GRADE-LEVEL EXPECTATIONS (GLE) HANDBOOK

FOURTH GRADE

LOUISIANA DEPARTMENT OF EDUCATION

CECIL J. PICARD
STATE SUPERINTENDENT OF EDUCATION

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LOUISIANA
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GRADE-LEVEL EXPECTATIONS HANDBOOK OVERVIEW

INTRODUCTION

In 1997, rigorous K–12 content standards were approved for mathematics, English language arts, science, social studies, foreign languages, and the arts. In conjunction with the development of these content standards, the Louisiana Department of Education (LDE) developed standards-based tests in English language arts, mathematics, science and social studies for grades 4, 8, 10, and 11. These tests have served as the basis for Louisiana's School and District Accountability System for several years. The development of Grade-Level Expectations (GLEs) in 2003 in English language arts, mathematics, science and social studies was a continuation of Louisiana's effort to expand and extend the content standards. GLEs identify what all students should know or be able to do by the end of a given grade level from prekindergarten through grade 12 in these four content areas.

PURPOSES OF THE GLE HANDBOOKS

The Louisiana Grade-Level Expectations handbooks include grade-specific information about the GLEs. Each handbook includes introductory information for each content area contained within the handbook, a glossary, and tables that map the relationship between the standards and/or strands, benchmarks, and GLEs. Each handbook also correlates with one of fourteen GLE posters.

GRADE-LEVEL EXPECTATIONS DEVELOPMENT GUIDELINES

Each grade-level expectation is meant to further define a content standard and benchmark(s). There is a progression of specificity; the standards represent broad statements, benchmarks are more specific, and GLEs provide the most detail. Grade-level expectations have been developed from prekindergarten through grade 12.

GLEs do not represent the entire curriculum for a given grade or course. Rather, they represent the core content that should be mastered by the end of a given year by all students. For mastery to be achieved at a given level, it may be necessary for those skills to be introduced at an earlier grade. Similarly, skills will need to be maintained after mastery has occurred.

The GLEs were developed with the following goals in mind:

- to articulate learning from PreK–12
- to be appropriate for the developmental or grade level of students
- to move from the concrete to the abstract
- to attend to prerequisite skills and understandings
- to be specific, but not so specific as to be too small in "grain size" compared with other GLEs for a particular content area

The GLEs were developed with an effort to avoid including:

- statements of curricular activities or instructional strategies
- value-laden concepts and understandings

SUMMARY OF GLE DEVELOPMENT PROCESS

In December 2002, the LDE selected Data Recognition Corporation (DRC) as the contractor for the Grade-Level Expectations Project. The steps in the process of developing the Grade-Level Expectations for English language arts, mathematics, science, and social studies are described below.

1. **Identifying National Consultants.** National consultants representing each content area were selected to provide a national perspective to the GLE project and to assist the LDE and DRC with various steps in the GLE development process.

2. **Conducting Teacher Committee Meetings.** In March and April of 2003, content-area development committees, comprised of approximately 120 Louisiana classroom teachers, administrators, special populations teachers, and resource teachers chosen for their knowledge of standards and curriculum, were convened to assist with the development of the GLEs for English language arts, mathematics, science, and social studies.

3. **Completing Initial drafts.** The draft GLEs for the four content areas were completed and prepared for further review.

4. **Convening Focus Groups.** Two eighty-member groups of educators, nominated by their districts, reviewed the draft GLEs for horizontal and vertical alignments with the standards for English language arts, mathematics, science, and social studies and provided additional input on these initial drafts to the LDE.

5. **Conducting an Online/Electronic Public Review.** An online/electronic public review and feedback system was developed for the GLEs and made available on the LDE Web site. The purpose of this review was to solicit a broad range of feedback on the GLEs from parents, teachers, and other stakeholders.

6. **Completing an External Review.** With assistance from the staff of the Council of Chief State School Officers (CCSSO), twelve content specialists (three per content area) from other states or from universities or educational organizations across the nation were invited to serve on the review committee. In addition, the LDE also invited the national consultants from each content area to participate in the review meeting to answer questions about the development of the GLEs. External review committee members reviewed the GLE documents prior to the meetings, met with national consultants and LDE staff, and provided specific feedback on the GLEs via a written report.

7. **Conducting Final Committee Meeting.** The public comments and suggestions from the online public review were tabulated, and the additional comments and feedback from the external review committee meeting were compiled for sharing with committee members during the third and final GLE development committee meeting. The outcome of the third meeting of content-area committees consisted of suggestions for final edits that would be incorporated into the documents for presentation to the Louisiana State Board of Elementary and Secondary Education.

8. **Obtaining SBESE Board Approval of the GLEs.** In October 2003, the LDE staff presented the GLEs to the Louisiana State Board of Elementary and Secondary Education for review and approval.

9. **Conducting Preworkshops and GLE Awareness Workshops.** Two preworkshops for district supervisors in early December 2003 and fifteen GLE awareness workshops for local school personnel in late January 2004 have been conducted to inform educators about the grade-level expectations and their future role as it relates to curriculum and assessment

CONCLUSION

Louisiana's content standards and benchmarks have guided the Louisiana education reform program for several years. As an extension of the content standards and benchmarks, the GLEs provide a link among instruction, curriculum, and assessment. The primary goal is a common understanding among parents, students, teachers, and the general public about what is expected of Louisiana students as they progress from grade to grade.

ENGLISH LANGUAGE ARTS INTRODUCTION

INTRODUCTION

Louisiana's English language arts content standards encompass reading, writing, researching, and listening and speaking. Each benchmark within a standard delineates what students should know and be able to do by the end of a grade cluster. Grade-Level Expectations (GLEs) further define the knowledge and skills students are expected to master by the end of each grade or high school course. The GLEs for each grade are developmentally appropriate and increase in complexity to build the knowledge and skills students need. For example, the GLE in PreK, "participate in group-shared writing experiences that include rhyming and descriptive words," begins the development of the concept "recognizing and applying literary devices." In subsequent grades, GLEs build on this foundational literary concept.

ELEMENTARY: PREKINDERGARTEN–GRADE 4

At the elementary level, prekindergarten through third-grade students focus on understanding and learning the basics of how to read. The building blocks of reading as presented in *The Reading First Initiative* and the *National Reading Panel Report (2000)* provide the foundation for the GLEs. These building blocks emphasize five areas of reading instruction: phonemic awareness, phonics, vocabulary, fluency, and text comprehension. The GLEs emphasize these building blocks.

To develop a basic understanding of a text, beginning readers in prekindergarten through third grade should be able to 1) use context and other word-identification strategies, 2) recognize what a text is mainly about, and 3) recognize some supporting information within a text. As students become more confident in their ability to decode (read) and encode (write) text, they make a process transition from *learning to read* to *reading to learn*. By fourth grade, students shift from using only basic skills and strategies as they learn to read to developing higher-level thinking skills as they gain an ability to understand the structures and concepts of more complex literary and informational texts.

At the elementary level, prekindergarten through third-grade students focus on understanding and learning the basics of how to write. Students learn to write for different purposes. At these grade levels, students learn the mechanics of how to write and how to use the basic writing formats. In the fourth grade, students develop writing skills that include using organizational strategies as well as applying writing processes.

Listening skills for PreK through fourth grade show progression from being able to follow simple directions to the ability to understand, respond to, compare, and critique messages heard from a variety of sources. At the earliest levels, speaking skills are demonstrated in the expression of feelings, needs, and ideas. As children mature, speaking skills progress through a continuum, culminating in the delivery of rehearsed oral presentations.

In the elementary grades, students begin the process of developing skills to acquire and communicate knowledge using a variety of sources, including technology. From identifying and describing simple schedules and charts to interpreting complex graphic organizers such as maps, diagrams, timelines, and tables, students learn to locate, select, and synthesize information from a variety of resources.

ENGLISH LANGUAGE ARTS INTRODUCTION

MIDDLE SCHOOL: GRADES 5–8

At the middle school level, the focus is on developing an understanding of literary and structural elements found in literature and informational texts. Students deepen understanding of texts by developing and applying critical thinking skills to become more independent learners. Learning to make connections among events, characters, and other story elements helps students relate what they have read to their own lives and experiences. To make rigorous academic progress, students at the middle school level should comprehend and process texts that are organized in a variety of ways to accomplish different purposes.

Fifth-grade through eighth-grade students develop competence in communicating thoughts and ideas through written expression. At this level, students write multiparagraph compositions for different purposes, within specific contexts, and for a variety of audiences. By implementing the practices of good writing, grammar, and usage, student writers develop skill in writing with increased clarity and complexity.

Speaking and listening skills at this grade cluster focus on effective oral communication and include students preparing and giving formal and informal presentations. Knowledge of the research process extends as students gain skill in accessing, evaluating, and documenting information using technology resources to produce research reports.

HIGH SCHOOL: GRADES 9–12

At the high school level, students in grades nine through twelve focus on developing the ability to bring multiple levels of understanding to the texts that they read. Students employ critical thinking strategies such as asking questions as they read, making predictions, drawing conclusions, and creating meanings to match their initial assumptions about a text. Students at this level read between and beyond the lines of sophisticated, complex texts in order to shape their learning and to do more critical thinking at school and in real life.

Ninth-grade through twelfth-grade students develop competence in using writing processes to craft a wide variety of compositions for academic as well as real-life purposes. At this level, writers develop individual styles and increase proficiency in revising, editing, and proofreading their own work.

Speaking and listening skills are fine-tuned at this level and include learning both to follow and communicate complex directions and to prepare and deliver oral responses and complex presentations. Students gain skill in using all parts of the research process to produce thoughtful, well-organized research papers that have real-life and academic applications.

ENGLISH LANGUAGE ARTS INTRODUCTION

STANDARDS/BENCHMARKS/GLES

Codes at the end of each GLE are used to identify a developmental profile indicator from the *Louisiana Standards for Programs Serving Four-Year-Old Children* (Table 1) and/or benchmarks from the *Louisiana English Language Arts Content Standards* (Table 2). A GLE may apply to more than one benchmark; as a result, a GLE may have more than one code.

Developmental Profile Indicator Codes: The first term is always PK, which means prekindergarten. The second term indicates the domain and content area (i.e., Language and Literacy Development). The third term indicates the skill area (i.e., Listening, Speaking, Reading, Writing) and skill number (e.g., 1, 2).

Table 1. **Explanation of Developmental Profile Indicator Codes**

Code(s)	Explanation
PK-LL-L3	Prekindergarten, Language and Literacy Development, Listening, Skill 3
PK-LL-R4	Prekindergarten, Language and Literacy Development, Reading, Skill 4
PK-LL-S2	Prekindergarten, Language and Literacy Development, Speaking, Skill 2

GLE Numbering and Benchmark Codes:

Grade-Level Expectations are numbered consecutively in each grade level and grouped by standard in the following order:

- Standards 1, 6, and 7—Reading and responding
- Standards 2 and 3—Writing process and conventions of language
- Standard 4—Speaking and listening
- Standard 5—Using information resources

Benchmarks are coded by content area, standard number, and grade cluster. The first part is always ELA, which stands for English language arts. The second part, or term, indicates the standard number. The third term indicates the grade cluster and benchmark number.

Table 2. Explanation of Benchmark Codes

Code(s)	Explanation
G-1A-E1	Geography, Standard 1, Substrand A, Elementary, Benchmark 1
C-1B-E2	Civics, Standard 1, Substrand B, Elementary, Benchmark 2
E-1C-M2	Economics, Standard 1, Substrand C, Middle School, Benchmark 2
H-1C-H3	History, Standard 1, Substrand C, High School, Benchmark 3

FOURTH GRADE INTRODUCTION

Fourth Grade

Grade-Level Expectations (GLEs) for fourth grade focus on developing awareness of the nuances of reading and writing. Students identify and interpret literary elements of narratives and begin to understand the unique characteristics of expository text. Writing ability strengthens as students use writing processes to develop compositions that are carefully organized and elaborated with appropriate details. Their own distinctive voice emerges as they choose words and use descriptive and figurative language to express ideas appropriate for particular audiences or purposes. Fourth-grade students continue to develop speaking and listening skills during group interactions. They also learn to present informal and prepared oral presentations. Knowledge of the research process develops as students learn to access and document information from electronic and print sources.

SAMPLE PAGE AND KEY FOR ENGLISH LANGUAGE ARTS (ELA)

Standard

Standard One: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

Benchmarks	Grade-Level Expectations
ELA-1-E1: gaining meaning from print and building vocabulary using a full range of strategies (e.g., self-monitoring and correcting, searching, cross-checking), evidenced by reading behaviors using phonemic awareness, phonics, sentence structure, and meaning	1. Use understanding of base words, roots, prefixes, and suffixes to decode more complex words (ELA-1-E1) 2. Determine the meaning of unfamiliar words using knowledge of word origins and inflections (ELA-1-E1) 3. Determine word meanings, word choices, and pronunciations using a broad variety of reference aids such as dictionaries, thesauruses, synonym finders, and reference software (ELA-1-E1)
ELA-1-E2: using the conventions of print (e.g., left-to-right directionality, top-to-bottom, one-to-one matching, sentence framing)	
ELA-1-E3: adjusting speed of reading (e.g., appropriate pacing, intonation, expression) to suit the difficulty of materials and the purpose for reading (e.g., enjoying, learning, problem solving)	4. Adjust speed of reading to accomplish purpose based on text complexity (ELA-1-E3)
ELA-1-E4: recognizing story elements (e.g., setting, plot, character, theme) and literary devices (e.g., simile, dialogue, personification) within a selection	5. Identify a variety of story elements, including: • the impact of setting on character • multiple conflicts • first- and third-person points of view • development of theme (ELA-1-E4) 6. Identify literary devices, including metaphor and hyperbole (ELA-1-E4)

Benchmarks

Grade-Level Expectations (GLEs)

FOURTH GRADE
ENGLISH LANGUAGE ARTS (ELA)

Standard One: Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

Benchmarks	Grade-Level Expectations
ELA-1-E1: gaining meaning from print and building vocabulary using a full range of strategies (e.g., self-monitoring and correcting, searching, cross-checking), evidenced by reading behaviors using phonemic awareness, phonics, sentence structure, and meaning	1. Use understanding of base words, roots, prefixes, and suffixes to decode more complex words (ELA-1-E1) 2. Determine the meaning of unfamiliar words using knowledge of word origins and inflections (ELA-1-E1) 3. Determine word meanings, word choices, and pronunciations using a broad variety of reference aids such as dictionaries, thesauruses, synonym finders, and reference software (ELA-1-E1)
ELA-1-E2: using the conventions of print (e.g., left-to-right directionality, top-to-bottom, one-to-one matching, sentence framing)	
ELA-1-E3: adjusting speed of reading (e.g., appropriate pacing, intonation, expression) to suit the difficulty of materials and the purpose for reading (e.g., enjoying, learning, problem solving)	4. Adjust speed of reading to accomplish purpose based on text complexity (ELA-1-E3)

ELA-1-E4: recognizing story elements (e.g., setting, plot, character, theme) and literary devices (e.g., simile, dialogue, personification) within a selection	5. Identify a variety of story elements, including: • the impact of setting on character • multiple conflicts • first- and third-person points of view • development of theme (ELA-1-E4) 6. Identify literary devices, including metaphor and hyperbole (ELA-1-E4)
ELA-1-E5: reading, comprehending, and responding to written, spoken, and visual texts in extended passages (e.g., range for fiction passages—450-1,000 words; range for nonfiction—450-850 words)	7. Answer literal and inferential questions about ideas and information in grade-appropriate texts in oral and written responses (ELA-1-E5)
ELA-1-E6: interpreting (e.g., retelling, summarizing) texts to generate connections to real-life situations	8. Connect information in grade-appropriate texts to prior knowledge and real-life situations in oral and written responses (ELA-1-E6)
ELA-1-E7: reading with fluency (natural sequencing of words) for various purposes (e.g., enjoying, learning, problem solving)	9. Increase oral and silent reading fluency and accuracy with grade-appropriate texts (ELA-1-E7) 10. Demonstrate oral reading fluency of at least 140 words per minute in fourth-grade text with appropriate pacing, intonation, and expression (ELA-1-E7)
Standard Six: Students read, analyze, and respond to literature as a record of life experiences.	
Benchmarks	**Grade-Level Expectations**
ELA-6-E1: recognizing and responding to United States and world literature that represents the experiences and traditions of diverse ethnic groups	11. Compare and contrast stories/tales from different cultures and explain the influence of culture on each tale in oral, written, and visual responses (ELA-6-E1)

ELA-6-E2: recognizing and responding to a variety of classic and contemporary fiction and non- fiction literature from many genres (e.g., folktales, legends, myths, biography, autobiography, poetry, short stories)	12. Identify a variety of types of literature, including poetry and short stories, in oral and written responses (ELA-6-E2)
ELA-6-E3: identifying and distinguishing key differences of various genres	13. Identify and explain the defining characteristics of various types of literature, including the myth and the legend (ELA-6-E3)
Standard Seven: Students apply reasoning and problem-solving skills to reading, writing, speaking, listening, viewing, and visually representing.	
Benchmarks	**Grade-Level Expectations**
ELA-7-E1: using comprehension strategies (e.g., sequencing, predicting, drawing conclusions, comparing and contrasting, making inferences, determining main ideas) to interpret oral, written, and visual texts	14. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, such as: • sequencing events and steps in a process • explaining how the setting impacts other story elements, including the characters' traits and actions • using specific evidence from a story to describe a character's traits, actions, relationships, and/or motivations • confirming or denying a prediction about information in a text • comparing and contrasting story elements or information within and across texts • identifying stated main ideas and supporting details • making simple inferences (ELA-7-E1)
ELA-7-E2: using basic reasoning skills, life experiences, and available information to solve problems in oral, written, and visual texts	15. Justify solutions to problems in texts by verifying, confirming, and supporting (ELA-7-E2)

ELA-7-E3: recognizing an author's purpose (reason for writing), and viewpoint (perspective)	16. Distinguish an author's purpose for writing, including entertaining, expressing an opinion, defending an argument, or conveying information (ELA-7-E3) 17. Explain in oral or written responses how an author's life and times are reflected in a text (ELA-7-E3) 18. Explain how an author's purpose influences organization of a text, word choice, and sentence structure (ELA-7-E3)
ELA-7-E4: using basic reasoning skills to distinguish fact from opinion, skim and scan for facts, determine cause and effect, generate inquiry, and make connections with real-life situations	19. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including: • supporting differences between fact and opinion with information from texts • skimming and scanning texts for various purposes (e.g., locating information, verifying facts) • identifying cause-effect relationships in texts and real-life situations • generating questions to guide examination of topics in texts and real-life situations • explaining connection between information from texts and real-life experiences (ELA-7-E4)

Standard Two: Students write competently for a variety of purposes and audiences.	
Benchmarks	**Grade-Level Expectations**
ELA-2-E1: drawing, dictating and writing compositions that clearly state or imply a central idea with supporting details in a logical, sequential order (beginning, middle, end)	20. Write compositions of at least three paragraphs organized with the following: • a clearly stated central idea • an introduction and a conclusion • a middle developed with supporting details • a logical, sequential order • transitional words and phrases that unify points and ideas (ELA-2-E1) 21. Organize individual paragraphs with topic sentences, relevant elaboration, and concluding sentences (ELA-2-E1)
ELA-2-E2: focusing on language (vocabulary), concepts, and ideas that show an awareness of the intended audience and/or purpose (e.g., classroom, real-life, workplace) in developing compositions	22. Identify an audience for a specific writing assignment and select appropriate vocabulary, details, and information to create a tone or set the mood and to affect or manipulate the intended audience (ELA-2-E2)
ELA-2-E3: creating written texts using the writing process	23. Develop grade-appropriate compositions by identifying and applying writing processes, including the following: • selecting topic and form • prewriting (e.g., brainstorming, researching, raising questions, generating graphic organizers) • drafting • conferencing with peers and teachers • revising based on feedback and use of various tools (e.g., LEAP21 Writer's Checklist, rubrics) • proofreading/editing • publishing using available technology (ELA-2-E3)

ELA-2-E4: using narration, description, exposition, and persuasion to develop compositions (e.g., stories, letters, poems, logs)	24. Develop paragraphs and compositions of at least three paragraphs using the various modes (i.e., description, narration, exposition, and persuasion), emphasizing narration and description (ELA-2-E4)
ELA-2-E5: recognizing and applying literary devices (e.g., figurative language)	25. Use a variety of literary devices, including hyperbole and metaphor, in compositions (ELA-2-E5)
ELA-2-E6: writing as a response to texts and life experiences (e.g., journals, letters, lists)	26. Write for various purposes, including: • formal and informal letters that follow a specific letter format, include relevant information, and use an appropriate closure • informational reports that include facts and examples and that present important details in a logical order • book reports that include an opinion and/or a persuasive viewpoint (ELA-2-E6)
Standard Three: Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.	
Benchmarks	**Grade-Level Expectations**
ELA-3-E1: writing legibly, allowing margins and correct spacing between letters in a word and words in a sentence	27. Write legibly in standard cursive or printed form, indenting paragraphs appropriately, using standard margins, and demonstrating fluency (ELA-3-E1)
ELA-3-E2: demonstrating use of punctuation (e.g., comma, apostrophe, period, question mark, exclamation mark), capitalization, and abbreviations in final drafts of writing assignments	28. Use standard English punctuation, including apostrophes in contractions and in the possessive case of singular and plural nouns (ELA-3-E2) 29. Capitalize greetings, titles of respect, and titles of books, articles, chapters, movies, and songs (ELA-3-E2)
ELA-3-E3: demonstrating standard English structure and usage by writing clear, coherent sentences	30. Write using standard English structure and usage, including: • using active and passive voices of verbs • avoiding writing with sentence fragments and run-on sentences (ELA-3-E3)

ELA-3-E4: using knowledge of the parts of speech to make choices for writing	31. Apply knowledge of parts of speech in writing, including: • selecting and using common interjections appropriately • identifying and using transitive and intransitive verbs correctly • identifying and using verb tenses correctly, including present perfect, past perfect, and future perfect • using grade-appropriate irregular verb tenses correctly (ELA-3-E4)
ELA-3-E5: spelling accurately using strategies (e.g., letter-sound correspondence, hearing and recording sounds in sequence, spelling patterns, pronunciation) and resources (e.g., glossary, dictionary) when necessary	32. Use knowledge of root words, affixes, and syllable constructions to spell words (ELA-3-E5) 33. Alphabetize to the fourth and fifth letters (ELA-3-E5)
Standard Four: Students demonstrate competence in speaking and listening as tools for learning and communicating.	
Benchmarks	**Grade-Level Expectations**
ELA-4-E1: speaking intelligibly, using standard English pronunciation	34. Adjust pacing to suit purpose, audience, and setting when speaking (ELA-4-E1)
ELA-4-E2: giving and following directions/procedures	35. Interpret, follow, and give multi-step directions (ELA-4-E2)
ELA-4-E3: telling or retelling stories in sequence	
ELA-4-E4: giving rehearsed and unrehearsed presentations	36. Deliver presentations that include the following: • information drawn from several sources and identification of the sources • effective introductions and conclusions • details, examples, anecdotes, or statistics that explain or clarify information • information selected to persuade or influence the audience (ELA-4-E4)

ELA-4-E5: speaking and listening for a variety of audiences (e.g., classroom, real-life, workplace) and purposes (e.g., awareness, concentration, enjoyment, information, problem solving)	37. Demonstrate active listening strategies, including asking questions, responding to cues, and making eye contact (ELA-4-E5) 38. Adjust speaking content according to the needs of the audience (ELA-4-E5)
ELA-4-E6: listening and responding to a wide variety of media (e.g., music, TV, film, speech)	39. Listen to and critique messages such as advertising that are communicated in a variety of mediums, including television and print (ELA-4-E6)
ELA-4-E7: participating in a variety of roles in group discussions (e.g., active listener, contributor, discussion leader)	40. Identify the effectiveness and dynamics of group process and cooperative learning (ELA-4-E7)
Standard Five: Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.	
Benchmarks	**Grade-Level Expectations**
ELA-5-E1: recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, alphabetizing, captions, legends, pull-down menus, keyword searches, icons, passwords, entry menu features)	41. Locate information using organizational features of a variety of resources, including: • electronic information such as keyword searches, passwords, and entry menu features • print materials such as indices, glossaries, table of contents, title pages, and map legends (ELA-5-E1) 42. Locate information using a broad variety of reference sources, including almanacs, atlases, newspapers, magazines, and brochures (ELA-5-E1)

ELA-5-E2: locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials)	43. Evaluate the usefulness of information selected from multiple sources, including: • library and online databases • electronic reference works • Internet information • community and government data • interviews • experiments • surveys (ELA-5-E2)
ELA-5-E3: locating, gathering, and selecting information using graphic organizers, simple outlining, note taking, and summarizing to produce texts and graphics	44. Use keywords and phrases to take notes from oral, written, and electronic media sources (ELA-5-E3) 45. Paraphrase or summarize information from a variety of sources (ELA-5-E3) 46. Construct simple outlines with main topics and subtopics that reflect the information gathered (ELA-5-E3)
ELA-5-E4: using available technology to produce, revise, and publish a variety of works (e.g., book reviews, summaries, short research reports)	47. Use electronic and print resources (e.g., spelling, grammar, and thesaurus checks) to revise and publish book reviews and research reports (ELA-5-E4)
ELA-5-E5: giving credit for borrowed information by telling or listing sources	48. Create a list of sources (e.g., books, encyclopedias, online resources) following a specified format (ELA-5-E5) 49. Define *plagiarism* (ELA-5-E5)
ELA-5-E6: recognizing and using graphic organizers (e.g., charts/graphs, tables/schedules, diagrams/maps)	50. Read and interpret timelines, charts, graphs, schedules, tables, diagrams, and maps generated from grade-appropriate materials (ELA-5-E6)

MATHEMATICS INTRODUCTION

INTRODUCTION

Grade-Level Expectations (GLEs) are explicit recommendations for what students should know and be able to do as a result of each level of schooling from prekindergarten through grade 12. This degree of specificity is made with the expectation that all students in Louisiana have access to a high-quality instructional program in mathematics. Instructional programs must provide all students with a solid foundation in mathematics, regardless of race or ethnic origin, geographical location, or socioeconomic status. The design, delivery, and assessment of such programs require careful planning, articulation, and coordination.

The GLEs provide a basis for all of these goals. Further, they clearly define what schools and teachers need to focus on in each year of instruction. This focus provides teachers with a quick listing of the main ideas that frame the year's study and, at the same time, helps students see the connections in the mathematics they are studying.

The following list of GLEs provides a comprehensive look at the expectations for all Louisiana mathematics students for each grade level. They define the targets for instruction, assessment, and emphasis during each year of public schooling. Further, they outline the promises that each teacher is striving to make to successive teachers about what their students know and can do. Such attempts at articulation serve to tighten the curriculum; help avoid programs that have great breadth, but no depth; and assist in helping teachers link the mathematics they are teaching to what students have already studied and to what they will be using in other areas of the curriculum.

ORGANIZATIONAL PRINCIPLES

All GLEs in mathematics are organized by grade levels and address one or more benchmarks in the six mathematics strands: Number and Number Relations; Algebra; Geometry; Measurement; Data Analysis, Probability, and Discrete Math; and Patterns, Relations, and Functions.

With the single exception of prekindergarten, there are GLEs representing each of the six strands for each grade level. In addition, the number of GLEs in each strand either increases or decreases depending on the experience of the learner. For example, most of the GLEs in prekindergarten and kindergarten are based on Number and Number Relations, and few are based on the Data Analysis, Probability, and Discrete Math, or Patterns, Relations and Functions strands. By grade 9, the trend reverses as students have completed most of their study of Number.

Not all high school students take the same courses, nor do they take them in the same order. As a result, the Grade-Level Expectations for grades 9 and 10 represent the content that all students should master before graduation. When mastery occurs will depend on the order in which courses are taken. The expectations are written with a view toward a greater integration of mathematics learning across these two grades than traditionally has been the case. For schools teaching separate courses in Algebra I and Geometry, the total of the Grade-Level Expectations for grades 9 and 10 should be considered as what students should be able to do by the end of grade 10, rather than thinking of these as separate outcomes for grade 9 and grade 10.

MATHEMATICS INTRODUCTION

The GLEs for grades 11/12 represent the core content for students who enroll in Algebra II and higher courses in preparation for post-secondary education. They reflect the content of collegiate entrance examinations and mathematics found in common applications in such programs of study.

BENCHMARK CODES

Codes at the end of each GLE are used to identify a developmental profile indicator from the *Louisiana Standards for Programs Serving Four-Year-Old Children* (Table 1) and/or benchmarks from the *Louisiana Mathematics Framework* (Table 2). A GLE may apply to more than one benchmark and, as a result, a GLE may have more than one code.

Developmental Profile Indicator Codes: The first part is always PK, which means prekindergarten. The second part indicates the domain and content area (i.e., Cognitive Mathematics). The third part indicates the skill area (i.e., Number, Measurement, Geometry, Data, Patterns) and skill number (e.g., 1, 2).

Table 1. Explanation of Developmental Profile Indicator Codes

Code(s)	Explanation
PK-CM-N1	Prekindergarten, Cognitive Mathematics, Number, Skill 1
PK-CM-M3	Prekindergarten, Cognitive Mathematics, Measurement, Skill 3
PK-CM- G2	Prekindergarten, Cognitive Mathematics, Geometry, Skill 2

Benchmark Codes: Benchmark codes have 3 parts. The first part in the benchmark code refers to the strand (e.g., Number and Number Relations). The second part refers to the benchmark number. The third part refers to the grade cluster (i.e., E, M, H).

Table 2. Explanation of Benchmark Codes

Code	Explanation
N-1-E	Number and Number Relations, Benchmark 1, Elementary
G-5-M	Geometry, Benchmark 5, Middle School
A-3-H	Algebra, Benchmark 3, High School

MATHEMATICS INTRODUCTION

Each of the following GLE grade listings opens with a concise note about the focal emphases of that grade. These emphases serve to shape and mold the program for that individual grade level. Such focal points at each level and the careful articulation of these ideas lead to significant growth in students' abilities to learn and profitably apply mathematics in their professional, vocational, and personal lives.

FOURTH GRADE INTRODUCTION

Fourth Grade

At grade 4, students focus on extending the place value system and continuing to develop concepts of multiplication and division. This includes fact mastery for the two operations, as well as the capability to handle the multiplication of 2-digit numbers and the division of a 3-digit number by a 1-digit number. Knowledge of numbers and their multiples and factors is developed to handle divisibility by 2, 3, 5, and 10. Paralleling the paper-and-pencil work with multiplication and division is the development of knowing when and how to estimate, as well as which computational technique (e.g., paper-and-pencil, mental, or calculator) is appropriate for a given situation. Working with fractions and decimals, students learn to represent and write decimals through hundredths and fractions through twelfths. Work with money skills is finalized, and students are expected to make change and compute money amounts reasonable to their ages.

In Measurement, grade 4 students apply their computational skills by working problems associated with length, area, temperature, capacity, and time, including simple elapsed time. In Geometry, students measure and classify angles as right, acute, and obtuse. Their concepts about geometric transformations are extended by making and testing conjectures about figures and the results of various operations on figures. Students' spatial skills are also extended through the use of perspective drawings and visualizations of rotations of objects. Descriptions of locations are developed through the use of number lines and coordinate grids.

At the grade 4 level, students are expected to be able to recognize trends, write summaries, and make predictions from data representations. These students also encounter mean, median, and mode and their use in describing central tendencies. Grade 4 students extend their abilities to represent and solve one-step problems where the solution is a whole number. This is paralleled in pattern work where the focus is on the ability to verbally represent a pattern and use it to produce the next few terms in a sequence.

SAMPLE PAGE AND KEY FOR MATHEMATICS

SAMPLE PAGE AND KEY FOR MATHEMATICS

Strand/ Standard

Number and Number Relations: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

Benchmarks	Grade-Level Expectations
N-1-E: constructing number meaning and demonstrating that a number can be expressed in many different forms (e.g., standard notation, number words, number lines, geometrical representation, fractions, and decimals)	1. Read and write place value in word, standard, and expanded form through 1,000,000 (N-1-E) 2. Read, write, compare, and order whole numbers using place value concepts, standard notation, and models through 1,000,000 (N-1-E) (N-3-E) (A-1-E) 3. Illustrate with manipulatives when a number is divisible by 2, 3, 5, or 10 (N-1-E) 4. Know all basic facts for multiplication and division through 12 x 12 and 144 ÷ 12, and recognize factors of composite numbers less than 50 (N-1-E) (N-6-E) (N-7-E) 5. Read, write, and relate decimals through hundredths and connect them with corresponding decimal fractions (N-1-E) 6. Model, read, write, compare, order, and represent fractions with denominators through twelfths using region and set models (N-1-E) (A-1-E) Also see GLE #7.
N-2-E: demonstrating number sense and estimation skills, giving particular attention to common equivalent reference points (i.e., 1/4 = 25% = .25; ½ = 50% = .5; $1 = 100%, etc.)	7. Give decimal equivalents of halves, fourths, and tenths (N-2-E) (N-1-E) 8. Use common equivalent reference points for percents (i.e., ¼, ½, ¾, and 1 whole) (N-2-E) 9. Estimate fractional amounts through twelfths, using pictures, models, and diagrams (N-2-E) Also see GLE #27.

Benchmarks

Grade-Level Expectations (GLEs)

FOURTH GRADE

MATHEMATICS

Number and Number Relations: In problem-solving investigations, students demonstrate an understanding of the real number system and communicate the relationships within that system using a variety of techniques and tools.

Benchmarks	Grade-Level Expectations
N-1-E: constructing number meaning and demonstrating that a number can be expressed in many different forms (e.g., standard notation, number words, number lines, geometrical representation, fractions, and decimals)	1. Read and write place value in word, standard, and expanded form through 1,000,000 (N-1-E) 2. Read, write, compare, and order whole numbers using place value concepts, standard notation, and models through 1,000,000 (N-1-E) (N-3-E) (A-1-E) 3. Illustrate with manipulatives when a number is divisible by 2, 3, 5, or 10 (N-1-E) 4. Know all basic facts for multiplication and division through 12 x 12 and 144 ÷ 12, and recognize factors of composite numbers less than 50 (N-1-E) (N-6-E) (N-7-E) 5. Read, write, and relate decimals through hundredths and connect them with corresponding decimal fractions (N-1-E) 6. Model, read, write, compare, order, and represent fractions with denominators through twelfths using region and set models (N-1-E) (A-1-E) Also see GLE #7.
N-2-E: demonstrating number sense and estimation skills, giving particular attention to common equivalent reference points (i.e., 1/4 = 25% = .25; ½ = 50% = .5; $1 = 100%, etc.)	7. Give decimal equivalents of halves, fourths, and tenths (N-2-E) (N-1-E) 8. Use common equivalent reference points for percents (i.e., ¼, ½, ¾, and 1 whole) (N-2-E) 9. Estimate fractional amounts through twelfths, using pictures, models, and diagrams (N-2-E) Also see GLE #27.

N-3-E: reading, writing, representing, comparing, ordering, and using whole numbers in a variety of forms (e.g., standard notation, number line, and geometrical representation)	See GLE #2.
N-4-E: demonstrating a conceptual understanding of the meaning of the basic arithmetic operations (add, subtract, multiply, and divide) and their relationships to each other	10. Solve multiplication and division number sentences including interpreting remainders (N-4-E) (A-3-E) Also see GLE #19.
N-5-E: selecting appropriate operation(s) (add, subtract, multiply, and divide) for a given situation	
N-6-E: applying a knowledge of basic math facts and arithmetic operations to real-life situations	11. Multiply 3-digit by 1-digit numbers, 2-digit by 2-digit numbers, and divide 3-digit numbers by 1-digit numbers, with and without remainders (N-6-E) (N-7-E) 12. Count money, determine change, and solve simple word problems involving money amounts using decimal notation (N-6-E) (N-9-E) (M-1-E) (M-5-E) Also see GLE #4.
N-7-E: constructing, using, and explaining procedures to compute and estimate with whole numbers (e.g., mental math strategies)	See GLEs #4 and #11.
N-8-E: selecting and using appropriate computational methods and tools for given situations involving whole numbers (e.g., estimation, mental arithmetic, calculator, or paper and pencil)	13. Determine when and how to estimate, and when and how to use mental math, calculators, or paper/pencil strategies to solve multiplication and division problems (N-8-E)
N-9-E: demonstrating the connection of number and number relations to the other strands and to real-life situations	14. Solve real-life problems, including those in which some information is not given (N-9-E) Also see GLE #12.

Algebra: In problem-solving investigations, students demonstrate an understanding of concepts and processes that allow them to analyze, represent, and describe relationships among variable quantities and to apply algebraic methods to real-world situations.	
Benchmarks	**Grade-Level Expectations**
A-1-E: demonstrating a conceptual understanding of variables, expressions, equations, and inequalities (e.g., use letters or boxes to represent values; understand =, ≠, <, and > symbols)	15. Write number sentences or formulas containing a variable to represent real-life problems (A-1-E) 16. Write a related story problem for a given algebraic sentence (A-1-E) 17. Use manipulatives to represent the distributive property of multiplication over addition to explain multiplying numbers (A-1-E) (A-2-E) Also see GLEs # 2 and #6.
A-2-E: modeling and developing strategies for solving equations and inequalities	18. Identify and create true/false and open/closed number sentences (A-2-E) 19. Solve one-step equations with whole number solutions (A-2-E) (N-4-E) Also see GLE #17.
A-3-E: recognizing the connection of algebra to the other strands and to real-life situations (e.g., number sentences or formulas to represent real-world problems)	See GLE #10.

Measurement: In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

Benchmarks	Grade-Level Expectations
M-1-E: applying (measure or solve measurement problem) the concepts of length (inches, feet, yards, miles, millimeters, centimeters, decimeters, meters, kilometers), area, volume, capacity (cups, liquid pints and quarts, gallons, milliliters, liters), weight (ounces, pounds, tons, grams, kilograms), mass, time (seconds, minutes, hours, days, weeks, months, years), money, and temperature (Celsius and Fahrenheit) to real-world experiences	See GLEs #12, #20 and #22.
M-2-E: selecting and using appropriate standard and non-standard units of measure (e.g., paper clips and Cuisenaire rods) and tools for measuring length, area, capacity, weight/mass, and time for a given situation by considering the purpose and precision required for the task	20. Measure length to the nearest quarter-inch and mm (M-2-E) (M-1-E) 21. Describe the concept of volume, and measure volume using cubic in. and cubic cm and capacity using fl. oz. and ml (M-2-E) (M-3-E) 22. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter (i.e., in., cm, ft., yd., mile, m, km), area (i.e., square inch, square foot, square centimeter), capacity (i.e., fl. oz., cup, pt., qt., gal., l, ml), weight/mass (i.e., oz., lb., g, kg, ton), and volume (i.e., cubic cm, cubic in.) (M-2-E) (M-1-E) 23. Set up, solve, and interpret elapsed time problems (M-2-E) (M-5-E) 24. Recognize the attributes to be measured in a real-life situation (M-2-E) (M-5-E)
M-3-E: using estimation skills to describe, order, and compare measures of length, capacity, weight/mass, time, and temperature	25. Use estimates and measurements to calculate perimeter and area of rectangular objects (including squares) in U.S. (including square feet) and metric units (M-3-E) 26. Estimate the area of an irregular shape drawn on a unit grid (M-3-E) Also see GLE #21.

M-4-E: converting from one unit of measurement to another within the same system (customary and metric); comparisons between systems should be based on intuitive reference points, not formal computations (e.g., a meter is a little longer than a yard)	27. Use unit conversions within the same system to solve real-life problems (e.g., 60 sec. = 1 min., 12 objects = 1 dozen, 12 in. = 1 ft., 100 cm = 1 m, 1 pt. = 2 cups) (M-4-E) (N-2-E) (M-5-E)
M-5-E: demonstrating the connection of measurement to the other strands and to real-life situations	See GLEs #12, #23, #24, and #27.
Geometry: In problem-solving investigations, students demonstrate an understanding of geometric concepts and applications involving one-, two-, and three-dimensional geometry, and justify their findings.	
Benchmarks	**Grade-Level Expectations**
G-1-E: determining the relationships among shapes	28. Identify the top, bottom, or side view of a given 3-dimensional object (G-1-E) (G-3-E) Also see GLE #32.
G-2-E: identifying, describing, comparing, constructing, and classifying two-dimensional and three-dimensional geometric shapes using a variety of materials	29. Identify, describe the properties of, and draw circles and polygons (triangle, quadrilateral, parallelogram, trapezoid, rectangle, square, rhombus, pentagon, hexagon, octagon, and decagon) (G-2-E)
G-3-E: making predictions regarding combinations, subdivisions, and transformations (slides, flips, turns) of simple plane geometric shapes	30. Make and test predictions regarding transformations (i.e., slides, flips, and turns) of plane geometric shapes (G-3-E) 31. Identify, manipulate, and predict the results of rotations of 90, 180, 270, and 360 degrees on a given figure (G-3-E) Also see GLE #28.
G-4-E: drawing, constructing models, and comparing geometric shapes, with special attention to developing spatial sense	

G-5-E: identifying and drawing lines and angles and describing their relationships to each other and to the real world	32. Draw, identify, and classify angles that are acute, right, and obtuse (G-5-E) (G-1-E)
G-6-E: demonstrating the connection of geometry to the other strands and to real-life situations	33. Specify locations of points in the first quadrant of coordinate systems and describe paths on maps (G-6-E)
Data Analysis, Probability, and Discrete Math: In problem-solving investigations, students discover trends, formulate conjectures regarding cause-and-effect relationships, and demonstrate critical thinking skills in order to make informed decisions.	
Benchmarks	**Grade-Level Expectations**
D-1-E: collecting, organizing, and describing data based on real-life situations	34. Summarize information and relationships revealed by patterns or trends in a graph, and use the information to make predictions (D-1-E) 35. Find and interpret the meaning of mean, mode, and median of a small set of numbers (using concrete objects) when the answer is a whole number (D-1-E) Also see GLEs #36 and #37.
D-2-E: constructing, reading, and interpreting data in charts, graphs, tables, etc.	36. Analyze, describe, interpret, and construct various types of charts and graphs using appropriate titles, axis labels, scales, and legends (D-2-E) (D-1-E) 37. Determine which type of graph best represents a given set of discrete data (D-2-E) (D-1-E)
D-3-E: formulating and solving problems that involve the use of data	38. Solve problems involving simple deductive reasoning (D-3-E) 39. Use lists, tables, and tree diagrams to generate and record all possible combinations for 2 sets of 3 or fewer objects (e.g., combinations of pants and shirts, days and games) and for given experiments (D-3-E) (D-4-E)
D-4-E: exploring, formulating, and solving sequence-of-pattern problems involving selection and arrangement of objects/numerals	40. Determine the total number of possible outcomes for a given experiment using lists, tables, and tree diagrams (e.g., spinning a spinner, tossing 2 coins) (D-4-E) (D-5-E) Also see GLE #39.

D-5-E: predicting outcomes based on probability (e.g., make predictions of same chance, more likely, or less likely; determine fair and unfair games)	41. Apply appropriate probabilistic reasoning in real-life contexts using games and other activities (e.g., examining fair and unfair situations) (D-5-E) (D-6-E) Also see GLE #40.
D-6-E: demonstrating the connection of data analysis, probability, and discrete math to other strands and real-life situations	See GLE #41.
Patterns, Relations, and Functions: In problem-solving investigations, students demonstrate an understanding of patterns, relations, and functions that represent and explain real-world situations.	
Benchmarks	**Grade-Level Expectations**
P-1-E: recognizing, describing, extending, and creating a wide variety of numerical (e.g., skip counting of whole numbers), geometrical, and statistical patterns	42. Find and describe patterns resulting from operations involving even and odd numbers (such as even + even = even) (P-1-E) 43. Identify missing elements in a number pattern (P-1-E)
P-2-E: representing and describing mathematical relationships using tables, variables, open sentences, and graphs	44. Represent the relationship in an input-output situation using a simple equation, graph, table, or word description (P-2-E)
P-3-E: recognizing the use of patterns, relations, and functions in other strands and in real-life situations	

SCIENCE INTRODUCTION

GENERAL DEVELOPMENT PRINCIPLES

The content described by the Grade-Level Expectations (GLEs) does not represent the entire science curriculum for a grade or course. The GLEs indicate core content to be mastered by the end of a given grade. Science content can be added and enriched as appropriate for a district program, school, or student. For mastery to be attained, most content must be introduced earlier than the grade identified for mastery. Once a particular skill has been identified as a GLE, the skill should be reinforced in subsequent years, but it is not repeated in the list of expectations for subsequent years.

ELEMENTARY: PREKINDERGARTEN–GRADE 4

Students at the prekindergarten (PreK) through grade 4 levels are learning to observe by using their senses, describing properties of substances using appropriate terminology, and comparing, sorting, classifying, and reading about the natural world. Science activities and investigations can be used to engage students in reading, expository writing, measuring, calculating, graphing, and communicating.

MIDDLE SCHOOL: GRADES 5–8

To develop a deeper understanding of concepts, science content focus areas have been identified for grades 5–8. They are listed in Table 1.

Table 1. Middle School Science Focus Areas

Grade	Focus Area
5	Integrated Science
6	Physical Science
7	Life Science
8	Earth and Space Science

In addition to the designated focus areas, the Science as Inquiry (SI) and Science and the Environment (SE) strands are integrated into each of the middle school grades. Other content may be integrated locally within school districts. Additionally, districts not teaching middle school science in the same order as the focus areas may need to realign their curriculum to meet *i*LEAP assessment requirements.

HIGH SCHOOL: GRADES 9–12

In high school, GLEs were developed for six science courses, one each at ninth- and tenth-grade levels and four for the eleventh- and twelfth-grade levels, with the following recommendations in mind (Table 2):

Table 2. High School Courses

Strand	Course(s)	Recommended Grades
Physical Science	Physical Science	9
	Chemistry I	11–12
	Physics I	11–12
Life Science	Biology I	10
Earth and Space Science	Earth Science	11–12
Science and the Environment	Environmental Science	11–12

Students may meet the state's high school graduation requirements in science in a variety of ways. Both personal preference and district course offerings affect which courses are taken and may determine the order in which courses are taken.

Chemistry and Physics are advanced Physical Science courses. GLEs for these courses are based on the Physical Science benchmarks but require higher-level skills and understandings. Prerequisite GLEs for Chemistry and Physics can be found in the Physical Science course recommended for grade 9.

STANDARDS/BENCHMARKS/GLES

The organization of the science GLEs aligns with the *Louisiana Science Framework* (1997). The science GLEs address benchmarks from all five content strands outlined in the framework document.

Additional resources used to facilitate the development of the science GLEs include the *National Science Education Standards* (NSES, 1996), the National Assessment of Educational Progress *Science Framework* (NAEP, 1999), and the various Project 2061 publications of the American Association for the Advancement of Science. These national standards are reflected in the *Louisiana Science Framework* and the GLEs.

The five Louisiana science content standards are broad goals for what all students in Louisiana should know and be able to do in science. In the *Louisiana Science Framework*, strands are based on the five science standards. That is, each strand represents one of the five standards. The strands and their respective abbreviated codes are Science as Inquiry (SI), Physical Science (PS), Life Science (LS), Earth and Space Science (ESS), and Science and the Environment (SE). There is one process strand, Science as Inquiry, and four content strands. This organization into strands does not imply that science must be taught in separate isolated units. In fact, teachers are encouraged to teach integrated, interdisciplinary units of study.

Codes at the end of each GLE are used to identify a developmental profile indicator from the *Louisiana Standards for Programs Serving Four-Year-Old Children* (Table 3) and/or benchmarks from the *Louisiana Science Framework* (Table 4). A GLE may apply to more than one benchmark and, as a result, a GLE may have more than one code.

Developmental Profile Indicator Code: The first part of the code is always PK, which means prekindergarten. The second part, or term, indicates the domain and content area (i.e., Cognitive Science). The third term indicates the skill area, or strand, (i.e., PS, LS, ES) and skill number (e.g., 1, 2).

Table 3. Explanation of Developmental Profile Indicator Codes

Code(s)	Explanation
PK-CS-L4	Prekindergarten, Cognitive Science, Life Science, Skill 4
PK-CS-P3	Prekindergarten, Cognitive Science, Physical Science, Skill 3
PK-CS-ES1	Prekindergarten, Cognitive Science, Earth and Space Science, Skill 1

Benchmark Codes: The first term in the benchmark code refers to the strand (i.e., SI, PS, LS, ESS, SE). The second term refers to the grade cluster (i.e., E for elementary, M for middle school, and H for high school). The third term refers to the substrand and benchmark number (e.g., A1, B2, C3).

For most grade clusters, strands are divided into substrands or major topical areas. (The SE strand has no substrands at the PreK–4 and 5–8 grade levels.) Science GLEs have been developed and are organized based on this secondary breakdown. Substrands are indicated by the letters in the benchmark code designations.

Table 4. Explanation of Benchmark Codes

Code(s)	Explanation
SI-E-A5	SI strand, Elementary level, substrand A, benchmark 5
PS-M-B4	PS strand, Middle School level, substrand B, benchmark 4
SE-H-A6 LS-H-D1	SE strand, High School level, substrand A, benchmark 6 *and* LS strand, High School level, substrand D, benchmark 1

SCIENCE INTRODUCTION

The SI standard states: *The students will **do** science by engaging in partial and full inquiries that are within their developmental capabilities*. The GLEs for the SI strand of the science framework are to be embedded in all science courses at every grade level and cannot be considered in isolation from the other strands. The processes and skills in the SI strand are to be integrated with the science content of the other four strands.

Each of the following GLE listings by grade opens with a summary describing the focal emphases of that grade. These emphases serve to shape and mold the program for that individual grade level. Careful articulation of these GLEs in a program will assure Louisiana a future marked by significant growth in students' abilities to learn, apply, and appreciate science concepts in all aspects of their lives.

FOURTH GRADE INTRODUCTION

Fourth Grade

Fourth-grade students evaluate the results of their scientific investigations and begin to organize information through classification. Students identify variables to ensure that only one experimental (i.e., independent) variable is tested at a time and use critical thinking skills to draw conclusions and evaluate or justify their results. For example, in the LS strand, students explain how fish are suited to live in an aquatic habitat.

SAMPLE PAGE AND KEY FOR SCIENCE

Strand/ Standard

Substrand

Benchmarks

Grade-Level Expectations (GLEs)

Science As Inquiry: The students will <u>do</u> science by engaging in partial and full inquiries that are within their developmental capabilities.	
A. The Abilities Necessary to do Scientific Inquiry	
Benchmarks	**Grade-Level Expectations**
SI-E-A1: asking appropriate questions about organisms and events in the environment	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
SI-E-A2: planning and/or designing and conducting a scientific investigation	3. Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2) 4. Predict and anticipate possible outcomes (SI-E-A2) 5. Identify variables to ensure that only one experimental variable is tested at a time (SI-E-A2) 6. Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
SI-E-A3: communicating that observations are made with one's senses	7. Use the five senses to describe observations (SI-E-A3)
SI-E-A4: employing equipment and tools to gather data and extend the sensory observations	8. Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4) 9. Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)

FOURTH GRADE

SCIENCE

Science As Inquiry: The students will <u>do</u> science by engaging in partial and full inquiries that are within their developmental capabilities.

A. The Abilities Necessary to do Scientific Inquiry

Benchmarks	Grade-Level Expectations
SI-E-A1: asking appropriate questions about organisms and events in the environment	1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1) 2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
SI-E-A2: planning and/or designing and conducting a scientific investigation	3. Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2) 4. Predict and anticipate possible outcomes (SI-E-A2) 5. Identify variables to ensure that only one experimental variable is tested at a time (SI-E-A2) 6. Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
SI-E-A3: communicating that observations are made with one's senses	7. Use the five senses to describe observations (SI-E-A3)
SI-E-A4: employing equipment and tools to gather data and extend the sensory observations	8. Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4) 9. Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)

SI-E-A5: using data, including numbers and graphs, to explain observations and experiments	10. Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4) 11. Combine information, data, and knowledge from one or more of the science content areas to reach a conclusion or make a prediction (SI-E-A5)
SI-E-A6: communicating observations and experiments in oral and written formats	12. Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (e.g., drawings, journals, reports, presentations, exhibitions, portfolios) (SI-E-A6)
SI-E-A7: utilizing safety procedures during experiments	13. Identify and use appropriate safety procedures and equipment when conducting investigations (e.g., gloves, goggles, hair ties) (SI-E-A7)
B. Understanding Scientific Inquiry	
SI-E-B1: categorizing questions into what is known, what is not known, and what questions need to be explained	14. Identify questions that need to be explained through further inquiry (SI-E-B1) 15. Distinguish between what is known and what is unknown in scientific investigations (SI-E-B1)
SI-E-B2: using appropriate experiments depending on the questions to be explored	16. Select the best experimental design to answer a given testable question (SI-E-B2)
SI-E-B3: choosing appropriate equipment and tools to conduct an experiment	17. Recognize that a variety of tools can be used to examine objects at different degrees of magnification (e.g., hand lens, microscope) (SI-E-B3)
SI-E-B4: developing explanations by using observations and experiments	18. Base explanations and logical inferences on scientific knowledge, observations, and scientific evidence (SI-E-B4)
SI-E-B5: presenting the results of experiments	19. Describe procedures and communicate data in a manner that allows others to understand and repeat an investigation or experiment (SI-E-B5)
SI-E-B6: reviewing and asking questions about the results of investigations	20. Determine whether further investigations are needed to draw valid conclusions (SI-E-B6) 21. Use evidence from previous investigations to ask additional questions and to initiate further explorations (SI-E-B6) 22. Explain and give examples of how scientific discoveries have affected society (SI-E-B6)

Physical Science: Students will develop an understanding of the characteristics and interrelationships of matter and energy in the physical world.	
A. Properties of Objects and Materials	
Benchmarks	**Grade-Level Expectations**
PS-E-A1: observing, describing, and classifying objects by properties (size, weight, shape, color, texture, and temperature)	
PS-E-A2: measuring properties of objects using appropriate materials, tools, and technology	23. Determine linear, volume, and weight/mass measurements by using both metric system and U.S. system units to compare the results (PS-E-A2)
PS-E-A3: observing and describing the objects by the properties of the materials from which they are made (paper, wood, metal)	
PS-E-A4: describing the properties of the different states of matter and identifying the conditions that cause matter to change states	24. Illustrate how heating/cooling affects the motion of small particles in different phases of matter (PS-E-A4)
PS-E-A5: creating mixtures and separating them based on differences in properties (salt, sand)	25. Describe various methods to separate mixtures (e.g., evaporation, condensation, filtration, magnetism) (PS-E-A5)
B. Position and Motion of Objects	
PS-E-B1: observing and describing the position of an object relative to another object or the background	
PS-E-B2: exploring and recognizing that the position and motion of objects can be changed by pushing or pulling (force) over time	
PS-E-B3: describing an object's motion by tracing and measuring its position over time	26. Measure, record, and graph changes in position over time (e.g., speed of cars, ball rolling down inclined plane) (PS-E-B3)

PS-E-B4: investigating and describing how the motion of an object is related to the strength of the force (pushing or pulling) and the mass of the object	27. Describe how the amount of force needed to cause an object to change its motion depends on the mass of the object (PS-E-B4)
C. Forms of Energy	
PS-E-C1: experimenting and communicating how vibrations of objects produce sound and how changing the rate of vibration varies the pitch	28. Explain the relationship between volume (amplitude) of sound and energy required to produce the sound (PS-E-C1) 29. Compare the rates at which sound travels through solids, liquids, and gases (PS-E-C1) 30. Explain the relationship between frequency (rate of vibration) and pitch (PS-E-C1)
PS-E-C2: investigating and describing how light travels and what happens when light strikes an object (reflection, refraction, and absorption)	31. Diagram what happens to white light as it passes through a prism (PS-E-C2) 32. Describe how light bends or refracts when traveling through various materials (e.g., pencil in a glass of water) (PS-E-C2)
PS-E-C3: investigating and describing different ways heat can be produced and moved from one object to another by conduction	33. Describe how heat energy moves through a material by conduction (PS-E-C3) 34. Give examples of ways heat can be generated through friction (e.g., rubbing hands) (PS-E-C3) 35. Give examples of ways heat can be produced by conversion from other sources of energy (PS-E-C3)
PS-E-C4: investigating and describing how electricity travels in a circuit	36. Test and classify materials as *conductors* and *insulators* of electricity (PS-E-C4) 37. Demonstrate how a complete circuit is needed for conducting electricity (PS-E-C4)
PS-E-C5: investigating and communicating that magnetism and gravity can exert forces on objects without touching the objects	38. Explain the effects of Earth's gravity on all objects at or near the surface of Earth (PS-E-C5)
PS-E-C6: exploring and describing simple energy transformations	39. Describe energy transformations (e.g., electricity to light, friction to heat) (PS-E-C6)
PS-E-C7: exploring and describing the uses of energy at school, home, and play	

Life Science: The students will become aware of the characteristics and life cycles of organisms and understand their relationships to each other and to their environment.	
A. Characteristics of Organisms	
Benchmarks	**Grade-Level Expectations**
LS-E-A1: identifying the needs of plants and animals, based on age-appropriate recorded observations	
LS-E-A2: distinguishing between living and nonliving things	
LS-E-A3: locating and comparing major plant and animal structures and their functions	40. Explain the functions of plant structures in relation to their ability to make food through photosynthesis (e.g., roots, leaves, stems, flowers, seeds) (LS-E-A3) 41. Describe how parts of animals' bodies are related to their functions and survival (e.g., wings/flying, webbed feet/swimming) (LS-E-A3)
LS-E-A4: recognizing that there is great diversity among organisms	
LS-E-A5: locating major human body organs and describing their functions	42. Describe how the organs of the circulatory and respiratory systems function (LS-E-A5)
LS-E-A6: recognizing the food groups necessary to maintain a healthy body	43. Explain the primary role of carbohydrates, fats, and proteins in the body (LS-E-A6) 44. Analyze food labels to compare nutritional content of foods (e.g., amounts of carbohydrates, fats, proteins) (LS-E-A6)
B. Life Cycles of Organisms	
LS-E-B1: observing and describing the life cycles of some plants and animals	45. Identify reproductive structures in plants and describe the functions of each (LS-E-B1) 46. Describe how some plants can be grown from a plant part instead of a seed (LS-E-B1) 47. Sequence stages in the life cycles of various organisms, including seed plants (LS-E-B1)

LS-E-B2: observing, comparing, and grouping plants and animals according to likenesses and/or differences	48. Classify examples of plants and animals based on a variety of criteria (LS-E-B2)
LS-E-B3: observing and recording how the offspring of plants and animals are similar to their parents	49. Compare similarities and differences between parents and offspring in plants and animals (LS-E-B3)
LS-E-B4: observing, recording, and graphing student growth over time using a variety of quantitative measures (height, weight, linear measure of feet and hands, etc.)	
C. Organisms and Their Environments	
LS-E-C1: examining the habitats of plants and animals and determining how basic needs are met within each habitat	50. Explain how some organisms in a given habitat compete for the same resources (LS-E-C1) 51. Describe how organisms can modify their environment to meet their needs (e.g., beavers making dams) (LS-E-C1)
LS-E-C2: describing how the features of some plants and animals enable them to live in specific habitats	52. Describe how some plants and animals have adapted to their habitats (LS-E-C2) 53. Identify the habitat in which selected organisms would most likely live and explain how specific structures help organisms to survive (LS-E-C2)
LS-E-C3: observing animals and plants and describing interaction or interdependence	54. Describe the effect of sudden increases or decreases of one group of organisms upon other organisms in the environment (LS-E-C3)

Earth and Space Science: The students will develop an understanding of the properties of earth materials, the structure of the Earth system, the Earth's history, and the Earth's place in the universe.	
A. Properties of Earth Materials	
Benchmarks	**Grade-Level Expectations**
ESS-E-A1: understanding that earth materials are rocks, minerals, and soils	55. Recognize that sedimentary rocks are composed of particles that result from weathering and erosion (e.g., sandstones, conglomerates) (ESS-E-A1) 56. Investigate the properties of soil (e.g., color, texture, capacity to retain water, ability to support plant growth) (ESS-E-A1) Also see GLE #63.
ESS-E-A2: understanding that approximately three-fourths of the Earth's surface is covered with water and how this condition affects weather patterns and climates	57. Explain how unequal heating of Earth's land and water affects climate and weather by using a model (ESS-E-A2)
ESS-E-A3: investigating, observing, and describing how water changes from one form to another and interacts with the atmosphere	58. Draw, label, and explain the components of a water cycle (ESS-E-A3)
ESS-E-A4: investigating, observing, measuring, and describing changes in daily weather patterns and phenomena	59. Measure, chart, and predict the weather using various instruments (e.g., thermometer, barometer, anemometer) (ESS-E-A4) 60. Identify various types of weather-related natural hazards and effects (e.g., lightning, storms) (ESS-E-A4) 61. Identify safety measures applicable to natural hazards (ESS-E-A4)
ESS-E-A5: observing and communicating that rocks are composed of various substances	62. Classify rocks and minerals according to texture, color, luster, hardness, and effervescence (ESS-E-A5) 63. Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (e.g., sand dunes, canyons, volcanoes, earthquakes) (ESS-E-A5) (ESS-E-A1)
ESS-E-A6: observing and describing variations in soil	

ESS-E-A7: investigating fossils and describing how they provide evidence about plants and animals that lived long ago and the environment in which they lived	
B. Objects in the Sky	
ESS-E-B1: observing and describing the characteristics of objects in the sky	
ESS-E-B2: demonstrating how the relationship of the Earth, moon, and sun causes eclipses and moon phases	64. Describe and sequence the phases of the Moon and eclipses (ESS-E-B2) 65. Compare a solar and a lunar eclipse (ESS-E-B2) 66. Diagram the movement of the Moon around Earth and the movement of Earth around the Sun (ESS-E-B2)
ESS-E-B3: observing and recording the changing appearances and positions of the moon in the sky at night and determining the monthly pattern of lunar change	67. Explain the changing appearance of the Moon and its location in the sky over the course of a month (ESS-E-B3)
ESS-E-B4: modeling changes that occur because of the rotation of the Earth (alternation of night and day) and the revolution of the Earth around the sun	68. Identify the relationship between Earth's tilt and revolution and the seasons (ESS-E-B4)
ESS-E-B5: understanding that the sun, a star, is a source of heat and light energy and identifying its effects upon the Earth	
ESS-E-B6: understanding that knowledge of the Earth as well as of the universe is gained through space exploration	69. Explain how technology has improved our knowledge of the universe (e.g., Hubble telescope, space stations, lunar exploration) (ESS-E-B6)

Science and the Environment: In learning environmental science, students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world.	
Benchmarks	**Grade-Level Expectations**
SE-E-A1: understanding that an "ecosystem" is made of living and non-living components	70. Design an ecosystem that includes *living (biotic)* and *nonliving (abiotic)* components and illustrates interdependence (SE-E-A1)
SE-E-A2: understanding the components of a food chain	71. Describe and explain food chains/webs and the directional flow of energy in various ecosystems (e.g., construct a model, drawing, diagram, graphic organizer) (SE-E-A2) 72. Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g., consumer, herbivores, nonliving component) (SE-E-A2)
SE-E-A3: identifying ways in which humans have altered their environment, both in positive and negative ways, either for themselves or for other living things	
SE-E-A4: understanding that the original sources of all material goods are natural resources and that the conserving and recycling of natural resources is a form of stewardship	
SE-E-A5: understanding that most plant and animal species are threatened or endangered today due to habitat loss or change	

SOCIAL STUDIES INTRODUCTION

INTRODUCTION

Grade-Level Expectations (GLEs) for social studies further define the knowledge and skills students are expected to master by the end of each grade level or high school course. The GLEs for each grade are developmentally appropriate, with foundational concepts being introduced in prekindergarten and expanded as students move from one grade to the next.

Social studies concepts are arranged to build the knowledge and skills students will need to meet the benchmarks. For example, the foundation needed to achieve the K-4 benchmark, "demonstrating how economic wants affect decisions about using goods and services," is laid beginning in PreK with the GLE, "demonstrate an awareness of the uses of money in play activities." In each subsequent elementary grade, there are GLEs that build on this foundational economic concept. Knowledge and skills related to economic decisions continue to build in middle school; in high school, students then are expected to "identify factors that drive economic decisions (e.g., incentives, benefits, costs, trade-offs, consequences)."

In addition to the goal of building knowledge and skills across the grades, the GLEs are organized so that each elementary and middle school grade has a particular focus. High school GLEs are organized around core content courses.

ELEMENTARY: PREKINDERGARTEN–GRADE 4

Prekindergarten and kindergarten students focus on identifying and understanding their roles as members of their families, class, school, community, nation, and the world. The first grade focus is on the study of the school community, family, and the local community. Second grade focuses on the local community. Third grade GLEs focus on the state of Louisiana, and fourth grade on the United States. The GLEs for Geography, Civics, Economics, and History are generally linked to the overall focus for each grade, although some social studies concepts of culture, geographic location, and trade are addressed from a global perspective. The changing focus from grade to grade reflects and reinforces students' broadening perspective of the world around them as they move through elementary school.

MIDDLE SCHOOL: GRADES 5–8

In middle school, the GLEs reflect a shift from the elementary school concentration on the foundations of social studies to a more in-depth study of different social studies strands, historical eras, and geographical areas. Each grade has a primary historical/geographic focus. The fifth grade focus is on the early history of America from the historical beginnings to approximately 1763. In the sixth grade, the primary focus is on World History, from the earliest human activity to 1500. The seventh grade GLEs focus on U.S. History from the American Revolution through Reconstruction, while eighth grade focuses on Louisiana History through the present.

Each middle school grade also has a secondary focus. In fifth and sixth grades, the secondary focus is Geography. At these grades, students continue to broaden their perspective of the world through the study of Geography and to develop the geographic concepts that will be applied in the study of History at succeeding grades. In seventh grade, the secondary focus is Civics, as early U.S. History provides a rich context for the study of government. The secondary focus for eighth grade is Economics, in part because many of the economic concepts in the benchmarks are more developmentally appropriate for eighth graders than for younger students. Additionally, the primary eighth grade focus on Louisiana provides students a familiar context for applying and understanding economic concepts.

It is important to note that while each grade has a primary and a secondary focus, students are expected to apply their knowledge and skills from other strands in their study of History. For example, previously mastered economic concepts, such as scarcity and interdependence, are embedded in seventh grade U.S. History GLEs that address the issues of mercantilism, tariffs, and sectionalism. Similarly, Geography skills mastered at fifth and sixth grades are reinforced and applied at all succeeding grades.

HIGH SCHOOL: GRADES 9–12

The GLEs for high school were developed around five core courses in high school social studies to provide students more in-depth study of each social studies strand: Geography (Core Course: World Geography), Civics (Core Course: Civics), Economics (Core Course: Free Enterprise); and History (Core Courses: World History—since 1500 and U.S. History—since 1877). Students are expected to build on the knowledge and skills mastered at earlier grades in order to meet the high school GLEs and benchmarks. For example, in U.S. History—since 1877, students use what they learned in seventh grade U.S. History as a basis for their understanding and analysis of later history. Additionally, students' foundational knowledge and skills in Geography, Civics, and Economics are applied in the U.S. History GLEs.

HISTORICAL THINKING SKILLS

There is a set of unifying GLEs related to historical thinking skills (substrand A of the History strand) present in every grade from prekindergarten through eighth grade, and in the two high school History courses. These historical thinking skills build throughout the grades, asking students to progress from concrete skills (e.g., understanding relative chronology) to complex analytical skills (e.g., analyzing historical periods, change and continuity). These skills are embedded and applied meaningfully throughout the study of social studies and are not mastered in isolation.

SOCIAL STUDIES INTRODUCTION

STANDARDS/BENCHMARKS/GLES

Codes at the end of each GLE are used to identify a developmental profile indicator from the *Louisiana Standards for Programs Serving Four-Year-Old Children* (Table 1) and/or benchmarks from the *Louisiana Social Studies Content Standards* (Table 2). A GLE may apply to more than one benchmark, and as a result, a GLE may have more than one code.

Developmental Profile Indicator Codes: The first part is always PK, which means prekindergarten. The second part indicates the domain and content area (i.e., Cognitive Social Studies). The third part indicates the skill area (i.e., Geography, Civics, Economics, History) and skill number (e.g., 1, 2).

Table 1. Explanation of Developmental Profile Indicator Codes

Code(s)	Explanation
PK-CSS-G3	Prekindergarten, Cognitive Social Studies, Geography, Skill 3
PK-CSS-C1	Prekindergarten, Cognitive Social Studies, Civics, Skill 1
PK-CSS-E1	Prekindergarten, Cognitive Social Studies, Economics, Skill 1
PK-CSS-H1	Prekindergarten, Cognitive Social Studies, History, Skill 1

Benchmark Codes: Benchmark codes have 3 parts. The first part identifies the strand (i.e., Geography, Civics, Economics, History). The second part gives the standard number and substrand. The third part indicates the grade cluster and benchmark number.

Table 2. Explanation of Benchmark Codes

Code(s)	Explanation
G-1A-E1	Geography, Standard 1, Substrand A, Elementary, Benchmark 1
C-1B-E2	Civics, Standard 1, Substrand B, Elementary, Benchmark 2
E-1C-M2	Economics, Standard 1, Substrand C, Middle School, Benchmark 2
H-1C-H3	History, Standard 1, Substrand C, High School, Benchmark 3

FOURTH GRADE INTRODUCTION

Fourth Grade

The grade 4 Grade-Level Expectations (GLEs) center on the study of the United States. Grade 2 students focus on their community. Grade 3 students focus on the study of Louisiana. Grade 4 builds on the previously learned concepts of social studies.

SAMPLE PAGE AND KEY FOR SOCIAL STUDIES

Strand/ Standard

Substrand

Benchmarks

Grade-Level Expectations (GLEs)

Geography—Physical and Cultural Systems: Students develop a spatial understanding of Earth's surface and the processes that shape it, the connections between people and places, and the relationship between man and his environment.	
A. The World in Spatial Terms	
Benchmarks	**Grade-Level Expectations**
G-1A-E1: identifying and describing the characteristics and uses of geographic representations, such as various types of maps, globes, graphs, diagrams, photographs, and satellite-produced images	1. Interpret different kinds of maps using a map key/legend, compass rose, cardinal and intermediate directions, and distance scale (G-1A-E1) 2. Use a variety of images or other spatial graphics (e.g., aerial photographs, satellite images) to locate major physical and human characteristics (G-1A-E1)
G-1A-E2: locating and interpreting geographic features and places on maps and globes	3. Locate and label places on a map or globe: the seven continents, the United States and its major land forms, major bodies of water and waterways, referring to the poles, the equator, latitude, longitude and meridians (G-1A-E2) 4. Identify all U.S. states by shapes and position on map (G-1A-E2)
G-1A-E3: constructing maps, graphs, charts, and diagrams to describe geographical information and to solve problems	5. Draw, complete, and add features to a map (including such map elements as a title, compass rose, legend, and scale), based on given information (G-1A-E3)
B. Places and Regions	
G-1B-E1: describing and comparing the physical characteristics of places, including land forms, bodies of water, soils, vegetation, and climate	6. Describe and compare the distinguishing characteristics of various land forms, bodies of water, climates, and forms of vegetation in the United States (G-1B-E1) 7. Identify the best place for human settlement based on a map showing physical characteristics of an area (G-1B-E1)
G-1B-E2: identifying and describing the human characteristics of places, including population distributions and culture	

FOURTH GRADE

SOCIAL STUDIES

Geography—Physical and Cultural Systems: Students develop a spatial understanding of Earth's surface and the processes that shape it, the connections between people and places, and the relationship between man and his environment.

A. The World in Spatial Terms	
Benchmarks	**Grade-Level Expectations**
G-1A-E1: identifying and describing the characteristics and uses of geographic representations, such as various types of maps, globes, graphs, diagrams, photographs, and satellite-produced images	1. Interpret different kinds of maps using a map key/legend, compass rose, cardinal and intermediate directions, and distance scale (G-1A-E1) 2. Use a variety of images or other spatial graphics (e.g., aerial photographs, satellite images) to locate major physical and human characteristics (G-1A-E1)
G-1A-E2: locating and interpreting geographic features and places on maps and globes	3. Locate and label places on a map or globe: the seven continents, the United States and its major land forms, major bodies of water and waterways, referring to the poles, the equator, latitude, longitude and meridians (G-1A-E2) 4. Identify all U.S. states by shapes and position on map (G-1A-E2)
G-1A-E3: constructing maps, graphs, charts, and diagrams to describe geographical information and to solve problems	5. Draw, complete, and add features to a map (including such map elements as a title, compass rose, legend, and scale), based on given information (G-1A-E3)
B. Places and Regions	
G-1B-E1: describing and comparing the physical characteristics of places, including land forms, bodies of water, soils, vegetation, and climate	6. Describe and compare the distinguishing characteristics of various land forms, bodies of water, climates, and forms of vegetation in the United States (G-1B-E1) 7. Identify the best place for human settlement based on a map showing physical characteristics of an area (G-1B-E1)
G-1B-E2: identifying and describing the human characteristics of places, including population distributions and culture	

G-1B-E3: describing how the physical and human characteristics of places change over time	8. Explain physical and human developments in a region of the United States since it was first settled based on given information (G-1B-E3)
G-1B-E4: defining and differentiating regions by using physical characteristics, such as climate and land forms, and by using human characteristics, such as economic activity and language	9. Identify, define, and compare regions of the United States using physical and human characteristics (e.g., land forms and use, cultural diversity) (G-1B-E4)
C. Physical and Human Systems	
G-1C-E1: describing how physical processes help to shape features and patterns on Earth's surface	10. Identify physical processes that change Earth's surface and create physical features suddenly or over time (e.g., what physical processes created the Grand Canyon, the Great Lakes, the Hawaiian Islands) (G-1C-E1)
G-1C-E2: describing and comparing the types of settlement and patterns of land use in local communities, the United States, and world regions	11. Identify geographical/physical reasons for regional variations that influence patterns of settlement and land use in the United States and the world, past and present (G-1C-E2)
G-1C-E3: describing and explaining the characteristics, distribution, and migration of human populations	12. Describe characteristics of the human population in a given area (e.g., cultural diversity, population size or growth) (G-1C-E3) Also see GLE #61.
G-1C-E4: identifying and comparing the cultural characteristics of different regions and people	13. Explain and compare the cultural identities of various U.S. regions and how a region is influenced by past events and the heritage of its people (G-1C-E4)
G-1C-E5: locating and explaining the spatial distribution of economic activities	14. Locate economic activities that use natural resources in the local region, state, and nation and describe the importance of the activities to these areas (G-1C-E5)
G-1C-E6: identifying and describing types of territorial units, such as parishes or counties, states, and countries	15. Differentiate between countries, states, parishes, and cities (G-1C-E6)
D. Environment and Society	
G-1D-E1: identifying and explaining ways in which people depend upon and modify the physical environment	16. Identify ways in which people in the United States depend upon and modify the physical environment (G-1D-E1)
G-1D-E2: describing how humans adapt to variations in the physical environment	

G-1D-E3: describing the locations, causes, and effects of natural disasters on the environment and society	17. Identify natural disasters, their causes, areas prone to them, and how those disasters affect people and the environment (G-1D-E3)
G-1D-E4: describing the use, distribution, and importance of natural resources	18. Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4) 19. Describe the use, distribution, and importance of natural resources in different regions of the United States using geographic tools such as maps (G-1D-E4)
Civics—Citizenship and Government: Students develop an understanding of the structure and purposes of government, the foundations of the American democratic system, and the role of the United States in the world, while learning about the rights and responsibilities of citizenship.	
A. Structure and Purposes of Government	
Benchmarks	**Grade-Level Expectations**
C-1A-E1: describing government in terms of the people and groups who make, apply, and enforce rules and laws in the home, school, community, and nation	
C-1A-E2: explaining the necessity and basic purposes of government	20. Identify the necessity or basic purposes of government in such terms as establishing order, providing security, managing conflict, and providing services (C-1A-E2)
C-1A-E3: comparing limited governments to unlimited governments	21. Distinguish between *limited government* and *unlimited government* (C-1A-E3) 22. Explain the role of government and the rights of citizens (C-1A-E3)
C-1A-E4: identifying and describing some of the major responsibilities of local, state, and national governments	23. Identify the three branches of the federal government and describe their major responsibilities (C-1A-E4)
C-1A-E5: identifying key members of government at the local, state, and national levels and describing their powers and the limits on their powers	24. Identify key government positions at the national level, their respective powers, and limits on their powers (C-1A-E5)

C-1A-E6: explaining how officials in government acquire the authority to exercise political power	25. Distinguish between elected and appointed officials and give examples of each at the local, state, and national levels (C-1A-E6)
C-1A-E7: explaining the purposes and importance of rules and laws	26. Identify the purpose and importance of a rule or a law (C-1A-E7)
B. Foundations of the American Political System	
C-1B-E1: identifying basic principles of American constitutional democracy and explaining how the constitutions of the United States and Louisiana reflect these principles	27. Describe the significance of the Declaration of Independence, the U.S. Constitution and its principles of democracy, and the Bill of Rights (e.g., basic freedoms) (C-1B-E1) 28. Explain the similarities between the Louisiana and U.S. Constitutions (C-1B-E1)
C-1B-E2: discussing the importance of citizens' sharing and supporting the principles of American constitutional democracy	29. Explain the concept of *nation* with reference to countries, governments, and peoples (C-1C-E1) 30. Identify ways nations interact and why interactions are important (e.g., treaties, diplomacy) (C-1C-E1) 31. Identify the United Nations and its role in international peace keeping (C-1C-E1)
C. International Relationships	
C-1C-E1: explaining that the world is divided into different nations and describing the major ways that these nations interact	
D. Roles of the Citizen	
C-1D-E1: explaining the meaning of citizenship and the means by which individuals become citizens of the United States	32. Identify the means by which individuals become U.S. citizens (C-1D-E1)
C- 1D-E2: describing the rights and responsibilities of citizenship in a democratic society	33. Identify the rights and responsibilities of citizenship in making the nation a better place to live (C-1D-E2)

C-1D-E3: identifying and discussing civic traits that are important to the preservation and improvement of American constitutional democracy	34. Discuss civic traits of *good citizenship* that are important to the preservation and improvement of American constitutional democracy, using an excerpt from a speech, address, or essay which illustrates those traits (C-1D-E3) (C-1D-E4)
C-1D-E4: describing the many ways that citizens can participate in and contribute to their communities and to American society	See GLE #34.
C-1D-E5: discussing issues related to citizenship and public service	35. Identify a national issue and describe how good citizenship can help solve the problem (C-1D-E5)
Economics—Interdependence and Decision Making: Students develop an understanding of fundamental economic concepts as they apply to the interdependence and decision making of individuals, households, businesses, and governments in the United States and the world.	
A. Fundamental Economic Concepts	
Benchmarks	**Grade-Level Expectations**
E-1A-E1: recognizing that limited resources require people to make decisions	36. Demonstrate that limited resources necessitate choices and decisions (E-1A-E1)
E-1A-E2: identifying what is gained and lost when individuals or groups make decisions	
E-1A-E3: demonstrating how economic wants affect decisions about using goods and services	
E-1A-E4: discussing and determining the process for making economic decisions	37. Explain the factors, including trade-offs, involved in a choice or decision (e.g., discuss the choices and decisions involved in developing a personal budget) (E-1A-E4)

E-1A-E5: explaining the relationships among producers and consumers	38. Identify the four basic questions all producers must answer (i.e., What will be produced? How will it be produced? For whom will it be produced? How much will be produced?) (E-1A-E5)
E-1A-E6: describing how natural resources, human resources, and capital (human-made) resources have been used and are combined in the production of goods and services	39. Describe the combination of natural, human, and capital resources needed to produce a given good (e.g., a candy bar) or given service (e.g., recycling paper) (E-1A-E6)
E-1A-E7: describing how specialization affects productivity and contributes to the need for interdependence among producers and consumers	40. Define some effects of division of labor and specialization in a given context, such as a simple assembly line (e.g., greater labor productivity/output per hour) (E-1A-E7)
E-1A-E8: determining how the development of skills and knowledge relates to career opportunity and economic well-being	41. Describe the benefits of increasing one's skill/knowledge and various ways to do so (E-1A-E8)
E-1A-E9: identifying different methods for the distribution of goods and services, including the concept of markets	42. Describe the basic concept of a *market (*e.g., exchange of goods/services between buyers and sellers) and identify ways of transporting goods (E-1A-E9)
E-1A-E10: identifying some of the economic institutions, such as households and banks, that make up the economy	43. Identify the roles of banks, governments, businesses, and households in the economy (E-1A-E10)
E-1A-E11: explaining and demonstrating why people participate in voluntary exchanges and how money helps in the process	44. Identify the relationship between money, writing checks, and credit cards (E-1A-E11) 45. Explain why people engage in voluntary exchange/barter/direct trading (E-1A-E11)
B. Individuals, Households, Businesses, and Governments	
E-1B-E1: describing how prices are determined by the interactions of buyers and sellers	46. Describe how supply and demand affect the price of a good or service in a given situation (E-1B-E1)
E-1B-E2: explaining how the changes in prices affect incentives to produce, consume, and save	47. Explain how a rise or fall in prices affects personal, family, and government budgets (E-1B-E2)
E-1B-E3: identifying and explaining economic concepts, such as profit as an incentive for people to take economic risk	48. Identify the terms *profit* and *risk* and give examples of risk that businesses take to make a profit (E-1B-E3)

E-1B-E4: explaining why some goods and services are provided by the government through taxing, charging user fees, and borrowing	49. Define *tax* and explain how government pays for goods and services through taxes and fees (E-1B-E4)
E-1B-E5: identifying the major goods and services produced in the local community and state	
History—Time, Continuity, and Change: Students develop a sense of historical time and historical perspective as they study the history of their community, state, nation, and world.	
A. Historical Thinking Skills	
Benchmarks	**Grade-Level Expectations**
H-1A-E1: demonstrating an understanding of the concepts of time and chronology	50. Interpret data presented in a timeline or construct a historical timeline (e.g., events in history, historical figure's life and accomplishments) (H-1A-E1)
H-1A-E2: recognizing that people in different times and places view the world differently	51. Compare how a person today might view an issue or event differently from a person living in an earlier time (H-1A-E2) 52. Describe the point of view of an historical figure or group, drawing on given stimulus material (e.g., views expressed in the "I Have a Dream" speech) (H-1A-E2)
H-1A-E3: identifying and using primary and secondary historical sources to learn about the past	53. Interpret historical information in a map, table, or graph (H-1A-E3) 54. Compare and contrast primary and secondary sources (H-1A-E3)
B. Families and Communities	
H-1B-E1: describing and comparing family life in the present and the past	55. Describe beliefs, customs, and traditions of family life in the past and present (H-1B-E1)
H-1B-E2: relating the history of the local community and comparing it to other communities of long ago	

C. Louisiana and United States History	
H-1C-E1: describing the people, events, and ideas that were significant to the growth and development of our state and nation	56. Identify and describe major early explorers and explorations in North America (H-1C-E1) 57. Identify leaders and their influence in the early development of America (H-1C-E1) 58. Describe the importance of events and ideas significant to our nation's development (H-1C-E1) 59. Identify a document/speech/address significant to the development of the nation from an excerpt (e.g., Preamble to the U.S. Constitution), and identify the author/speaker of a particular document/speech/address (H-1C-E1)
H-1C-E2: identifying the development of democratic principles and discussing how these principles have been exemplified by historic figures, events, and symbols	60. Describe American democratic principles as exemplified by major historic events, groups of people, and leaders (e.g., American Revolution, Civil War, Civil Rights Movement) (H-1C-E2)
H-1C-E3: describing the causes and nature of various movements of large groups of people into and within Louisiana and the United States throughout history	61. Identify the causes and effects of the major historical (voluntary and involuntary) migrations to and within America (H-1C-E3) (G-1C-E3)
H-1C-E4: recognizing how folklore and other cultural elements have contributed to our local, state, and national heritage	62. Identify and explain cultural elements that have contributed to our national heritage H-1C-E4)
D. World History	
H-1D-E1: identifying the characteristics and historical development of selected societies throughout the world	63. Identify how dance, music, and arts of various cultures around the world reflect the history, daily life, and beliefs of the people (H-1D-E1) 64. Identify significant historical achievements of various cultures of the world (e.g., building of the pyramids, founding of the Olympics) (H-1D-E1)
H-1D-E2: describing the social and economic impact of major scientific and technological advancements	65. Identify and describe inventions that have affected people's lives or altered their view of the world (H-1D-E2) 66. Identify the chronological order of major scientific or technological advancements (H-1D-E2)

H-1D-E3: discussing the impact of significant contributions made by historic figures from different regions of the world	67. Identify important historic figures from around the world and explain the impact of their contributions (e.g., Galileo, Madame Curie, Guttenberg) (H-1D-E3)

GLOSSARY

ENGLISH LANGUAGE ARTS GLOSSARY

Acronym — A word created from the first letters of each (or most) word in a phrase, such as SCUBA, *self-contained underwater breathing apparatus*.

Affix — A letter or group of letters attached to the beginning and/or end of a root word that changes its meaning or function, such as the prefix *un-* and the suffix *-able* in *undeniable*.

Allegory — A narrative in which the characters, events, action, and setting are contrived not only to make sense in themselves but also to signify a second, correlated order of persons, things, concepts, or events.

Alliteration — The repetition of the beginning sounds of two or more neighboring words, such as "*Peter Piper picked a peck of pickled peppers*."

Argumentative — A type of writing that develops or debates a topic in a logical or persuasive way.

Assonance — The repetition of a vowel sound in words, such as the long *e* sound in *she feeds the seals*.

Climax — In a story or play, the turning point or highest point of interest in the action of the plot. See also **plot sequence**.

Cognate — Two or more words from different languages that are related to one another because their historical base is the same or similar.

Conceit — A metaphor or simile that is constructed using elaboration or exaggeration to establish a striking parallel between two apparently dissimilar things or situations.

Connotative — The emotional, implied, or suggested meaning attached to a word that goes beyond its literal meaning.

Consonance — The repetition of final consonant sounds, such as *bake*, *stick*, *clock*.

GLOSSARY

Consonant Blends — Two or more consonants that are blended together rapidly without loss of identity of the sounds, such as the *bl* sound in *black* or the *str* sound in *struggle*.

Conventions of Print — Fundamental knowledge of how a person interacts with printed material based on the culture of the person. This knowledge forms the basis upon which a person learns to read. Examples include directionality (left to right, top to bottom), differences between letters and words, uppercase and lowercase letters, punctuation, understanding that books have front and back covers, title page, author, etc.

Conventions of Writing — Fundamental knowledge of how a person uses his or her own understanding of the written language when writing. This knowledge includes grammar, usage, mechanics (including capitalization and punctuation), structure (topic sentence, paragraph, etc.), and spelling.

Declarative Sentence — A sentence that states an idea, a fact, or an argument—often punctuated by a period—such as *The rabbit hopped*.

Deductive Reasoning — The process of logical reasoning that proceeds from the more general to the more specific; reasoning from whole to parts.

Denotative — The literal meaning or dictionary definition of a word.

Derivative — A word formed by adding an affix (prefix and/or suffix) to a root or stem, such as *dogs*, *highly*, *running*, *bicycle*, *replant*.

Developmental Spelling — The transitional stages students progress through as they move toward spelling standard English words.

Digraph — Two or more letters that make up a single sound, such as the *ph* sound in *phone* or the *oo* sound in *foot*.

Dialect — The social or regional variation of a language as it differs from the standard language.

Diphthong — A single vowel sound made when the tongue glides from one vowel sound to another in the same syllable, such as the *ow* sound in *owl* or the *ai* sound in *main*.

GLOSSARY

Dramatic Monologue	A type of poem or speech uttered by an assumed character, or persona, in a specific situation at a critical moment, that reveals the character's innermost thoughts and feelings to the audience. See also **soliloquy**.
Epic	A long narrative poem about a subject, and told in an elevated style, centering on the adventures of a larger-than-life hero or heroine, and reflecting the ideals of a nation or culture.
Etymology	The study of words—their origins, history, and meanings.
Euphemism	A word or expression used to replace unacceptable or taboo language.
Exclamatory Sentence	A sentence that expresses a strong opinion or emotion, often punctuated by an exclamation point or marked by intonation, such as *What a fantastic play!*
Expository	A mode of writing that is informational in nature. It is used to explain, describe, or tell about something.
Falling Action	The part of the plot generally following the climax, in which the author reveals the result of the conflict.
Fiction	Literary writing whose content comes from the imagination and is not necessarily based on fact but is designed to entertain; specifically, a type of literature, especially prose (novels, short stories, and forms of folklore).
Figurative Language	Language enriched by word images and figures of speech; not literal in its intent, but designed to make the reader take an imaginative leap to understand the author's point. Often includes the use of similes, metaphors, personification, etc.
Flashback	A literary device in which an earlier event is inserted into a narrative to show events that happened at an earlier time.
Fluency	The ability to orally read words or express ideas with clarity and ease.
Foreshadowing	The technique of arranging events and information in a narrative so that later events are set up beforehand.
Genre	A French term for a kind, a literary type or class.

GLOSSARY

Graphic Organizer — A representation of information in forms such as maps, charts, graphs (including pie charts and bar graphs), or tables, which visually organize information to identify patterns and relationships.

Homograph — One of two or more words that have the same spelling but differ in origin, meaning, and sometimes pronunciation, such as *bear* (large animal) and *bear* (support; carry) or *bow* (weapon for shooting arrows) and *bow* (forward part of a ship) and *bow* (bend in greeting or respect).

Homonym — One of two or more words that have the same sound and often the same spelling but that differ in meaning, such as bay (a body of water) and bay (part of a window).

Hyperbole — A figure of speech in which subject exaggeration is used for emphasis or effect, such as *That tree must be a mile tall!*

Idiom — A verbal expression that does not mean what it literally says and which may not be understood without local knowledge of the given language. For example, *You're barking up the wrong tree* is the equivalent to arriving at the wrong conclusion.

Imperative Sentence — A verb, a phrase, or a sentence whose construction or spoken tone issues a command and is punctuated with an exclamation point, for example, *Watch out!*

Inductive Reasoning — The process of logical reasoning that proceeds from the more specific to the more general; reasoning from parts to a whole.

Inflection — A change in the form of a word by the addition of an affix or by changing the base of the word to indicate grammatical features, such as number, person, tense, or mood, for example, *run* to *runs* or *run* to *ran*.

Inflectional Forms — The changing grammatical forms, functions, and meanings of a base or root word as different affixes are added to it. For example, the root word is bake; some inflectional forms of *bake* are *bake<u>s</u>*, *bake<u>d</u>*, *bak<u>ing</u>*, *<u>pre</u>bake*.

Interrogative Sentence — A sentence or expression that asks a question and is punctuated with a question mark, such as *Where are you going?*

GLOSSARY

Intonation — The rise and fall in pitch of the spoken voice, helping to convey the meaning of a phrase or sentence, for example, the difference between a command and a question as in "*Stop!*" or "*Stop?*"

Irony — A literary technique for implying, through words, plot or character development, that the actual comments or situation is quite different from what is asserted. The author's use of tone, exaggeration, or understatement often suggests the opposite of the literal meaning of the words used.

Literal — The simplest, nonfigurative, or most obvious meaning of a word or words; without exaggeration or embellishment. The words stated mean exactly what they say.

Literary Devices — Rhetorical elements (such as metaphor, foreshadowing, flashback, allusion, symbolism, irony, hyperbole, etc.) used to create a desired mood or tone in a piece of writing.

Metaphor — A figure of speech that makes an implied comparison between two things, such as *Habits are first cobwebs and then cables*.

Mood — The emotional state expressed in a literary work.

Motif — Intentional repetition of a word, phrase, event, or idea used as a unifying element in a piece of writing.

Multicultural Literature — Writing that reflects the customs, beliefs, and experiences of people of differing nationalities, ethnicities, cultures, and races.

Narrative — 1. A written (or orally presented) story that consists mainly of a sequence of events, which may be fictional or nonfictional. Narratives generally give an account of something presented as if it really happened.

2. A mode of writing that includes telling a story.

Nonfiction — A genre of writing designed to explain, argue, or describe a real event rather than to tell an invented story. A type of prose other than fiction but including biography and autobiography.

Nonphonetic Word — Any word whose pronunciation cannot be accurately predicted from its spelling.

GLOSSARY

Onomatopoeia — The formation and use of words to imitate sounds, such as *buzz*, *bang*, *crunch*, etc. A figure of speech in which the sound reflects the sense.

Onset — The part of a syllable that precedes the syllable peak when spoken aloud. Typically, the consonants preceding the syllable's vowel sound, such as the *gr* in *grape*.

Paradox — An apparently contradictory or illogical statement that goes against common sense but suggests a truth, such as *Less is more.*

Personification — A metaphorical figure of speech in which nonhumans (animals, objects, or concepts) are given human qualities.

Persuasive — A mode of writing or a spoken text, the purpose of which is to prove something to be true, credible, or worthy. Arguments may be explicit or implicit, but the purpose of a persuasive argument is to convince an audience to adopt a belief or perform a desired action.

Phoneme — The smallest sound unit of speech that conveys a difference in the meaning of a word, for example, /*b*/ in *book* and /*t*/ in *took*.

Phonemic Awareness — An understanding of the sounds (phonemes) that make up syllables and spoken words.

Phonics — The application of sound-symbol relationships to read and write words.

Phonological Awareness — A broad term that includes identifying and making oral rhymes, working with syllables, onsets and rimes.

Plot Sequence — The structure of the actions of a narrative or drama. The classic plot sequence is as follows: 1) exposition, 2) rising action, 3) climax, and 4) falling action leading to 5) resolution.

Point of View

In fiction, the narrative perspective used by an author to tell a story:

- Third-person points of view:
  - omniscient – gives the reader an all-knowing position from which to see actions and the characters' thoughts
  - limited— point of view that presents the story from outside any single character's perception, but the reader has no special insight into the characters' minds or motivations
- First person points of view—events are related as they are perceived by one character.
  - self-conscious narrator—aware that he or she is composing a work of art and takes the reader into his or her confidence about problems involved either seriously or for comic purposes
  - fallible or unreliable narrator—his or her interpretation of matters does not coincide with the implicit beliefs and norms of value held by the author, whose beliefs and norms the author expects the reader to share.

In nonfiction, used to discuss the author's beliefs and objectivity or subjectivity toward his or her subject.

Prefix

An affix (a letter or group of letters) that comes before a base or root word, such as *pro* at the start of *proclaim*.

Primary Source

A research resource that a writer studies first hand and that contains original opinions or information. A writer may use primary sources as research for an essay or presentation, such as interviews, journals/diaries, letters, autobiographies, etc. See also **secondary source**.

R-controlled Vowel

The modified sound of a vowel immediately preceding /r/ in the same syllable, as in *care*, *never*, *sir*, *or*, *curse*, etc.

Resolution

The part of a story following the climax in which the conflict is resolved.

Rhetorical

Using the principles of rhetoric (the art of finding the available means of persuasion for a given situation) to compose effective and purposeful texts or speeches.

Rime

One or more vowels following the consonant sound of a syllable, such as /ŏŏk/ in *c<u>oo</u>k* or *br<u>oo</u>k*, or /ā/ in *st<u>ay</u>*.

GLOSSARY

Rising Action — The part of a story in which the plot becomes increasingly complicated and introduces the conflict. Rising action generally leads to the climax of the story.

Satire — A literary technique or work that uses ridicule, humor, and wit to expose vices and fallacies. It may provoke change in the targeted beliefs, attitudes, or institutions.

Secondary Source — A research resource that contains the work and ideas of other authors or researchers. A writer may use secondary sources as research for an essay or presentation, such as reference books, articles by other authors, biographies, etc. See also **primary source**.

Simile — A comparison of two things that are apparently dissimilar, usually using the words *like* or *as*, for example, *coffee as cold as ice*.

Soliloquy — A speech, usually dramatic, performed by a character while or as if alone on stage. The soliloquy generally is used to develop the speaker's character and typically is a projection of the speaker's innermost thoughts. See also **dramatic monologue**.

Sound Devices — Literary terms that emphasize the sound(s) of the word (e.g., alliteration, assonance, consonance, onomatopoeia).

Standard English — The style of spoken and written English used in most schools, businesses, and government organizations in the United States. Standard English varies geographically and culturally, but maintains a fairly uniform grammatical structure.

Story Elements — Typical components that make up a story's structure and can be discussed individually, such as plot, characters, setting, theme, conflict, and outcome.

Stream of Consciousness — In literature, a technique used to present a character's thoughts and feelings as they develop; generally a random but continual flow of these thoughts and feelings.

GLOSSARY

Style — An author's distinctive manner of using language that suits his or her ideas and purpose in writing. An author's style often reflects his or her personality and beliefs and appears through each writer's characteristic ways of arranging ideas and use of diction, sentence structures, rhythm, figures of speech, and other elements of composition.

Suffix — An affix (a letter or group of letters) that comes at the end of a base or root word that changes the meaning or grammatical function of the word, such as *-ing* at the end of *fishing*.

Symbol and Symbolism — Symbol: a word or a set of words that signifies an object or event which itself signifies something else. Scales, for example, symbolize justice; a dove, peace; the lion, strength and courage.

Symbolism: the use of a concrete image to express an emotion or an abstract idea, such as the white whale representing the concept of evil in *Moby Dick*.

Syntax — The pattern or structure of word order in sentences, phrases, and clauses. The rules of grammar that dictate proper sentence construction.

Technical Writing — Writing for the purpose of communicating scientific or technical information or instructions to a specific audience.

Theme — A main idea or central idea that may be stated directly or indirectly. A theme may be profound, difficult to understand, or even moralistic. Generally a theme can be extracted as the reader explores a text.

Thesis Statement — The main point or argument of which an author or speaker tries to convince an audience through writing or speech.

Tone — The reflections of an author's attitude toward the topic and the audience as suggested by his or her word choices and stylistic efforts, for example, using a *formal* or *informal* tone. The tone of a text may also indicate the message or reaction that an author hopes for from the audience. See also **voice**.

Visual Texts — Information conveyed with images, or with meaningful patterns or sequences. Visual texts range from diagrams to documentaries. Other examples include tables, flowcharts, storyboards, picture glossaries, maps, and movies.

GLOSSARY

Voice — The expression of an author's self or identity as reflected in sentence construction and word choices, for example, using an active or passive voice. Less formally, the total effect of the elements of style that make a particular author's voice distinctive. See also **tone**.

Webbing — Any method of using diagrams, mapping, or other graphic-based tools that illustrate the relationships among the ideas and topics to be included in a piece of writing. May be used as a tool for teaching prewriting, outlining, comprehension, and note-taking.

GLOSSARY

MATHEMATICS GLOSSARY

Absolute Error — The difference between a measured value and the actual value. For example, when the thermometer reads 75º, the actual temperature might be 73º. The absolute error is 2 degrees.

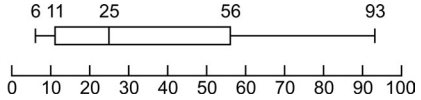
Accuracy — The extent to which a measurement/value/quantity conforms to an actual fact. For example, "The accuracy of this estimate will ensure there is enough water in the container without it overflowing."

Associative Property — A property, applicable to addition and multiplication, which states that it does not matter how numbers are grouped if they are all being added or all being multiplied (e.g., 2 + (4 + 9) = (2 + 4) + 9).

Asymptote — A line or curve that is approached (but never actually reached) by a function (e.g., the *x*-axis is an asymptote of the function $f(x) = \frac{1}{x}$).

Backward Reasoning — The reasoning involved when one assumes a conclusion is true and then works (or reasons) backwards to the evidence that the conclusion is true.

Box and Whiskers Plot — A graph in which five elements in a set of data are specifically marked: minimum value, first quartile, median value, third quartile and maximum value. This plot indicates a minimum of 6, first quartile of 11, median of 25, third quartile of 56 and maximum value of 93.



Combinations — Sets containing a certain number of objects selected from another set. The combinations of three items from the set $\{a,b,c,d\}$ are: $\{a,b,c\},\{a,b,d\},\{a,c,d\},\{b,c,d\}$. The sets *{a, b, c}* and *{b, a, c}* are considered to be the same sets.

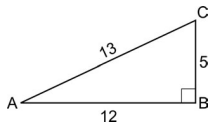
GLOSSARY

Common Equivalent Reference Points	Common fractions with decimal equivalents that can be used to approximate other nearby values. For example, ¼ = 0.25, ½ = 0.5, and ¾ =0 .75. Since 4/10 is slightly less than ½, its decimal equivalent will be slightly less than 0.5.
Commutative Property	A property, applicable to addition and multiplication; this property states that it does not matter in which order numbers are added or multiplied. (e.g., 5 + 6 = 6 + 5 and 8 x 9 = 9 x 8).
Complementary Events	Events that, when combined, constitute all possibilities. In the study of mathematics, the set of all complementary events constitutes the universal set. For example, writing an even integer or writing an odd integer are complementary events, since every possible integer is either even or odd.
Computational Fluency	A level of skill reached when a person is able to execute an algorithm or procedure efficiently and correctly without assistance.
Congruent	Figures that have the same size and shape.
Conic Sections	Figures that result from the intersection of a plane and a double-napped cone. The conic sections are a circle, an ellipse, a parabola, and a hyperbola.
Contrapositive	Given a statement of the form, "If P, then Q," the contrapositive is the statement, "If not Q, then not P." The contrapositive is logically equivalent to the original statement. Given the statement, "If it rained, then Bob went inside," the contrapositive is, "If Bob did not go inside, then it did not rain."
Converse	Given a statement of the form, "If P, then Q," the converse is the statement, "If Q, then P." The converse is not necessarily logically equivalent to the original statement. For example, given the statement, "If it rained, then Bob went inside," the converse is, "If Bob went inside, then it rained."
Coordinate Systems	Systems used to locate points using lines or points.

GLOSSARY

Cosine Ratio

The cosine of an angle in a right triangle is the ratio of the length of the adjacent side to the length of the hypotenuse. For example, in triangle ABC shown below, the cosine of angle A $\left[\cos(A)\right]$ is the ratio $\frac{12}{13}$.

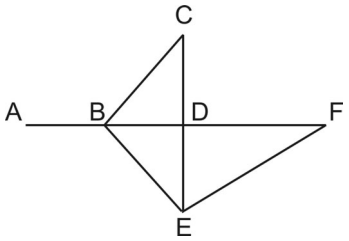


Degenerate Conics

Figures that result from the intersection of a plane and a double-napped cone, but are not "true" conic sections. The degenerate conics are a point, a line, and two intersecting lines.

Euler Path

A path that connects two vertices of a graph and travels each path in the graph exactly once. For example, the path A-B-C-D-B-E-D-F-E is an Euler path.



Dependent Events

Events that influence each other. If a bag contains three red marbles and two green marbles, randomly picking a red marble from the bag and then randomly picking a green marble from the bag (without replacing the red marble) are dependent events.

Dilation

A transformation that maps lines onto parallel lines. A dilation may be a translation (no size change) or an enlargement. The image on a movie screen represents a dilation of the image on the film.

GLOSSARY

Discrete Mathematics

The branch of mathematics dealing with situations in which there are a finite or countable number of values or objects (i.e., not continuous). For example, since no fractional values are applicable, determining the combination of colors that can be used in a drawing requires application of discrete mathematics. Three colors, a discrete number, is reasonable. $3\frac{1}{2}$ and other fractional numbers of colors do not make sense and are not reasonable solutions.

Distributive Property of Multiplication Over Addition

Property that states that for numbers *a, b,* and *c*, $a(b+c) = ab + ac$.

Expanded Form

The form of a number written as a sum to show place value. For example, the expanded form of 367 is 300 + 60 + 7.

Frequency Table

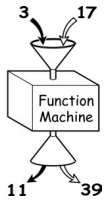
A table that lists how often different outcomes occur. Below is a frequency table representing the results of a poll about students' favorite fruits.

FAVORITE FRUITS	
Fruit	**Frequency**
apple	5
banana	9
orange	5
strawberry	7

GLOSSARY

Function Machine

A simple way to think of a function. You provide one input value and the machine (function) produces one output value. The diagram below shows a function machine which doubles and adds five to each number placed into the machine.

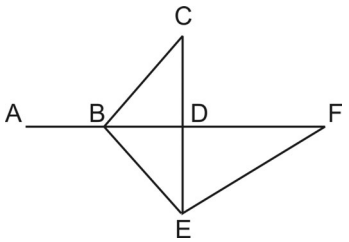


Fundamental Counting Principle

The principle that states that, "If there are **r** ways to do one thing and **s** ways to do another, and **t** ways to do a third thing, and so on, then the number of ways of doing all those things at once is **r** x **s** x **t** x …". Suppose a license plate lists a sequence of three letters followed by three digits. There are a total of $26 \bullet 26 \bullet 26 \bullet 10 \bullet 10 \bullet 10 = 17,576,000$ possible, different license plates.

Hamiltonian Path

A path that connects two vertices of a graph and visits each vertex in the graph exactly once. The path A-B-C-D-E-F is a Hamiltonian path.



Independent Events

Events that have no influence on each other. For example, flipping "tails" with a coin and rolling a four with a die are independent events.

GLOSSARY

Inverse — Given a statement of the form, "If P, then Q," the inverse of the statement is, "If not P, then not Q." The inverse is not necessarily logically equivalent to the original statement. Given the statement, "If it rained, then Bob went inside," the inverse is, "If it didn't rain, then Bob didn't go inside."

Inverse Operations — Operations that "undo" or are opposites of one another are inverse operations (e.g., addition and subtraction, multiplication and division).

Line of Symmetry — A line that divides a geometric object into two congruent halves.

Manipulatives — Concrete, physical objects used to help illustrate mathematical concepts.

Matrix (*pl.* Matrices) — A set of values arranged in a rectangular array. For example, the coefficients of the expressions $3x^2 + 7x + 9$, $11x^2 + (-8x) + 52$, and $-4x^2 + 21x + (-7)$ are represented in the matrix $\begin{bmatrix} 3 & 7 & 9 \\ 11 & -8 & 52 \\ -4 & 21 & -7 \end{bmatrix}$.

Mental Math — Computations and estimations performed without the aid of paper and pencil.

Mutually Exclusive Events — Two or more events, each of which precludes all the others. For example, the people voting in a presidential election and the people who are celebrating their 15^{th} birthday on that election day are mutually exclusive events.

Ordinal Number — A number that denotes position in a sequence. In the sentence, "Susan was the 6^{th} person in line," 6^{th} is an ordinal.

Outcomes — Results that are possible from an experiment or simulation. For example, the possible outcomes of rolling a six-sided number cube are rolls of 1, 2, 3, 4, 5, and 6.

Perfect Square — A number that can be written as the square of one of its factors. For example, the number 36 is a perfect square since it is the product of 6 and 6 (i.e., $6 \bullet 6 = 36$). The number 36 is said to be the square of 6.

GLOSSARY

Permutations — The ordered arrangements of the elements of a set. For example, the permutations of the list $\{A, B, C\}$ are (1) $\{A, B, C\}$ (2) $\{A, C, B\}$ (3) $\{B, A, C\}$ (4) $\{B, C, A\}$ (5) $\{C, A, B\}$ and (6) $\{C, B, A\}$

Pictographs — A visual representation of statistical data that uses pictures to indicate value or quantity.

Picture Graphs — See **pictograph**.

Polyhedron (*pl.* Polyhedra) — A three dimensional object with faces that are plane polygons. Cubes are polyhedra in which each face is a square.

Polynomial Expression — A mathematical expression that is the sum of terms, each of which is the product of a constant and a non-negative power of a variable or variables. For example, the expression $5x^7 + 11x^2 + 7x + (-3)$ is a polynomial expression.

Precision — The degree of specificity to which a measurement/value/quantity is determined. For example, "The measurement is precise to the nearest millimeter."

Probability — A number between 0 and 1, inclusive, which indicates the likelihood of an event occurring. For example, the probability of rolling a 1 on a fair, six-sided number cube is 1/6.

Pythagorean Theorem — The theorem that states a triangle is a right triangle if, and only if, the sum of the squares of the two sides is equal to the square of the hypotenuse. For example, the measures of the sides and hypotenuse of a triangle are 6 in., 8 in., and 10 in. Therefore, the triangle is a right triangle since $6^2 + 8^2 = 10^2$.

Quartiles — The three values that divide a set of data into four intervals with an equal number of elements in each interval. In the set of values $\{1,2,3,4,5,6,7\}$, the quartiles are 2 (1^{st}), 4 (median) and 6 (3^{rd}).

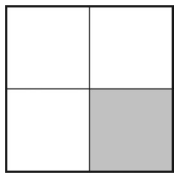
Range — The absolute difference between the greatest and least value in a set of data. For example, the range of the data set $\{7,8,12,17,23\}$ is $16\,(23 - 7)$.

GLOSSARY

Rational Number — Any number that can be written as a fraction in which both the numerator is an integer and the denominator is a natural number. For example, 3/7 is a rational number since it can be written as a fraction.

Rectangular Array — An arrangement of objects to aid in understanding multiplication. For example, four rows with three pieces of candy in each row can be used to illustrate 3 x 4 = 12 and 4 x 3 = 12.

Region Model — A geometric figure divided into equally-sized parts to illustrate fractional concepts. For example, the model below could be used to illustrate ¼ (the shaded region) or ¾ (the unshaded region).



Related Turn-around Pairs — Addition and multiplication facts that are the same except for the order in which the numbers are added or multiplied. For example, 2 + 3 = 5 and 3 + 2 = 5 is a related turn-around pair.

Rotational Symmetry — The property of an object such that after the object is rotated a number of degrees (less than 360°), the object is identical to the original object. For example, a square has rotational symmetry because it can be rotated 90 degrees and then appears identical to the original square.

Scatter Plot — A two-dimensional graph of a collection of points.

Sequences of Arithmetic Growth — A sequence of numbers in which the difference between successive terms is constant and the value of successive terms is increasing. For example, the pattern 4, 7, 10, 13, 16, 19, … is an arithmetic sequence with a constant difference of 3.

Sequence of Geometric Growth — A sequence of numbers in which the ratio of successive elements is constant and the value of successive elements is increasing. For example, the pattern 3, 6, 12, 24, 48, 96, 192, … is a geometric sequence with a constant ratio of 2.

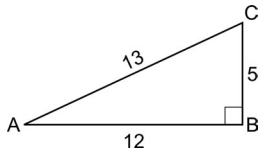
GLOSSARY

Set Model — A model for fractions in which the fraction is shown by a subset of highlighted objects out of the total set of objects. For example, one-third might be represented as • o o.

Similarity — The quality of having the same shape and proportional corresponding linear measurements. For example, the triangles are the same shape, but each side of the one triangle is six times as long as the corresponding side of the other triangle. Also, a marble and a bowling ball are not the same size, but they are similar.

Simulation — A representation (physical, written, verbal, graphic, procedural, experimental, etc.) of a situation or event(s). For example, the results of turning a spinner that is divided into ten equivalent parts marked zero (0) through nine (9) can be used to simulate the sequence of numbers on a license plate.

Sine Ratio — The sine of an angle in a right triangle is the ratio of the length of the opposite side to the length of the hypotenuse. For example, in triangle ABC shown below, the sine of angle A $\left[\sin(A)\right]$ in triangle ABC is the ratio $\frac{5}{13}$.



Skip-counting — Counting forward or backwards by a number other than 1. For example, starting at 2 and skip-counting forward by 2s would result in the sequence: 2, 4, 6, 8, …

Standard Form — The form in which numbers are traditionally written. For example, 367 is in standard form.

GLOSSARY

Stem and Leaf Plot

A data display consisting of "stems," which are the data with the last digit removed, and "leaves," which are the last digits of the data.

Stem	Leaves
3	4 4 6 8
4	0 3 6 6 7
5	1 1 3 4

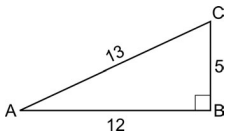
Key: 4 | 3 = 43

Symbolic Representation

A representation that uses symbols to model a situation or event. For example, the circumference of a circle is found by multiplying the diameter by pi. The symbolic representation that models this calculation is $C = \pi d$.

Tangent Ratio

The tangent of an angle in a right triangle is the ratio of the length of the opposite side to the length of the adjacent side. For example, in triangle ABC shown below, the tangent of angle A $\left[\tan(A)\right]$ in triangle ABC is the ratio $\frac{5}{12}$.



Tessellations

A covering of the plane using the same, non-overlapping shapes.

Trend Line (line of best fit)

The line, or equation of a line, that best represents the trend formed by the points in a scatter plot.

Unwrapping

The act of solving an equation by using inverse operations and knowing which operation to use first. This concept is sometimes associated with the concept of wrapping and unwrapping a present. When you unwrap, the first step is to "undo" the last step used when the gift was wrapped. For example, to solve the equation $4x + 2 = 6$, you would subtract 2 from both sides of the equation to "unwrap" the x.

GLOSSARY

SCIENCE GLOSSARY

Acceleration — The change in velocity per unit time; it is a vector quantity, as are velocity and position. The metric units of acceleration are meters per second squared or m/s^2.

Aerobic Respiration — Process of respiration that involves the release of energy from glucose or another organic compound in the presence of oxygen. The basic word equation that summarizes aerobic respiration is (glucose + oxygen $\rightarrow$ carbon dioxide + water + energy). The balanced chemical equation is $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O +$ energy. The energy produced is captured in adenosine triphosphate (ATP) molecules.

Anaerobic Respiration — Process of cellular respiration in which a cell obtains energy from inorganic molecules in the absence of oxygen.

Biome — A biome is a group of ecosystems that covers a large geographic area, related by having a similar type of vegetation, and governed by a similar climate. Examples of biomes are arctic tundra, coniferous forest, temperate forest, grassland, desert, tropical rain forest, and ocean.

Biosphere — Thin layer of Earth's surface where life exists; it includes all living organisms and all organic matter.

Bohr Model — Simplified, schematic model of the atom proposed by Niels Bohr in 1915 and more familiarly known as the planetary model. In the Bohr model, neutrons and protons occupy a dense central nucleus and the electrons orbit the nucleus.

Cardinal Directions — The four basic points (top or north, bottom or south, left side or west, and right side or east) on a compass.

Carrying Capacity — The maximum number of individuals of a species or population that an ecosystem can support without being degraded or destroyed over time.

Celestial — Of or related to the sky or universe, as the planets and stars.

Centripetal Force — Force acting on a body in curvilinear motion that pulls the object toward the center of curvature or axis of rotation.

GLOSSARY

Circuit	Closed path followed by an electrical current.
Closed System	A complex unity of diverse parts that is isolated so that it experiences no interactions to the outside environment; a closed-loop system.
Communicable Disease	Disease that is transmittable between persons or species; contagious disease.
Compression Waves	Waves which travel back and forth in the same direction as the waves wave motion; an example of compression waves is sound waves; also known as longitudinal waves.
Conductor	Substance or medium that transmits heat, light, sound, or especially, an electrical charge.
Consistency	Repeatability or reproducibility of measurements.
Continental Drift	The movement of continents as described by the German geologist and meteorologist Alfred Wegener in 1915. A theory that proposed the continents had once been joined together and have slowly drifted apart by an unknown mechanism. Essentially this theory has been replaced by advances in plate tectonics, which built on the original theory of continental drift.
Constants/Controls	Those factors (variables) that are kept unchanged or are restricted during a controlled experiment.
Control/Control Group	A group of subjects or objects in a scientific experiment or group investigation that does not receive the treatment being tested.
Controlled Experiment	An experiment in which all but one of the variable factors are experiment kept the same in order to observe the results of changing one factor, the independent variable.
Coulomb's Law	Principle stating that electrostatic force is proportional to the product of the charges and inversely proportional to the square of the distance between them. Charles A. Coulomb, a French scientist, was the first to quantitatively measure the electrical attraction and repulsion between charged objects.

GLOSSARY

Covalent Compound	A compound in which bonded atoms share electrons; it is formed compound when two nonmetals bond to each other.
Data	Numerical or descriptive, factual information, especially that which is derived from scientific observations or experiments, organized for analysis.
Dependent Variable	A variable whose value is determined by the changes made in the variable independent variable. Those factors observed for changes in value as a result of adjustments made in the independent variable.
Dichotomous Key	Tool that can be used to correctly identify organisms or objects in the natural world (e.g., trees, flowers, rocks, minerals) through a series of divergent choices between two descriptions.
Dimensional Analysis	Problem-solving method based on the fact that any number or analysis mathematical expression can be multiplied by one without changing its value; also called factor-label method or unit factor method.
Doppler Effect	Apparent change in the wavelength of radiation caused by the relative motion of a source and the observer. As the source and/or the observer draw closer together, the observed frequency is higher than the emitted frequency and decrease as they move apart.
Electromagnetic Waves	Waves that involve varying electrical and magnetic fields at right angles to each other and the direction of wave propagation (direction of travel of the waves). Examples of these waves that together comprise the electromagnetic spectrum are light (visible, infrared, and ultraviolet) waves, microwaves, x-rays, gamma rays, and radio waves.
Electrostatic Forces	Forces between electrically-charged objects at rest, as measured and expressed by Coulomb's law.
Empirical	Based entirely on experimental evidence and observation rather than theory.
Endothermic Chemical Reactions	Chemical reactions such as photosynthesis that absorb energy in chemical order to proceed and cannot occur spontaneously; these types of reactions reactions are characterized by positive heat flow (i.e., into the reaction) and an increase in enthalpy.

GLOSSARY

Eukaryotic Cells	Cells that contain membrane-bound nuclei and organelles.
Exothermic Chemical Reactions	Chemical reactions that release energy in the form of heat, light, or chemical sound. In the laboratory, these reactions produce heat and may reactions be flammable or explosive.
Genotype	Combination of two alleles that an organism inherits for a certain trait; genetic makeup of an organism.
Guiding Questions	Questions that begin a process of thinking and questioning leading to discovery through exploration and manipulation of data.
Habitat	Specific environment or part of an ecosystem where an organism lives (e.g., woods, desert).
Hertzsprung-Russell (HR) Diagram	A two-dimensional plot of the observed stars used to group them by spectral class, relative luminosity (compared to Sun = 1), diagram absolute magnitude or degree of brightness on a logarithmic scale, and effective temperature (Kelvin).
Homeostasis	The maintenance of the internal environment in a system within tolerable limits; the resistance to change and the maintenance of equilibrium, or constant conditions, in a system.
Hybridization	1. Cross-mating between two closely related species. 2. Concept dictating the nature of bonding and resulting molecular shapes of carbon compounds.
Hypothesis	Rational explanation of a single event or phenomenon based upon what has been observed but not proven. A tentative explanation for the cause of an observed phenomenon.
Independent Variable	Manipulated variable in a scientific experiment or investigation that determines the changes in the dependent variables.
Inertia	The tendency of a body at rest to remain at rest, or if moving in a straight line, to continue moving in a straight line, unless acted on by an outside force.

GLOSSARY

Inexhaustible Resources	Apparently endless resources such as the Sun, wind, or internal resources heat of Earth.
Inference	Process of drawing a conclusion or making a logical judgment based on prior conclusions or evidence but without direct observation.
Inorganic Matter	Matter not involving or relating to living organisms or the products of organic life.
Inquiry	Systematic process of using knowledge and skills to acquire and/or apply new knowledge and skills.
Ion	An atom or group of atoms that has acquired a net positive or negative electrical charge by gaining or losing one or more electrons.
Ionic Compound	A compound in which bonded atoms transfer electrons from one to the other; it is usually formed when metals bond to nonmetals.
Kinetic Energy	The energy of motion of an object, as expressed in the equation, $KE = ½ * m * v^2$, where m equals the mass of the object and v equals the speed of the object.
Lewis Dot Structures	Symbolic representations in atoms and simple ions showing structures valence electrons as dots placed around the symbol of the element, *and* structures illustrating covalent compounds or polyatomic ions showing valence electrons arranged among the atoms symbols in the molecule to illustrate the bonding of the atoms.
Lithospheric Plate	One of the movable sections of Earth's crust and upper mantle.
Medium	Substance, for example water or glass, through which something else, such as sound or light, is transmitted or carried.
Metamorphosis	Process of change of organisms through various stages in their life cycles. May be complete, involving the four stages of egg, larva, pupa, and adult, as in butterflies and moths, or incomplete, as in the gradual development of many insects and crustaceans.

GLOSSARY

Metric System Units of Measurement	Decimal system of weights and measurements that includes units of Standard International or SI units measurement.
Meiosis	Process of cellular division in which the number of chromosomes in each daughter cell is reduced by half the number in the parent cell. This cellular division process produces gametes.
Mitosis	Process of cellular division in which a cell's chromosomes are divided into two identical sets prior to cytoplasmic division. This process produces two identical daughter cells.
Model	Simulation of a real object that has explanatory power but that typically differs in size, scale, and/or detail; examples include plan, scheme, structure, or mathematical equation.
Molality	Number of moles of solute dissolved in one kilogram of solvent.
Molarity	Number of moles of solute dissolved in a liter of solution.
Nebular Hypothesis	Hypothesis for the origin of the solar system that proposes that hypothesis that the Sun and planets formed from the same cloud of gas and dust in interstellar space.
Niche	The role an organism carries out in its habitat.
Noncommunicable Disease	Disease that is not transmittable between persons or species; disease non-contagious disease.
Nonpoint-source	Sources of pollution that do not result from a single point or pollution source, for example, erosion of soil materials from multiple farms and construction sites that are carried and deposited in an adjacent stream as opposed to specific points of discharge.
Nonstandard Tools	Objects or instruments such as pieces of string, rows of blocks, tools fingers, hands, or pencils used for measurement; examples do not include standard and systematic means of measurement such as scales, rulers, clocks, and thermometers.

GLOSSARY

Normality	Concentration of a solution expressed in gram equivalent weights of solute per liter; it is particularly useful in titration calculations.
Null Hypothesis	Statistical hypothesis, often the reverse of what the experimenter actually believes, that is used to determine if the results obtained can be rejected merely on the basis of chance factors.
Organic Matter	Matter that is of, related to, or derived from living organisms.
Phenotype	The expression of an organism's traits as a result of its genetic makeup; outward appearance of an organism.
Pitch	Relative quality of highness or lowness of sound that is primarily dependent on the frequency of the waves produced by its source.
Plate Tectonics	Theory that Earth's outer shell consists of individual plates which interact in various ways and produce earthquakes, volcanoes, and mountain building.
Point-source Pollution	Pollution originating from a single source such as a discharge pipe from a sewage plant or chemical factory.
Potable Water	Water fit for human consumption.
Potential Energy	Energy that is stored in an object as a result of its vertical position.
Precision	The relative degree of exactness and reproducibility between measurements or estimates.
Prokaryotic Cells	Cells that lack an organized, membrane bound nucleus.
Punnett Square	Chart or grid system used to compute and visualize all possible genotypes of a genetic cross.
Refract	To deflect or bend from a straight path, as when a light wave changes direction as it passes from one medium into another of different density.

GLOSSARY

Revolution	The motion of a body or object around another body or object, for example, the revolution of Earth around the Sun.
Rotation	The spinning of a planet such as Earth or other object on its axis.
Rules of Evidence	Criteria used to examine and evaluate experimental results; examples include testability, reliability, application of standards and controls, error rate, subjection to peer review, and acceptance in the scientific community.
Scalar Quantity	A quantity that is completely specified by its magnitude and has no direction in space; examples are mass, length, volume, temperature, and speed.
Scientific Evidence	Evidence in which theories are validated against physical observations and not judged simply on the basis of their logical compatibility with available data; includes criteria such as testability, reliability, application of standards and controls, error rate, subjection to peer review, and acceptance in the scientific community.
Sea-floor Spreading	It is the process of producing new sea floor crust on the ocean floor between two diverging tectonic plates.
Standard International (SI) Units of Measurement	More complete, coherent version of the metric system of International measurement; basic units of the SI system include the centimeter (SI) units of or meter, gram or kilogram, and second. measurement
Standard Tools	Instruments such as meter sticks, pan balances, graduated cylinders, or thermometers used for systematic measurement.
Statistical Significance	A test performed to determine if the null hypothesis can be significance rejected, and if so, then the effect in the sample is found to be statistically significant.
Stoichiometry	Quantitative relationship between chemical substances in a reaction.
Superposition	Principle in geology which states that in any undisturbed sequence of sedimentary rocks each bed is older than the layers above and younger than the layers found below.

GLOSSARY

Sustainability	Capacity of continuing and maintaining a population and growth with minimal long-term effects on natural resources and the environment. *Sustainable* means that a process can be continued indefinitely without depleting the energy and resources upon which it depends.
Sustainable Development	Development that provides benefits now without sacrificing or development depleting resources or causing environmental impacts that will affect future generations.
Symbolic Representation	Ways in which science ideas such as chemical elements, formulas, representation ions, and equations are expressed; other examples include numbers in scientific notation illustrations, fractions, graphs, or spreadsheets.
Terrestrial	Relating to Earth or earthlike, its environments, or its inhabitants.
Testable Question/ a Hypothesis/Investigation	A query that can be answered through experimentation or research; hypothesis that makes predictions about the compatibility or investigation noncompatibility of observable evidence; an investigation or experiment to answer a testable question or hypothesis.
Scientific Theory	Explanation of a set of related observations or events based upon theory hypotheses that have verified through multiple investigations. Scientific theories differs from the general use of the word theory because this term applies to well tested and widely accepted ideas that explain certain observable facts.
Translucent	Transmitting light with sufficient diffusion so as to prevent distinct perception of images.
Transverse Waves	Waves in which the motion is up and down or at right angles to the direction of propagation or the direction in which the waves are traveling. Examples include radio waves, light waves, heat waves, and water waves.
U.S. System Units of Measurement	Principal and customary system of weights and measurements of measurement used in the U.S.A.; although the names of the units are the same as in the British system, the sizes of some units differ.
Valence Electron	Orbital electrons in the outermost shell of an atom that largely determine its properties and that are capable of forming chemical bonds with other atoms.

GLOSSARY

Validity	Degree to which an experimenter is measuring what s/he thinks; more generally refers to the strength of conclusions, inferences, propositions.
Vector Quantity	Quantity that is not complete unless both a magnitude and a direction are specified; an example is velocity.
Velocity	Vector quantity specifying both the speed and direction of a body or an object in motion.
Zygote	Fertilized egg resulting from the joining of two haploid gametes.

GLOSSARY

SOCIAL STUDIES GLOSSARY

Absolute Chronology — Chronology is the sequencing of events by time, from earliest to most recent. Absolute chronology is the sequencing of events according to the exact date (day, month, and/or year) that an event occurred.

Atmosphere — The several layers of gases that surround Earth and separate our planet from space.

Biosphere — The part of Earth and its atmosphere in which plant or animal life exists or is possible.

Capital Resources — One of three types of resources, natural, human, and capital, used in the production of goods and services. Capital resources are human-made products, such as tools, equipment, buildings, and machines that are used to produce other goods and services.

Cardinal Directions — The four primary points on the compass: north, south, east, and west.

Choice/Trade-off — An economic choice requires choosing among alternatives. The result of making a choice is that something is given up to get something else. The result of a choice is a trade-off.

Command Economy — An economic system in which the government regulates the economy and answers the four basic economic questions (i.e., "what to produce," "how to produce," "how much to produce," and "for whom to produce"). In a command economy, the central government or authority determines both supply and price.

Complements — Goods or services that are usually consumed or used together (e.g., hot dogs/hot dog buns). A change in demand for one complement causes a similar change in demand for the other complement. Also known as complementary goods.

Concurrent Powers — Powers that may be exercised by both the national (federal) government and state governments (e.g., the power to tax).

Consumer — A person who satisfies a want or need by buying or using a good or service.

GLOSSARY

Cost/Benefit	All predicted costs weighed against the predicted benefits of an economic choice. The process and outcome of weighing costs and benefits is known as cost/benefit analysis.
Culture, Elements of	Cultural elements include the customary beliefs, social forms, and material traits of a racial, religious, or social group. These elements may be spread from group to group through direct and indirect contact. See also **cultural diffusion**.
Cultural Diffusion	The process of spreading cultural elements (e.g., music, religious beliefs/practices, clothing) from society to society through indirect or direct contact among groups.
Cultural Diversity	The variety of human cultures represented in a specific group, institution, or region.
Delegated Powers	Powers granted to the national (federal) government under the U.S. Constitution, including expressed and implied powers, as enumerated in Articles I, II and III (e.g., declaring war).
Demographic Variables	The statistical data variables of a population (e.g., age, gender, income, location, employment, education).
Demographics	The characteristics or statistical data of a population as classified by age, gender, income, location, employment, or education.
Division of Labor	The division of an entire production process into a number of simpler tasks, each one of which is undertaken by a different individual who typically specializes in one task. See also **specialization**.
Economic Institution	Any institution that has evolved in a market economy to help individuals and/or groups accomplish their goals. Banks, labor unions, corporations, legal systems, and not-for-profit organizations are examples of economic institutions that are essential to a market economy.
Equilibrium Point	The price when the supply of goods matches demand. Also known as equilibrium price.

GLOSSARY

European Union (EU)	An economic and political association of European countries founded by the Treaty of Rome in 1957 as a common market for six nations. It was known as the European Community until January 1, 1994, and is currently comprised of 15 European countries—Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden. The EU's goals are a single market for goods and services without any economic barriers, and a common currency—the euro—with one monetary authority.
Federalism	A form of political organization in which governmental power is divided among a central government and territorial subdivisions (e.g., states, or provinces).
Five Themes of Geography, The	*Location* (position on Earth's surface), *region* (the basic unit of geographic study), *place* (the human and physical characteristics that give meaning and character to a place and distinguish it from other places), *movement* (humans interacting on Earth), and *human/environment interaction* (the positive and negative effects of people interacting with their surroundings).
G8	The G8 (Group of Eight) is comprised of the heads of state/government of the major industrialized democracies who meet annually to deal with international trade and other economic and political issues facing their nations or the international community as a whole. The meetings began in 1975 with a Group of Six (France, Germany, Great Britain, Italy, Japan, and the United States). Canada joined in 1976; Russia became a full participant in 1998.
Goods and Services	A good is an object, such as a toy, a box of cereal, or a computer, that can be used to satisfy a person's want or need. A service, such as waiting on a table or providing dental care, is an action that can be used to satisfy a person's want or need.
Human Characteristics	In geography, features or patterns of features on Earth's surface created by humans.
Human Resources	One of three types of resources, natural, human, and capital, used in the production of goods and services. Human resources are people, such as teachers, truck drivers, and factory workers, who work to produce goods or provide services.

GLOSSARY

Human Systems — The processes, patterns, and functions of human settlement, structures, and competition for control of Earth's surface.

Hydrosphere — The water realm of Earth, which includes water contained in the oceans, lakes, rivers, ground, snowfields, glaciers, and water vapor in the atmosphere.

Implied Powers — Powers that are not specifically enumerated for the national (federal) government, but are "implied" in Article I, Section 8, Clause 18 of the U.S. Constitution. This clause, also known as the elastic clause, or the necessary and proper clause, gives Congress the authority to "make all laws which shall be necessary and proper for carrying into execution the foregoing powers and all other powers vested by the Constitution in the government of the United States, or in any department or officer thereof." An early example of Congress exercising its implied powers was the establishment of a national bank in 1791.

Inflation — An increase in the general level of prices consumers pay for goods and services. This is equivalent to a fall in the value or purchasing power of money. The Consumer Price Index is a common measure of inflation.

Interdependence — The situation which occurs when individuals and businesses rely on each other for production of goods or providing services to satisfy wants and needs due to specialization or division of labor. See also **division of labor**, **specialization**.

Intermediate Directions — The points on the compass that fall between the four primary points (north, south, east, and west). The intermediate directions are northeast, northwest, southeast, and southwest.

International Monetary Fund — An international financial organization that was established in 1946 to stabilize the international monetary system. It manages the global financial system and provides loans to its member states to help alleviate balance of payments problems. Part of its mission is to help countries that experience serious economic difficulties. In return, the countries who are helped are obliged to enact certain reforms, such as privitization.

Laws — Regulations that are issued and enforced by a government or other authority and that bind every member of society.

GLOSSARY

Limited Government — A government in which a constitution, statement of rights, or other laws define the limits of those in power. Everyone, including all authority figures, must obey the laws. The United States has a limited government with powers delegated to different branches of government by the U.S. Constitution and its amendments.

Lithosphere — The uppermost portion of the solid Earth, including the soil, land, and geologic formations.

Market Economy — An economic system in which individuals answer the four basic economic questions (i.e., "what to produce," "how to produce," "how much to produce," and "for whom to produce") based on supply, demand, and prices. This economic system is also known as free enterprise, and has the following characteristics: private ownership of goods and the factors of production, freedom of individuals to make economic choices, the use of prices to allocate resources, and a limited economic role for government.

Mental Map — A map that represents the mental image a person has of an area. A mental map includes geographic features and spatial relationships, as well as a person's perceptions and attitudes regarding the place. Also known as a cognitive map.

Mercantilism — An economic doctrine/system prevalent in Europe from the 16th century to the mid-18th century. This doctrine held that the economic interests of a nation could be strengthened by tariffs, increased foreign trade, monopolies, and a balance of exports over imports. This economic doctrine influenced the British attitude and policies towards its American colonies (i.e., the colonies were held for the economic benefit of the mother country).

Migration — The process of people moving to a new place with the intent of staying at the destination permanently or for a relatively long period of time.

Militarization — Act of assembling and putting into readiness for war or other emergency.

NAFTA — The North American Free Trade Agreement which was signed by the United States, Canada, and Mexico in 1992 and became effective on January 1, 1994. It created a free trade zone among the three countries and immediately removed trade barriers and tariffs on most goods. Certain tariffs on such goods as textiles and automobiles were planned to be gradually eliminated over a 15-year timetable.

GLOSSARY

Nation	A nation is a group of people sharing aspects of their language, culture, religion, and/or ethnicity (e.g., Cherokee Nation). A nation may exist within more than one state (i.e., across political boundaries). The term nation is sometimes applied to a group of people organized under a single government, country, or to the government of a sovereign state. See also **nation-state**.
Nation-State	Often refers to a political unit of people living in a defined territory, with government authority in their economy, political organization, and external security. Thus, the term nation-state is often used interchangeably with the term state. However, nation-state more properly refers to a state in which a single nation (i.e., group of people sharing aspects of their language, culture, religion, and/or ethnicity) is dominant. See also **nation**.
Natural Disasters	Calamitous events resulting in great material damage, loss, and distress. They are the result of natural phenomena such as floods, hurricanes, tornadoes, earthquakes, etc.
Natural Resources	One of three types of resources, natural, human, and capital, used in the production of goods and services. Natural resources are not made by humans. They are found in and on Earth, such as water, oil, and trees.
Opportunity Cost	The value of the next best (second best) alternative that must be given up when a choice is made.
Patterns of Land Use	The societal patterns of exploiting the land for agricultural, industrial, residential, or other purposes.
Physical Characteristics	In geography, traits that are used to describe the natural environment of a place. Physical characteristics may be related to climate, vegetation, soil, landform, or body of water.
Physical Systems	Physical processes that shape Earth's surface and interact with plant and animal life to create, sustain, and modify ecosystems.
Primary Sources	Documents produced by a person who participated in or observed an event, or artifacts, such as photographs produced by a person who lived during the time period being studied.
Producer	A person or business that uses resources to make goods or provide services.

GLOSSARY

Productivity	The relationship between input (workers, machines, materials, and capital) and output (goods and services), e.g., the number of loaves of bread a particular bakery can make in a single day.
Profit	The amount of money left over after all of the costs of production have been paid (revenues minus costs).
Region	An area of Earth that has physical or human characteristics that make it distinctive from other areas.
Relative Chronology	Chronology is the sequencing of events by time, that is from earliest to most recent. Relative chronology is the sequencing of events, individuals, or time periods in relation to each other (e.g., which came first). Relative chronology does not rely on knowing the exact date (day, month, and/or year) that an event occurred.
Relative Location	A position that is described solely in relation to another position(s); where a place is in relation to other places.
Reserved Powers	The powers not delegated to the national (federal) government by the U.S. Constitution, nor prohibited to the states. These powers are reserved to the states (e.g., creating a school system) or the people.
Risk	In economics, risk is the potential loss when a choice is made. For example, in choosing to finance the production of a good, there is the risk that product sales will not generate sufficient revenues to cover production expenses.
Rural Areas	Areas that are sparsely settled and are distinct from more densely populated urban and suburban areas. Rural areas are also distinct from unsettled, or wilderness, areas.
Scarcity	The condition that occurs when there are not enough resources (goods and services) to satisfy wants and needs.
Secondary Sources	Summaries or interpretations of historical events produced by people who did not observe or participate in the events.

GLOSSARY

Specialization — At a broad level, specialization means the production of a limited variety of goods or services by a business, region, or nation. At an individual level, specialization usually refers to a worker who produces only one part of a final product, rather than producing the entire product (e.g., an autoworker who only installs engines in automobiles). There may also be specialization within providing services (e.g., one person may sort the mail and another may deliver it). See also **division of labor**.

Substitutes — Goods or services that can be used or consumed interchangeably (i.e., they satisfy the same want). Also known as substitute goods.

Suburban Area — A residential, or largely residential, area located on the outskirts of a city.

Supply and Demand — Supply is the quantity of a good or service that producers are willing and able to offer for sale at various prices at any given time. Demand is the quantity of a good or service that consumers are willing and able to buy at various prices at any given time. These two forces combined result in the law of supply and demand: more will be bought at lower prices and less at higher prices, and more will be produced at higher prices than will be produced at lower prices.

Technology — A broad and encompassing term that includes any tool, instrument, machine, system, or process that humans develop to solve human problems and/or assist in living in or managing the physical environment.

Topography — The shape or configuration of Earth's surface, including relief and position of natural and human-made features.

Trade-off — See **choice/trade-off.**

Traditional Economy — An economic system in which customs, habits, and religious beliefs determine how the four basic economic questions (i.e., "what to produce," "how to produce," "how much to produce," and "for whom to produce") are answered. In a traditional economy most goods and services are produced by and for a family, with little surplus for sale or barter.

Unemployment — In economic terms, the measure of the number of workers that want to work but do not have jobs.

Unlimited Government	A government in which control is held solely by the ruler and his or her appointees, and there are no limits imposed on the ruler's authority.
Urban Area	A geographical area constituting a city or town.
World in Spatial Terms, The	Refers to understanding and interpreting the world in terms of geographic representations.