



Computer Science Principles

(This exam is in PILOT status for the 19-20 school year. No certificate is available.)

EXAM INFORMATION

Exam number

803

Items

26

Points

30

Prerequisites

25 WPM

Recommended Course Length

ONE YEAR

National Career Cluster

INFORMATION TECHNOLOGY
SCIENCE, TECHNOLOGY,
ENGINEERING, & MATHEMATICS

Performance Standards

PENDING

Certificate Available

NO

DESCRIPTION

Computer Science Principles is a new course that follows a project to develop a computer science course that seeks to broaden participation in computing and computer science. The course places emphasis on the principles of computer science rather than just programming. Big ideas and concepts include: (1) Computing is a creative activity. (2) Abstraction reduces information and detail to facilitate focus on relevant concepts. (3) Data and information facilitate the creation of knowledge. (4) Algorithms are used to develop and express solutions to computational problems. (5) Programming enables problem solving, human expression, and creation of knowledge. (6) The Internet pervades modern computing. (7) Computing has global impacts.

EXAM BLUEPRINT

STANDARD	PERCENTAGE OF EXAM
1- Creativity and Computing	3%
2 - Abstraction	17%
3 - Data	10%
4 - Algorithms	17%
5 - Programming	33%
6 - Internet	13%
7 - Computation	7%



STANDARD 1

CREATIVITY AND COMPUTING ARE PROMINENT FORCES IN INNOVATION; THE INNOVATIONS ENABLED BY COMPUTING HAVE HAD AND WILL CONTINUE TO HAVE FAR-REACHING IMPACT. AT THE SAME TIME, COMPUTING FACILITATES EXPLORATION AND THE CREATION OF KNOWLEDGE. THIS COURSE WILL EMPHASIZE THESE CREATIVE ASPECTS OF COMPUTING. STUDENTS IN THIS COURSE WILL CREATE INTERESTING AND RELEVANT ARTIFACTS WITH THE TOOLS AND TECHNIQUES OF COMPUTER SCIENCE.

- Objective 1** Computing fosters the creation of artifacts.
1. Use computing tools and techniques to create artifacts.
 2. Collaborate in the creation of computational artifacts.
 3. Analyze computational artifacts.
- Objective 2** Computing fosters creative expression.
1. Use computing tools and techniques for creative expression.
- Objective 3** Programming is a creative process.
1. Use programming as a creative tool.

STANDARD 2

ABSTRACTION REDUCE INFORMATION AND DETAIL TO FACILITATE FOCUS ON RELEVANT CONCEPTS. EVERYONE USES ABSTRACTION ON A DAILY BASIS TO EFFECTIVELY MANAGE COMPLEXITY. IN COMPUTER SCIENCE, ABSTRACTION IS A CENTRAL PROBLEM-SOLVING TECHNIQUE. IT IS A PROCESS, A STRATEGY, AND THE RESULT OF REDUCING DETAIL TO FOCUS ON CONCEPTS RELEVANT TO UNDERSTANDING AND SOLVING PROBLEMS. THIS COURSE WILL INCLUDE EXAMPLES OF ABSTRACTIONS USED IN MODELING THE WORLD, MANAGING COMPLEXITY, AND COMMUNICATING WITH PEOPLE AS WELL AS WITH MACHINES. STUDENTS IN THIS COURSE WILL LEARN TO WORK WITH MULTIPLE LEVELS OF ABSTRACTION WHILE ENGAGING WITH COMPUTATIONAL PROBLEMS AND SYSTEMS.

- Objective 1** A combination of abstractions built upon binary sequences can be used to represent all digital data.
1. Describe the combination of abstractions used to represent data.
 2. Explain how binary sequences are used to represent digital data.
- Objective 2** Multiple levels of abstraction are used in computation.
1. Develop an abstraction.
 2. Use multiple levels of abstraction in computation.
- Objective 3** Models and simulations use abstraction to raise and answer questions.
1. Use models and simulations to raise and answer questions.

STANDARD 3

DATA AND INFORMATION FACILITATE THE CREATION OF KNOWLEDGE. COMPUTING ENABLES AND EMPOWERS NEW METHODS OF INFORMATION PROCESSING THAT HAVE LED TO MONUMENTAL CHANGE ACROSS DISCIPLINES, FROM ART TO BUSINESS TO SCIENCE. MANAGING AND INTERPRETING AN OVERWHELMING AMOUNT OF RAW DATA IS PART OF THE FOUNDATION OF OUR INFORMATION SOCIETY AND ECONOMY. PEOPLE USE COMPUTERS AND COMPUTATION TO TRANSLATE, PROCESS, AND VISUALIZE RAW DATA, AND CREATE INFORMATION. COMPUTATION AND COMPUTER SCIENCE FACILITATE AND ENABLE A NEW UNDERSTANDING OF DATA AND INFORMATION THAT CONTRIBUTES KNOWLEDGE TO THE WORLD. STUDENTS IN THIS COURSE WILL



WORK WITH DATA USING A VARIETY OF TOOLS AND TECHNIQUES TO BETTER UNDERSTAND THE MANY WAYS IN WHICH DATA IS TRANSFORMED INTO INFORMATION AND KNOWLEDGE.

- Objective 1** People use computer programs to process information to gain insight and knowledge.
1. Use computers to process information to gain insight and knowledge.
 2. Collaborate when processing information to gain insight and knowledge.
 3. Communicate insight and knowledge gained from using computer programs to process information.
- Objective 2** Computing facilitates exploration and the discovery of connections in information.
1. Use computing to facilitate exploration and the discovery of connections in information.
 2. Use large data sets to explore and discover information and knowledge.
- Objective 3** Computational manipulation of information requires consideration of representation, storage, security, and transmission.
1. Analyze the considerations involved in the computational manipulation of information.

STANDARD 4

ALGORITHMS ARE FUNDAMENTAL TO EVEN THE MOST BASIC EVERYDAY TASKS. ALGORITHMS REALIZED IN SOFTWARE HAVE AFFECTED THE WORLD IN PROFOUND AND LASTING WAYS. THE DEVELOPMENT, USE, AND ANALYSIS OF ALGORITHMS IS ONE OF THE MOST FUNDAMENTAL ASPECTS OF COMPUTING. STUDENTS IN THIS COURSE WILL WORK WITH ALGORITHMS IN MANY WAYS: THEY WILL DEVELOP AND EXPRESS ORIGINAL ALGORITHMS, THEY WILL IMPLEMENT ALGORITHMS IN SOME LANGUAGE, AND THEY WILL ANALYZE ALGORITHMS BOTH ANALYTICALLY AND EMPIRICALLY.

- Objective 1** An algorithm is a precise sequence of instructions for a process that can be executed by a computer.
1. Develop an algorithm designed to be implemented to run on a computer.
- Objective 2** Algorithms are expressed using languages.
1. Express an algorithm in a language.
- Objective 3** Algorithms can solve many but not all problems.
1. Appropriately connect problems and potential algorithmic solutions.
- Objective 4** Algorithms are evaluated analytically and empirically.
1. Evaluate algorithms analytically and empirically.

STANDARD 5

PROGRAMMING ENABLES PROBLEM SOLVING, HUMAN EXPRESSION, AND CREATION OF KNOWLEDGE. PROGRAMMING AND THE CREATION OF SOFTWARE HAVE CHANGED OUR LIVES. PROGRAMMING RESULTS IN THE CREATION OF SOFTWARE, AND IT FACILITATES THE CREATION OF MORE GENERAL COMPUTATIONAL ARTIFACTS INCLUDING MUSIC, IMAGES, VISUALIZATIONS, AND MORE. IN THIS COURSE, PROGRAMMING WILL ENABLE EXPLORATION AND THE OBJECT OF STUDY. THIS COURSE WILL INTRODUCE STUDENTS TO THE CONCEPTS AND TECHNIQUES USED IN WRITING PROGRAMS AND TO THE WAYS IN WHICH PROGRAMS ARE DEVELOPED AND USED BY PEOPLE; THE FOCUS OF THE COURSE IS NOT ON PROGRAMMING PER SE, BUT ON ALL ASPECTS OF COMPUTATION. STUDENTS IN THIS COURSE WILL CREATE PROGRAMS, TRANSLATING HUMAN INTENTION INTO COMPUTATIONAL ARTIFACTS.

- Objective 1** Programs are written to execute algorithms.
1. Explain how programs implement algorithms.
- Objective 2** Programming is facilitated by appropriate abstractions.



- Objective 3 Programs are developed and used by people.
1. Use abstraction to manage complexity in programs.
 1. Evaluate a program for correctness.
 2. Develop a correct program.
 3. Collaborate to solve a problem using programming.
- Objective 4 Programming uses mathematical and logical concepts.
1. Employ appropriate mathematical and logical concepts in programming.

STANDARD 6

INTERNET PERVADES MODERN COMPUTING. THE INTERNET AND THE SYSTEMS BUILT ON IT HAVE HAD A PROFOUND IMPACT ON SOCIETY. COMPUTER NETWORKS SUPPORT COMMUNICATION AND COLLABORATION. THE PRINCIPLES OF SYSTEMS AND NETWORKS THAT HELPED ENABLE THE INTERNET ARE ALSO CRITICAL IN THE IMPLEMENTATION OF COMPUTATIONAL SOLUTIONS. STUDENTS IN THIS COURSE WILL GAIN INSIGHT INTO HOW THE INTERNET OPERATES, STUDY CHARACTERISTICS OF THE INTERNET AND SYSTEMS BUILT UPON IT, AND ANALYZE IMPORTANT CONCERNS SUCH AS CYBERSECURITY.

- Objective 1 The Internet is a network of autonomous systems.
1. Explain the abstractions in the Internet and how the Internet functions.
- Objective 2 Characteristics of the Internet and the systems built on it influence their use.
1. Explain characteristics of the Internet and the systems built on it.
 2. Analyze how characteristics of the Internet and the systems built on it influence their use.
- Objective 3 Cybersecurity is an important concern for the Internet and the systems built on it.
1. Connect the concern of cybersecurity with the Internet and the systems built on it.

STANDARD 7

COMPUTATION HAS CHANGED THE WAY PEOPLE THINK, WORK, LIVE, AND PLAY. OUR METHODS FOR COMMUNICATING, COLLABORATING, PROBLEM SOLVING, AND DOING BUSINESS HAVE CHANGED AND ARE CHANGING DUE TO INNOVATIONS ENABLED BY COMPUTING. MANY INNOVATIONS IN OTHER FIELDS ARE FOSTERED BY ADVANCES IN COMPUTING. COMPUTATIONAL APPROACHES LEAD TO NEW UNDERSTANDINGS, NEW DISCOVERIES, AND NEW DISCIPLINES. STUDENTS IN THIS COURSE WILL BECOME FAMILIAR WITH MANY WAYS IN WHICH COMPUTING ENABLES INNOVATION, AND THEY WILL ANALYZE THE POTENTIAL BENEFITS AND HARMFUL EFFECTS OF COMPUTING IN A NUMBER OF CONTEXTS.

- Objective 1 Computing affects communication, interaction, and cognition.
1. Analyze how computing affects communication, interaction, and cognition.
 2. Collaborate as part of a process that scales.
- Objective 2 Computing enables innovation in nearly every field.
1. Connect computing with innovations in other fields.
- Objective 3 Computing has both beneficial and harmful effects.
1. Analyze the beneficial and harmful effects of computing.
- Objective 4 Computing is situated within economic, social, and cultural contexts.
1. Connect computing within economic, social, and cultural contexts.