
AP Computer Science Principles

Scoring Guidelines and Notes for 2018 Reading

September 2017

AP

CollegeBoard

Instructional Planning Report (IPR)



What is an IPR?

These are subject-specific score reports comparing the performance of a teacher's students against the global population of test-takers, helping teachers target areas for increased attention and focus in the curriculum.

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 Data Updated Aug 3, 2017, Report Run Aug 3, 2017
 Computer Science Principles

Performance on Performance Tasks (Maximum Possible Score = 40)

Performance Tasks	Max Possible Score	Global Mean	Group Mean	Number of Students in Your Group			
				Lowest Fourth	Second Fourth	Third Fourth	Highest Fourth
CREATE - APPLICATIONS FROM IDEAS	12	7.9	8.4	3	4	7	11
CREATE - DEVELOPING A PROGRAM WITH A PURPOSE (LOS 5.4.1, AND 5.1.1 OR 5.1.2)	3	2.8	2.8	##	##	##	##
CREATE - DEVELOPING A PROGRAM WITH A PURPOSE (LOS 5.1.1 OR 5.1.2)	3	2.2	2.4	##	##	##	##
CREATE - APPLYING ALGORITHMS (LOS 4.1.1, 4.1.2, 5.2.1, 5.5.1)	3	1.5	1.2	3	0	15	7
CREATE - APPLYING ABSTRACTION (LOS 3.2.1, 5.3.1)	3	1.4	2.0	0	4	9	12
EXPLORE - IMPACT OF COMPUTING INNOVATIONS (LOS 1.2.1 OR 1.2.2)	7	4.4	4.8	4	0	7	14
EXPLORE - USING DEVELOPMENT PROCESSES AND TOOLS (LOS 1.2.1 OR 1.2.2)	1	1.0	1.0	##	##	##	##
EXPLORE - ANALYZING IMPACT OF COMPUTING (LOS 7.1.1, 7.3.1, 7.4.1)	3	2.1	2.2	##	##	##	##
EXPLORE - ANALYZING DATA AND INFORMATION (LOS 3.3.1)	2	0.8	0.8	##	##	##	##
EXPLORE - FINDING AND EVALUATING INFORMATION (LOS 7.5.2)	1	0.5	0.8	##	##	##	##
Task Summary		25.1	26.8	5	3	8	9

Indicates that the distribution is not displayed because more than half of the total AP global group earned the same score.
 ** Indicates that the distribution is not displayed because there were fewer than five questions in the category.

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Page 1 compares the overall performance of your students to the overall performance of students across the nation.

- Based on 47,216 students.
 - Globally – 73.8% of students earned a 3, 4, or 5
 - Globally – 35.1% of students earned a 4 or 5
- Based on 50,092 students
 - Globally – 74.6% of students earned a 3, 4, or 5
 - Globally – 35.6% of students earned a 4 or 5

AP[®] Instructional Planning Report (2017)

✓ Data Updated Aug 3, 2017, Report Run Aug 3, 2017

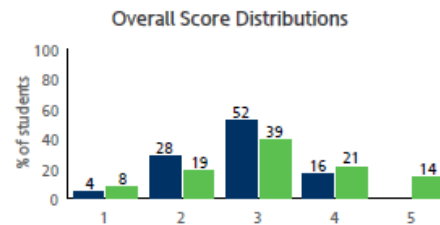
This subject-specific report compares your students' performance on specific topics in this AP Exam with the performance of all students on these same topics, helping teachers target areas for increased attention and focus in the curriculum. Other uses of the report, such as teacher evaluation or institutional ranking, are not warranted. Students who tested on late-testing dates are not included in this report.

Computer Science Principles



■ Your Group Total Students: 25

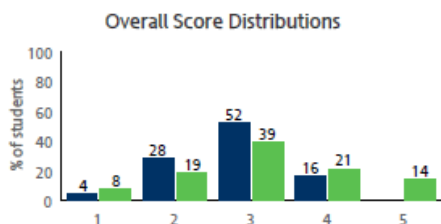
■ Global Total Students: 47,216



Overall Score Distributions	1	2	3	4	5
Number of Students in Your Group	1	7	13	4	0
% Students in Your Group	4.0	28.0	52.0	16.0	0.0
% Students Globally	7.6	18.6	38.7	21.3	13.8

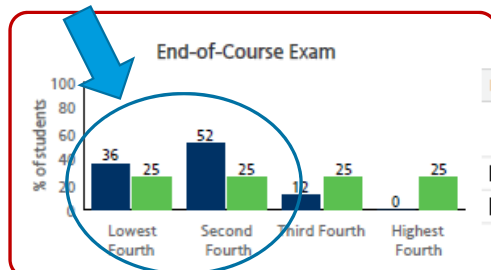
A comparison of student performance on End-of-course exam and Performance Task is also provided.

- Global performance is broken into quartiles. These do not correlate with the cut scores or the number of 2, 3, 4 or 5.

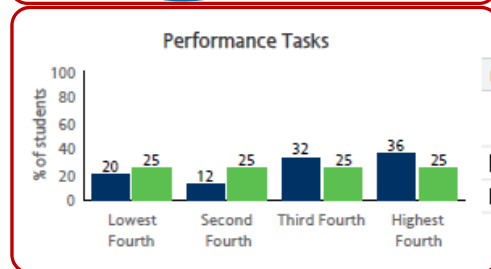


Overall Score Distributions	1	2	3	4	5
Number of Students in Your Group	1	7	13	4	0
% Students in Your Group	4.0	28.0	52.0	16.0	0.0
% Students Globally	7.6	18.6	38.7	21.3	13.8

35.1%



End-of-Course Exam	Lowest Fourth	Second Fourth	Third Fourth	Highest Fourth
Number of Students in Your Group	9	13	3	0
% Students in Your Group	36.0	52.0	12.0	0.0
% Students Globally	25.0	25.0	25.0	25.0



Performance Tasks	Lowest Fourth	Second Fourth	Third Fourth	Highest Fourth
Number of Students in Your Group	5	3	8	9
% Students in Your Group	20.0	12.0	32.0	36.0
% Students Globally	25.0	25.0	25.0	25.0



Page 2:
Performance on
the multiple choice
is reported by Big
Idea and Skill.

- Max Possible Score = 60; 60% of the exam comes from MC.
- ## AP[®] Instructional Planning Report (2017)

✓ Data Updated Aug 3, 2017, Report Run Aug 3, 2017

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Performance on Multiple-Choice Exam (Maximum Possible Score = 60)

Big Ideas

Skills

Content Area	Max Possible Score	Global Mean	Group Mean	Number of Students in Your Group			
				Lowest Fourth	Second Fourth	Third Fourth	Highest Fourth
BIG IDEA 1: CREATIVITY	0	##	##	##	##	##	##
BIG IDEA 2: ABSTRACTION	13	8	7	8	8	8	1
BIG IDEA 3: DATA AND INFORMATION	9	7	6	8	3	7	7
BIG IDEA 4: ALGORITHMS	12	8	7	8	8	9	0
BIG IDEA 5: PROGRAMMING	15	11	10	6	10	6	3
BIG IDEA 6: THE INTERNET	9	7	6	11	5	4	5
BIG IDEA 7: GLOBAL IMPACT	6	5	5	3	6	4	12
SKILL: INTERPRETING DATA ABSTRACTION (LOS 2.1.1; 2.1.2)	5	3	2	9	6	4	6
SKILL: APPLYING ABSTRACTION (LOS 2.2.1; 2.2.2; 2.2.3; 5.3.1)	7	5	4	6	8	8	3
SKILL: ANALYZING DATA AND INFORMATION USING MODELS (LOS 2.3.1; 2.3.2)	5	4	3	5	11	0	9
SKILL: ANALYZING DATA AND INFORMATION (LOS 3.1.1; 3.1.3; 3.2.1; 3.2.2; 3.3.1)	9	7	6	8	3	7	7
SKILL: APPLYING ALGORITHMS (LOS 4.1.1; 4.1.2; 5.2.1; 5.5.1)	12	8	7	5	11	8	1
SKILL: EVALUATING ALGORITHMS (LOS 4.2.1; 4.2.2; 4.2.3; 4.2.4)	5	3	2	4	10	8	3
SKILL: DEVELOPING A PROGRAM FOR A PURPOSE (LOS 5.1.1; 5.1.2; 5.4.1)	6	4	4	6	10	6	3
SKILL: ANALYZING THE INTERNET (LOS 6.1.1; 6.2.1; 6.2.2; 6.3.1)	9	7	6	11	5	4	5
SKILL: ANALYZING IMPACT OF COMPUTING (LOS 7.1.1; 7.1.2; 7.2.1; 7.3.1; 7.4.1)	6	5	5	3	6	4	12
Content Area Summary		44	38	9	13	3	0

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Page 3:
Performance on
the tasks are
reported as a
whole and by
associated rubric
rows.

- Max Possible Score = 40; 40% of the exam comes from PT.

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Computer Science Principles


Performance on Performance Tasks (Maximum Possible Score = 40)

Performance Tasks	Max Possible Score	Global Mean	Group Mean	Number of Students in Your Group			
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EXPLORE - ANALYZING IMPACT OF COMPUTING (LOS 7.1.1, 7.3.1, 7.4.1)	3	2.1	2.2	##	##	##	##
EXPLORE - ANALYZING DATA AND INFORMATION (LO 3.3.1)	2	0.8	0.8	##	##	##	##
EXPLORE - FINDING AND EVALUATING INFORMATION (LO 7.5.2)	1	0.5	0.8	##	##	##	##
Task Summary		25.1	26.8	5	3	8	9

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Scoring Guidelines and Notes



Some frequently asked assessment questions.

Do the students have to submit all parts of the PT to get a score?

- Students have to take the end-of-course exam to get a score.

Plagiarism

- Students can ONLY collaborate on the writing of their program for the Create task. Not on the written responses or video.
- No collaboration on Explore task.
- Algorithm and Abstraction should be developed by the student.
- The algorithms that are being integrated can be existing algorithms, but the way they are being combined should be the students unique work.
- **Teachers are able to report plagiarism and guideline violations (student work that was provided feedback and submitted) via the digital portfolio.**

Changes to the scoring guidelines and notes were made based on feedback from the readers and to increase the reader reliability.

Open Forum

- The College Board received feedback from the readers about difficulties and concerns with the scoring guidelines

Focus Group at the Reading

- A focus group meeting was held to obtain reader feedback on what works well with the scoring guidelines as well as what was unclear and difficult to apply.

New Scoring Guidelines and Notes

- New scoring guidelines and notes were created by the chief reader in collaboration with the development committee and the College Board

Piloting of Scoring Guidelines

- Scoring guidelines and notes were piloted based at a mock reading in July. We used actual student responses from the June 2017 reading.
- Reader reliability was very high.

Teachers need to be sure they adhere to the assessment guidelines

Assessment Overview and Performance Task Directions for Students

- The Handouts section of the Course and Exam Description have been extracted into a pdf for teachers to more easily provide the performance task directions and guidelines to teachers. It can be found here: <https://apcentral.collegeboard.org/pdf/ap-csp-student-task-directions.pdf?course=ap-computer-science-principles>

Collaboration

- Collaboration is only allowed on the program code itself, and not on the written responses or video. Students who collaborated on the written responses were flagged as plagiarized.

Templates

- New, generic templates are being created for students to use for the written responses for Create and Explore. These will be posted to the digital portfolio soon. **Students should not be using the 2016 – 17 templates as these contain task directions specific to that year’s task.**

The Performance Task Scoring Guidelines and Notes include the following columns.

Reporting Category:

- This column explains which reporting category this row will be reported under on the Instructional Planning Report

Task

- This column indicates what part of the performance task submission will be rated with this row of the rubric.

Scoring Criteria

- This column represents the actual rubric language that readers will use to evaluate student responses.

Decision Rules

- This column further explains the scoring criteria and when students will be penalized and when they will not be penalized.

Scoring Notes

- This column is included to provide the reader with definitions or terms used in the scoring criteria and decision rules. Often these are LOs, EKs, and other definitions that are found in the course and exam description.

Create Performance Task

Scoring Guidelines and Notes

8 binary rows

Row 1 still focuses on the video.

Note:

- Row 1 allows for students to confuse purpose and function without penalty.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 1 Developing a Program with a Purpose	VIDEO & RESPONSE 2A	<ul style="list-style-type: none"> • The video demonstrates the running of at least one feature of the program submitted. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • The response (audio narration or written response) identifies the purpose of the program (what the program is attempting to do). 	<p>Response earns the point if it explains the function of the program instead of identifying the purpose.</p> <p>Response earns the point if the illustrated feature runs, even if it does not function as intended.</p> <p>Response earns the point if the video includes a narration or some form of closed captioning that addresses the purpose of the program.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • a video is not submitted; • the video does not illustrate the feature mentioned in the response; or • the video does not illustrate the running of the feature (screen shots or storyboards are not acceptable and would not be credited). 	<ul style="list-style-type: none"> • Purpose means the intended goal or objective of the program. • Function means how the program works.

Rows 2 and 3 align with row 2 of the 2017 rubric.

Note:

- Row 2 – the response has to address the “entire program”.
- Row 3 – the incremental development process does not need to be described for this point.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 2 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none"> • Describes or outlines steps used in the incremental and iterative development process to create the entire program. 	<p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the response does not indicate iterative development; • refinement and revision are not connected to feedback, testing, or reflection; or • the response only describes the development at two specific points in time. 	<ul style="list-style-type: none"> • Development processes are iterative and cyclical in nature and require students to reflect AND improve on what they have created. Examples of iterative development could include reflection, revision, testing and refining, and improvements based on feedback. • The incremental and iterative development process does not need to be a formal method such as waterfall, top – down, bottom-up, agile, etc.
Row 3 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none"> • Specifically identifies at least two program development difficulties or opportunities. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • Describes how the two identified difficulties or opportunities are resolved or incorporated. 	<p>Response earns the point if it identifies two opportunities, or two difficulties, or one opportunity and one difficulty AND describes how each is resolved or incorporated.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • only one distinct difficulty or opportunity in the process is identified and described; or • the response does not describe how the difficulties or opportunities were resolved or incorporated. 	

Rows 4, 5 and 6 align with row 3 of the 2017 rubric.

Note:

- Row 4 – We are really focusing on the definitions provided for what constitutes an algorithm.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 4 Applying Algorithms	CODE SEGMENT IN RESPONSE 2C	<ul style="list-style-type: none"> • Selected code segment implements an algorithm. 	<p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the algorithm consists of a single instruction; • the code segment consisting of the algorithm is not included in the written responses section or is not explicitly identified in the program code section; or • the algorithm is not explicitly identified (i.e., the entire program is selected as an algorithm, without explicitly identifying the code segment containing the algorithm). 	<ul style="list-style-type: none"> • Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages. (EU 4.1) • Algorithms make use of sequencing, selection or iteration. (EK 4.1.1A)

Rows 4, 5 and 6 align with row 3 of the 2017 rubric.

Note:

- Row 5 – Students need to “Explain how,” which is different from “Describe what”. Describing what the algorithm does will not get credit. This will be a difficult distinction for students.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 5 Applying Algorithms	RESPONSE 2C	<ul style="list-style-type: none"> Selected code segment implements an algorithm that uses mathematical or logical concepts. AND Explains how the selected algorithm functions. AND Describes what the selected algorithm does in relation to the overall purpose of the program. 	<p>The algorithm being described can utilize existing language functionality, or library calls. Response earns the point even if the algorithm was not newly developed. (i.e., a student’s reimplementation of the algorithm to find the minimum value)</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> the selected algorithm consists of a single instruction; the selected algorithm consists solely of library calls to existing language functionality; the selected algorithm does not include mathematical or logical concepts; the response only describes what the selected algorithm does without explaining how it does it; the response does not explicitly address the program’s purpose; the code segment consisting of the selected algorithm is not included in the written responses section or is not explicitly identified in the program code section; or the algorithm is not explicitly identified (i.e., the entire program is selected as an algorithm, without explicitly identifying the code segment containing the algorithm). 	<ul style="list-style-type: none"> See Row 4 definitions and curriculum framework alignment. Mathematical concepts include mathematical expressions using arithmetic operators and mathematical functions. (EK 5.5.1.D) Logical concepts include Boolean algebra and compound expressions. (EK 5.5.1E and 5.5.1F) Iteration is the repetition of part of an algorithm until a condition is met or for a specified number of times. (EK 4.1.1D) Selection uses a Boolean condition to determine which of two parts of an algorithm is used. (EK 4.1.1C) Iteration is the repetition of part of an algorithm until a condition is met or for a specified number of times. (EK 4.1.1D) Selection uses a Boolean condition to determine which of two parts of an algorithm is used. (EK 4.1.1C)

Rows 4, 5 and 6 align with row 3 of the 2017 rubric.

Note:

- Row 6 – focuses on whether the algorithm is an integration of 2 or more algorithms.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 6 Applying Algorithms	RESPONSE 2C	<ul style="list-style-type: none"> Selected code segment implements an algorithm that includes at least two or more algorithms. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> At least one of the included algorithms uses mathematical or logical concepts. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> Explains how one of the included algorithms functions independently. 	<p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> the selected algorithm consists of a single instruction; the selected algorithm consists solely of library calls to existing language functionality; neither of the included algorithms nor the selected algorithm that includes two or more algorithms uses mathematical or logical concepts; the code segment consisting of the algorithm is not included in the written responses section or is not explicitly identified in the program code section; or the algorithm is not explicitly identified (i.e., the entire program is selected as an algorithm, without explicitly identifying the code segment containing the algorithm). 	<ul style="list-style-type: none"> See Row 4 and Row 5 definitions and curriculum framework alignment.

Rows 7 and 8 align with row 4 of the 2017 rubric.

Note:

- Row 7 – the student must have developed the abstraction. If the abstraction is an existing abstraction, students can get row 8, but not row 7.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 7 Applying Abstraction	CODE SEGMENT IN RESPONSE 2D	<ul style="list-style-type: none"> • Selected code segment is a student-developed abstraction. 	<p>Responses that use existing abstractions to create a new abstraction, such as creating a list to represent a collection (e.g., a classroom, an inventory), would earn this point.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the response is an <i>existing</i> abstraction such as variables, existing control structures, event handlers, APIs; • the code segment consisting of the abstraction is not included in the written responses section or is not explicitly identified in the program code section; or • the abstraction is not explicitly identified (i.e., the entire program is selected as an abstraction, without explicitly identifying the code segment containing the abstraction). 	<ul style="list-style-type: none"> • The following are examples of abstractions (EK 5.3.1): <ul style="list-style-type: none"> o Procedures o Parameters o Lists o Application program interfaces (APIs) o Libraries • Lists and other collections can be treated as abstract data types (ADTs) in developing programs. (EK 5.5.1)
Row 8 Applying Abstraction	RESPONSE 2D	<ul style="list-style-type: none"> • Explains how the selected abstraction manages the complexity of the program. 	<p>Responses should not be penalized for explanations of abstractions that are not developed by the student.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the explanation does not apply to the selected abstraction; or • the abstraction is not explicitly identified (i.e., the entire program is selected as an abstraction, without explicitly identifying the code segment containing the abstraction). 	<ul style="list-style-type: none"> • See Row 7 definitions and curriculum framework alignment.

Examples on AP Central

Create Examples

AP Central Example

Sample C – 2b

Row 2 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none">Describes or outlines steps used in the incremental and iterative development process to create the entire program.
Row 3 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none">Specifically identifies at least two program development difficulties or opportunities. ANDDescribes how the two identified difficulties or opportunities are resolved or incorporated.

Insert response for 2b in the text box below.

I wrote this program, first by creating an identity for the user by incorporating user choice and a user input box to allow for personalization, and then by creating worlds with mini games within them for the user's chosen character to complete. My first problem arose when I tried to carry the username input from the character choice screen throughout the rest of the game. Because I had initially used a local variable, the user input was only recorded to the screen on which it was provided, instead of to the entire program. To resolve this issue, I changed the username input to a global variable that was able to be called on multiple screens in the program. I encountered a similar issue when I attempted to move the user's chosen character between screens. To make it appear as though the image traveled to the new screen as the user switched screens, I created a variable that stored the value of whichever character the user clicked on the first screen (i.e. boy=1 when the boy image was clicked) and then used an algorithm that incorporated an if statement to set other images throughout the program to the user's character of choice. Both of these difficulties were handled independently.

AP Central Example

Sample A – 2b

Row 2 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none">Describes or outlines steps used in the incremental and iterative development process to create the entire program.
Row 3 Developing a Program with a Purpose	RESPONSE 2B	<ul style="list-style-type: none">Specifically identifies at least two program development difficulties or opportunities. ANDDescribes how the two identified difficulties or opportunities are resolved or incorporated.

2b.

Being unfamiliar with Firebase's structure, I encountered a problem while programming when I tried to include a 3rd Firebase database. Upon the addition of the component and the corresponding coding elements, my app could no longer be packaged or loaded onto a device for testing. My app would always crash while loading. Unable to find a clear syntax error, I resolved the issue by debugging and deleting portions of the code until the app would finally successfully load and then reprogramming the deleted portions of code.

Another difficulty I encountered was transferring variables across screens in order to access the correct user's data. Opening a new screen in App Inventor would clear the values of the variable on the device, which would render them unusable on the next screen. I resolved this independently by assembling the contents of each screen into its own arrangement, and utilizing the .visible property of these arrangements to make them appear and disappear, providing the illusion of multiple screens and allowing the accessed variable values to be consistent across all "screens".

AP Central Example

Sample A – 2c

Row 4 Applying Algorithms	CODE SEGMENT IN RESPONSE 2C	<ul style="list-style-type: none"> Selected code segment implements an algorithm.
Row 5 Applying Algorithms	RESPONSE 2C	<ul style="list-style-type: none"> Selected code segment implements an algorithm that uses mathematical or logical concepts. AND Explains how the selected algorithm functions. AND Describes what the selected algorithm does in relation to the overall purpose of the program.
Row 6 Applying Algorithms	RESPONSE 2C	<ul style="list-style-type: none"> Selected code segment implements an algorithm that includes at least two or more algorithms. AND At least one of the included algorithms uses mathematical or logical concepts. AND Explains how one of the included algorithms functions independently.

2c.

Since Firebase is asynchronous, this block is used to properly handle the requested info and enact the correct procedures

```

when AccountDB . GotValue
  tag value
do
  if get tag == UsernameInput . Text
  then
    if get value == *
    then
      set FeedbackLabel . Text to *Username does not exist*
      set FeedbackLabel . TextColor to red
    else
      call loginProcedure
      accountPassword get value
    else if get tag == *User*
    then
      call createAccount
      listOfUsers get value
  
```

As my program uses Firebase databases to store user data, `AccountDB.GotValue` is an important algorithm as it handles all data retrieved from the account database such as users and passwords. Because Firebase data requests are handled asynchronously to the program, it is necessary that when data is sent back from Firebase, the algorithm examines the tag and values sent back in order to properly redirect the program to either proceed with a login or create account procedure.

AP Central Example

Sample A – 2c

<p>Row 4</p> <p>Applying Algorithms</p>	<p>CODE SEGMENT IN RESPONSE 2C</p>	<ul style="list-style-type: none"> Selected code segment implements an algorithm.
<p>Row 5</p> <p>Applying Algorithms</p>	<p>RESPONSE 2C</p>	<ul style="list-style-type: none"> Selected code segment implements an algorithm that uses mathematical or logical concepts. AND Explains how the selected algorithm functions. AND Describes what the selected algorithm does in relation to the overall purpose of the program.
<p>Row 6</p> <p>Applying Algorithms</p>	<p>RESPONSE 2C</p>	<ul style="list-style-type: none"> Selected code segment implements an algorithm that includes at least two or more algorithms. AND At least one of the included algorithms uses mathematical or logical concepts. AND Explains how one of the included algorithms functions independently.

One of the integrated algorithms is the procedure called `loginProcedure` (above). When called, the procedure `loginProcedure` will login in the user and load up the user's diary entries if the correct password is entered. Otherwise, an error message will appear and the user will have to try again.

```

do
  if (is empty UsernameInput - Text -) or (is empty PasswordInput - Text -)
  then
    set FeedbackLabel - Text - to "Fields are empty. Please reenter."
    set FeedbackLabel - TextColor - to red
  else if (is in list? thing UsernameInput - Text -)
  then
    list listOfUsers
    then
      set FeedbackLabel - Text - to "This username already exists."
      set FeedbackLabel - TextColor - to red
    else
      call AccountDB - AppendValue
      tag "User"
      valueToAdd UsernameInput - Text -
      call AccountDB - StoreValue
      tag UsernameInput - Text -
      valueToStore PasswordInput - Text -
      set global userName to UsernameInput - Text -
      call UserDataDB - StoreValue
      tag get global userName
      valueToStore create empty list
      call UserDataDB - StoreValue
      tag join get global userName
      valueToStore " "
    then
      set FeedbackLabel - Text - to "Account creation successful. Please login."
      set FeedbackLabel - TextColor - to green
  end if
end do
  
```

The procedure `createAccount` shown above is another integrated algorithm that helps create a user's account and mark the designated locations for the user's data in Firebase given that they had provided a valid password and an unique username. The integration of the two procedures `createAccount` and `loginProcedure` helps the overall algorithm perform and regulate the core functions of the login screen of creating accounts and logging in.

AP Central Example

Sample A – 2d

Row 7 Applying Abstraction	CODE SEGMENT IN RESPONSE 2D	<ul style="list-style-type: none">Selected code segment is a student-developed abstraction.
Row 8 Applying Abstraction	RESPONSE 2D	<ul style="list-style-type: none">Explains how the selected abstraction manages the complexity of the program.

```
to loadUserEntryData entries
do
  if is list empty? list get entries
  then
    call Notifier . showAlert
    notice "Welcome! Click New to start a new entry"
    set NavBar . Visible to true
    set EntryPage . Visible to false
    set LoginScreenArrangement . Visible to false
  else
    set UserEntryList . Elements to get entries
    set NavBar . Visible to true
    set EntryPage . Visible to false
    set LoginScreenArrangement . Visible to false
```

One abstraction I developed to manage the complexity of my code was the procedure `loadUserEntryData`. `loadUserEntryData` helps populate a list of user's entries and is called multiple times throughout the program using different (albeit only slightly) parameters. Implementing this abstraction improves the readability of the code by reducing redundancy and the overall line count. Instead of repeating the nine lines of code in every place, I would only need to call the procedure `loadUserEntryData`. In addition, this abstraction manages complexity as any future changes that need to be made to loading user entry data can be done in a single place. Overall, this abstraction was a helpful in managing redundancy, length of code, editability, and overall complexity.

Explore Performance Task

Scoring Guidelines and Notes
8 binary rows

Row 1 assesses the Computational Artifact

Note:

- The computational artifact really needs to be doing the illustrating, representing or explaining of the computing innovation's intended purpose, function, or effect. The written response will only be used to understand HOW the computational artifact does this. If the student just explains the purpose, function or effect in the written response, they will not get this point.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 1 Using Development Processes and Tools	COMP. ARTIFACT	<p>The computational artifact:</p> <ul style="list-style-type: none"> Identifies the computing innovation. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> Provides an illustration, representation, or explanation of the computing innovation's intended purpose, function, or effect. 	<p>The written response can be used to aid the understanding of how the computational artifact illustrates, represents, or explains the computing innovation's intended purpose, function, or effect.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> there is no artifact; the artifact is not a computational artifact; the innovation identified in the artifact does not match the innovation described in the written response; the artifact does not identify the innovation clearly; the artifact does not illustrate, represent or explain the innovation's intended purpose, function, or effect; the artifact illustrates a feature of the innovation instead of the purpose, function, or effect; or the written response describes the innovation's intended purpose and function without explaining how the computational artifact illustrates, represents, or explains the intended purpose, function, or effect. 	<ul style="list-style-type: none"> A computational artifact is something created by a human using a computer and can be, but is not limited to, a program, an image, an audio, a video, a presentation, or a Web page file. The computational artifact could solve a problem, show creative expression, or provide a viewer with new insight or knowledge. A computing innovation is an innovation that includes a computer or program code as an integral part of its functionality.

Rows 2 and 3 are similar to the 2017 rubric

Note:

- **Row 2 - The innovation has to be a computing innovation. A computing innovation is an innovation that includes a computer or program code as an integral part of its functionality.**
- **Row 3 – If the innovation is not a computing innovation, but the effect they describe is a computing innovation, they can earn this point.**

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 2 Analyzing Impact of Computing	RESPONSE 2A	<ul style="list-style-type: none"> • States a fact about the correctly identified computing innovation’s intended purpose OR function. 	<p>Do NOT award a point if:</p> <ul style="list-style-type: none"> • the identified innovation is not a computing innovation; or • the written statement gives an effect (which is required for the scoring criteria in Row 3, not Row 2). 	<ul style="list-style-type: none"> • A computing innovation is an innovation that includes a computer or program code as an integral part of its functionality. • Computing innovations may be physical computing innovations such as Google glasses or self-driving cars, non-physical computer software like a cell phone app, or computing concepts such as e-commerce or social networking which rely on physical transactions conducted on the Internet. • Purpose means the intended goal or objective of the innovation. • Function means how the innovation works (e.g., consumes and produces data).
Row 3 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none"> • Identifies at least ONE effect of the identified or described computing innovation. 	<p>The effect does not need to be specifically identified as beneficial or harmful.</p> <p>The effect must be identified, but it doesn’t have to be described to earn the point.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the described innovation is not a computing innovation; • the response does not state an effect (The purpose or function of the computing innovation is not the effect of the innovation.); or • the identified effect is not a result of the use of the innovation as intended (e.g., a self-driving car is not intended to crash, therefore, its exposure to hacking is not an effect of its intended use). 	<ul style="list-style-type: none"> • An effect may be an impact, result, outcome, etc.

Rows 4 and 5 align to row 4 in the 2017 rubric

Note:

- To better assess student understanding, row 4 was split into 2 rows.
- Row 4 focuses on the beneficial and harmful effects
- Row 5 focuses on the connection to society, economy, or culture.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 4 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none"> • Identifies a beneficial effect of the identified or described computing innovation. <p style="text-align: center;">AND</p> <ul style="list-style-type: none"> • Identifies a harmful effect of the identified or described computing innovation. 	<p>Responses that earn this point will also earn the point for Row 3.</p> <p>Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the described innovation is not a computing innovation; • the response is missing the adjectives harmful or beneficial (or synonyms thereof); • the response is missing a plausible beneficial effect; • the response is missing a plausible harmful effect; or • the identified effect is not a result of the use of the innovation as intended (e.g., a self-driving car is not intended to crash, therefore, its exposure to hacking is not an effect of its intended use). 	<ul style="list-style-type: none"> • An effect may be an impact, result, outcome, etc. • Beneficial and/or harmful effects are contextual and interpretive; identification includes both the classification of the effect as beneficial or harmful and justification for that classification.

Rows 4 and 5 align to row 4 in the 2017 rubric

Note:

- To better assess student understanding, row 4 was split into 2 rows.
- Row 4 focuses on the beneficial and harmful effects
- Row 5 focuses on the connection to society, economy, or culture.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 5 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none"> • Explains how ONE of the identified effects relates to society, economy, or culture. 	<p>Responses that earn the point for this row must have earned the point for Row 3.</p> <p>Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the described innovation is not a computing innovation; or • the explanation does not connect one of the effects to society, economy, or culture. 	<ul style="list-style-type: none"> • Effects need to be related to society, economy, or culture and need to be connected to a group or individuals. Examples include but are not limited to: <ul style="list-style-type: none"> o The innovation and impact of social media online access varies in different countries and in different socioeconomic groups (EK 7.4.1A) o Mobile, wireless, and networked computing have an impact on innovation throughout the world (EK 7.4.1B) o The global distribution of computing resources raises issues of equity, access and power (EK 7.4.1C) o Groups and individuals are affected by the “digital divide” (EK 7.4.1D) o Networks and infrastructure are supported by both commercial and governmental initiatives (EK 7.4.1E)

Rows 6 and 7 require students to analyze computing innovation's data

Note:

- Students struggled with identifying the actual type of the data verses the input devices that are used to collect the data, such as sensors or scanners.
- Students have to identify the data storage, data privacy or data security concern.

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 6 Analyzing Data and Information	RESPONSE 2D	<ul style="list-style-type: none"> • Identifies the data that the identified or described computing innovation uses AND • Explains how that data is consumed, produced, OR transformed. 	<p>Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the described innovation is not a computing innovation; • the response does not state the specific name of the data or simply says "data"; • the response confuses or conflates the innovation with the data: response fails to explain what happens to the data; or • the response confuses the source of the data with the data. 	<ul style="list-style-type: none"> • Data types include: integers, numbers, Booleans, text, image, video, audio, signals. Data that infer these types like fingerprints, temperature, music, length, pictures, etc. are allowed. • Data collection devices (e.g. sensors, cameras, etc.) are not data. • Large data sets include data such as transactions, measurements, texts, sounds, images, and videos. (EK 3.2.2A)
Row 7 Analyzing Data and Information	RESPONSE 2D	<ul style="list-style-type: none"> • Identify one data storage, data privacy, OR data security concern related to the identified or described computing innovation. 	<p>Responses should be evaluated on the rationale provided in the response not on the interpretation or inference on the part of the scorer.</p> <p>Responses can earn this point even if they refer to the data in a general without specifically identifying the data being used.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the described innovation is not a computing innovation; or • the response identifies or describes a concern that is not related to data. 	

Row 8 requires students to use in-text citation.

Note:

- **Must have 3 in-text citations**
- **In-text citations must be included in the list of references in 2e.**

Reporting Category	Task	Scoring Criteria	Decision Rules	Scoring Notes
Row 8 Finding and Evaluating Information	RESPONSE 2E & ARTIFACT / WRITTEN RESPONSE	<ul style="list-style-type: none"> • References, through in-text citation, at least 3 different sources. 	<p>The in-text citations can be in either the artifact or the written response.</p> <p>The in-text citations may be oral in the computational artifact.</p> <p>Do NOT award a point if any one of the following is true:</p> <ul style="list-style-type: none"> • the response contains a list of sources only, no in-text citations; • the response contains less than three in-text citations; or • there are fewer than three sources cited, even if there are three or more in-text citations. 	<ul style="list-style-type: none"> • In-text citations may be provided in any way that acknowledges the source: <ul style="list-style-type: none"> ○ According to..." or "As written in the New York Times..." ○ Parenthetical ○ Footnotes ○ Numerical superscripts with corresponding footnote ○ Number system with a corresponding reference

Examples on AP Central

[Explore Examples](#)

AP Central Example

Sample C – 2a - Artifact

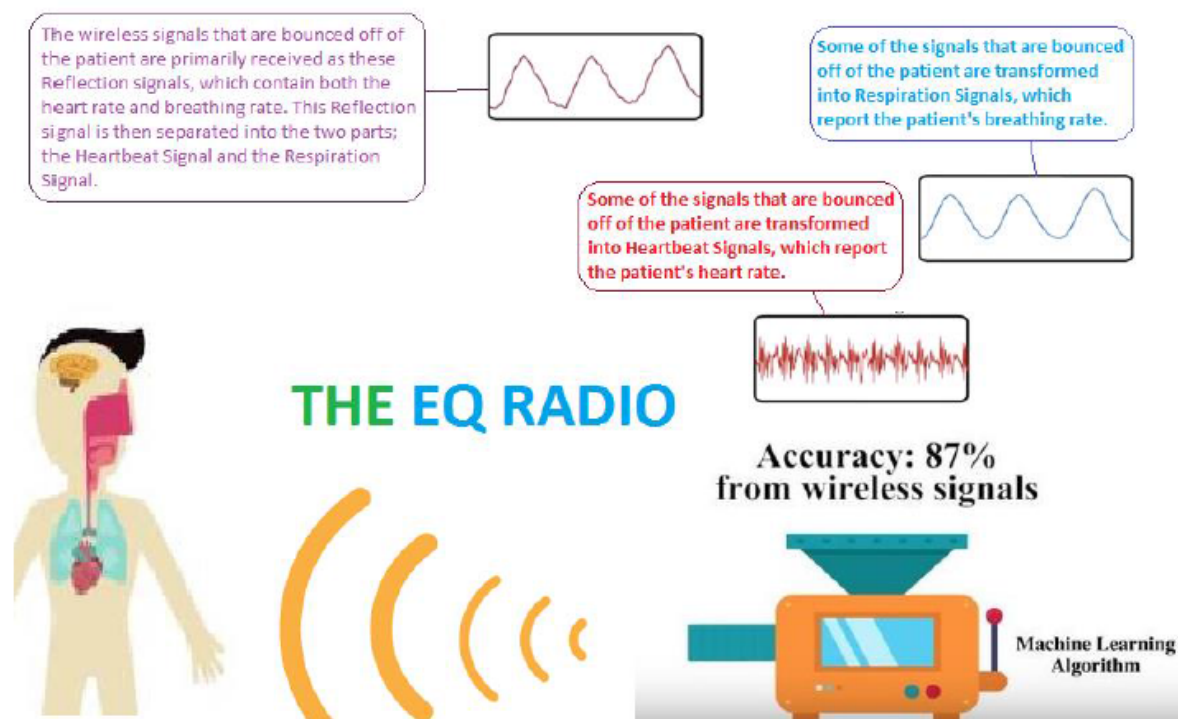
<p>Row 1</p> <p>Using Development Processes and Tools</p>	<p>COMP. ARTIFACT</p>	<p>The computational artifact:</p> <ul style="list-style-type: none">Identifies the computing innovation.ANDProvides an illustration, representation, or explanation of the computing innovation's intended purpose, function, or effect.
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AP Central Example

Sample B – 2a - Artifact

<p>Row 1</p> <p>Using Development Processes and Tools</p>	<p>COMP. ARTIFACT</p>	<p>The computational artifact:</p> <ul style="list-style-type: none"> Identifies the computing innovation. <p>AND</p> <ul style="list-style-type: none"> Provides an illustration, representation, or explanation of the computing innovation's intended purpose, function, or effect.
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My computational artifact represents the EQ Radio. The EQ Radio is a device designed by MIT students to determine what kind of emotion someone is feeling, even if they are attempting to hide it[3]. In my picture, the EQ Radio[4] can be seen bouncing wireless signals[5] off of the patient's body[5] and using reflected signals to deduce their heart rate, breathing patterns, and other factors that are symptomatic of certain emotions[4]. Then, it compares the data it has gathered on this patient with the data gathered about other patients to fine tune its result and be more accurate.

AP Central Example

Sample C – 2a

Row 2 Analyzing Impact of Computing	RESPONSE 2A	<ul style="list-style-type: none">States a fact about the correctly identified computing innovation's intended purpose OR function.
--	------------------------	---

The Global Positional System, otherwise known as the GPS, has had a huge impact on society since it has been created. Shown in the computational artifact, GPS has a variety of different uses. Originally, it was created for military purposes, but it was soon realized that civilians could utilize this device according to the "General Information On GPS." Nowadays, it is used for driving directions, tracking lost items, monitoring the locations of children, and much more (Bajaj). The artifact demonstrates the several functions of the GPS within the various pictures and some of the components involved with the functionality of the device.

AP Central Example

Sample C – 2c

Row 3 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none">Identifies at least ONE effect of the identified or described computing innovation.
Row 4 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none">Identifies a beneficial effect of the identified or described computing innovation. <p style="text-align: center;">AND</p> <ul style="list-style-type: none">Identifies a harmful effect of the identified or described computing innovation.
Row 5 Analyzing Impact of Computing	RESPONSE 2C	<ul style="list-style-type: none">Explains how ONE of the identified effects relates to society, economy, or culture.

Since the GPS innovation has so many potential uses, there are numerous different harmful and beneficial effects, all described in Karen Bajaj's article. When looking at the GPS's ability to track children, this becomes a huge benefit to society. It betters the safety for children nowadays. If they get lost, a parent can easily use their iPhone to track their location. Also, if parents sees that their child is heading towards somewhere that is potentially dangerous, they can prevent the child from getting in trouble. Though it could be seen as an invasion of privacy, it can very easily increase the safety of children or even teenagers. Another GPS function that is very popular is the use of driving directions. While this is very convenient at times, people in society have become very reliant on this luxury. It causes many people to only trust the words of the GPS and to not actually become familiar with the places they are going. If something were to happen while someone was driving and they had to know where they were, many people would have no idea where they were. While many people would be able to use their phone to find out where they are, if for some reason they could not do this, they would be in trouble. While GPS probably has more benefits than detriments, there are definitely some major harmful effects from people's overuse of the GPS.

AP Central Example

Sample C – 2d

Row 6 Analyzing Data and Information	RESPONSE 2D	<ul style="list-style-type: none">Identifies the data that the identified or described computing innovation uses ANDExplains how that data is consumed, produced, OR transformed.
Row 7 Analyzing Data and Information	RESPONSE 2D	<ul style="list-style-type: none">Identify one data storage, data privacy, OR data security concern related to the identified or described computing innovation.

According to Fred Zahradnik in his Lifewire article, GPS takes in data signals from several satellites that are in orbit around the Earth. Using these signals, a GPS can pinpoint your exact or relative location. In general, the data it produces is the location, but depending on which specific device you are using at the time, the location can be used to figure out other things, like directions, speed, and more. However, there can be some serious security concerns when it comes to using GPS. According to Catherine Rump, the government can track people's locations through their cell phone use. Every minute or so phones registers its location with the cell phone networks, allowing data to be easily available to when you might be. Also, when you use GPS on your phone, such as google maps, the government can monitor where you go and what you are doing. It is pretty invasive, but it is very difficult to avoid and the government can use it as a helpful tool to track criminals.

AP Central Example

Sample C – 2e

Row 8	RESPONSE 2E & ARTIFACT / WRITTEN RESPONSE	<ul style="list-style-type: none">References, through in-text citation, at least 3 different sources.
Finding and Evaluating Information		

Since the GPS innovation has so many potential uses, there are numerous different harmful and beneficial effects, all described in Karen Bajaj's article. When looking at the GPS's ability to track children, this becomes a huge benefit to society. It betters the safety for children nowadays. If they get lost, a parent can easily use their iPhone to track their location. Also, if parents sees that their child is heading towards somewhere that is potentially dangerous, they can prevent the ...

According to Fred Zahradnik in his Lifewire article, GPS takes in data signals from several satellites that are in orbit around the Earth. Using these signals, a GPS can pinpoint your exact or relative location. In general, the data it produces is the location, but depending on which specific device you are using at the time, the location can be used to figure out other things, like directions, speed, and more. However, there can be some serious security concerns when it comes to using GPS. According to Catherine Rump, the government can track people's locations through their cell phone use. Every minute or so phones registers its location with the cell phone networks, ...

Bajaj, Karan. "How to Use GPS to Locate Things and Track People - The Economic Times." *The Economic Times*. N.p., n.d. Web. 05 Dec. 2016.
<<http://economictimes.indiatimes.com/wealth/spend/how-to-use-gps-to-locate-things-and-track-people/articleshow/55386722.cms>>.

Rump, Catherine. "How GPS Tracking Threatens Our Privacy." *CNN*. Cable News Network, 07 Nov. 2011. Web. 07 Dec. 2016.

Zahradnik, Fred. "The Technology That Makes GPS Satellite-Based Navigation System Work." *Lifewire*. N.p., 16 Oct. 2016. Web. 05 Dec. 2016. <<https://www.lifewire.com/how-gps-works-1683296>>.

Thank You.

Questions?

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