2024

AP® Computer Science Principles

Sample Student Responses and Scoring Commentary Set 1

Inside:

Written Response 1

☑ Scoring Guidelines

☑ Student Samples

☑ Scoring Commentary

Digital Portfolio Components provided separately

Video, Program Requirements, and Written Response 1 3 points

General Scoring Notes

- Written responses should be evaluated solely on the rationale provided.
- Responses must demonstrate all scoring criteria, including those within bulleted lists, in each reporting category to earn the point for that category.
- Terms and phrases defined in the terminology list are italicized when they first appear.

Reporting Category	Scoring Criteria	Decision Rules
Course Project: Video **(0–1 points)**	The video demonstrates the running of the program including: • *input* • *program functionality* • *output*	**Consider the video (or Program Code if necessary) when scoring this point.** • The video needs to show at least one example of the program’s functionality. • If the source of the input is unclear from the video, consider the full program code file when scoring this point. **Do NOT award a point if the following is true:** • The video does not show a demonstration of the program running (screenshots or storyboards are not acceptable and would not be credited).
Course Project: Program Requirements **(0–1 points)**	The program code includes: • A *student-developed procedure* • A call to the student-developed procedure • A *list* (or other *collection type*) • A use of the list • *Selection* • *Iteration*	**Consider the Personalized Project Reference (or Program Code if necessary) when scoring this point.** • If the program requirements do not appear in the Personalized Project Reference, consider the full program code file when scoring this point. • The procedure does not need to have a *parameter* to earn this point. • The *code segments* demonstrating selection and iteration do not need to appear in the same *algorithm* to earn this point. • The code segments demonstrating selection and iteration do not need to be contained in a procedure to earn this point. **Do NOT award a point if any one or more of the following is true:** • The list is a one-element list. • The use of the list is irrelevant (i.e., not connected to the program’s functionality). • The call to the procedure is inconsistent with the procedure header (unless allowed by the programming language). • The use of either the selection or the iteration is trivial (i.e., does not affect the outcome of the program).

Reporting Category	Scoring Criteria	Decision Rules
Written Response 1: Program Design, Function, and Purpose **(0–1 points)**	The written response: • describes at least one valid input to the program. • describes what the program does with the input.	**Consider the Video (or Program Code if necessary) and Written Response 1 when scoring this point.** • If the video is not available or does not show the described input, consider the full program code file when scoring this point. • Either a specific example of the input or a description of the input can meet this criteria. • If a response describes an interaction with a device (e.g., mouse or keyboard) as input, it must describe what the program does with the input resulting from the interaction. • Other forms of input could include databases, device inputs such as sensors, or command line arguments. • The response does not need to describe all valid inputs to the program and what the program does with all of these inputs, but all descriptions given must be correct. **Do NOT award a point if the following is true:** • The description of the valid input is implausible, inaccurate, or inconsistent with the program. • The description of what the program does with the input(s) is implausible, inaccurate, or inconsistent with the program.

AP Computer Science Principles Create Performance Task Terminology

Algorithm: An algorithm is a finite set of instructions that accomplish a specific task. Every algorithm can be constructed using combinations of sequencing, selection, and iteration.

Arguments: The values of the parameters when a procedure is called.

Code segment: A code segment refers to a collection of program statements that are part of a program. For text-based, the collection of program statements should be continuous and within the same procedure. For block-based, the collection of program statements should be contained in the same starter block or what is referred to as a “Hat” block.

Collection type: Aggregates elements in a single structure. Some examples include: databases, hash tables, dictionaries, sets, or any other type that aggregates elements in a single structure.

Data stored in a list: Input into the list can be through an initialization or through some computation on other variables or list elements.

Input: Program input is data that are sent to a computer for processing by a program. Input can come in a variety of forms, such as tactile (through touch), audible, visual, or text. An event is associated with an action and supplies input data to a program.

Iteration: Iteration is a repetitive portion of an algorithm. Iteration repeats until a given condition is met or for a specified number of times. The use of recursion is a form of iteration.

List: A list is an ordered sequence of elements. The use of lists allows multiple related items to be represented using a single variable. Lists are referred to by different terms, such as arrays or arraylists, depending on the programming language.

List being used: Using a list means the program is creating new data from existing data or accessing multiple elements in the list.

Output: Program output is any data that are sent from a program to a device. Program output can come in a variety of forms, such as tactile, audible, visual, movement, or text.

Parameter: A parameter is an input variable of a procedure. Explicit parameters are defined in the procedure header. Implicit parameters are those that are assigned in anticipation of a call to the procedure. For example, an implicit parameter can be set through interaction with a graphical user interface.

Procedure: A procedure is a named group of programming instructions that may have parameters and return values. Procedures are referred to by different names, such as method, function, or constructor, depending on the programming language. A procedure is executed through the use of a procedure call.

Program functionality: The behavior of a program during execution, often described by how a user interacts with it.

Purpose: The problem being solved or creative interest being pursued through the program.

Selection / conditional statement: A selection / conditional statement affects the sequential flow of control by executing different statements based on a condition being true or false. The use of if-statements and try / exception statements are examples of selection / conditional statements.

Sequencing: The application of each step of an algorithm in the order in which the code statements are given.

Student-developed procedure / algorithm: Program code that is student-developed has been written (individually or collaboratively) by the student who submitted the response. Calls to existing program code or libraries can be included but are not considered student-developed. Event handlers are built-in abstractions in some languages and will therefore not be considered student-developed. In some block-based programming languages, event handlers begin with “when.”

QUESTION 1

Write your response to QUESTION 1 on this page.

My program takes a string from the user as input. The program then takes that string and counts how often each letter apperes in the string. This is done by incrementing the value of a key in the dictionary that corosponds to the letter. There will be a key for each letter in the string. This dictionary is then returned to the user.

Use a pencil or a pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

QUESTION 1

Write your response to QUESTION 1 on this page.

One valid input to my program is a string typed into a text box by the user. My program takes that message, and, letter by letter, creates a new message with a modified alphabet list to encrypt the original in caesar cipher. It does this by iterating through the string, replacing letters with a corresponding one and just ignoring any numbers or punctuation marks. However, if the input is already encrypted and the user wants to decrypt it, they can press another button to do the same process as before 25 times to find any messages with words that match a list of commonly used words. It will build a list with them, and then display them, so the user can look between to see which message is the right one, since some may have a word smushed in with all the gibberish

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QUESTION 1

Write your response to QUESTION 1 on this page.

one valid input my program has is,
"first_input = input("what color is made by mixing the colors, red & blue together?")

My Program takes this input, and lets the user(a child who is still learning their colors) answer the question.

The Program uses this input to help further educate children, generally in grades K-2nd grade, to help them further their knowledge on colors. They need help to under stand what colors mix to create other colors, which can help them learn more for school.

Use a pencil or a pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

QUESTION 1

Write your response to QUESTION 1 on this page.

One function in this Program is the function "Information." This function pulls the Show or movie you select from the drop down menve and tells you varivs information about it. It goes into the if statement and tells you what cantry it was made in, the IMDB rating of the Show/movie, what year it was made, it's age rating, the name of the show/movie, and the Show/movie's genre. once it identifies all of that information, it displays everything onto your screen for you to read.

Use a pencil or a pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

QUESTION 1

Write your response to QUESTION 1 on this page.

1. One valid input to my program would be if a user clicked the desired x & y coordinates that would select the picture of the rock which was created using shapes. Once the user has clicked the image their choice, in this situation the rock out of rock, paper, or scissors, it is compared with the computer's choice which is chosen at random. If the user and the computer's choice is the same then it will result in a Tie and no points are awarded to either the computer or player. ~~Th~~ If the rock is chosen by the user and the scissors are chosen by the computer then the player will win and recieve one point to their score. If the computer chooses paper when the user chose rock then it will result in a win for the computer and they will gain an additional point to their score. Whatever the outcome is the new score of the player and the computer will be displayed.

Use a pencil or a pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

QUESTION 1

Write your response to QUESTION 1 on this page.

one input in my program is the varicble jump. this is used to tell the program to execute the jumping motion.

Use a pencil or a pen with black or dark blue ink. Do NOT write your name. Do NOT write outside the box.

Question 1

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

The responses to this question were expected to demonstrate that the student could:

- demonstrate the program input, functionality, and output in a short video (Course Project: Video),
- develop a working program that includes a student-developed procedure including sequencing, selection and iteration, and the creation and use of at least one list or collection (Course Project: Program Requirements), and
- explain at least one valid program input and how the program uses the input to perform its functionality (Written Response 1: Program Design, Function, and Purpose).

Students were asked to record a video demonstrating their program's functionality including input and output. Input could be user input (e.g. mouse clicks, text-entry) or file or database input. The source of the input can be verified by examining the program code if the video did not clearly capture the input.

The students were then asked to provide, on their Personalized Project Reference sheet, segments of code from their program that demonstrated a student-developed procedure which utilized selection and iteration appropriately, along with segments of code showing the creation of a list (or collection) and use of the same list (or collection) to contribute to the purpose of the program. Designing a program that includes these core features is critical to understanding basic programming in any language.

In Written Response 1, students were asked to explain at least one valid input into their program and how the input was used in the program's functionality. The video and program code could be considered, in addition to the student's written response. The response was expected to describe program functionality when discussing the effect of the input and not merely the resulting output.

Question 1 (continued)

Sample: A
Score:
Video: 1
Program Requirements: 1
Question 1: 1

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by using a keyboard to type, "hi this is my string".
- The response demonstrates program functionality by showing the screen change in response to the keyboard response.
- The response demonstrates output by showing, "{' ': 4, 'g': 1, 'h': 2, 'I': 4, 'm': 1, 'n': 1,…", in response to the entered string.

Program Requirements:
The response earned this point, demonstrating all six criteria:

- The response includes a student-developed procedure: `count(strng)`.
- The response calls the procedure: `count(input("What string woud you like counted? "))`.
- The response includes selection: `if letters[character] == 0…`
- The response includes iteration: `for character in string.ascii_lowercase…`
- The response includes a list or collection: `letters`.
- The response shows the list or collection being used in the program in part ii of the List section of the PPR.

Question 1:
The response earned this point, demonstrating both criteria:

- The response describes at least one valid input to the program: "My program takes a string from the user as input."
- The response describes what the program does with the input: "counts how often each letter apperes in the string."

Question 1 (continued)

Sample: B
Score:
Video: 1
Program Requirements: 1
Question 1: 1

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by typing text into the upper text box.
- The response demonstrates program functionality by encrypting the inputted text.
- The response demonstrates output by displaying the encrypted string in the lower textbox.

Program Requirements:
The response earned this point, demonstrating all six criteria:

- The response includes a student-developed procedure: `crypt(message, number)`.
- The response calls the procedure: `crypt(getText("messageInput, encryptNumber)`.
- The response includes selection: `if(message.toLowerCase().subString…`
- The response includes iteration: `for(var i = 0; i < number; i++)…`
- The response includes a list: `filteredWords`.
- The response shows the list being used in the program in part ii of the List section of the PPR.

Question 1:
The response earned this point, demonstrating both criteria:

- The response describes at least one valid input to the program: "One valid input to my program is a string typed into a textbox by the user …"
- The response describes what the program does with the input: "that's that message … creates a new message … to encrypt the original in caesar cipher."

Question 1 (continued)

Sample: C
Score:
Video: 1
Program Requirements: 1
Question 1: 0

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by showing, “Purple,” being typed as response to the question, “What color is made by mixing the colors red & blue?”
- The response demonstrates program functionality by showing the screen change in response to the typed response.
- The response demonstrates output by displaying, “You nailed it! your awsome," on the screen.

Program Requirements:
The response earned this point, demonstrating all six criteria:

- The response includes a student-developed procedure: `purple_question(first_input).`
- The response calls the procedure: `purple_question(first_input).`
- The response includes selection: `if first_input in purple_list:…`
- The response includes iteration: `for i in range(2):…`
- The response includes a list or collection: `yes_answer`.
- The response shows the list being used in the program in part ii of the List section of the PPR.

Question 1:
The response did not earn this point, demonstrating neither of the criteria:

- The response does not describe at least one valid input to the program. The input described in the response is, “first_input = input(“What color is made by mixing the colors, red & blue together?”)” This is the prompt that the user is given, but the response does not give a valid input accepted by the program.
- The response does not describe what the program does with the input. The response writes about how the user would use the program, but not what happens to the input in the program code.

Question 1 (continued)

Sample: D
Score:
Video: 1
Program Requirements: 1
Question 1: 0

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by showing the use of the dropdown to select, "All Of Us Are Dead."
- The response demonstrates program functionality by showing the screen change in response to the button marked, "Go," being clicked.
- The response demonstrates output by displaying the text, "Korea," as well as the other data generated.

Program Requirements:
The response earned this point, demonstrating all six criteria:

- The response includes a student-developed procedure: `Information(n)`.
- The response calls the procedure: `Information(Info)`.
- The response includes selection: `if (n == Name[i])…`
- The response includes iteration: `for (var i=0; i<Name.length; i++)…`
- The response includes a list or collection: `Name`.
- The response shows the list being used in the program in part ii of the List section of the PPR.

Question 1:
The response did not earn this point, demonstrating neither of the criteria:

- The response does not describe at least one valid input to the program. The response describes the procedure "Information."
- The response describes what the program does with the procedure but does not describe an input.

Question 1 (continued)

Sample: E
Score:
Video: 1
Program Requirements: 0
Question 1: 1

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by selecting the image of the rock and paper.
- The response demonstrates program functionality by displaying the multiple rounds of playing the game.
- The response demonstrates output by displaying the results of the game: "Tie!" and "You lose!"

Program Requirements:
The response did not earn this point, demonstrating five out of six criteria:

- The response includes a student-developed procedure: `determine_winner(player_choice, computer_choice)`.
- The response calls the procedure: `determine_winner(player_click, computer_click)`.
- The response includes selection: `if player_choice == computer_choice):` …
- The response does not include iteration.
- The response does include a list or collection: `score`.
- The response does show the list or collection being used in the program in part ii of the List section of the PPR or Program Code.

Question 1:
The response earned this point, demonstrating both criteria:

- The response describes at least one valid input to the program: "a user clicked the desired x & y coordinates that would select the picture."
- The response describes what the program does with the input: "it is compared with the computer's choice."

Question 1 (continued)

Sample: F
Score:
Video: 1
Program Requirements: 0
Question 1: 0

Video:
The response earned this point, demonstrating all three criteria:

- The response demonstrates input by clicking the frog with the mouse.
- The response demonstrates program functionality by showing the game being played.
- The response demonstrates output by the frog moving on the screen.

Program Code:
The response did not earn this point, demonstrating three out of six criteria:

- The response includes a student-developed procedure: `jump`.
- The response calls the procedure: `jump`.
- The response does not include selection.
- The response includes iteration: `repeat(10)...`
- The response does not include a list or collection.
- The response does not show the list or collection being used in the program in part ii of the List section or Program Code.

Question 1:
The response did not earn this point, demonstrating neither of the criteria:

- The response does not describe at least one valid input to the program. The response explains the "variable jump."
- The response describes what the program does with the procedure but does not describe an input.