

AP Computer Science A/B

[Ver. 2.0]

Syllabus

SCHOOL YEAR 2021-2022

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IEEE SENIOR MEMBER

Eric Chou, Ph.D.



IEEE Senior Member
CSTA Member

 **eC Learning Channel**

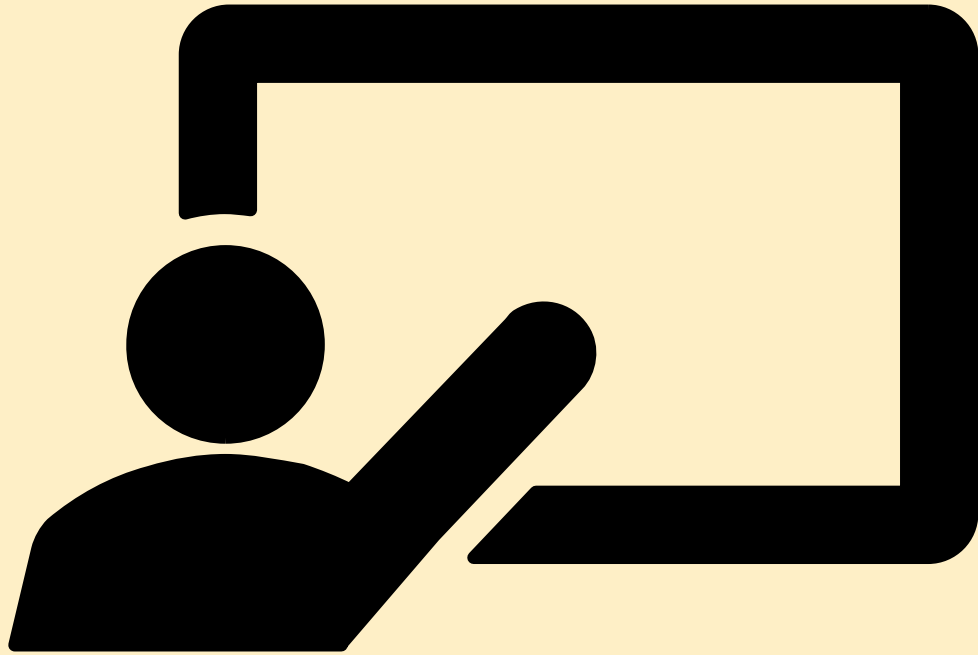


IEEE

USC



**National
Taiwan
University**



Overview

LECTURE 1



AP Computer Science Course A

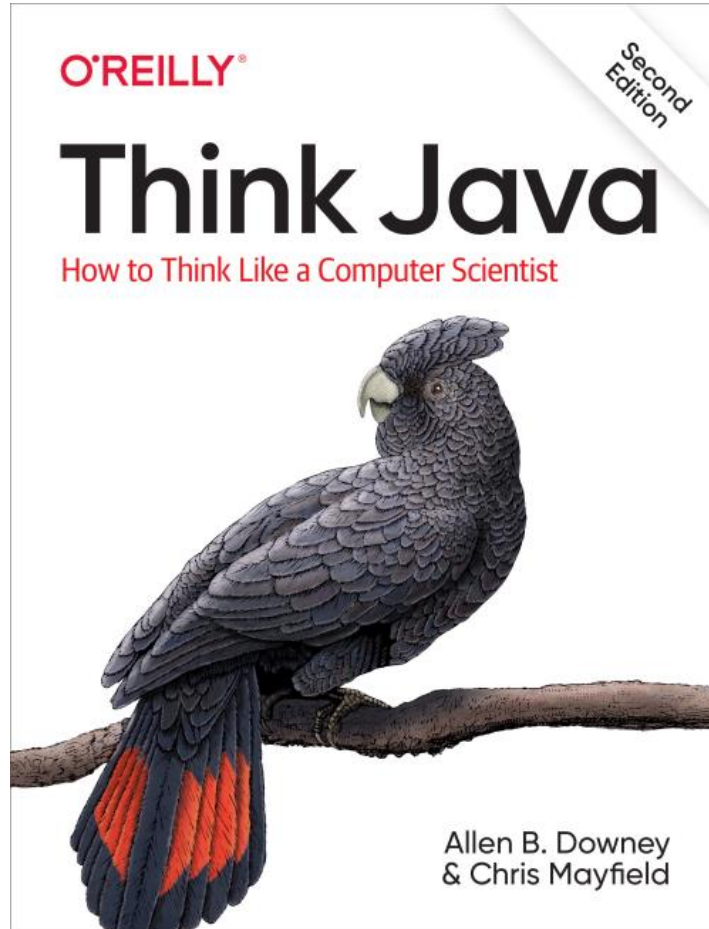
The CED organizes the course into ten commonly taught units
[Starting 2019-2020 School Year]

- This series of units represents a sequence that is found in widely adopted college textbooks and that many AP Computer Science A teachers have told us they follow:
 1. Primitive Types
 2. Using Objects
 3. Boolean Expressions and if Statements
 4. Iteration
 5. Writing Classes
 6. Array
 7. ArrayList
 8. 2-D Array
 9. Inheritance
 10. Recursion



Introduction to Programming Using Java

CS 21 Think Java (Pre-AP Java)



- [Chapter 1: Computer Programming](#)
- [Chapter 2: Variables and Operators](#)
- [Chapter 3: Input and Output](#)
- [Chapter 4: Methods and Testing](#)
- [Chapter 5: Conditionals and Logic](#)
- [Chapter 6: Loops and Strings](#)
- [Chapter 7: Arrays and References](#)
- [Chapter 8: Recursive Methods](#)
- [Chapter 9: Immutable Objects](#)
- [Chapter 10: Mutable Objects](#)
- [Chapter 11: Designing Classes](#)
- [Chapter 12: Arrays of Objects](#)
- [Chapter 13: Objects of Arrays](#)
- [Chapter 14: Extending Classes](#)
- [Chapter 15: Arrays of Arrays](#)
- [Chapter 16: Reusing Classes](#)
- [Chapter 17: Advanced Topics](#)



Java Programming Essentials

CS 22 AP Computer Science A

Unit 1

Elementary
Programming
Basic Java

Unit 2

Structured
Programming
Decisions
Loops
Methods

Unit 3

Array
ND Arrays
ArrayLists

Review 1

SDLC
Pseudo Code

Review 2

Flow Chart
Dia Diagramming

Review 3

Class Diagram
Violet Tool



Java Object-Oriented Programming

CS 23 AP Computer Science B

Unit 4

OO Programming
Inheritance
Polymorphism
Abstract Classes
Interface

Unit 5

Algorithms
Recursion

Unit 6

AP Labs
Chatbot
Picture Lab
Elevens

Review 4

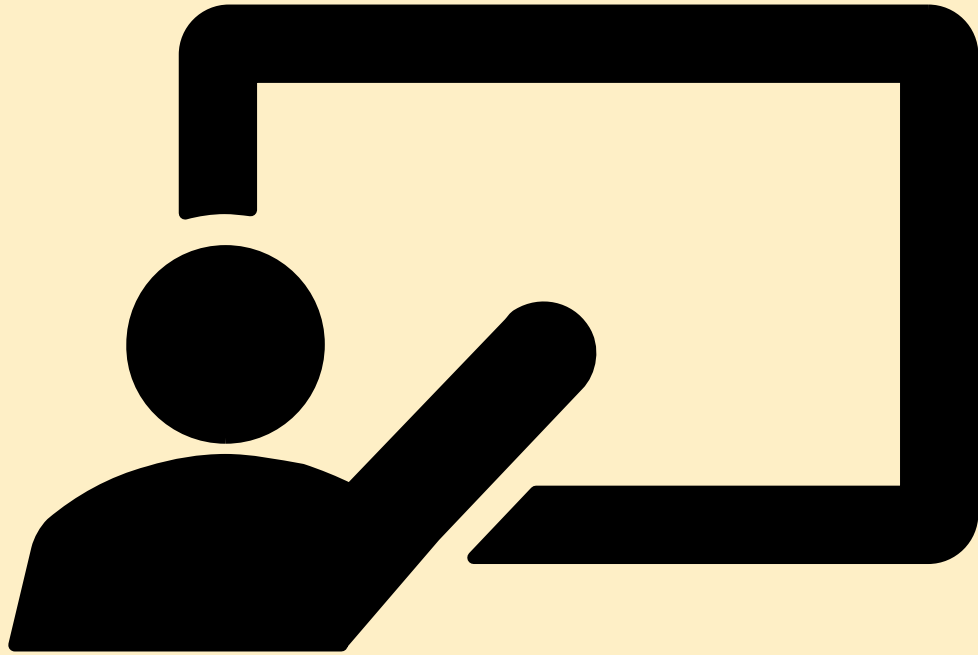
GUI
Programming
Swing/AWT

Review 5

Software Testing
Software Eng.
JUnit Testing

CS 24

AP Exam
Reviews



Tools

LECTURE 1



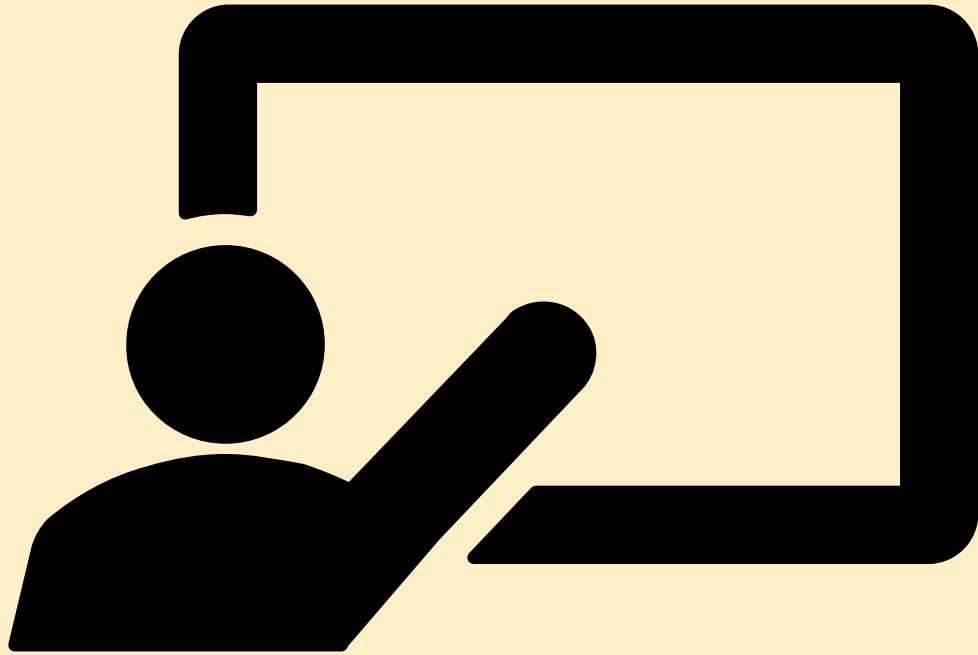
eC Academy

Realize Your Dreams



Pea

Zip



Textbook

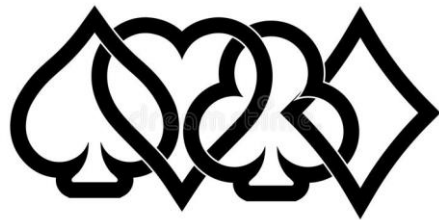
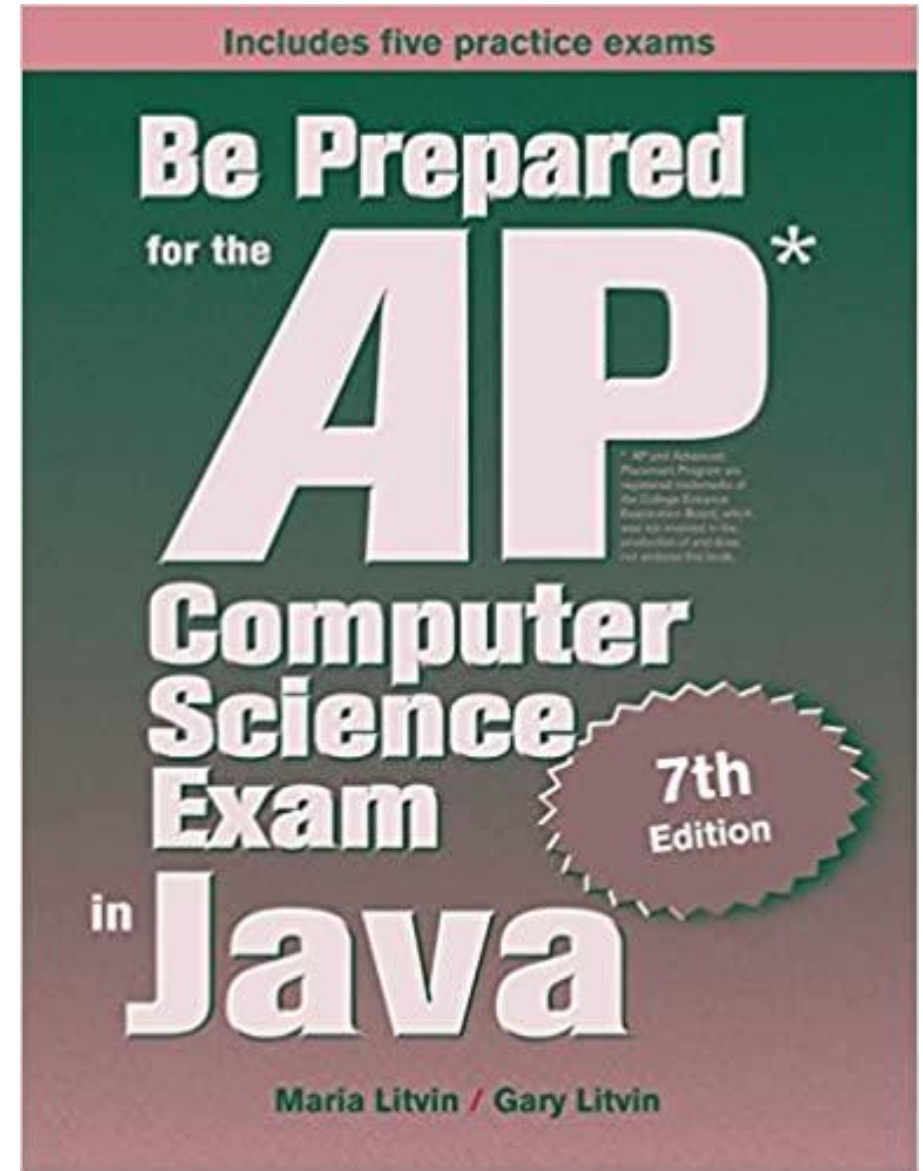
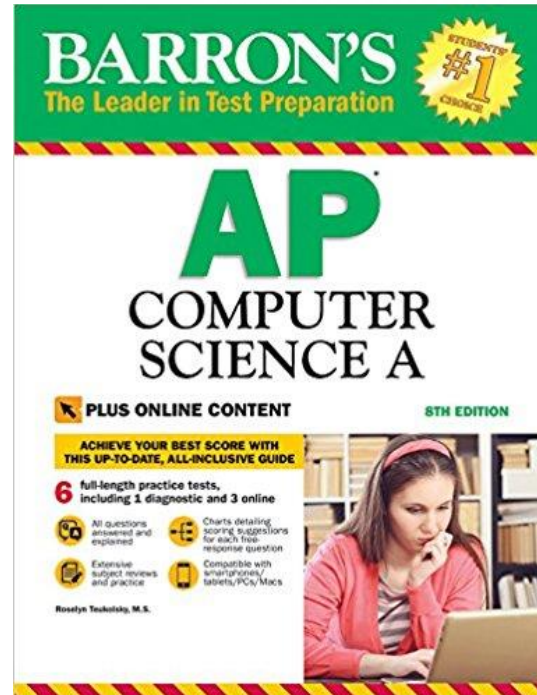
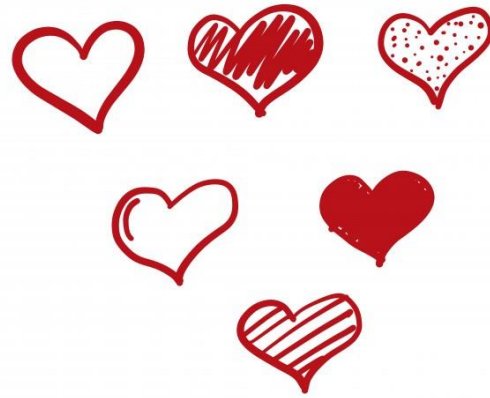
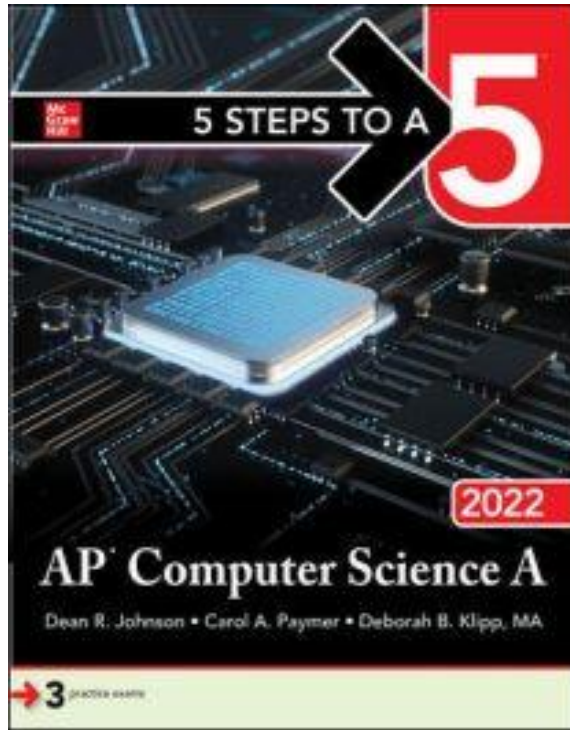
LECTURE 1

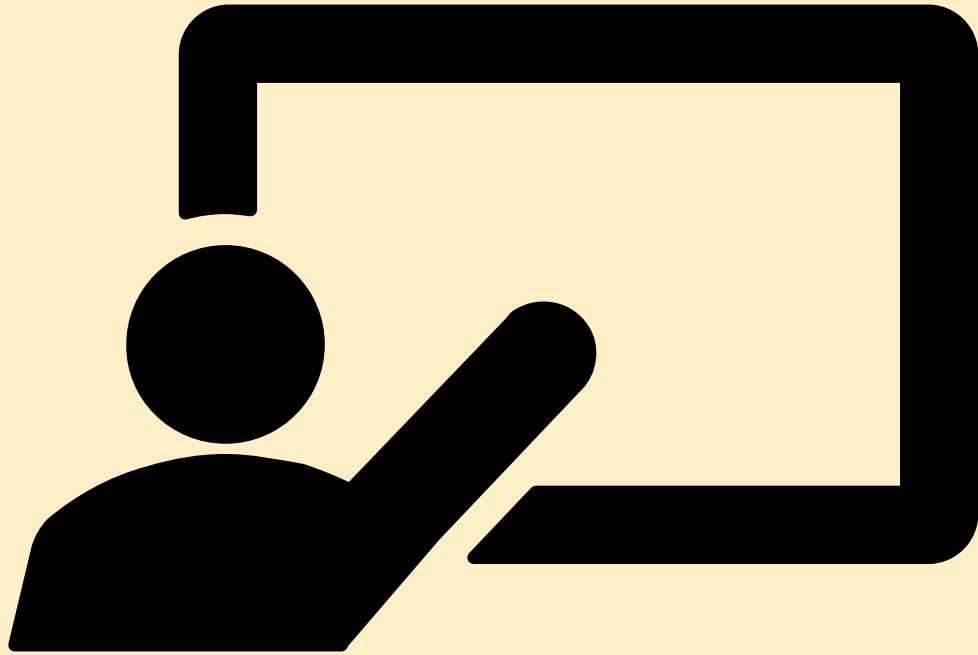


Java Programming Essentials: ...

ter Science Review







APCSA Exam

LECTURE 1



AP Java Subset:

<https://apstudent.collegeboard.org/apcourse/ap-computer-science-a/about-the-exam/java-subset>

- The AP Java subset is intended to outline the features of Java that may appear on the AP Computer Science A Exam.
- The AP Java subset is NOT intended as an overall prescription for computer science courses – the subset itself will need to be supplemented in order to address all topics in a typical introductory curriculum.
- For example, input and output must be part of a course on computer programming. However, there are many ways to handle input and output in Java.
- Because of this variation, details of input and output(except for basic text output using **System.out.print** and `System.out.println`) are not tested on the AP Computer Science A Exam.



AP Computer Science Format

- The exam is three hours long and has two parts — multiple choice and free response. Each section is worth 50% of the final exam grade.
- You will not be tested on minor points of Java syntax.
- All responses involving code must be answered in Java. If your free response answer involves too much materials not in AP Java. That means you are going into a wrong direction.



AP Computer Science Exam Format and Score Allocation (New since 2016)

- **Section I: Multiple Choice** — 40 Questions;
1 hour and 30 minutes
- **Section II: Free Response** — 4 questions;
1 hour and 30 minutes
Each 9 points
(Total score curved to 40)

Total 80 points. Best score 80/80.



Multiple Choice Problem

1 point/question no deduction.

1. Consider the following code segment.

```
int value = 15;
while (value < 28)
{
    System.out.println(value);
    value++;
}
```

What are the first and last numbers output by the code segment?

	<u>First</u>	<u>Last</u>
(A)	15	27
(B)	15	28
(C)	16	27
(D)	16	28
(E)	16	29



Free Response Problem

No Computer, No Graphics, Handwriting !!!

1. This question involves reasoning about one-dimensional and two-dimensional arrays of integers. You will write three static methods, all of which are in a single enclosing class, named `DiverseArray` (not shown). The first method returns the sum of the values of a one-dimensional array; the second method returns an array that represents the sums of the rows of a two-dimensional array; and the third method analyzes row sums.

(a) Write a static method `arraySum` that calculates and returns the sum of the entries in a specified one-dimensional array. The following example shows an array `arr1` and the value returned by a call to `arraySum`.

<u>arr1</u>					<u>Value returned by arraySum(arr1)</u>
0	1	2	3	4	
1	3	2	7	3	16



Exam Updates

Starting in the 2019-20 school year, there will be updates to the AP Computer Science A Exam to ensure consistency in the distribution of skills assessed on every version of the exam:

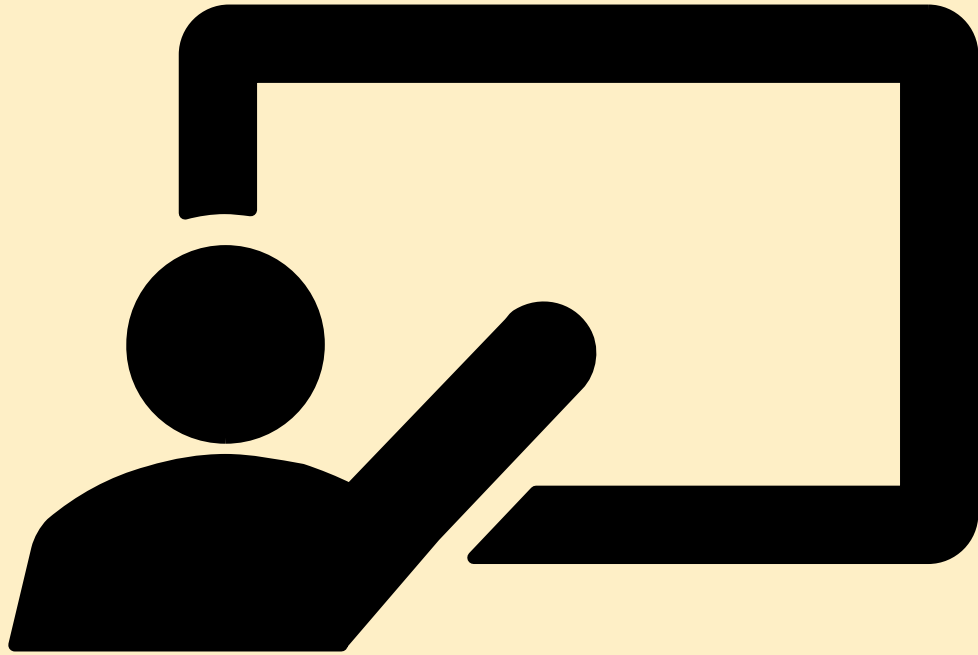
- The weighting, timing, point values, and number of questions on the exam aren't changing.
- The exam will have question types that stay consistent every year so that you and your students know what to expect on exam day.
- The four free-response question types will remain the same from year to year:
 - Question 1: Methods and Control Structures, where students call methods and work with control structures without the added complexity of data structures.
 - Question 2: Class, where students design and implement a described class.
 - Question 3: Array/**ArrayList**, where students complete program code that uses array or **ArrayList** objects.
 - Question 4: 2-D Array, where students complete program code that uses 2-D arrays.



Exam Updates

Starting in the 2019-20 school year, there will be updates to the AP Computer Science A Exam to ensure consistency in the distribution of skills assessed on every version of the exam:

- Free-response questions will measure student performance at a range of performance levels. (Currently, each free-response question is written to assess students at the highest ability levels.)
- There will be defined skills assessed in the same proportions on all versions of the exam. (Currently, because there aren't any defined course skills, the assessed skills vary.)



Schedule

LECTURE 1

CS 22 AP Computer Science A

Week	Topic	Time
1	Unit 1/Chapter 1: Introduction	
2	Unit 1/Chapter 2: Elementary Programming – Data Types and Number System	
3	Unit 1/Chapter 2: Elementary Programming – Operators and Type Conversion	
4	Unit 1/Chapter 3: Boolean, Character and APIs – Boolean, Character, Math classes	
5	Unit 1 Chapter 3: Boolean, Character and APIs – String class and Unit 2/Chapter 4/5: Basic if-else and loops	
6	Unit 2/Chapter 4: Decisions – Switch/Conditional Statements and Boolean Algebra	
7	Unit 2/Chapter 5: Loops – Repetition, Indexed, Sentinel, Input Validation, 2D space, Histogram (Standard Loops)	
8	Unit 2/Chapter 5: Loops – Swap, rotation, shuffling, factorial, reverse, palindrome, toBinary, Sum, Max (Special)	
9	Unit 2/Chapter 6: Methods – Basic Recursion	
10	Unit 3/Chapter 7: 1-D Arrays	
11	Unit 3/Chapter 7: 1-D Arrays – Sequence and Array Processing	
12	Unit 3/Chapter 8: N-D Arrays – 2D Arrays	
13	Unit 3/Chapter 9: ArrayList	
14	Unit 3/Chapter 9: ArrayList – ArrayList Processing – Insertion/Deletion/Frequency List/Non-occurring List	

CS 23 AP Computer Science B

Week	Topic	Time
1	Unit 4/Chapter 10: Classes and Objects I (Program Structure, Data Structure)	
2	Unit 4/Chapter 10: Classes and Objects II (Array of Objects, Objects of Arrays)	
3	Unit 4/Chapter 10: Classes and Objects III (Scope, Encapsulation, and other topics)	
4	Unit 4/Chapter 11: Object-Oriented Thinking – IsA, HasA, Class Design Topics	
5	Unit 4/Chapter 11: Object-Oriented Thinking –String Builder, String Buffer, BigInteger, BigDecimal	
6	Unit 4/Chapter 12: Inheritance	
7	Unit 4/Chapter 12: Polymorphism	
8	Unit 4/Chapter 13: Abstract Class and Interface	
9	Unit 4/Chapter 14: Exceptions and File I/O	
10	Unit 5/Chapter 15: Algorithm Study	
11	Unit 5/Chapter 16: Algorithm – Lin/Bin Search, Swap, Rotation, ...	
12	Unit 5/Chapter 16: Algorithm Sorting – Insertion Sort, Selection Sort, Bubble Sort, Merge Sort	-
13	Unit 5/Chapter 17: Recursion – Study of Recursion and isPalindrome, toBinary algorithms	
14	Unit 5/Chapter 17: Recursion – Tail Recursion, Helper Function, Accumulator, Recursive Processing.	

CS 24 AP Computer Science A Review

Week	Topic	Time
1	Week 0: MC 2009	
2	Week 1: McGraw Hills Practice Diagnostic Exam	
3	Week 2: AP FRQ2009	
4	Week 3: Barron 1 - Basic Programming, McGraw Hills Practice Exam 1, AP2010FRQ	
5	Week 4: Barron 2 - Java API Classes, McGraw Hills Practice Exam 2, AP2011FRQ	
6	Week 5: Barron 3 - Data Structure, Barrons Practice Exam 1, AP2012FRQ	
7	Week 6: Barron 4 - Control Structure, Barrons Practice Exam 2, AP2013FRQ	
8	Week 7: Barron 5 - OOP Barrons Practice Exam 3, AP2014FRQ	
9	Week 8: Barron 6 - Algorithm 1 Be Prepared 1, AP2015FRQ	
10	Week 9: Barron 7 - Algorithm 2 Be Prepared 2, AP2016FRQ	
11	Week 10: Barron 8 - Design Pattern 1 Be Prepared 3, AP2017FRQ	
12	Week 11: Barron 9 - Design Pattern 2 Be Prepared 4, AP2018FRQ	
13	Week 12: Design Pattern 3 Be Prepared 5, AP2019FRQ	
14	Week 13: Exit review for review course: AP 2015 Exam Multiple Choice	

FREMONT UNIFIED SCHOOL DISTRICT

INSTRUCTIONAL CALENDAR SCHOOL YEAR 2021-2022

Important Dates

**DAYS LISTED BELOW
ARE NON-SCHOOL DAYS
FOR STUDENTS**

Teacher Workdays

August 17, 2021
June 7, 2022

Staff Development Days

August 16, 2021
December 23, 2021
March 18, 2022

Parent Conferences

November 22, 2021
November 23, 2021
(Sites may vote to hold
conferences on alternate
dates and times. Check
with school site.)

Non Work Day

December 24, 2021
April 15, 2022

VACATION & HOLIDAYS

Independence Day: July 5
Labor Day: Sept. 6
Veterans Day: Nov. 11
Thanksgiving: Nov. 24-26
Winter Break: Dec. 27-Jan. 7
M.L.King Jr.: Jan. 17
Presidents' Day: Feb. 21
Spring Break: Apr. 18-22
Memorial Day: May 30

CLASSIFIED HOLIDAYS (CSEA & SEIU ONLY)

Winter/Spring Break:
Dec. 23, 24, 27, 31, Jan. 3
April 15

TEACHER WORKDAY

FIRST & LAST DAYS OF SCHOOL

VACATIONS, NON

WORK DAYS & HOLIDAYS

STAFF DEV. DAYS

PARENT CONFERENCES

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

S	M	T	W	T	F	S
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

S	M	T	W	T	F	S
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26	27	28	29	30		

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17	18	19	20	21	22	23
24	25	26	27	28	29	30

S	M	T	W	T	F	S
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7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

S	M	T	W	T	F	S
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2	3	4	5	6	7	8
9	10	11	12	13	14	15
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30	31					

S	M	T	W	T	F	S
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5	6	7	8	9	10	11
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19	20	21	22	23	24	25
26	27	28				

S	M	T	W	T	F	S
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5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

S	M	T	W	T	F	S
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S	M	T	W	T	F	S
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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

For more details, visit us on the FUSD web site www.fremont.k12.ca.us
From the home page click on "Our District/Calendar"

Reports to Parents

ELEMENTARY REPORTING TRIMESTERS

End of 1st Trimester: 11/12
End of 2nd Trimester: 3/4
End of 3rd Trimester: 6/6

PROGRESS REPORTS

1st Report: 10/1
2nd Report: 1/21
3rd Report: 4/29

REPORT CARDS

1st Report Card: 11/22, 23
2nd Report Card: 3/17
3rd Report Card: 6/6

SECONDARY REPORTING SEMESTERS

1st Semester ends: 12/22
2nd Semester ends: 6/6

SECONDARY REPORTING QUARTERS

End of 1st Quarter: 10/15
End of 2nd Quarter: 12/22
End of 3rd Quarter: 3/17
End of 4th Quarter: 6/6

PROGRESS REPORTS

1st Report: Week of 9/13
2nd Report: Week of 11/1
3rd Report: Week of 2/7
4th Report: Week of 4/11

Board of Education

Meetings are held on the
2nd & 4th Wednesdays in the
Board Room at the
District Office unless
otherwise specified.

Coding
Bat

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Note:

- 2 Spring Break Sessions are float days
- Schedule is subject to adjustments