AP Computer Science A

2021 Exam Results

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The 2021 Exam

About the 2021 AP Exams

2020

One-time Contingency

- One-time contingency to allow exams at-home
- Exams shortened and FRQ-only
- All-online, all-remote AP reading
- Exams and platform built in ~10 weeks

2021

Print + Digital

- Return to full-scope, full-length exams in all subjects
- Digital option for most courses
- Digital exams included MCQ + FRQ and kept traditional format for most courses
- AP Reading still all-online and all-remote

2022

Back to Paper

- Exams planned to be administered on paper, in schools
- Reading planned to be in-person (for most courses), conducted on computers (including ability for multi-dimensional scoring)

2021 AP CSA Exam Format

Both the paper and pencil and digital exams in 2021 used the traditional format, as indicated in the CED

40 Multiple Choice questions

4 Free-Response questions

- Methods and Control Structures
- Class Design
- Array / ArrayList
- 2D Array

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The 2021 Reading

AP Online Scoring from Home

Online scoring in 2021 – how it went…

Successes

- Students were scored consistently and fairly.
- Professional Development

Challenges

- We missed each other!
- Time zone differences

By the numbers

- 336 Readers + 79 Leaders = 415 participants
  - Readers trained to use rubric reliably & consistently.

To learn more and apply, visit:
collegeboard.org/apreading

In 2021, AP readers scored from home in all 50 states, and Puerto Rico!

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2021 Exam Results

AP CSA Exam Score Distribution

(All versions of exam)

65%

of students scored 3 or higher

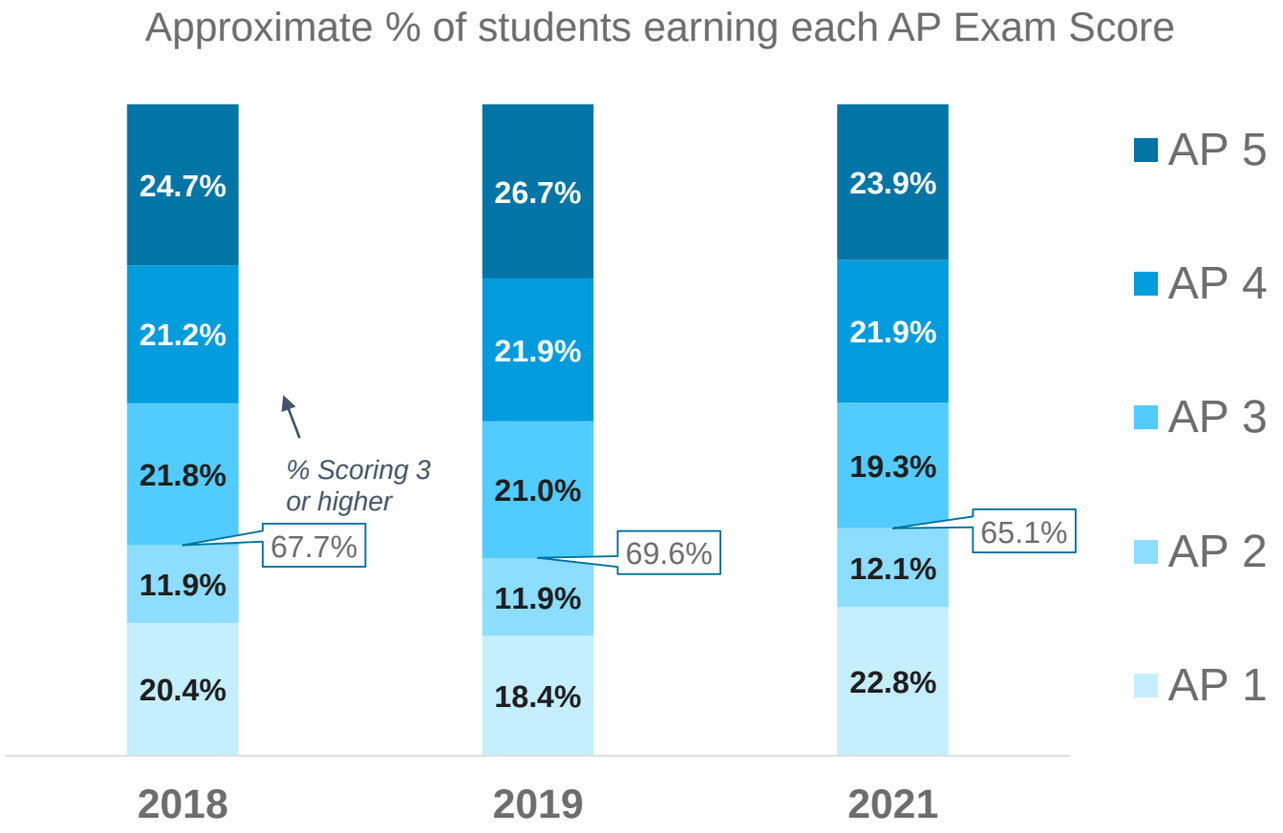
AP Exam Score	Approximate % Students EARNING this AP Score	Approximate % Students BELOW this AP Score
AP 5	23.90%	76.10%
AP 4	21.89%	54.21%
AP 3	19.27%	34.94%
AP 2	12.12%	22.82%
AP 1	22.82%	NA

AP CSA Exam Grade Distributions

Observations:
Compared to the last two years, 2021 students earned:

- *about same # of 4's*
- *fewer 3's and 5's*

- *challenging 2021 learning environment*



Note: 2020 grade distributions not shown

AP CSA Mean Student Scores

In 2021, multiple exam forms were used to provide additional security.

These Mean Scores are shown for the main operational administration (Administration 1) only.

Question	Mean Score (out of 9 points)
Question #1 (Methods and Control)	4.57
Question #2 (Class Design)	4.95
Question #3 (Array / `ArrayList`)	4.21
Question #4 (2D Array)	4.09

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Scoring Review:
Question 1
(Methods and Control Structures)

AP CSA 2021 Q1: Mean Student Scores

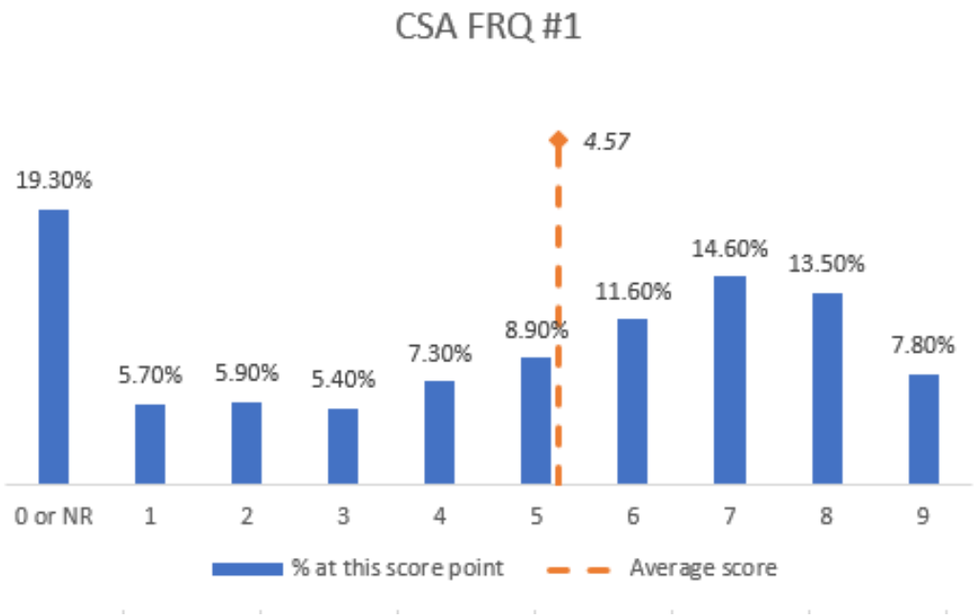
Question 1: Performance and observations

Students are assessed on their ability to write program code that requires them to call methods, loops, and conditional statements.

1. This question involves the `WordMatch` class, which stores a secret string and provides methods that compare other strings to the secret string. You will write two methods in the `WordMatch` class.

```
public class WordMatch
{
    /** The secret string. */
    private String secret;

    /** Constructs a WordMatch object with the given secret string of lowercase letters. */
    public WordMatch(String word)
    {
        /* implementation not shown */
    }

    /** Returns a score for guess, as described in part (a).
     *  Precondition: 0 < guess.length() <= secret.length()
     */
    public int scoreGuess(String guess)
    {  /* to be implemented in part (a) */  }

    /** Returns the better of two guesses, as determined by scoreGuess and the rules for a
     *  tie-breaker that are described in part (b).
     *  Precondition: guess1 and guess2 contain all lowercase letters.
     *                guess1 is not the same as guess2.
     */
    public String findBetterGuess(String guess1, String guess2)
    {  /* to be implemented in part (b) */  }
}
```

2021 FRQ 1: Methods and Control Structures



Overall mean score: **4.57**

Student strengths

1. Calling helper methods correctly and using returned values appropriately
2. Computing the `scoreGuess` return value (product of counter and square of length of guess).

Common errors/misconceptions:

1. Incorrectly accessing all appropriate substrings of `secret`.
   - Skipping letters
   - Counting the same substring more than once
2. Incorrectly performing an alphabetic comparison

Scoring Review: Question 2 (Class)

AP CSA 2021 Q2: Mean Student Scores

Question 2: Performance and observations

Students are assessed on their ability to write a class based on a class definition.

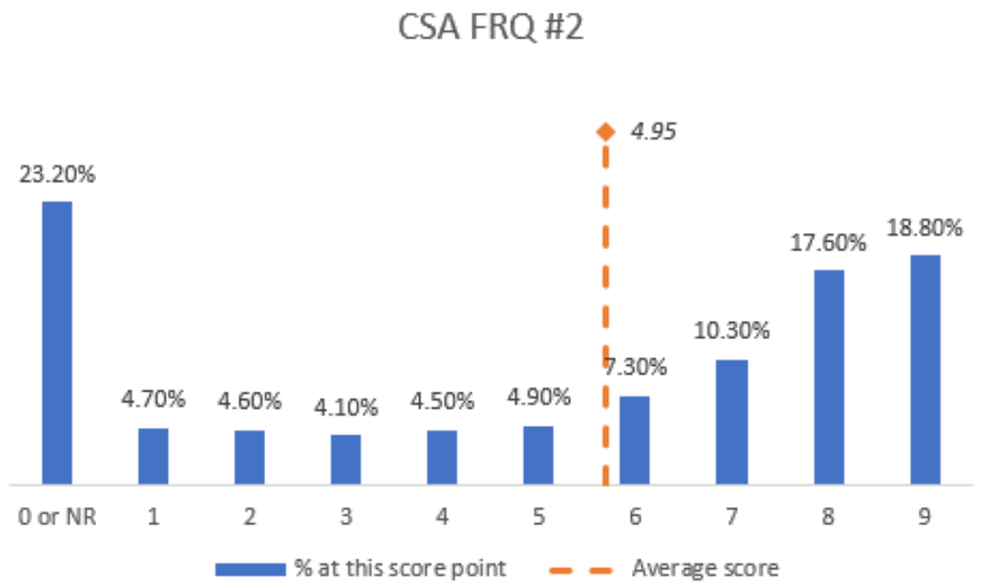
2. The class `SingleTable` represents a table at a restaurant.

```
public class SingleTable
{
    /** Returns the number of seats at this table. The value is always greater than or equal to 4. */
    public int getNumSeats()
    {  /* implementation not shown */  }

    /** Returns the height of this table in centimeters. */
    public int getHeight()
    {  /* implementation not shown */  }

    /** Returns the quality of the view from this table. */
    public double getViewQuality()
    {  /* implementation not shown */  }

    /** Sets the quality of the view from this table to value. */
    public void setViewQuality(double value)
    {  /* implementation not shown */  }

    // There may be instance variables, constructors, and methods that are not shown.
}
```

At the restaurant, customers can sit at tables that are composed of two single tables pushed together. You will write a class `CombinedTable` to represent the result of combining two `SingleTable` objects, based on the following rules and the examples in the chart that follows.

- A `CombinedTable` can seat a number of customers that is two fewer than the total number of seats in its two `SingleTable` objects (to account for seats lost when the tables are pushed together).
- A `CombinedTable` has a desirability that depends on the views and heights of the two single tables. If the two single tables of a `CombinedTable` object are the same height, the desirability of the `CombinedTable` object is the average of the view qualities of the two single tables.

2021 FRQ 2: Class



Overall mean score: **4.95**

Student strengths

1. `public` / `private` visibility declarations
2. Method headers
3. Calling the methods of a `SingleTable` object
4. Arithmetic expressions to compute desirability as average view quality

Common errors/misconceptions:

1. Incorrectly identifying the design as requiring inheritance
2. Declaring instance variables (not at all, in the wrong places)
3. Confusion on types

Scoring Review: Question 3 (Array / `ArrayList`)

AP CSA 2021 Q3: Mean Student Scores

Question 3: Performance and observations

Students are assessed on their ability to write programs that manipulates data in array or `ArrayList` objects.

3. A high school club maintains information about its members in a `MemberInfo` object. A `MemberInfo` object stores a club member's name, year of graduation, and whether or not the club member is in *good standing*. A member who is in good standing has fulfilled all the responsibilities of club membership.

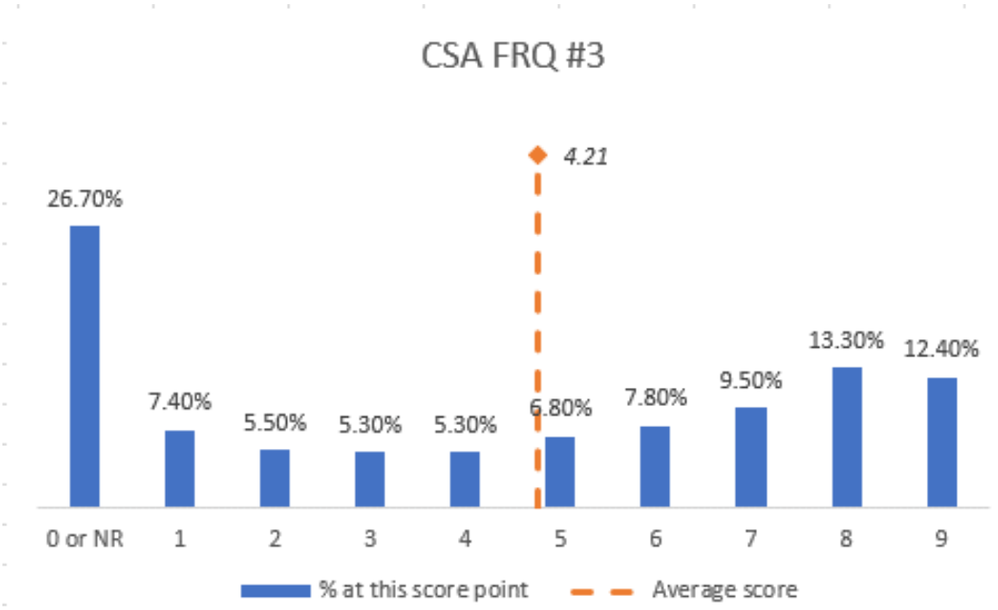
A partial declaration of the `MemberInfo` class is shown below.

```
public class MemberInfo
{
   /** Constructs a MemberInfo object for the club member with name name,
    *  graduation year gradYear, and standing hasGoodStanding.
    */
   public MemberInfo(String name, int gradYear, boolean hasGoodStanding)
   {  /* implementation not shown */  }

   /** Returns the graduation year of the club member. */
   public int getGradYear()
   {  /* implementation not shown */  }

   /** Returns true if the member is in good standing and false otherwise. */
   public boolean inGoodStanding()
   {  /* implementation not shown */  }

   // There may be instance variables, constructors, and methods that are not shown.
}
```

The `ClubMembers` class maintains a list of current club members. The declaration of the `ClubMembers` class is shown below.

```
public class ClubMembers
{
   private ArrayList<MemberInfo> memberList;
```

2021 FRQ 3: Array / `ArrayList`



Overall mean score: **4.21**

Student strengths

1. Declaring and initializing an `ArrayList`
2. Accessing elements using `get` method
3. Calling accessors of the `MemberInfo` class

Common errors/misconceptions:

1. Use of `remove` method in an enhanced for loop
2. Logically failing to distinguish the three cases
3. Confused array vs. `ArrayList` access
4. Skipping elements by traversing forward rather than backward

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Scoring Review: Question 4 (2D Array)

AP CSA 2021 Q4: Mean Student Scores

Question 4: Performance and observations

Students are assessed on their ability to write programs that manipulates data in 2D array objects.

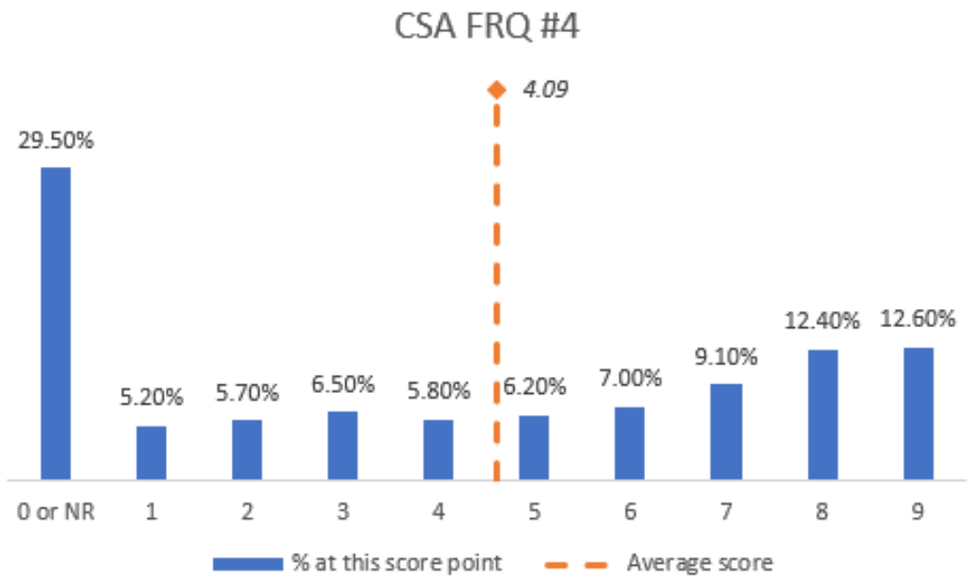
4. This question involves manipulating a two-dimensional array of integers. You will write two `static` methods of the `ArrayResizer` class, which is shown below.

```
public class ArrayResizer
{
    /** Returns true if and only if every value in row r of array2D is non-zero.
     *  Precondition: r is a valid row index in array2D.
     *  Postcondition: array2D is unchanged.
     */
    public static boolean isNonZeroRow(int[][] array2D, int r)
    {  /* to be implemented in part (a) */  }

    /** Returns the number of rows in array2D that contain all non-zero values.
     *  Postcondition: array2D is unchanged.
     */
    public static int numNonZeroRows(int[][] array2D)
    {  /* implementation not shown */  }

    /** Returns a new, possibly smaller, two-dimensional array that contains only rows
     *  from array2D with no zeros, as described in part (b).
     *  Precondition: array2D contains at least one column and at least one row with no zeros.
     *  Postcondition: array2D is unchanged.
     */
    public static int[][] resize(int[][] array2D)
    {  /* to be implemented in part (b) */  }
}
```

2021 FRQ 4: 2D Array



Overall mean score: **4.09**

Student strengths

1. Indexing 2D arrays by row and column
2. Declaring 2D arrays
3. Correctly copying entire rows by reference

Common errors/misconceptions:

1. Failure to maintain a separate row counter for the destination 2D array
2. Index / element confusion, especially with enhanced `for` loop.
3. Calling static method on an object
4. array / `ArrayList` confusion (using .add and .remove on an array)

Improving Student Performance

1. Have students practice tracing traversals that also involve removal

2. Remind students to read problems carefully and to answer the question

3. Have students describe in their own words what happens

4. Have students practice drawing 1D arrays or `ArrayList`s containing objects

5. Have students describe in their own words the difference between accessing an array and accessing an `ArrayList`

AP Classroom Resources

1. Practice with PCs (Progress Checks)
2. Early introduction to FRQs with Topic Questions
3. AP Daily Videos and Faculty Lectures
4. Targeted resources to Improve Student Performance
5. Leverage Provider resources to support instruction

Questions?

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AP Computer Science A:

Becoming a Reader

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- AP readers gain exposure to the full universe of student responses
- AP readers are compensated for their effort
- AP readers can earn Continuing Education Units (CEUs) and Professional Development Hours (PDHs)

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