

Computer Science Principles

Exam Information	Description
Exam number 803 Items 38 National Career Cluster Information Technology, Science, Technology, Engineering, & Mathematics Certification available Yes	The Computer Science Principles industry certification offers students a broad overview of the field of computer science. Through the development of algorithms and programs, students will learn to design and evaluate solutions to real-world problems. They will explore how data is created, transformed, and interpreted to support decision-making and innovation. The course also examines the inner workings of computing systems and the impact of computing innovations on society. Students will be encouraged to contribute to a collaborative and ethical computing culture, fostering responsible participation in the digital world.

Exam Blueprint and Performance Skills

Standard	Percentage of exam score
1. Computing And Data	26%
2. Creative Development	15%
3. Algorithms And Programming	28%
4. Computer Systems & Networks	22%
5. Impact Of Computing	9%

*Includes performance skill evaluation

Standard 1 - Computing And Data

Candidates will analyze how computers process and store data, focusing on analyzing & interpreting data to recognize patterns.

Objective 1 Hardware/Software

1. Explain the differences between hardware and software and how they relate to input, storage, processing, and output.
2. Understand the different file sizes (bit, byte, kilobyte, megabyte, gigabyte, terabyte, and petabyte).
3. Discuss the difference between consumer and enterprise (cloud) storage.

Objective 2 Binary Numbers

1. Calculate the binary (base 2) equivalent of a positive integer (base 10) and vice versa.
2. Compare and order binary numbers.

Objective 3 Data Compression

1. Candidates should know the difference between and the use cases of Lossy vs. Lossless.
 - a. Lossy - Compression algorithm in which some of the data from the original file is lost.
 - b. Lossless - Compression algorithm in which file size is reduced without any quality loss.

Optional: Standard performance evaluations on the final page of this document

Standard 2 - Creative Development

Collaboration is essential in developing computing innovations. Candidates will construct explanations (design solutions) using evidence-based reasoning. By modeling their innovations as systems with interacting components, candidates will better understand and be able to communicate how their designs function.

Objective 1 Collaboration

1. Explain how collaboration affects the development of a solution.
2. Collaborate in the development of solutions.

Objective 2 Program Function and Purpose

1. Identify the problem.
 - a. Investigate the purpose of a program as it relates to solving the problem.
2. Investigate the situation, context, or task.
3. Understand how to break down program specifications into smaller tasks using top-down design and pseudocode.
4. Generalize data sources through variables.
 - a. Understand the uses of different data types (examples: integer, float/double, characters/strings, boolean, etc.)
5. Explain how a code segment or program functions.

Objective 3 Identify Different Error Types

1. Identify Different Error Types.
 - a. Identify errors in algorithms and programs, including error discovery through testing.
 - b. Identify different types of errors such as logic, run-time, and syntax errors.

Optional: Standard performance evaluations on the final page of this document

Standard 3 - Algorithms And Programming

Candidates will use mathematical, computational thinking and programming language skills to build algorithms with system structure essential for solving problems and completing tasks.

Objective 1 Variables and Assignments

1. Use variables of different data types (examples: integer, float/double, characters/strings, boolean, etc.)
2. Convert data types to other data types.
3. Determine the value of a variable as a result of an assignment.

Objective 2 Mathematical Expressions

1. Implement arithmetic operators (=, +, -, *, /, and MOD) and order of operations (PEMDAS).

Objective 3 Calling and Developing Procedures/Functions/Methods

1. Write statements to call Procedures/Functions/Methods
2. Determine the result of a Procedures/Functions/Methods

Objective 4 Input / Output

1. Receive and store user input.
2. Print to console
3. Send to output device

Objective 5 Strings

1. Evaluate expressions that manipulate strings.
 - a. String concatenation joins together two or more strings end-to-end to make a new string.

Objective 6 Boolean Expressions

1. Write and evaluate expressions using relational operators ($=$, $\neq$, $>$, $<$, $\geq$, and $\leq$).
2. Write and evaluate expressions using logical operators (AND, OR, NOT).

Objective 7 Conditionals

1. Write conditional statements, such as IF statements and ELSE IF statements.
2. Determine the result of conditional statements.

Objective 8 Iteration/Looping

1. Write iteration statements, such as for loops and while loops.
2. Determine the result of iteration statements.

Optional: Standard performance evaluations on the final page of this document.

Standard 4 - Computer Systems & Networks

Candidates will understand, develop, and model how computer systems and networks transfer data using protocols and the Internet is built on systems and models that use protocols to transfer data.

Objective 1 Computing Systems:

1. Candidates will identify a variety of computing systems.
 - a. A computing device is a physical artifact that can run a program. Some examples include computers, tablets, servers, routers, and smart sensors.
 - b. A computing system is a group of computing devices and programs working together for a common purpose.
 - c. A computer network is a type of computing system.

Objective 2 Networks & The Internet:

1. Explain how computing devices work together in a network (Network, Path, Routing, Packets, Bandwidth).
 - a. A computer network is a group of interconnected computing devices capable of sending or receiving data.
 - b. A path between two computing devices on a computer network (a sender and a receiver) is a sequence of directly connected computing devices that begins at the sender and ends at the receiver.
 - c. Routing is the process of finding a path from sender to receiver.
 - d. Bandwidth – The bandwidth of a computer network is the maximum amount of data that can be sent in a fixed amount of time.
 - e. Packets contain a chunk of data and metadata used for routing the packet between the origin and the destination on the Internet, as well as for data reassembly.
 - f. Packets may arrive at the destination in order, out of order, or not at all.
2. Explain how the Internet works (Fault Tolerance, Protocols, HTTP, HTTPS).
 - a. The Internet is a computer network consisting of interconnected networks that use standardized, open (nonproprietary) communication protocols.
3. Understand the difference between the Internet and the World Wide Web.
 - a. The World Wide Web is a system of linked pages, programs, and files.
 - b. HTTP is a protocol used by the World Wide Web.
 - c. The World Wide Web uses the Internet.

Optional: Standard performance evaluations on the final page of this document

Standard 5 - Impact Of Computing

Candidates will plan and investigate the impacts of computing on societal, economical, and cultural issues to

recognize patterns in use. Thus, contributing to a computing culture that is collaborative and ethical.

Objective 1 Beneficial and Harmful Effects

1. Explore how an effect of a computing innovation can be both beneficial and harmful.
2. Explore advances in computing that have generated and increased creativity in other fields, such as medicine, engineering, communications, and the arts.

Objective 2 Digital Divide and Computing Bias

1. Explore issues that contribute to the digital divide (demographics, geographics, socioeconomic, equity, access, influence).
2. Explore how bias exists in computing innovations.

Objective 3 Legal and Ethical Concerns

1. Explain how the use of computing can raise legal and ethical concerns.
2. Understand how ease of access and distribution of digitized information raises intellectual property concerns regarding ownership, value, and use.
3. Understand the differences between Copyright, Creative Commons, Public Domain, & Trademark
4. Understand how AI impacts the programming field.
5. Explain why you should not use AI to write your code as a beginner programmer.
6. Understand that AI tools can be helpful for debugging code, but it's important to double-check their suggestions using your own programming knowledge.

Objective 4 Safe Computing

1. Describe the risks to privacy from collecting and storing personal data on a computer system.
 - a. Permanence of online information
 - b. Candidates will understand that all their online behavior and digital communications will have long-term ramifications either positive or negative.
2. Explain how computing resources can be protected (password strength) and can be misused.
3. Explain how unauthorized access to computing resources is gained.
4. Understand essential cybersecurity concepts.
 - a. Malware (adware, trojan horse, virus, ransomware, etc.)
 - b. Social Engineering (phishing, etc.)

Optional: Standard performance evaluations on the final page of this document

Performance Skills Evaluation

Exam name: Computer Science Principles

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Standard 1 – Computing And Data Candidates will differentiate between hardware and software, convert decimal to binary and binary to decimal, and identify when to use lossy vs. lossless compression.	Pass:
Standard 2 – Creative Development Candidates will use problem solving skills and collaboration to explore the purpose of a program and identify errors.	Pass:
Standard 3 – Algorithms And Programming Candidates will use algorithms and programming to solve problems and evaluate the results.	Pass:
Standard 4 – Computer Systems & Networks Candidates will explain how computer systems and networks, primarily the Internet, work.	Pass:
Standard 5 – Impact of Computing - Candidates will discuss the benefits and issues of computing. - Candidates will develop and use safe internet practices.	Pass:

Evaluator Name: _____

Date: _____