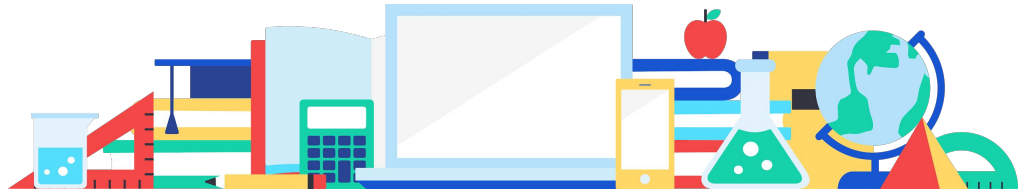
AP Computer Science Principles Topics & Resources

Updated December 2023



Our pilot

Beta Subject: Computer Science Coaching

Why we're launching a beta version?

Computer Science is one of our most requested new subjects, we've decided to launch it on a pilot basis! We're looking forward to learning alongside you about how to make this a strong resource to bridge the digital divide. Most students attending low-income schools do not have access to computer science courses, and they have even more limited access to 1:1 computer science tutoring.

The virtual classroom

During our pilot phase coaches & students will interact on a virtual whiteboard. We're working on building out a code editor!

Code.org partnership

We've partnered with Code.org to offer personalized tutoring to help underrepresented and underserved students improve their understanding and performance in AP CSP! This means the majority of students you'll work with will be using their curriculum. Here is a quick overview of their curriculum & student facing tools. If you create a teacher account using "UPchieve" as your organization you can have full access to their CSP Course!

Your role

Coaching Computer Science on Demand

AP Computer Science Principles familiarity

You do NOT need to have taken this course to coach it! If you have a general understanding of any programming language, along with the topics covered in this training, you should be able to help students with most assignments. However, make sure to familiarize yourself with the final exam and task at the end of this training, many students will ask for help preparing for these!

Help with coding

AP CSP courses vary in programming language, if your student requests specific help in a language you're not familiar with feel free to let them know to request a different coach and leave feedback on your post-session form so that UPchieve staff can improve the way we match coaches and students.

Leave us feedback on post-session forms on how to improve!

We'll also send a survey for all computer science coaches at the end of the pilot phase to learn how to improve this course offering.

Topics

Big ideas covered in AP Computer Science Principles

Creative Development (10-13% of AP Exam)

- ➔ Collaboration
- ➔ Program Function and Purpose
- ➔ Program Design and Development
- ➔ Identifying and Correcting Errors [in programs]

Data (17-22% of AP Exam)

- ➔ Binary Numbers
- ➔ Data Compression
- ➔ Extracting Information from Data
- ➔ Using Programs with Data

Computer Systems and Networks (11-15% of AP Exam)

- ➔ The Internet
- ➔ Fault Tolerance
- ➔ Parallel and Distributed Computing

Topics

Big ideas covered in AP Computer Science Principles (continued)

Algorithms and Programming (30-35% of AP Exam)

- ➔ Variables and Assignments
- ➔ Data Abstraction
- ➔ Mathematical Expressions
- ➔ Strings
- ➔ Boolean Expressions
- ➔ Conditionals (selection), nested conditionals, iteration
- ➔ Developing Algorithms
- ➔ Lists
- ➔ Binary Search
- ➔ Calling Procedures
- ➔ Developing Procedures
- ➔ Libraries
- ➔ Random Values
- ➔ Simulations
- ➔ Algorithmic Efficiency
- ➔ Undecidable Problems

Topics

Big ideas covered in AP Computer Science Principles (continued)

Impact of Computing (21-26% of AP Exam)

- ➔ Beneficial and Harmful Effects
- ➔ Digital Divide
- ➔ Computing Bias
- ➔ Crowdsourcing
- ➔ Legal and Ethical Concerns
- ➔ Safe Computing

Exam

Overview AP Exams

What is AP?

Advanced Placement is a specific type of course created by the nonprofit organization College Board. Students take these courses to prepare for college level coursework.

What is an AP exam & why is it important?

Students are able to take a national exam in April or May to demonstrate their mastery of course content. **These exams are important because, depending on the student's score they can be granted college credit for the course!** Usually public colleges and universities require a 3 out of 5, while other colleges may require a 4 or 5. Some high school teachers also incorporate a student's AP score into their final grade.

Unique Format of AP Computer Science Principles Exam

The AP Computer Science Principles Exam consists of the "Create performance task" and an end-of-course AP Exam. The Create performance task requires at least 9 hours of dedicated class time for students to complete. The end-of-course exam is 3 hours long and includes 70 multiple-choice questions and four written response prompts related to the Create performance task.

Exam

AP Computer Science Principles Exam

Format

- ➔ 3 hour exam in May
- ➔ Section 1 (2 hours): 70 multiple choice questions (70% of exam score) Practice Questions
  - ◆ 57 single-select and 8 multiselect multiple-choice questions
    - Conceptual questions (how something works or causes and effects)
    - Coding problems (analyze lines of code, check code for errors)
    - Robot's Path (which code will move the robot)
    - Binary conversion (test knowledge of binary numbers)
  - ◆ 5 single-select multiple-choice questions with reading passage about a computing innovation
- ➔ Section 2 (1 hour on exam day): 4 written responses about the student's "Create performance task" (see next slide for more on the performance task) Sample Questions
  - ◆ Question about: Program Design, Function, and Purpose; Algorithm Development; Errors and Testing; Data and Procedural Abstraction
  - ◆ The longest of these responses is 300 words at most, and the word count total is 750 words
- ➔ Pseudo Code reference sheet provided

Scoring

- ➔ The exam is a scaled score that is converted into 1-5 final score
- ➔ There is no penalty for wrong answers so students should complete each question

Sample Questions videos

Create performance task

AP Computer Science Principles “Create performance task”

What is the “Create performance task”?

Students will develop a computer program of their choice during the course (students have at least 9 hours of in-class time for this task) and an end-of-course written response section where students demonstrate their understanding of their personal Create performance task by answering four prompts. They have access to a Personalized Project Reference (like a cheat sheet) to look at the day of the exam.

Requirements for the task

- Student-developed program code must...
  - Have a user interface with both input and output
  - Create and use a list of information
  - At least one procedure that contributes to the program’s intended purpose
  - An algorithm that includes sequencing, selection, and iteration that is in the body of the selected procedure
  - Calls to the student-developed procedure
- Video of the program running including...
  - Input to the program
  - One aspect of the functionality of the program
  - Output produced by the program

Create performance task

AP Computer Science Principles “Create performance task”

Scoring (Rubric)

- Each component of the performance task is graded 0-1 for a final score of 6, this will account for 30% of the final AP exam grade
  - **Program Purpose and Function**: Students should be able to describe the overall purpose of the program, the functionality the video shows and the input and output of the program in the video.
  - **Data Abstraction**: The code segments should show storing data in a list and how that list is used. Students should be able to name the variable representing the list and what data the list represents
  - **Managing complexity**: Students will have to explain how the code use lists to manage complexity.
  - **Procedural Abstraction**: Students will describe a procedure with one parameter that has an effect on the functionality and where it is called.
  - **Algorithm Implementation**: Students will have to explain their algorithm (that includes sequencing, selection, iteration) in enough detail that someone else could recreate it.
  - **Testing:** Students will describe two calls, the conditions they test and the results.

Examples

- CodeHS
- Code.org video
- 15 examples

Resources

Course & Practice

- ➔ Khan Academy: AP College Computer Science Principles Course
- ➔ Code.org Computer Science Principles (create a teacher account)
- ➔ AP Course at a Glance

Create Task

- ➔ Example AP Create tasks and scores
- ➔ Guide to Helping Develop a Creative Performance Task

Exam

- ➔ AP Computer Science Practice Exam Videos
- ➔ AP CSP Exam Reference Sheet
- ➔ Example Official AP Test Questions 2023
- ➔ Exam Prep from Fiveable
- ➔ Khan Academy: Exam Preparation
- ➔ Unofficial Practice Tests