Computer Science Principles

Performance Assessment

Computer Science Principles is a pilot course and exam under development. It is not an Advanced Placement® (AP) course currently being offered by the College Board.

The following document provides an updated version of the through-course performance assessment made up of two separate performance tasks. These performance tasks were developed as part of the upcoming new Advanced Placement Computer Science Principles (AP CSP). Previous versions were piloted in academic years 2012-13 and 2013-14 at high schools and universities.

The AP CSP Development Committee, comprised of secondary and post-secondary subject matter experts, has developed the following version based on student responses, feedback from teachers who used the tasks in the classroom, and discussions with computer science education consultants as well as experts well-versed in high-stakes assessments.

The Performance Tasks, which require students to complete specific tasks in two different areas, comprise the through-course assessment for AP CSP. The other part of the AP CSP assessment is an objectively-scored exam, given at the end of the course.

Many of the changes in this version of the through-course performance assessment make clear the requirements and expectations for student work. We have worked to make the instructions more concise, to make it simple to determine what is expected in terms of length and format for each part of the performance tasks, and to facilitate collection of the artifacts and writing that students will do in completing the tasks.

Computer Science Principles
Performance Task: Create — Applications from Ideas

Programming is a creative process that involves individual and collaborative effort to bring ideas to life through designing, developing, testing, and debugging programs.

For this task, you and your partner will individually and collaboratively develop programs of your choosing. You will be asked to answer questions about your programs, and you will be asked to provide details about how you and your partner collaborated.

You will be provided 12 hours of class time to complete this Performance Task.

A. General Requirements

For this performance task, you are required to:

- work as a team to develop a program together and answer questions about it. The team should consist of two students; however, a single group of three is allowed to accommodate an odd number of students in the class.
- work alone to write an individual program, and answer questions about your individual program and about the collaboration between you and your partner.

B. Program Requirements

You will develop one program with your partner and one program on your own. The program you produce individually must be different from the one you write collaboratively and from your partner's individually-produced program. You could choose to add additional features to the collaboratively-produced program, or start a new program. The program you write independently can be written in the same language or in a different language as the program that you write collaboratively.

Programs are required to:

- include the basic programming elements of the language you use. For example, programs should demonstrate appropriate use of numbers, text, variables, statements, mathematical expressions with arithmetic operators, logical and Boolean operators and expressions, and sets/lists/other collections.
- demonstrate the creation of abstractions to develop and manage the complexity of the program (e.g., functions/procedures, parameterization, or data abstractions).
- demonstrate the use of algorithms (including sequencing, selection, and iteration) as building blocks of the program.

It is recommended that:

- Both partners should be actively involved in the program development. For example, you may choose to employ *Pair Programming*, in which one partner "drives" (types and uses the mouse) while the other "navigates" (reviews and helps to guide what the driver is doing), with the partners changing roles every 20 minutes. Another method of collaboration is for each partner to develop pieces of the program, combine those pieces, and provide frequent feedback to each other during the development process.

C. Program Submission

For both the collaborative and individual programs:

- submit program source code in a single PDF document of copy-and-pasted code, either as text or as screenshot(s).
- submit a video *with voice or text annotation* that displays the successful running of a portion of the program. The video must illustrate the intended purpose of the program and *its length cannot exceed one minute*. Your teacher will share submission guidelines with you that include suggestions on video tools.

D. Collaborative Reflection on Programs and Process

Working collaboratively, prepare responses for each of the following prompts:

1. Describe the *purpose* of your collaborative program. (*100 words max)*
2. Identify the *programming language* you used to develop your program.
3. Demonstrate that your program illustrates *abstraction*.
    a. Identify and *select a segment of code from the program* that illustrates the use of abstraction. Upload a PDF document with copy-and-pasted code, either as text or a screenshot.
    b. Explain *how* the selected code illustrates the use of abstraction. *(100 words max)*
4. Demonstrate that your program illustrates a *complex algorithm*.
    a. Identify and select a segment or segments of code in the program that illustrate *the most complicated algorithm* in your program. Upload a PDF document of copy-and-pasted code, either as text or a screenshot.
    b. Generally *describe what the algorithm does*. *(100 words max)*
5. Discuss how you *incrementally developed* your program. What did you create first? What came next? What problems did you encounter and solve? *(100 words max)*

E. Individual Reflection on Programs and Process

Working on your own, respond directly to each of the following prompts:

1. Describe the *purpose* of your individually developed program. *(100 words max)*
2. Identify the *programming language* you used to develop your program.
3. On the collaborative program, *how did you and your partner share the work*? *(100 words max)*
4. What was the *most significant feedback you provided* that helped your partner review and revise the collaborative program? *(50 words max)*
5. What was the *most significant feedback your partner provided* that helped you review and revise the collaborative program? *(50 words max)*

F. Learning Objectives

This Performance Task addresses the following Computer Science Principles Learning Objectives (LOs):

1.1.1 Apply a creative development process when creating computational artifacts. [P2]
1.2.2 Create a computational artifact using computing tools and techniques to solve a problem. [P2]
1.2.3 Create a new computational artifact by combining or modifying existing artifacts. [P2]
1.2.4 Collaborate in the creation of computational artifacts. [P6]
1.2.5 Analyze the correctness, usability, functionality, and suitability of computational artifacts. [P4]
1.2.1 Create a computational artifact for creative expression. [P2]
2.2.1 Develop an abstraction when writing a program or creating other computational artifacts. [P2]
2.2.2 Use multiple levels of abstraction to write programs. [P3]
4.1.1 Develop an algorithm for implementation in a program. [P2]
4.1.2 Express an algorithm in a language. [P5]
5.1.1 Develop a program for creative expression, to satisfy personal curiosity, or to create new knowledge. [P2]
5.1.2 Develop a correct program to solve problems. [P2]
5.2.1 Explain how programs implement algorithms. [P3]
5.3.1 Use abstraction to manage complexity in programs. [P3]
5.4.1 Evaluate the correctness of a program. [P4]
5.1.3 Collaborate to develop a program. [P6]
5.5.1 Employ appropriate mathematical and logical concepts in programming. [P1]

Computer Science Principles
Performance Task: Explore — Impact of Computing Innovations

Computing innovations have had considerable impact on the social, economic and cultural areas of our lives. To focus your work on this task, select a computing innovation that has significant impact, or the potential for significant impact on our society, economy, or culture, and that possesses the potential for both beneficial and harmful effects.

You will be provided 8 hours of class time to complete this Performance Task.

A. General Requirements

For this performance task, you are required to:

- work alone while completing the task.
- choose an innovation that has a significant effect on some population. The effect could be a small effect on more than a hundred people, or a very large effect on a smaller number of people.

B. Written Requirements

You will write responses to specific prompts associated with content requirements. Your responses should convey a deep level of understanding about your innovation and its impacts. Your responses must also include information learned from your references.

Innovation

Written responses must include:

- the innovation name and a description of the intended purpose of the innovation. (100 words max)
- an explanation of the technical details of this innovation in terms that someone completely unfamiliar with the innovation would understand. (100 words max)
- a description of the role computing plays in implementing the functionality associated with the innovation. (100 words max)
- a description of the relationship between data and the innovation. For example, you could describe the data used or produced by the innovation or any privacy issues associated with the innovation data. (100 words max)

Impacted Population

Written responses must include:

- a description of the population that is impacted by the innovation, including population characteristics such as approximate size, socioeconomic status, geographic location, health, age, gender, ethnicity, race, sexual orientation, and disability. (100 words max)

Social, Economic, or Cultural Impact

Written responses must include:

- a description of the long-term and short-term impacts (100 words max)
- a description of the beneficial and harmful effects of the innovation (100 words max)

C. Visual Artifact

Choose one of the potential beneficial or harmful effects of the innovation you described in your previous response and use a computer to create a visual artifact related to it.

- The visual artifact must be a visualization, graphic, or movie that provides additional insight to explain, clarify, or depict the beneficial or harmful effect of the innovation you selected.
- Provide a written summary to describe how the visual artifact you created illustrates the benefit or harm of the innovation. (50 words max)

D. References

Include at least two – and no more than five – references/citations to sources used to formulate your responses to this performance task.

- Each source must be a reliable newspaper/magazine article, book, news, or online source that anyone can access.
- For each reference, provide the full citation identifying the author, title, and source. For online references, include the permanent URL and the date on which you accessed the reference.
- At least two of the sources must have been created within the last two years.

E. Submissions

Submit your responses to the prompts described above adhering to the word length restrictions provided with each prompt. Upload your visual artifact using the upload option. If your visual artifact is a video, *its length cannot exceed one minute*. Your teacher will share submission guidelines with you that include suggestions on video tools.

F. Learning Objectives

1.1.1 Apply a creative development process when creating computational artifacts. [P2]
1.2.1 Create a computational artifact for creative expression. [P2]
1.2.2 Create a computational artifact using computing tools and techniques to solve a problem. [P2]
1.2.3 Create a new computational artifact by combining or modifying existing artifacts. [P2]
1.2.5 Analyze the correctness, usability, functionality, and suitability of computational artifacts. [P4]
3.3.1 Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information. [P4]
7.1.1 Explain how computing innovations affect communication, interaction, and cognition. [P4]
7.3.1 Analyze the beneficial and harmful effects of computing. [P4]
7.4.1 Explain the connections between computing and economic, social, and cultural contexts. [P1]