Table of Contents

Title 28
EDUCATION
Part CIV. Bulletin 104—Louisiana Computer Science Student Standards

Chapter 1. General Provisions 1
§101. Introduction 1
§103. Definitions 1
Chapter 3. Computing Systems 2
§301. Hardware and Software 2
§303. Troubleshooting 2
Chapter 5. Networks and the Internet 2
§501. Hardware and Network Communication 2
§503. Cybersecurity 2
Chapter 7. Data and Analysis 3
§701. Data Representation 3
§703. Data Collection 3
§705. Data Storage 3
§707. Visualizations and Transformations 4
§709. Inference and Models 4
Chapter 9. Algorithms and Programming 4
§901. Variables and Algorithms 4
§903. Control Structures 4
§905. Modularity 5
§907. Program Development 5
Chapter 11. Impacts of Computing 6
§1101. Intellectual Achievements 6
§1103. Social Interaction 6
§1105. Laws, Safety, and Industry Practices 6

Title 28
EDUCATION
Part CIV. Bulletin 104—Louisiana Computer Science Student Standards
Chapter 1. General Provisions

§101. Introduction

A. The computer science content standards are organized into five core concepts based on the Louisiana Computer Science Framework (LSCF). Each concept is further subdivided into relevant subconcepts which serve as a way to organize essential knowledge or computing skills.

B. The complexity of the standards progresses from kindergarten through twelfth grade. Within each concept, the content standards define the content and skills that students should master by the end of the elementary, middle, and high school grade bands. A standard represents a goal or outcome of an educational program and is not meant to serve as an instructional curriculum or assessment ask.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:260 (February 2025).

§103. Definitions

Abstraction—the process of reducing complexity by focusing on the most relevant details.

Algorithm—a step-by-step process to complete a task.

Code—any set of instructions expressed in a programming language.

Computational Artifact—anything created by a human using a computational thinking process and a computing device. A computational artifact can be, but is not limited to, a program, image, audio, video, presentation, or web page file.

Computational Thinking—a problem-solving process that can be applied to multiple disciplines and includes decomposition, abstraction, pattern recognition, and their impact on society.

Computer Science—the study of computers and algorithmic processes, including principles, hardware and software designs, implementation, and their impact on society.

Computing System—the collection of one or more computers or computing devices, including both hardware and software, integrated to accomplish shared tasks. A computing system may be used to refer to one device, but is more commonly used to refer to a collection of multiple connected devices, hardware, and computers.

Cyber Citizenship—the responsible use of technology which may include, but is not limited to, accessing and following acceptable, responsible behaviors to access technology within an acceptable use policy (AUP); social media use and limitations by age; data sharing and privacy; responsible personal cybersecurity practices; fact-checking and verifying information from social media outlets; understanding your personal digital footprint; obeying state and federal computing laws; and avoidance of cyber bulling and/or harassment.

Data Transformation—the process of converting, cleaning, and structuring data into a usable format for computers to process. The usable data can be analyzed to support data-driven decision making.

Digital Literacy—the ability to find, evaluate, utilize, share, and create digital content.

Emerging technologies—innovations, unexpected new technologies, new advances in computing, and future innovations that are happening in both the present and potential near future.

Model—a representation of some part of a problem or a system, and can act as a bridge between algorithms and actual implementation software.

Operation—the action that a computer carries out to complete a task. Not to be confused with mathematical operations of addition, subtraction, multiplication, and division. There are five basic types of computer operations: inputting, processing, outputting, storing, and controlling.

Procedure—an independent code module that fulfils some concrete tasks and is referenced within a larger body of program code. The fundamental purpose of a procedure is to offer a single point of reference for some small group or task that the developer or programmer may trigger by invoking the procedure itself.

Program—a set of instructions the computer executes to achieve an objective. When used as a verb, the term means to create a program by programming.

Programming Language—sets of computer instructions that can be utilized by a programmer to tell a computer what to do.

Reliability—an attribute of any system that consistently produces the same results to meet or exceed its requirements.

Remix—creating new program versions by recombining or modifying parts of the existing program's code to develop new solutions or compensate for problems.

Scalability—the capability of a network to handle a growing amount of work or the network's potential to be enlarged to accommodate future growth.

Simulation—a program that imitates the operation of a real-world process or system.

Software Development Life Cycle (SDLC)—a process for planning, creating, testing, and deploying an information

system. The stages in the SDLC are planning, requirements analysis, design, coding, testing, deployment, and maintenance.

Test Case—a set of variables under which a user will determine whether the system satisfies requirements or works correctly.

Usability—the degree to which software can be used by specified consumers to achieve a quantified objective with effectiveness, efficiency, and satisfaction in a quantified context of use.

Variable—a symbolic name used to keep track of a value that may change as a program runs.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:260 (February 2025).

Chapter 3. Computing Systems

§301. Hardware and Software

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Identify and select the appropriate hardware to complete computing tasks.

2. Identify and select the appropriate software to complete computing tasks.

3. Evaluate hardware and software types to meet users' needs in completing various computing tasks.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Analyze the functions and interactions of core components within a computer system.

2. Explain how hardware and software components work together to perform specific tasks.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday things.

2. Analyze the levels of interactions between application software and system software as well as the hardware layers.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:261 (February 2025).

§303. Troubleshooting

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Propose potential ways to address computing problems using appropriate hardware and software.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Evaluate possible solutions to a hardware or software problem.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Generate guidelines that convey systematic troubleshooting strategies that other users can utilize to identify and fix errors.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:261 (February 2025).

Chapter 5. Networks and the Internet

§501. Hardware and Network Communication

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Explain how networks connect computers to other computing systems and the Internet.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Analyze the various structures and functions of a network.

2. Identify and differentiate the protocols utilized in data sharing across networks.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Evaluate a network's scalability, reliability, and appropriateness by describing the relationship between routers, switches, devices, topology, and addressing (MAC, IP, Subnet, and Gateway).

2. Illustrate how to trace data through a network model, explaining the interactions that occur throughout the process.

3. Describe and evaluate the Internet as a digital public infrastructure (DPI) from the highest level to the private service provider level.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:261 (February 2025).

§503. Cybersecurity

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Describe personally identifiable information (PII) and identify practices for when and where sharing PII is appropriate.

2. Identify ways to maintain data security when using networks.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Explain how physical and digital security practices and measures proactively address threats to users, data, and devices within and across networks.

2. Analyze threats and vulnerabilities to information security for individuals and organizations.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Interpret and analyze mechanisms through which malware and other types of cyber attaches can impact hardware, software, and sensitive data.

2. Recommend security measures to address factors that create trade-offs between the usability and security of a computing system.

3. Compare and contrast how software developers protect computing systems and information from unauthorized used access.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:261 (February 2025).

Chapter 7. Data and Analysis

§701. Data Representation

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Classify types of data and describe the attributes used to sort data.

2. Organize and present data visually to highlight relationships and support claims.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Evaluate the most efficient and effective ways to arrange, collect, and visually represent data to inform others.

2. Analyze and explain the connection between data sets and graphical representations.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Evaluate data representations, propose strategies to reconstruct the data, and visualize data in a variety of ways.

2. Define and describe database structures to optimize the search and retrieval of data.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:261 (February 2025).

§703. Data Collection

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Select the appropriate data collection tool and technique to gather data to support a claim or communicate information.

2. Describe and collect data utilizing the appropriate units of measure and discuss how data format impacts a computing system.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Compare and contrast how data is collected using computational and non-computational tools and processes.

2. Analyze scenarios and computing systems to determine the appropriate data entry format for specific tools.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Explain and describe the impacts of uncertainty and the limitation of data collection technology and tools.

2. Describe the personal and legal impacts of accumulated date, both collected and derived, for given scenarios. Propose tools and techniques to manage the accumulated data appropriately.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:262 (February 2025).

§705. Data Storage

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Compare and contrast ways to store data using technology.

2. Explain how to save and name data, search for data, retrieve data, modify data, and delete data using a computing device.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Describe how different representations of real-world phenomena such as letters, numbers, and images are encoded as data.

2. Propose methods to back up data safely and the appropriate practices for data risk management.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Explain and utilize the appropriate data structural organization system to collaborate and communicate data within a team or user group in given scenarios.

2. Justify choices on how data elements are organized and where data is stored considering cost, speed, reliability, accessibility, privacy, and integrity.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:262 (February 2025).

§707. Visualizations and Transformations

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Organize and present data visually in at least three ways to highlight relationships and evaluate a claim.

2. Evaluate data quality and clean data when indicated using the criteria of validity, accuracy, completeness, consistency, and uniformity.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Utilize tools and techniques to locate, collect, and create visualizations of large-scale data sets.

2. Collect and transform data using computational tools to make functional and reliable data for use in hypothesis testing.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Create interactive data visualizations using software tools that explain complex data to others.

2. Utilize data analysis tools to ingest (extract, transform, and load) and process data into relevant information.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:262 (February 2025).

§709. Inference and Models

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Analyze data for patterns and relationships.

2. Utilize data to create models, answer investigative questions, and make predictions.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Describe and evaluate the accuracy of a modeled system by comparing the generated results with observed data from the system the data represents.

2. Refine computational models based on data generated by the models.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Apply and evaluate data analysis techniques to identify patterns represented in complex systems.

2. Analyze patterns in data visualizations, then select a collection tool to test a hypothesis and communicate the relevant information to others.

3. Create a model utilizing data with the appropriate simulated variable to develop predictions for real-world phenomena.

4. Evaluate the impact of the variable and the model on the performance of a simulation to refine a hypothesis.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:262 (February 2025).

Chapter 9. Algorithms and Programming

§901. Variables and Algorithms

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Create clearly named variable representing different data types and perform operations on the variables' values.

2. Create, use, and apply an algorithm to complete a task. Compare the results of algorithm usage trials and refine the algorithm.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Evaluate and use naming conventions for variable to accurately communicate the variables' meaning to other users and programmers.

2. Compare and contrast data constants and variables.

3. Evaluate algorithms in terms of efficiency, correctness, and clarity.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Explain what computer memory is and how variable are stored and retrieved.

2. Assess variables, then classify the scope and type of variable.

3. Design algorithms that can be adapted to express an idea or solve a problem.

4. Use and adapt classical algorithms to solve computational problems.

5. Identify and explain how a derived data type can be utilized in a real-world scenario.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.
HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:263 (February 2025).

§903. Control Structures

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Define what a control structure is and create programs that include sequences, conditional, events, and loops.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Explain the functions of various control structures. Compare and contrast examples of control structure types.

2. Design and iteratively develop programs that combine control structures into advanced control structures.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Justify the selection of control structures to balance implementation complexity, maintainability, and program performance.

2. Design and iteratively develop computational artifacts using events to initiate instructions.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:263 (February 2025).

§905. Modularity

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Define and apply decomposition to a complex problem in order to create smaller subproblems that can be solved through step-by-step instructions.

2. Modify, remix, or incorporate parts of an existing problem's solution to develop something new or add more advanced features to a program.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Decompose problems to facilitate program design, implementation, and review.

2. Create procedures with parameters to organize code and promote reusability.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Decompose problems into smaller components using constructs such as procedures, modules, and/or objects.

2. Create computational artifacts using procedures within a program, combinations of data and procedures, or independent but interrelated programs.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:263 (February 2025).

§907. Program Development

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Create a simple program to achieve a goal with expected outcomes.

2. Test and debug a program or algorithm to ensure the program produces the intended outcomes.

3. Collaborate with a team of peers to design, implement, test, and review the stages of program development.

4. Describe and justify the steps taken and choices made during a program's development.

5. Using an iterative process, test a program step-by-step and document areas of refinement.

6. Identify intellectual property rights and apply the appropriate attribution when creating or remixing programs.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Seek and incorporate feedback from peers to employ user-centered design solutions.

2. Incorporate existing resources into original programs and give the proper attributions.

3. Systematically test, document outcomes, and refine programs using a range of test cases.

4. Develop computational artifacts by working as a team, distributing tasks, and maintaining an iterative project timeline.

5. Use applicable industry practices to test, debug, document, and peer review code.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Design and develop programs by working in team roles using version control systems, integrated development environments (IDEs), and collaborative tools and practices.

2. Use a standard library and/or application programming interface (API) to create reusable code components to design simple programs and enhance existing programs.

3. Utilize the Software Development Life Cycle (SDLC) to create software that is a minimum viable product.

4. Iteratively evaluate and modify an existing program to add functionality and discuss intended and unintended implications.

5. Develop and utilize test cases to verify that a program performs according to the program's design specifications.

6. Apply the appropriate documentation techniques to make programs more accessible to debug and to be maintained by others.

7. Evaluate licenses that limit or restrict the use of computational artifacts when utilizing resources such as libraries.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:263 (February 2025).

Chapter 11. Impacts of Computing

§1101. Intellectual Achievements

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Describe how computing has changed the ways people live and work.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Identify foundational computational advancements through the use of technology innovation cycle.

2. Plan and devise new ideas and solutions for problems with inspiration from previous discoveries in computational knowledge.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Analyze the key milestones of computer science, historical events influenced by computer science, and the people connected to these achievements.

2. Explain how innovations in computer science and technology enable advancements in other fields of study.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:264 (February 2025).

§1103. Social Interaction

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Identify examples of cyberbullying with age-appropriate responses.

2. Identify and describe examples of appropriate versus inappropriate computer communications.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Analyze communication technologies and then describe how the technology's use influences individuals and society.

2. Generate designs that increase the accessibility and usability of technology for various groups of users.

3. Develop and propose norms for informal versus formal online communications.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Describe how cyberspace is becoming a universal medium for connecting humans, the economy, business, and computing.

2. Evaluate the adoption and adaptation of social norms from the physical world to the cyber world.

3. Describe and critique how algorithmic feedback loops can shape perceptions, reinforce a limited data set, and limit the sources of information that may inform the individual user.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:264 (February 2025).

§1105. Laws, Safety, and Industry Practices

A. Grade Band: K-5. By the end of fifth grade, students will:

1. Describe the safe versus unsafe uses of computing systems at age-appropriate levels.

2. Explain how the school and school system's computing rules and policies keep students safe.

3. Explain how online actions have real-world consequences and that laws and rules may also apply online.

B. Grade Band: 6-8. By the end of eighth grade, students will:

1. Recommend and propose computing-use guidelines to maintain a user's personal safety, privacy, and well-being.

2. Identify applicable laws that impact personal, industry, or business computing practices.

3. Describe and categorize factors that affect user's access to computing resources locally, nationally, and globally.

C. Grade Band: 9-12. By the end of twelfth grade, students will:

1. Describe and analyze the motive of online threat actors to a user's personal safety, privacy, and well-being.

2. Explain how the interconnectedness of cyberspace can lead to physical and digital vulnerabilities.

3. Compare and contrast the varied approaches used to govern data as intellectual property, control information access, and provide guidance to users.

4. Debate laws and industry regulations that impact the development and use of computational artifacts.

5. Debate the ethical consideration of creating and publishing computational artifacts.

6. Analyze the data provenance of computational artifacts.

7. Explain how individuals and organizations can exert influence on personal and societal perceptions and practices through computing technologies.

AUTHORITY NOTE: Promulgated in accordance with R.S. 17:6.

HISTORICAL NOTE: Promulgated by the Board of Elementary and Secondary Education, LR 51:264 (February 2025).