grades 9-12: 4 out of 8	Apply self-correcting strategies Develop materials for a portfolio Understand the study of literature and theories of literary criticism
Writing	Grade 8: 2 out of 4 Grades 9-12: 4 out of 4	Use a variety of primary and secondary sources
Speaking	Grade 8: 0 out of 4 Grades 9-12: 0 out of 4	Give oral presentations
Listening	Grade 8: 0 out of 2 Grades 9-12: 0 out of 2	Demonstrate active listening behaviors in a variety of situations
Viewing and Media Literacy	Grade 8: 0 out of 3 Grades 9-12: 0 out of 3	Analyze media
TOTALS 2 out of 5 Standards	Grade 8: 7 out of 21 Grades 9-12: 11 out of 21	

*Refer to New Jersey's Language Arts Literacy Core Content Curriculum Standards on pages 9–15.

Table A-2. Number of New Jersey Mathematics Standards Measured by EXPLORE, PLAN, the ACT, and WorkKeys		
New Jersey Standards*	**Number of New Jersey Cumulative Progress Indicators Measured by ACT's tests**	**Aspects of New Jersey Standards that are Not Measured**
Number and Numerical Operations	Grade 8: 3 out of 3 Grades 9-12: 2 out of 3	Recognize the limits of estimation
Geometry and Measurement	Grade 8: 4 out of 5 Grades 9-12: 4 out of 5	Use iterative procedures to generate geometric patterns
Patterns and Algebra	Grade 8: 4 out of 4 Grades 9-12: 4 out of 4	
Data Analysis, Probability, and Discrete Mathematics	Grade 8: 3 out of 4 Grades 9-12: 4 out of 4	Use vertex-edge graphs and algorithmic linking
Mathematical Processes	Grade 8: 5 out of 6 Grades 9-12: 5 out of 6	Use technology to gather, analyze, and communicate mathematical information
TOTALS 5 out of 5 Standards	Grade 8: 19 out of 22 Grades 9-12: 19 out of 22	

*Refer to New Jersey's Mathematics Core Content Curriculum Standards on pages 17–24.

Table A-3. Number of New Jersey Science Standards Measured by EXPLORE, PLAN, the ACT and WorkKeys						
New Jersey Standards*	**Number of New Jersey Cumulative Progress Indicators Measured by ACT's tests**					**Aspects of New Jersey Standards that are Not Measured**
Scientific Processes	Grade 8: Grades 9-12:	3 2	out of out of	3 3		
Science and Society	Grade 8: Grades 9-12:	0 0	out of out of	2 2		Describe how people from different cultures have contributed to science
Mathematical Applications	Grade 8: Grades 9-12:	3 4	out of out of	4 4		
Nature and Process of Technology	Grade 8: Grades 9-12:	0 0	out of out of	3 3		Compare and contrast science with technology
TOTALS 2 out of 4 Standards	**Process Standards**	12	out of	24		
Characteristics of Life	Grade 8: Grades 9-12:	(3) (3)	out of out of	(3) (3)		
Chemistry	Grade 8: Grades 9-12:	(2) (2)	out of out of	(2) (2)		
Physics	Grade 8: Grades 9-12:	(2) (2)	out of out of	(2) (2)		
Earth Science	Grade 8: Grades 9-12:	(4) (4)	out of out of	(4) (4)		
Astronomy and Space Science	Grade 8: Grades 9-12:	(4) (4)	out of out of	(4) (4)		
Environmental Studies	Grade 8: Grades 9-12:	(2) (2)	out of out of	(2) (2)		
TOTALS 6 out of 6 Standards	**Content Standards**	(34)	out of	(34)		

*Refer to New Jersey's Science Core Content Curriculum Standards on pages 25–31.

Language Arts Literacy

NEW JERSEY Grade 8
Core Content Curriculum Standards

STANDARD 3.1 Reading

All students will understand and apply the knowledge of sounds, letters, and words in written English to become independent and fluent readers and will read a variety of materials and texts with fluency and comprehension.

3.1.8 A. Concepts About Print/Text

1. Identify and use organizational structures to comprehend information. (e.g., logical order, comparison/contrast, cause/effect, chronological, sequential, procedural text).

3.1.8 B. Phonological Awareness

3.1.8 C. Decoding and Word Recognition

1. Distinguish among the spellings of homophones to determine meaning (e.g. cite, site, sight).
2. Apply spelling and syllabication rules that aid in decoding and word recognition.
3. Continue to use structural analysis and context analysis to decode new words.
4. Apply knowledge of word structures and patterns to read with automaticity.

3.1.8 D. Fluency

1. Read grade-level text orally with high accuracy and appropriate pacing, intonation, and expression.
2. Read increasingly difficult texts silently with comprehension and fluency.
3. Apply self-correcting strategies automatically to decode and gain meaning from print both orally and silently.
4. Adjust reading rate in response to the type of text and level of difficulty (e.g. recreational reading vs. informational reading).

3.1.8 E. Reading Strategies (before, during, and after reading)

1. Monitor reading for understanding by automatically setting a purpose for reading, making and adjusting predictions, asking essential questions, and relating new learning to background experiences.
2. Use increasingly complex text guides to understand different text structure and organizational patterns (e.g. chronological sequence or comparison and contrast).

3.1.8 F. Vocabulary and Concept Development

1. Develop and refine an extended vocabulary through listening and exposure to a variety of texts and independent reading.
2. Clarify word meanings through the use of a word's definition, example, restatement, or contrast.
3. Clarify pronunciations, meanings, alternate word choice, parts of speech, and etymology of words using the dictionary, thesaurus, glossary, and technology resources.
4. Expand reading vocabulary by identifying and correctly using idioms and words with literal and figurative meanings in their speaking and writing experiences.
5. Explain relationships between and among words including connotation/denotation, antonyms/synonyms, and words with multiple meanings.

3.1.8 G. Comprehension Skills and Response to Text

1. Differentiate between fact/opinion and bias and propaganda in newspapers, periodicals, and electronic texts.
2. Compare and analyze several authors' perspectives of a character, personality, topic, setting, or event.
3. Analyze ideas and recurring themes found in texts, such as good versus evil, across traditional and contemporary works.
4. Locate and analyze the elements of setting, characterization, and plot to construct understanding of how characters influence the progression and resolution of the plot.
5. Read critically by identifying, analyzing, and applying knowledge of the purpose, structure, and elements of nonfiction and providing support from the text as evidence of understanding.
6. Read critically by identifying, analyzing, and applying knowledge of the theme, structure, style, and literary elements of fiction and providing support from the text as evidence of understanding.
7. Respond critically to text ideas and the author's craft by using textual evidence to support interpretations.
8. Identify and analyze literary techniques and elements, such as figurative language, meter, rhetorical, and stylistic features of text.
9. Identify and analyze recurring themes across literary works.
10. Read critically and analyze poetic forms (e.g., ballad, sonnet, couplet).
11. Identify and understand the author's use of idioms, analogies, metaphors, and similes in prose and poetry.
12. Understand perspectives of authors in a variety of interdisciplinary works.
13. Interpret text ideas through journal writing, discussion, and enactment.

= Measured by EXPLORE English and/or Reading tests

14. Demonstrate the use of everyday texts (e.g., train schedules, directions, brochures) and make judgments about the importance of such documents.
15. Compare and analyze the various works of writers through an author's study.

3.1.8 H. Inquiry and Research

1. Produce written and oral work that demonstrates comprehension of informational materials.
2. Analyze a work of literature, showing how it reflects the heritage, traditions, attitudes, and beliefs of its authors.
3. Collect materials for a portfolio that reflect personal career choices.
4. Self-select materials appropriately related to a research project.
5. Read and compare at least two works, including books, related to the same genre, topic, or subject and produce evidence of reading (e.g., compare central ideas, characters, themes, plots, settings).

STANDARD 3.2 Writing

All students will write in clear, concise, organized language that varies in content and form for different audiences and purposes.

3.2.8 A. Writing as a Process (prewriting, drafting, revising, editing, postwriting)

1. Write stories or scripts with well-developed characters, setting, dialogue, clear conflict and resolution, and sufficient descriptive detail.
2. Write multi-paragraph compositions that have clear topic development, logical organization, effective use of detail, and variety in sentence structure.
3. Generate and narrow topics by considering purpose, audience, and form with a variety of strategies (e.g., graphic organizers, brainstorming, technology-assisted processes).
4. Revise and edit drafts by rereading for content and organization, usage, sentence construction, mechanics, and word choice.
5. Utilize the New Jersey Registered Holistic scoring rubric to improve and evaluate their writing and the writing of peers.
6. Compose, revise, edit, and publish writing using appropriate word processing software.
7. Reflect on own writing, noting strengths and setting goals for improvement.

3.2.8 B. Writing as a Product (resulting in a formal product or publication)

1. Extend knowledge of specific characteristics, structures, and appropriate voice and tone of selected genres and use this knowledge in creating written work, considering the purpose, audience, and context of the writing.
2. Write various types of prose, such as short stories, biographies, autobiographies, or memoirs that contain narrative elements.
3. Write reports and subject-appropriate nonfiction pieces across the curriculum based on research and including citations, quotations, and a works cited page.
4. Write a range of essays, including persuasive, speculative (picture prompt), descriptive, personal, or issue-based.

3.2.8 C. Mechanics, Spelling, and Handwriting

1. Use Standard English conventions in all writing, such as sentence structure, grammar and usage, punctuation, capitalization, spelling.
2. Use a variety of sentence types correctly, including combinations of independent and dependent clauses, prepositional and adverbial phrases, and varied sentence openings to develop a lively and effective personal style.
3. Understand and use parallelism, including similar grammatical forms, to present items in a series or to organize ideas for emphasis.
4. Refine the use of subordination, coordination, apposition, and other devices to indicate relationships between ideas.
5. Use transition words to reinforce a logical progression of ideas.
6. Edit writing for correct grammar, usage, capitalization, punctuation, and spelling.
7. Use a variety of reference materials, such as a dictionary, thesaurus, grammar reference, and/or internet/software resources to edit written work.
8. Write legibly in manuscript or cursive to meet district standards.

3.2.8 D. Writing Forms, Audiences, and Purposes (exploring a variety of forms)

1. Gather, select, and organize the most effective information appropriate to a topic, task, and audience.
2. Apply knowledge and strategies for composing pieces in a variety of genres (e.g., narrative, expository, persuasive, poetic, and everyday/ workplace or technical writing).
3. Write responses to literature and develop insights into interpretations by connecting to personal experiences and referring to textual information.
4. Write personal narratives, short stories, memoirs, poetry, and persuasive and expository text that relate clear, coherent events, or situations through the use of specific details.
5. Use narrative and descriptive writing techniques that show compositional risks (e.g., dialogue, literary devices sensory words and phrases, background information, thoughts and feelings of characters, comparison and contrast of characters).
6. Use a variety of primary and secondary sources to understand the value of each when writing a research report.
7. Write reports based on research and include citations, quotations, and works cited page.

8. Explore the central idea or theme of an informational reading and support analysis with details from the article and personal experiences.
9. Demonstrate writing clarity and supportive evidence when answering open-ended and essay questions across the curriculum.
10. State a position clearly and convincingly in a persuasive essay by stating the issue, giving facts, examples, and details to support the position, and citing sources when appropriate.
11. Present evidence when writing persuasive essays, examples, and justification to support arguments.
12. Choose an appropriate organizing strategy such as cause/effect, pro and con, parody, to effectively present a topic, point of view, or argument.
13. Use of a personal style and voice effectively to support the purpose and engage the audience of a piece of writing.
14. Maintain a collection of writing (e.g., a literacy folder, or a literacy portfolio).
15. Review scoring criteria of relevant rubrics.

STANDARD 3.3 Speaking

All students will speak in clear, concise, organized language that varies in content and form for different audiences and purposes.

3.3.8 A. Discussion (small group and whole class)

1. Support a position, acknowledging opposing views.
2. Present ideas and opinions spontaneously in response to a topic or other speakers.
3. Apply rules for cooperative or whole class debate on a controversial issue.
4. Define group roles using consensus to ensure task is understood and completed.
5. Participate in a formal debate (e.g., panel discussion).
6. Respond orally to literature.
7. Participate in class discussion appropriately.

3.3.8 B. Questioning (Inquiry) and Contributing

1. Paraphrase others' comments to clarify viewpoints.
2. Question to clarify others' opinions.
3. Integrate relevant information regarding issues and problems from group discussions and interviews for reports, issues, projects, debates, and oral presentations.
4. Solve a problem or understand a task through group cooperation.

3.3.8 C. Word Choice

1. Paraphrase, illustrate, clarify, and/or expand on a topic or idea.
2. Develop and use advanced vocabulary related to a topic.
3. Use language that stimulates an audience's interest.
4. Incorporate varied sentence structure and correct grammar.

3.3.8 D. Oral Presentation

1. Use writing to prompt discussion and enhance planning of formal and informal presentations.
2. Use visual aids, media, and/or technology to support oral communication.
3. Give oral presentations to different audiences for various purposes, such as summaries of books and articles, narratives, and persuasive topics, research projects, and extemporaneous/impromptu, dramatic speeches.
4. Acknowledge the audience with eye contact and use appropriate verbal responses to clarify questions and inquiries.
5. Incorporate peer feedback and teacher suggestions for revisions in content, organization, and delivery.
6. Use speaking techniques, including voice modulation, inflection, tempo, enunciation, and eye contact, for effective presentations.
7. Use a scoring rubric to prepare, evaluate, and improve the oral presentations of self and others.
8. Read aloud with fluency.

STANDARD 3.4 Listening

All students will listen actively to information from a variety of sources in a variety of situations.

3.4.8 A. Active Listening

1. Demonstrate active listening behaviors in a variety of situations (e.g., one-on-one or small group).
2. Demonstrate active listening by analyzing information, ideas, and opinions to determine relevancy.
3. Acknowledge the speaker through eye contact and use appropriate feedback and questions to clarify the speaker's message.
4. Recognize persuasive techniques and credibility in oral communication.
5. Listen to determine a speaker's purpose, attitude, and perspective.
6. Use, when appropriate, criteria/rubric to evaluate oral presentations, such as purpose, delivery techniques, content, visual aids, body language, and facial expressions.

3.4.8 B. Listening Comprehension

1. Interpret a speaker's verbal and nonverbal messages, purposes, and perspectives.
2. Exhibit proficiency in integrating oral reading with listening, writing, and viewing.
3. Critique information heard or viewed.
4. Critique oral presentations using agreed-upon criteria for evaluation (e.g., rubric).
5. Ask probing questions to elicit information, including evidence to support the speaker's claims and conclusions.

6. Paraphrase a speaker's purpose and point of view.
7. Make inferences based on an oral report or presentation.

STANDARD 3.5 Viewing and Media Literacy

All students will access, view, evaluate, and respond to print, nonprint, and electronic texts and resources.

3.5.8 A. Constructing Meaning

1. Analyze aspects of print and electronic texts that support the author's point of view, opinion, or attitude.
2. Analyze the use of elements (e.g., setting plot, theme, characters) to understand media presentations, such as film, video, television, and theatrical productions.
3. Analyze and respond to visual and print messages (e.g. humor, irony, metaphor) and recognize how words, sounds, and still or moving images are used in each medium to convey the intended messages.
4. Compare and contrast how the various forms of media (e.g. newspapers, radio, television, internet news outlets) cover the same topic.

3.5.8 B. Visual and Verbal Messages

1. Analyze and compare the pros and cons of visual and verbal advertising.
2. Evaluate various media messages for credibility.
3. Develop criteria/rubric to judge the effectiveness of visual and verbal presentations.
4. Make inferences based upon the content of still images
5. Compare and contrast media sources, such as film and book versions of a story.

3.5.8 C. Living with Media

1. Evaluate media forms, such as television, video, games, music, and film for content appropriateness (e.g., rating systems, rubric).
2. Analyze media content for emotional effect on audience.
3. Create media presentations and written reports, using multi-media resources such as an overhead projector, computer, and/or a tape recorder to communicate information.

NEW JERSEY Grades 9-12
Core Content Curriculum Standards

STANDARD 3.1 Reading

All students will understand and apply the knowledge of sounds, letters, and words in written English to become independent and fluent readers and will read a variety of materials and texts with fluency and comprehension.

3.1.12 A. Concepts About Print/Text

3.1.12 B. Phonological Awareness

3.1.12 C. Decoding and Word Recognition

3.1.12 D. Fluency

1. Read developmentally appropriate materials at an independent level with accuracy and speed.
2. Use appropriate rhythm, flow, meter, and pronunciation when reading.
3. Read a variety of genres and types of text with fluency and comprehension.

3.1.12 E. Reading Strategies (before, during, and after reading)

1. Identify, assess, and apply personal reading strategies that were most effective in previous learning from a variety of texts.
2. Practice visualizing techniques before, during, and after reading to aid in comprehension.
3. Judge the most effective graphic organizers to use with various text types for memory retention and monitoring comprehension.

3.1.12 F. Vocabulary and Concept Development

1. Use knowledge of word origins and word relationships, as well as historical and literary context clues, to determine the meanings of specialized vocabulary.
2. Use knowledge of root words to understand new words.
3. Apply reading vocabulary in different content areas.

3.1.12 G. Comprehension Skills and Response to Text

1. Identify, describe, evaluate, and synthesize the central ideas in informational texts.
2. Understand the study of literature and theories of literary criticism.
3. Understand that our literary heritage is marked by distinct literary movements and is part of a global literary tradition.
4. Compare and evaluate the relationship between past literary traditions and contemporary writing.
5. Analyze how works of a given period reflect historical and social events and conditions.
6. Recognize literary concepts, such as rhetorical device, logical fallacy, and jargon, and their effect on meaning.
7. Interpret how literary devices affect reading emotions and understanding.
8. Analyze and evaluate the appropriateness of diction and figurative language (e.g., irony, paradox).
9. Distinguish between essential and nonessential information, identifying the use of proper references and propaganda techniques where present.
10. Differentiate between fact and opinion by using complete and accurate information, coherent arguments, and points of view.
11. Analyze how an author's use of words creates tone and mood, and how choice of words advances the theme or purpose of the work.
12. Demonstrate familiarity with everyday texts such as job and college applications, W-2 forms, and contracts.
13. Read, comprehend, and be able to follow information gained from technical and instructional manuals (e.g., how-to books, computer manuals, or instructional manuals).

3.1.12 H. Inquiry and Research

1. Select appropriate electronic media for research and evaluate the quality of the information received.
2. Develop materials for a portfolio that reflect a specific career choice.
3. Develop increased ability to critically select works to support a research topic.
4. Read and critically analyze a variety of works, including books and other print materials (e.g., periodicals, journals, manuals), about one issue or topic, or books by a single author or in one genre, and produce evidence of reading.
5. Apply information gained from several sources or books on a single topic or by a single author to foster an argument, draw conclusions, or advance a position.
6. Critique the validity and logic of arguments advanced in public documents, their appeal to various audiences, and the extent to which they anticipate and address reader concerns.

STANDARD 3.2 Writing

All students will write in clear, concise, organized language that varies in content and form for different audiences and purposes.

3.2.12 A. Writing as a Process (prewriting, drafting, revising, editing, postwriting)

1. Engage in the full writing process by writing daily and for sustained amounts of time.
2. Use strategies such as graphic organizers and outlines to plan and write drafts according to the intended message, audience, and purpose for writing.
3. Analyze and revise writing to improve style, focus and organization, coherence, clarity of thought, sophisticated word choice and sentence variety, and subtlety of meaning.

= Measured by EXPLORE, PLAN, and/or the ACT English, Reading and/or Writing tests and/or WorkKeys RI

4. Review and edit work for spelling, usage, clarity, and fluency.
5. Use the computer and word-processing software to compose, revise, edit, and publish a piece.
6. Use a scoring rubric to evaluate and improve own writing and the writing of others.
7. Reflect on own writing and establish goals for growth and improvement.

3.2.12 B. Writing as a Product (resulting in a formal product or publication)

1. Analyzing characteristics, structures, tone, and features of language of selected genres and apply this knowledge to own writing.
2. Critique published works for authenticity and credibility.
3. Draft a thesis statement and support/defend it through highly developed ideas and content, organization, and paragraph development.
4. Write multi-paragraph, complex pieces across the curriculum using a variety of strategies to develop a central idea (e.g., cause-effect, problem/solution, hypothesis/results, rhetorical questions, parallelism).
5. Write a range of essays and expository pieces across the curriculum, such as persuasive, analytic, critique, or position paper.
6. Write a literary research paper that synthesizes and cites data using researched information and technology to support writing.
7. Use primary and secondary sources to provide evidence, justification, or to extend a position, and cite sources, such as periodicals, interviews, discourse, and electronic media.
8. Foresee readers' needs and develop interest through strategies such as using precise language, specific details, definitions, descriptions, examples, anecdotes, analogies, and humor as well as anticipating and countering concerns and arguments and advancing a position.
9. Provide compelling openings and strong closure to written pieces.
10. Employ relevant graphics to support a central idea (e.g., charts, graphic organizers, pictures, computer generated presentation).
11. Use the responses of others to review content, organization, and usage for publication.
12. Select pieces of writing from a literacy folder for a presentation portfolio that reflects performance in a variety of genres.

3.2.12 C. Mechanics, Spelling, and Handwriting

1. Use Standard English conventions in all writing, such as sentence structure, grammar and usage, punctuation, capitalization, and spelling.
2. Demonstrate a well-developed knowledge of English syntax to express ideas in a lively and effective personal style.
3. Use subordination, coordination, apposition, and other devices effectively to indicate relationships between ideas.
4. Use transition words to reinforce a logical progression of ideas.
5. Exclude extraneous details, repetitious ideas, and inconsistencies to improve writing.
6. Use knowledge of Standard English conventions to edit own writing and the writing of others for correctness.
7. Use a variety of reference materials, such as a dictionary, grammar reference, and/or internet/software resources to edit written work.
8. Write legibly in manuscript or cursive to meet district standards.

3.2.12 D. Writing Forms, Audiences, and Purposes (exploring a variety of forms)

1. Employ the most effective writing formats and strategies for the purpose and audience.
2. Demonstrate command of a variety of writing genres, such as:
   - Persuasive essay
   - Personal narrative
   - Research report
   - Literary research paper
   - Descriptive essay
   - Critique
   - Response to literature
   - Parody of a particular narrative style (fable, myth, short story)
   - Poetry
3. Evaluate the impact of an author's decisions regarding tone, word choice, style, content, point of view, literary elements, and literary merit, and produce an interpretation of overall effectiveness.
4. Apply all copyright laws to information used in written work.
5. When writing, employ structures to support the reader, such as transition words, chronology, hierarchy or sequence, and forms, such as headings and subtitles.
6. Compile and synthesize information for everyday and workplace purposes, such as job applications, resumes, business letters, and college applications.
7. Demonstrate personal style and voice effectively to support the purpose and engage the audience of a piece of writing.

STANDARD 3.3 Speaking

All students will speak in clear, concise, organized language that varies in content and form for different audiences and purposes.

3.3.12 A. Discussion

1. Support a position integrating multiple perspectives.

2. Support, modify, or refute a position in small or large-group discussions.
3. Assume leadership roles in student-directed discussions, projects, and forums.
4. Summarize and evaluate tentative conclusions and take the initiative in moving discussions to the next stage.

3.3.12 B. Questioning (Inquiry) and Contributing

1. Ask prepared and follow-up questions in interviews and other discussions.
2. Extend peer contributions by elaboration and illustration.
3. Analyze, evaluate, and modify group processes.
4. Select and discuss literary passages that reveal character, develop theme, and illustrate literary elements.
5. Question critically the position or viewpoint of an author.
6. Respond to audience questions by providing clarification, illustration, definition, and elaboration.
7. Participate actively in panel discussions, symposiums, and/or business meeting formats (e.g., explore a question and consider perspectives).

3.3.12 C. Word Choice

1. Modulate tone and clarify thoughts through word choice.
2. Improve word choice by focusing on rhetorical devices (e.g., puns, parallelism, allusion, alliteration).

3.3.12 D. Oral Presentation

1. Speak for a variety of purposes (e.g., persuasion, information, entertainment, literary interpretation, dramatization, personal expression).
2. Use a variety of organizational strategies (e.g., focusing idea, attention getters, clinchers, repetition, transition words).
3. Demonstrate effective delivery strategies (e.g., eye contact, body language, volume, intonation, articulation) when speaking.
4. Edit drafts of speeches independently and in peer discussions.
5. Modify oral communications through sensing audience confusion, and make impromptu revisions in oral presentation (e.g., summarizing, restating, adding illustrations/details).
6. Use a rubric to self-assess and improve oral presentations.

STANDARD 3.4 Listening

All students will listen actively to information from a variety of sources in a variety of situations.

3.4.12 A. Active Listening

1. Explore and reflect on ideas while hearing and focusing attentively.
2. Listen skillfully to distinguish emotive and persuasive rhetoric.
3. Demonstrate appropriate listener response to ideas in a persuasive speech, oral interpretation of a literary selection, or scientific or educational presentation.

3.4.12 B. Listening Comprehension

1. Listen to summarize, make judgments, and evaluate.
2. Evaluate the credibility of a speaker.
3. Determine when propaganda and argument are used in oral forms.
4. Listen and respond appropriately to a debate.

STANDARD 3.5 Viewing and Media Literacy

All students will access, view, evaluate, and respond to print, non print, and electronic texts and resources.

3.5.12 A. Constructing Meaning from Media

1. Understand that messages are representations of social reality and vary by historic time periods and parts of the world.
2. Identify and evaluate how a media product expresses the values of the culture that produced it.
3. Identify and select media forms appropriate for the viewer's purpose.

3.5.12 B. Visual and Verbal Messages

1. Analyze media for stereotyping (e.g., gender, ethnicity).
2. Compare and contrast three or more media sources.

3.5.12 C. Living with Media

1. Use print and electronic media texts to explore human relationships, new ideas, and aspects of culture (e.g., racial prejudice, dating, marriage, family, and social institutions).
2. Determine influences on news media based on existing political, historical, economical, and social contexts (e.g., importance of audience feedback).
3. Recognize that creators of media and performances use a number of forms, techniques, and technologies to convey their messages.

NEW JERSEY Grade 8
Core Content Curriculum Standards

STANDARD 4.1 Number and Numerical Operations

All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.

4.1.8 A. Number Sense

1. Extend understanding of the number system by constructing meanings for the following (unless otherwise noted, all indicators for grade 8 pertain to these sets of numbers as well):
   - ► Rational numbers
   - ► Percents
   - ► Exponents
   - ► Roots
   - ► Absolute values
   - ► Numbers represented in scientific notation
2. Demonstrate a sense of the relative magnitudes of numbers.
3. Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.
4. Compare and order numbers of all named types.
5. Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.
6. Recognize that repeating decimals correspond to fractions and determine their fractional equivalents.

   $\frac{5}{7}$ = 0.714285714285… = $\overline{0.714285}$

7. Construct meanings for common irrational numbers, such as π (pi) and the square root of 2.

4.1.8 B. Numerical Operations

1. Use and explain procedures for performing calculations involving addition, subtraction, multiplication, division, and exponentiation with integers and all number types named above with:
   - ► Pencil-and-paper
   - ► Mental math
   - ► Calculator
2. Use exponentiation to find whole number powers of numbers.
3. Find square and cube roots of numbers and understand the inverse nature of powers and roots.
4. Solve problems involving proportions and percents.
5. Understand and apply the standard algebraic order of operations, including appropriate use of parentheses.

4.1.8 C. Estimation

1. Estimate square and cube roots of numbers.
2. Use equivalent representations of numbers such as fractions, decimals, and percents to facilitate estimation.
3. Recognize the limitations of estimation and assess the amount of error resulting from estimation.

STANDARD 4.2 Geometry and Measurement

All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.

4.2.8 A. Geometric Properties

1. Understand and apply concepts involving lines, angles, and planes.
   - ► Complementary and supplementary angles
     - ► Vertical angles
   - ► Bisectors and perpendicular bisectors
   - ► Parallel, perpendicular, and intersecting planes
   - ► Intersection of plane with cube, cylinder, cone, and sphere
2. Understand and apply the Pythagorean theorem.
3. Understand and apply properties of polygons.
   - ► Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi
   - ► Regular polygons
   - ► Sum of measures of interior angles of a polygon
   - ► Which polygons can be used alone to generate a tessellation and why
4. Understand and apply the concept of similarity.
   - ► Using proportions to find missing measures
   - ► Scale drawings
   - ► Models of 3D objects
5. Use logic and reasoning to make and support conjectures about geometric objects.

4.2.8 B. Transforming Shapes

1. Understand and apply transformations.
   - ► Finding the image, given the pre-image, and vice-versa
   - ► Sequence of transformations needed to map one figure onto another
   - ► Reflections, rotations, and translations result in images congruent to the pre-image
   - ► Dilations (stretching/shrinking) result in images similar to the pre-image
2. Use iterative procedures to generate geometric patterns.
   - ► Fractals (e.g., the Koch Snowflake)
   - ► Self-similarity
   - ► Construction of initial stages

- ► Patterns in successive stages (e.g., number of triangles in each stage of Sierpinski's Triangle)

4.2.8 C. Coordinate Geometry

1. Use coordinates in four quadrants to represent geometric concepts.
2. Use a coordinate grid to model and quantify transformations (e.g., translate right 4 units).

4.2.8 D. Units of Measurement

1. Solve problems requiring calculations that involve different units of measurement within a measurement system (e.g., 4'3" plus 7'10" equals 12'1").
2. Use approximate equivalents between standard and metric systems to estimate measurements (e.g., 5 kilometers is about 3 miles).
3. Recognize that the degree of precision needed in calculations depends on how the results will be used and the instruments used to generate the measurements.
4. Select and use appropriate units and tools to measure quantities to the degree of precision needed in a particular problem-solving situation.
5. Recognize that all measurements of continuous quantities are approximations.
6. Solve problems that involve compound measurement units, such as speed (miles per hour), air pressure (pounds per square inch), and population density (persons per square mile).

4.2.8 E. Measuring Geometric Objects

1. Develop and apply strategies for finding perimeter and area.
   - ► Geometric figures made by combining triangles, rectangles and circles or parts of circles
   - ► Estimation of area using grids of various sizes
   - ► Impact of a dilation on the perimeter and area of a 2-dimensional figure
2. Recognize that the volume of a pyramid or cone is one-third of the volume of the prism or cylinder with the same base and height (e.g., use rice to compare volumes of figures with same base and height).
3. Develop and apply strategies and formulas for finding the surface area and volume of a three-dimensional figure.
   - ► Volume–prism, cone, pyramid
   - ► Surface area–prism (triangular or rectangular base), pyramid (triangular or rectangular base)
   - ► Impact of a dilation on the surface area and volume of a three–dimensional figure
4. Use formulas to find the volume and surface area of a sphere.

STANDARD 4.3 Patterns and Algebra

All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

4.3.8 A. Patterns

1. Recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers.
   - ► Descriptions using tables, verbal and symbolic rules, graphs, simple equations or expressions
   - ► Finite and infinite sequences
   - ► Arithmetic sequences (i.e., sequences generated by repeated addition of a fixed number, positive or negative)
   - ► Geometric sequences (i.e., sequences generated by repeated multiplication by a fixed positive ratio, greater than 1 or less than 1)
   - ► Generating sequences by using calculators to repeatedly apply a formula

4.3.8 B. Functions and Relationships

1. Graph functions, and understand and describe their general behavior.
   - ► Equations involving two variables
   - ► Rates of change (informal notion of slope)
2. Recognize and describe the difference between linear and exponential growth, using tables, graphs, and equations.

4.3.8 C. Modeling

1. Analyze functional relationships to explain how a change in one quantity can result in a change in another, using pictures, graphs, charts, and equations.
2. Use patterns, relations, symbolic algebra, and linear functions to model situations.
   - ► Using concrete materials (manipulatives), tables, graphs, verbal rules, algebraic expressions/equations/inequalities
   - ► Growth situations, such as population growth and compound interest, using recursive (e.g., NOW NEXT) formulas (cf. science standard 5.5 and social studies standard 6.6)

4.3.8 D. Procedures

1. Use graphing techniques on a number line.
   - ► Absolute value
   - ► Arithmetic operations represented by vectors (arrows) (e.g., "-3 + 6" is "left 3, right 6")
2. Solve simple linear equations informally, graphically, and using formal algebraic methods.
   - ► Multi-step, integer coefficients only (although answers may not be integers)
   - ► Using paper-and-pencil, calculators, graphing calculators, spreadsheets, and other technology
3. Solve simple linear inequalities.
4. Create, evaluate, and simplify algebraic expressions involving variables.
   - ► Order of operations, including appropriate use of parentheses

- ► Distributive property
- ► Substitution of a number for a variable
- ► Translation of a verbal phrase or sentence into an algebraic expression, equation, or inequality, and vice versa

5. Understand and apply the properties of operations, numbers, equations, and inequalities.
   - ► Additive inverse
   - ► Multiplicative inverse
   - ► Addition and multiplication properties of equality
   - ► Addition and multiplication properties of inequalities

STANDARD 4.4 Data Analysis, Probability, and Discrete Mathematics

All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

4.4.8 A. Data Analysis

1. Select and use appropriate representations for sets of data, and measures of central tendency (mean, median, and mode).
   - ► Type of display most appropriate for given data
   - ► Box-and-whisker plot, upper quartile, lower quartile
   - ► Scatter plot
   - ► Calculators and computer used to record and process information
   - ► Finding the median and mean (weighted average) using frequency data
   - ► Effect of additional data on measures of central tendency
2. Make inferences and formulate and evaluate arguments based on displays and analysis of data.
3. Estimate lines of best fit and use them to interpolate within the range of the data.
4. Use surveys and sampling techniques to generate data and draw conclusions about large groups.

4.4.8 B. Probability

1. Interpret probabilities as ratios, percents, and decimals.
2. Determine probabilities of compound events.
3. Explore the probabilities of conditional events (e.g., if there are seven marbles in a bag, three red and four green, what is the probability that two marbles picked from the bag, without replacement, are both red).
4. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models.
   - ► Frequency, relative frequency
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.
6. Play and analyze probability-based games, and discuss the concepts of fairness and expected value.

4.4.8 C. Discrete Mathematics–Systematic Listing and Counting

1. Apply the multiplication principle of counting.
   - ► Permutations: ordered situations with replacement (e.g., number of possible license plates) vs. ordered situations without replacement (e.g., number of possible slates of 3 class officers from a 23 student class)
   - ► Factorial notation
   - ► Concept of combinations (e.g., number of possible delegations of 3 out of 23 students)
2. Explore counting problems involving Venn diagrams with three attributes (e.g., there are 15, 20, and 25 students respectively in the chess club, the debating team, and the engineering society; how many different students belong to the three clubs if there are 6 students in chess and debating, 7 students in chess and engineering, 8 students in debating and engineering, and 2 students in all three?).
3. Apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.

4.4.8 D. Discrete Mathematics–Vertex-Edge Graphs and Algorithms

1. Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems.
   - ► Finding the shortest network connecting specified sites
   - ► Finding a minimal route that includes every street (e.g., for trash pick-up)
   - ► Finding the shortest route on a map from one site to another
   - ► Finding the shortest circuit on a map that makes a tour of specified sites
   - ► Limitations of computers (e.g., the number of routes for a delivery truck visiting n sites is n!, so finding the shortest circuit by examining all circuits would overwhelm the capacity of any computer, now or in the future, even if n is less than 100)

STANDARD 4.5 Mathematical Processes

All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

4.5 A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts.
   - ► Open-ended problems
   - ► Non-routine problems
   - ► Problems with multiple solutions

- ► Problems that can be solved in several ways

3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.

4.5 B. Communication

1. Use communication to organize and clarify mathematical thinking.
   - ► Reading and writing
   - ► Discussion, listening, and questioning
2. Communicate mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.
4. Use the language of mathematics to express mathematical ideas precisely.

4.5 C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

4.5 D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
   - ► Counterexamples as a means of disproving conjectures
   - ► Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

4.5 E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
   - ► Concrete representations (e.g., base-ten blocks or algebra tiles)
   - ► Pictorial representations (e.g., diagrams, charts, or tables)
   - ► Symbolic representations (e.g., a formula)
   - ► Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

4.5 F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences.

NEW JERSEY Grades 9-12
Core Content Curriculum Standards

STANDARD 4.1 Number and Numerical Operations

All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.

4.1.12 A. Number Sense

1. Extend understanding of the number system to all real numbers.
2. Compare and order rational and irrational numbers.
3. Develop conjectures and informal proofs of properties of number systems and sets of numbers.

4.1.12 B. Numerical Operations

1. Extend understanding and use of operations to real numbers and algebraic procedures.
2. Develop, apply, and explain methods for solving problems involving rational and negative exponents.
3. Perform operations on matrices.
   - ► Addition and subtraction
   - ► Scalar multiplication
4. Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.

4.1.12 C. Estimation

1. Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.

STANDARD 4.2 Geometry and Measurement

All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.

4.2.12 A. Geometric Properties

1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).
3. Apply the properties of geometric shapes.
   - ► Parallel lines–transversal, alternate interior angles, corresponding angles
   - ► Triangles
     a. Conditions for congruence
     b. Segment joining midpoints of two sides is parallel to and half the length of the third side
     c. Triangle Inequality
   - ► Minimal conditions for a shape to be a special quadrilateral
   - ► Circles–arcs, central and inscribed angles, chords, tangents
   - ► Self-similarity
4. Use reasoning and some form of proof to verify or refute conjectures and theorems.
   - ► Verification or refutation of proposed proofs
   - ► Simple proofs involving congruent triangles
   - ► Counterexamples to incorrect conjectures

4.2.12 B. Transforming Shapes

1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic object, and, conversely, determine whether and how one object can be transformed to another by a transformation or a sequence of transformations.
2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.
3. Determine whether two or more given shapes can be used to generate a tessellation.
4. Generate and analyze iterative geometric patterns.
   - ► Fractals (e.g., Sierpinski's Triangle)
   - ► Patterns in areas and perimeters of self-similar figures
   - ► Outcome of extending iterative process indefinitely

4.2.12 C. Coordinate Geometry

1. Use coordinate geometry to represent and verify properties of lines.
   - ► Distance between two points
   - ► Midpoint and slope of a line segment
   - ► Finding the intersection of two lines
   - ► Lines with the same slope are parallel
   - ► Lines that are perpendicular have slopes whose product is –1
2. Show position and represent motion in the coordinate plane using vectors.
   - ► Addition and subtraction of vectors

4.2.12 D. Units of Measurement

1. Understand and use the concept of significant digits.
2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.
   - ► Degree of accuracy of a given measurement tool

- ► Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

4.2.12 E. Measuring Geometric Objects

1. Use techniques of indirect measurement to represent and solve problems.
   - ► Similar triangles
   - ► Pythagorean theorem
   - ► Right triangle trigonometry (sine, cosine, tangent)
2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
   - ► Approximation of area using grids of different sizes
   - ► Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators, dynamic geometric software, and/or spreadsheets
   - ► Estimation of area, perimeter, volume, and surface area

STANDARD 4.3 Patterns and Algebra

All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

4.3.12 A. Patterns

1. Use models and algebraic formulas to represent and analyze sequences and series.
   - ► Explicit formulas for nth terms
   - ► Sums of finite arithmetic series
   - ► Sums of finite and infinite geometric series
2. Develop an informal notion of limit.
3. Use inductive reasoning to form generalizations.

4.3.12 B. Functions and Relationships

1. Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.
2. Analyze and explain the general properties and behavior of functions of one variable, using appropriate graphing technologies.
   - ► Slope of a line or curve
   - ► Domain and range
   - ► Intercepts
   - ► Continuity
   - ► Maximum/minimum
   - ► Estimating roots of equations
   - ► Intersecting points as solutions of systems of equations
   - ► Rates of change
3. Understand and perform transformations on commonly-used functions.
   - ► Translations, reflections, dilations
   - ► Effects on linear and quadratic graphs of parameter changes in equations
   - ► Using graphing calculators or computers for more complex functions
4. Understand and compare the properties of classes of functions, including exponential, polynomial, rational, and trigonometric functions.
   - ► Linear vs. non-linear
   - ► Symmetry
   - ► Increasing/decreasing on an interval

4.3.12 C. Modeling

1. Use functions to model real-world phenomena and solve problems that involve varying quantities.
   - ► Linear, quadratic, exponential, periodic (sine and cosine), and step functions (e.g., price of mailing a first-class letter over the past 200 years)
   - ► Direct and inverse variation
   - ► Absolute value
   - ► Expressions, equations and inequalities
   - ► Same function can model variety of phenomena
   - ► Growth/decay and change in the natural world
   - ► Applications in mathematics, biology, and economics (including compound interest)
2. Analyze and describe how a change in an independent variable leads to change in a dependent one.
3. Convert recursive formulas to linear or exponential functions (e.g., Tower of Hanoi and doubling).

4.3.12 D. Procedures

1. Evaluate and simplify expressions.
   - ► Add and subtract polynomials
   - ► Multiply a polynomial by a monomial or binomial
   - ► Divide a polynomial by a monomial
2. Select and use appropriate methods to solve equations and inequalities.
   - ► Linear equations–algebraically
   - ► Quadratic equations–factoring (when the coefficient of x^2 is 1) and using the quadratic formula
   - ► All types of equations using graphing, computer, and graphing calculator techniques
3. Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.

STANDARD 4.4 Data Analysis, Probability, and Discrete Mathematics

All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

4.4.12 A. Data Analysis

1. Use surveys and sampling techniques to generate data and draw conclusions about large groups.
   - ► Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)
2. Evaluate the use of data in real-world contexts.
   - ► Accuracy and reasonableness of conclusions drawn
   - ► Bias in conclusions drawn (e.g., influence of how data is displayed)
   - ► Statistical claims based on sampling
3. Design a statistical experiment, conduct the experiment, and interpret and communicate the outcome.
4. Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.
5. Analyze data using technology, and use statistical terminology to describe conclusions.
   - ► Measures of dispersion: variance, standard deviation, outliers
   - ► Correlation coefficient
   - ► Normal distribution (e.g., approximately 95% of the sample lies between two standard deviations on either side of the mean)

4.4.12 B. Probability

1. Calculate the expected value of a probability-based game, given the probabilities and payoffs of the various outcomes, and determine whether the game is fair.
2. Use concepts and formulas of area to calculate geometric probabilities.
3. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models, and solve problems using these models.
4. Determine probabilities in complex situations.
   - ► Conditional events
   - ► Complementary events
   - ► Dependent and independent events
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.
6. Understand and use the "law of large numbers" (that experimental results tend to approach theoretical probabilities after a large number of trials).

4.4.12 C. Discrete Mathematics–Systematic Listing and Counting

1. Calculate combinations with replacement (e.g., the number of possible ways of tossing a coin 5 times and getting 3 heads) and without replacement (e.g., number of possible delegations of 3 out of 23 students).
2. Apply the multiplication rule of counting in complex situations, recognize the difference between situations with replacement and without replacement, and recognize the difference between ordered and unordered counting situations.
3. Justify solutions to counting problems.
4. Recognize and explain relationships involving combinations and Pascal's Triangle, and apply those methods to situations involving probability.

4.4.12 D. Discrete Mathematics–Vertex–Edge Graphs and Algorithms

1. Use vertex–edge graphs and algorithmic thinking to represent and solve practical problems.
   - ► Circuits that include every edge in a graph
   - ► Circuits that include every vertex in a graph
   - ► Scheduling problems (e.g., when project meetings should be scheduled to avoid conflicts) using graph coloring
   - ► Applications to science (e.g., who-eats-whom graphs, genetic trees, molecular structures)
2. Explore strategies for making fair decisions.
   - ► Combining individual preferences into a group decision (e.g., determining winner of an election or selection process)
   - ► Determining how many Student Council representatives each class (9th, 10th, 11th, and 12th grade) gets when the classes have unequal sizes (apportionment)

STANDARD 4.5 Mathematical Processes

All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.

4.5 A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts.
   - ► Open-ended problems
   - ► Non-routine problems
   - ► Problems with multiple solutions
   - ► Problems that can be solved in several ways
3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.

4.5 B. Communication

1. Use communication to organize and clarify mathematical thinking.
   - ► Reading and writing

- ► Discussion, listening, and questioning

2. Communicate mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.
4. Use the language of mathematics to express mathematical ideas precisely.

4.5 C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

4.5 D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
   - ► Counterexamples as a means of disproving conjectures
   - ► Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

4.5 E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
   - ► Concrete representations (e.g., base-ten blocks or algebra tiles)
   - ► Pictorial representations (e.g., diagrams, charts, or tables)
   - ► Symbolic representations (e.g., a formula)
   - ► Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

4.5 F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
4. Use graphing calculators and computer software to investigate properties of functions and their graphs.
3. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences.

NEW JERSEY Grade 8
Core Content Curriculum Standards

STANDARD 5.1 Scientific Processes

All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.

5.1.8 A. Habits of Mind

1. Evaluate the strengths and weaknesses of data, claims, and arguments.
2. Communicate experimental findings to others.
3. Recognize that the results of scientific investigations are seldom exactly the same and that replication is often necessary.
4. Recognize that curiosity, skepticism, open-mindedness, and honesty are attributes of scientists.

5.1.8 B. Inquiry and Problem Solving

1. Identify questions and make predictions that can be addressed by conducting investigations.
2. Design and conduct investigations incorporating the use of a control.
3. Collect, organize, and interpret the data that result from experiments.

5.1.8 C. Safety

1. Know when and how to use appropriate safety equipment with all classroom materials.
2. Understand and practice safety procedures for conducting science investigations.

STANDARD 5.2 Science and Society

All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.

5.2.8 A. Cultural Contributions

1. Recognize that scientific theories:
   - ► develop over time;
   - ► depend on the contributions of many people; and
   - ► reflect the social and political climate of their time.
2. Know that scientists are men and women of many cultures who often work together to solve scientific and technological problems.
3. Describe how different people in different cultures have made and continue to make contributions to science and technology.

5.2.8 B. Historical Perspectives

1. Describe the impact of major events and people in the history of science and technology, in conjunction with other world events.
2. Describe the development and exponential growth of scientific knowledge and technological innovations.

STANDARD 5.3 Mathematical Applications

All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

5.3.8 A. Numerical Operations

1. Express quantities using appropriate number formats.
   - ► decimals
   - ► percents
   - ► scientific notation

5.3.8 B. Geometry and Measurement

1. Perform mathematical computations using labeled quantities and express answers in correctly derived units.

5.3.8 C. Patterns and Algebra

1. Express physical relationships in terms of mathematical equations derived from collected data.

5.3.8 D. Data Analysis and Probability

1. Represent and describe mathematical relationships among variables using graphs and tables.
2. Analyze experimental data sets using measures of central tendency.
   - ► mean
   - ► mode
   - ► median
3. Construct and use a graph of experimental data to draw a line of best fit and identify a linear relationship between variables.
4. Use computer spreadsheets, graphing and database applications to assist in quantitative analysis of data.

STANDARD 5.4 Nature and Process of Technology

All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

5.4.8 A. Science and Technology

1. Compare and contrast science with technology, illustrating similarities and differences between these two human endeavors.

5.4.8 B. Nature of Technology

1. Analyze a product or system to determine the problem it was designed to solve, the design constraints, trade-offs and risks involved in using the product or system, how the product or system might fail, and how the product or system might be improved.

5.4.8 C. Technological Design

1. Recognize how feedback loops are used to control systems.

STANDARD 5.5 Characteristics of Life

All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

5.5.8 A. Matter, Energy and Organization in Living Systems

1. Explain how the products of respiration and photosynthesis are recycled.
2. Recognize that complex multi cellular organisms, including humans, are composed of and defined by interactions of the following:
   - ► cells;
   - ► tissues;
   - ► organs; and
   - ► systems

5.5.8 B. Diversity and Biological Evolution

1. Compare and contrast kinds of organisms using their internal and external characteristics.
2. Discuss how changing environmental conditions can result in evolution or extinction of a species.
3. Recognize that individual organisms with certain traits are more likely to survive and have offspring.

5.5.8 C. Reproduction and Heredity

1. Describe how the sorting and recombining of genetic material results in the potential for variation among offspring of humans and other species.

STANDARD 5.6 Chemistry

All students will gain an understanding of the structure and behavior of matter.

5.6.8 A. Structure and Properties of Matter

1. Know that all matter is composed of atoms that may join together to form molecules.
2. Recognize that the phase of matter is determined by the arrangement and motion of atoms and molecules and that the motion of these particles is related to the energy of the system.
3. Know that there are groups of elements that have similar properties, including highly reactive metals, less reactive metals, highly reactive non-metals, and some almost completely non-reactive gases.
4. Recognize that a mixture often can be separated into the original substances using one of more of their characteristic physical properties

5.6.8 B. Chemical Reactions

1. Show how substances can chemically react with each other to form new substances having properties different from those of the original substances.
2. Show that in most chemical reactions energy is transferred into or out of a system.
3. Demonstrate that regardless how substances within a simple closed system interact, the total mass of the system remains the same.
4. Illustrate how atoms are rearranged when substances react, but that the total number of atoms and the total mass of the products remain the same as the original substances.

STANDARD 5.7 Physics

All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.

5.7.8 A. Motion and Forces

1. Use quantitative data to show that when more than one force acts on an object at the same time, the forces can reinforce or cancel each other producing a net (unbalanced) force that will change speed and/or direction of the object.
2. Recognize that every object exerts a gravitational force on every other object, and that the force depends on how much mass the objects have and how far apart they are.

5.7.8 B. Energy Transformations

1. Recognize that the sun is a major source of the Earth's energy and that solar energy includes visible, infrared and ultraviolet radiation.
2. Describe the nature of various forms of energy, including heat, light, sound, chemical, mechanical, and electrical and trace energy transformations from one form to another.
3. Describe how heat can be conducted through materials or transferred across space by radiation and know that if the material is a fluid, convection currents may aid the transfer of heat.
4. Show that light is reflected, refracted, or absorbed when it interacts with matter and that colors may appear as a result of this interaction.

STANDARD 5.8 Earth Science

All students will gain an understanding of the structure, dynamics, and geophysical systems of the Earth.

5.8.8 A. Earth's Properties and Materials

5.8.8 B. Atmosphere and Water

1. Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps.

5.8.8 C. Processes that Shape the Earth

1. Explain how Earth's landforms and materials are created through constructive and destructive processes.

2. Show how successive layers of sedimentary rock and the fossils contained in them can be used to confirm the age, history, changing life forms, and geology of Earth.

5.8.8 D. How We Study the Earth

1. Utilize data gathered from emerging technologies (e.g., geographic information systems (GIS) and global positioning systems (GPS)) to create representations and describe processes of change on the Earth's surface.
2. Explain how technology designed to investigate features of the Earth's surface impacts how scientists study the Earth.

STANDARD 5.9 Astronomy and Space Science

All students will gain an understanding of the origin, evolution, and structure of the universe

5.9.8 A. Earth, Moon, Sun System

1. Investigate the Earth, moon, and sun as a system and explain how the motion of these bodies results in the phases of the moon and eclipses.
2. Explain how the regular and predictable motions of the Earth and moon produce tides.
3. Explain how the tilt, rotation, and orbital pattern of the Earth relative to the sun produce seasons and weather patterns.

5.9.8 B. Solar System

1. Describe the physical characteristics of the planets and other objects within the solar system and compare Earth to the rest of the planets.

5.9.8 C. Stars

1. Understand that the sun is a star and that it shares characteristics with other stars.

5.9.8 D. Galaxies and Universe

1. Know that the universe consists of many billions of galaxies, each including billions of stars.

STANDARD 5.10 Environmental Studies

All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.

5.10.8 A. Natural Systems and Interactions

1. Investigate the impact of catastrophic events such as forest fires, floods, and hurricanes on the environment of New Jersey.

5.10.8 B. Human Interactions and Impact

1. Compare and contrast practices that affect the use and management of natural resources.

NEW JERSEY Grades 9-12
Core Content Curriculum Standards

STANDARD 5.1 Scientific Processes

All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.

5.1.12 A. Habits of Mind

1. When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.
2. Assess the risks and benefits associated with alternative solutions.
3. Engage in collaboration, peer review, and accurate reporting of findings.
4. Explore cases that demonstrate the interdisciplinary nature of the scientific enterprise.

5.1.12 B. Inquiry and Problem Solving

1. Select and use appropriate instrumentation to design and conduct investigations.
2. Show that experimental results can lead to new questions and further investigations.

5.1.12 C. Safety

1. Understand, evaluate and practice safe procedures for conducting science investigations.

STANDARD 5.2 Science and Society

All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.

5.2.12 A. Cultural Contributions

1. Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

5.2.12 B. Historical Perspectives

1. Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.
2. Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.
3. Describe the historical origin of important scientific developments such as atomic theory, genetics, and plate tectonics showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.

STANDARD 5.3 Mathematical Applications

All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

5.1.12 A. Numerical Operations

5.1.12 B. Geometry and Measurement

1. When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.

5.1.12 C. Patterns and Algebra

1. Apply mathematical models that describe physical phenomena to predict real world events.

5.1.12 D. Data Analysis and Probability

1. Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions.

STANDARD 5.4 Nature and Process of Technology

All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

5.4.12 A. Science and Technology

1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

5.4.12 B. Nature of Technology

1. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

5.4.12 C. Technological Design

1. Plan, develop, and implement a proposal to solve an authentic, technological problem.

STANDARD 5.5 Characteristics of Life

All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

5.5.12 A. Matter, Energy and Organization in Living Systems

1. Relate the structure of molecules to their function in cellular structure and metabolism.
2. Explain how plants convert light energy to chemical energy.

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

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

3. Describe how plants produce substances high in energy content that become the primary source of energy for life.
4. Relate disease in humans and other organisms to infections or intrinsic failures of system.

5.5.12 B. Diversity and Biological Evolution

1. Explain that through evolution the Earth's present species developed from earlier distinctly different species.
2. Explain how the theory of natural selection accounts for extinction as well as an increase in the proportion of individuals with advantageous characteristics within a species.

5.5.12 C. Reproduction and Heredity

1. Describe how information is encoded and transmitted in genetic material.
2. Explain how genetic material can be altered by natural and/or artificial means and how mutations and new gene combinations may have positive, negative, or no effect on organisms or species.
3. Assess the impact of current and emerging technologies on our understanding of inherited human characteristics.

STANDARD 5.6 Chemistry

All students will gain an understanding of the structure and behavior of matter.

5.6.12 A. Structure and Properties of Matter

1. Know that atoms are made of a positive nucleus surrounded by negative electrons and that the nucleus, a tiny fraction of the volume of an atom, is composed of protons and neutrons, each almost 2,000 times more massive than an electron.
2. Know that the number of protons in the nucleus defines the element.
3. Know that an atom's electron arrangement, particularly the outermost electrons, determines how the atom can interact with other atoms.
4. Explain that atoms form bonds (ionic and covalent) with other atoms by transferring or sharing electrons.
5. Explain how the Periodic Table of Elements reflects the relationship between the properties of elements and their atomic structure.
6. Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.
7. Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.
8. Know that different levels of energy of an atom are associated with different configurations of its electrons.

5.6.12 B. Chemical Reactions

1. Explain that the rate of reactions among atoms and molecules depends on how often they encounter one another and that the rate is affected by nature of reactants, concentration, pressure, temperature, and the presence of a catalyst.
2. Show that some changes in chemical bonds require a net input or net release of energy.

STANDARD 5.7 Physics

All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.

5.7.12 A. Motion and Forces

1. Apply the mathematical relationship between the mass of an object, the net force exerted on it, and the resulting acceleration.
2. Explain that whenever one object exerts a force on another, an equal and opposite force is exerted on the first object.
3. Recognize gravity as a universal force of attraction between masses and that the force is proportional to the masses and inversely proportional to the square of the distance between them.
4. Recognize that electrically charged bodies can attract or repel each other with a force that depends upon the size and nature of the charges and the distance between them and know that electric forces play an important role in explaining the structure and properties of matter.
5. Know that there are strong forces that hold the nucleus of an atom together and that significant amounts of energy can be released in nuclear reactions (fission, fusion, and nuclear decay) when these binding forces are disrupted.
6. Explain how electromagnetic, gravitational, and nuclear forces can be used to produce energy by causing chemical, physical, or nuclear changes and relate the amount of energy produced to the nature and relative strength of the force.
7. Demonstrate that moving electric charges can produce magnetic forces and moving magnets can produce electric forces.
8. Recognize that magnetic and electrical forces are different aspects of a single electromagnetic force.

5.7.12 B. Energy Transformations

1. Explain how the various forms of energy (heat, electricity, sound, light) move through materials and identify the factors that affect that movement.
2. Explain that while energy can be transformed from one form to another, the total energy of a closed system is constant.
3. Recognize that whenever mechanical energy is transformed, some heat is dissipated and is therefore unavailable for use.

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

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

4. Explain the nature of electromagnetic radiation and compare the components of the electromagnetic spectrum from radio waves to gamma rays.

STANDARD 5.8 Earth Science

All students will gain an understanding of the structure, dynamics, and geophysical systems of the Earth.

5.8.12 A. Earth's Properties and Materials

1. Explain the interrelationship of the geosphere, hydrosphere, and the atmosphere.

5.8.12 B. Atmosphere and Water

1. Describe how weather (in the short term) and climate (in the long term) involve the transfer of energy in and out of the atmosphere.

5.8.12 C. Processes that Shape the Earth

1. Use the theory of plate tectonics to explain the relationship among earthquakes, volcanoes, mid-ocean ridges, and deep-sea trenches.
2. Know that Earth is a system in which chemical elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles.
3. Recognize that the evolution of life on Earth has changed the composition of Earth's atmosphere through time.

5.8.12 D. How We Study the Earth

1. Analyze the evidence produced by a variety of techniques that is used to understand changes in the Earth that have occurred over time.
   - ► topography
   - ► fossils
   - ► rock stratification
   - ► ice cores
   - ► radiometric data

STANDARD 5.9 Astronomy and Space Science

All students will gain an understanding of the origin, evolution, and structure of the universe

5.9.12 A. Earth, Moon, Sun System

5.9.12 B. Solar System

1. Explain that our solar system coalesced from a nebular cloud of gas and dust left from exploding stars.

5.9.12 C. Stars

1. Describe the physical characteristics, stages of development, and the apparent motions of stars.

5.9.12 D. Galaxies and Universe

1. Describe data gathering and observation technologies and explain how they are used to explore the solar system and beyond.
2. Cite evidence to describe the scientific theory of the origin of the universe and the current explanations of its evolution.

STANDARD 5.10 Environmental Studies

All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.

5.10.12A. Natural Systems and Interactions

1. Distinguish naturally occurring process from those believed to have been modified by human interaction or activity.
   - ► climate change
   - ► ozone production
   - ► erosion and deposition
   - ► threatened and endangered specie

5.10.12 B. Human Interactions and Impact

1. Assess the impact of human activities on the cycling of matter and the flow of energy through ecosystems.
2. Use scientific, economic, and other data to assess environmental risks and benefits associated with societal activity.

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

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

Section C: ACT's College Readiness Standards Included in New Jersey's Grade 8–12 Core Content Curriculum Standards

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

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

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

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

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

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

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

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

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

Table C-5. ACT's College Readiness Standards — Science

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

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

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

Section D: ACT's WorkKeys Skills Included in New Jersey's Core Content Curriculum Standards

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

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

Because New Jersey educators are the experts on the New Jersey Core Content Curriculum Standards, we would strongly encourage them to examine this document and offer their interpretations.

WorkKeys Skills

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