

ECS & AP CSP & AP CS A, Oh My!

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Computer Science in HS

Computer science skills highly valued

Too few students exposed to programming

- low interest

- few opportunities

Numerous efforts targeting more K-12 opportunities, generating interest

- especially high school

So Many Courses!

Exploring Computer Science (ECS)

six unit studies touching on technical, social, and ethical challenges in computing

AP Computer Science Principles (AP CSP)

seven big ideas that guide students through computational thinking skills

AP Computer Science A (AP CS A)

equivalent to first semester of introductory computer science (CS1)

name? now-defunct AP CS AB

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Exploring Computer Science (ECS)

Developed in 2000s in response to low AP CS enrollment/offerings

based out of LA

Intended to be a first step for students/teachers to get to AP CS

Current format

six units

six weeks per unit

ECS: Units

Human-Computer Interaction (HCI)

Problem Solving

Web Design

Programming

Computing and Data Analysis

Robotics

ECS: HCI Unit

Explore the different components of the computer

- what is each used for?

- how are they connected?

Explore computer “intelligence”

- why do computers appear intelligent?

- what problems are they good at solving? what are they not good at solving?

ECS: Problem Solving Unit

Develop a set of instructions for obtaining some goal

- make a peanut butter sandwich

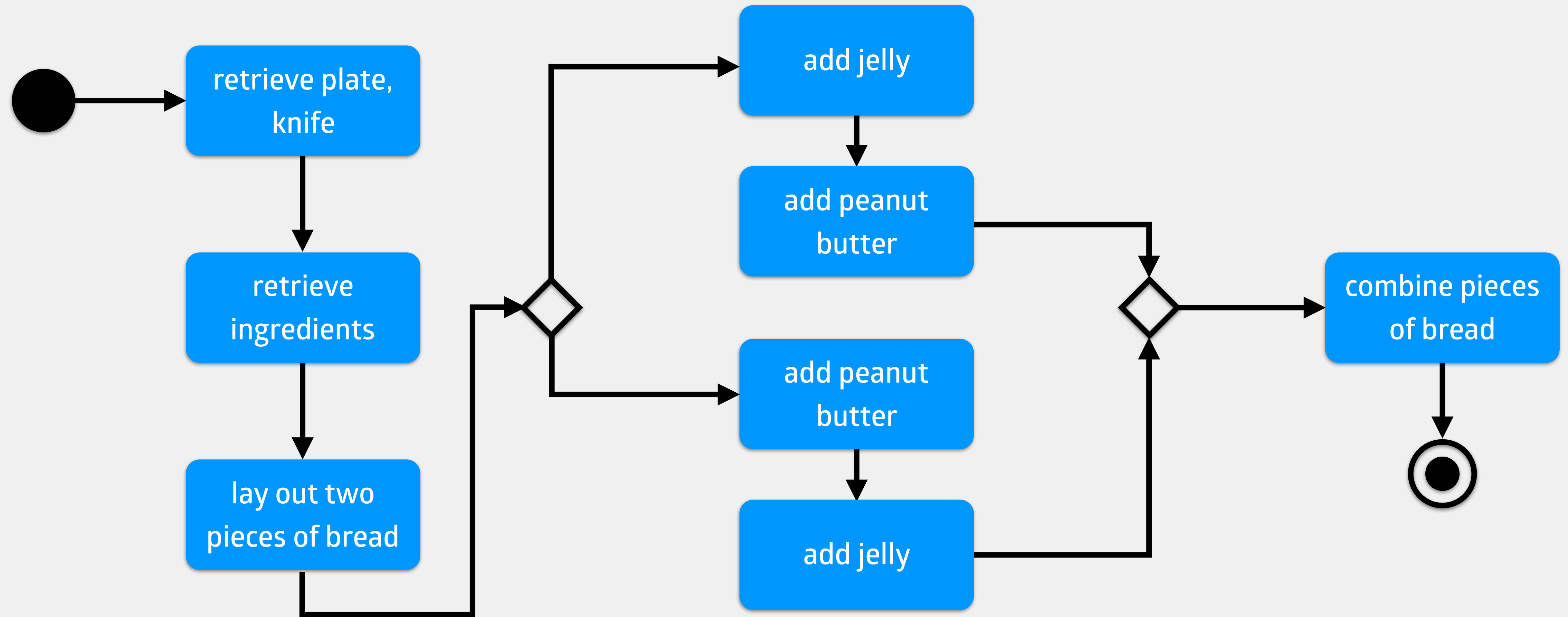
- draw a stick figure

Learn about binary

- how to count in binary

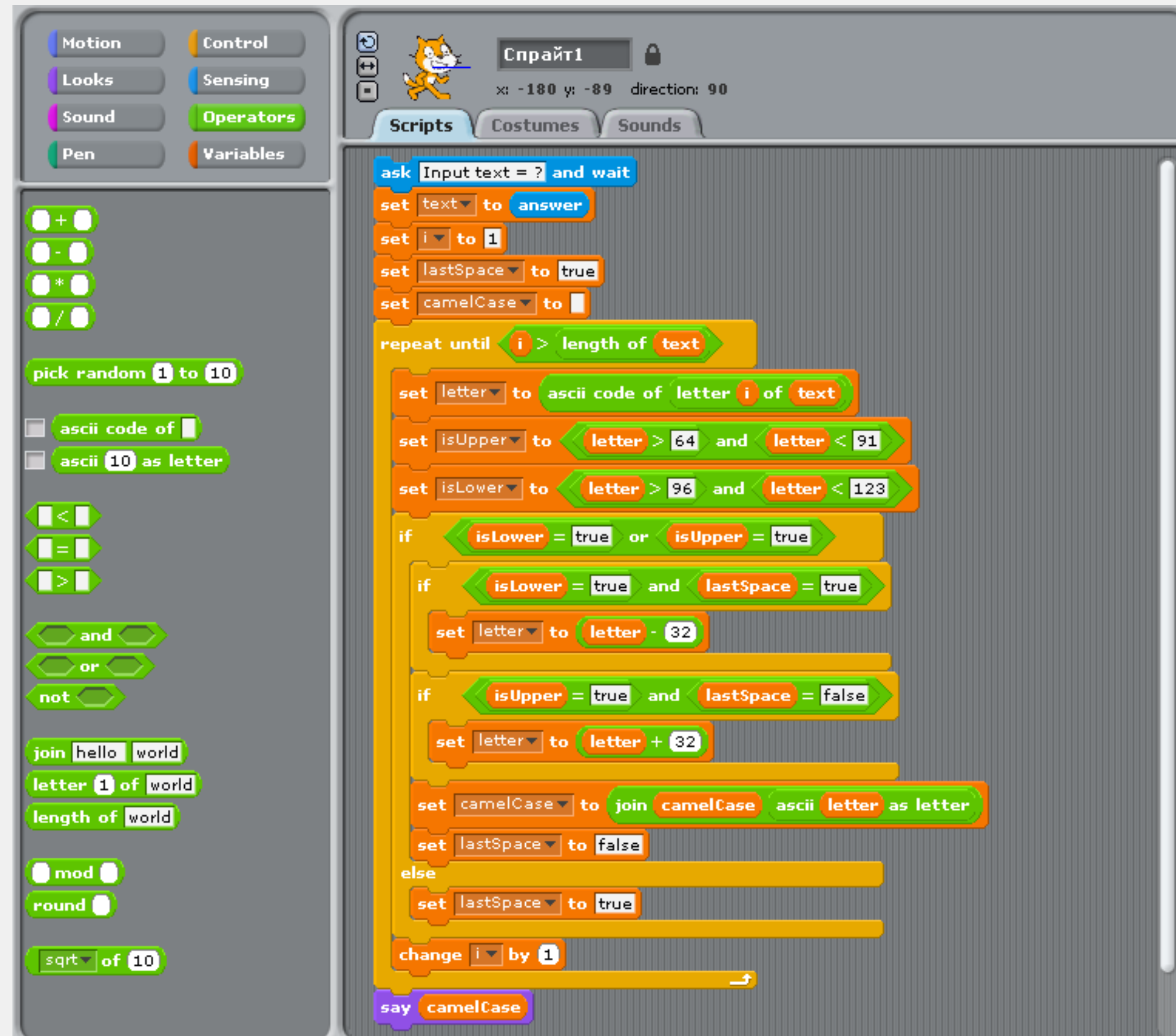
- convert numbers from binary to decimal

Making a PB&J Sandwich



ECS: Programming

Done in Scratch



ECS: Resources

Website: <http://www.exploringcs.org/>

curriculum, student/teacher resources...

curriculum v 5.0: <http://www.exploringcs.org/wp-content/uploads/2010/08/ExploringComputerScience-v5.0.pdf>

code.org: <https://code.org/educate/csp>

see more under AP CSP resources

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AP Computer Science Principles (AP CSP)

First offered/tested broadly in May 2017

Intended to present CS concepts for a broad range of students

Can also be considered a lead-in to AP CS A

AP CSP: Big Ideas

Creativity

Abstraction

Data and Information

Algorithms

Programming

The Internet

Global Impact

AP CSP: Abstraction Idea

How can programs benefit from abstraction?

Examples

- how can we represent real-world ideas on a computer?

- how can we represent real-world data on a computer?

- how can we use simulation to better understand the real world?

AP CSP: Data & Information Idea

How can we best find information and data using computers?

Examples

- how can we process data on a computer?

- how can programs help us discover new information?

- how can we effectively use the internet?

AP CSP: Programming

Can be done in a variety of different languages

drag and drop

Scratch

Snap!

App Inventor

text-based

Python

JavaScript

C

AP CSP: Exam Format

2 hours

all multiple choice

- select one answer from four options

- select two answers from four options

Resources

Website: <https://apcentral.collegeboard.org/courses/ap-computer-science-principles/course>

overview, webinar, mentoring program...

code.org: <https://code.org/educate/csp>

endorsed provider of curriculum

curriculum guide, short labs, engaging videos

other curricula: https://en.wikipedia.org/wiki/AP_Computer_Science_Principles

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AP Computer Science A (AP CS A)

Dates back to 1984

Offered in a popular contemporary programming language

current language: Java (since early 2000s)

AP CS A: Topic Outline

Object-Oriented Programming Design

Program Implementation

Program Analysis

Data Structures

Operations and Algorithms

Computing in Context

AP CS A: Data Structures/Operations and Algorithms

Implementation of a selection sort algorithm

UNSORTED LIST

SWAPS

Original	8	6	3	4	7	5	2
[0]	2	6	3	4	7	5	8
[1]	2	3	6	4	7	5	8
[2]	2	3	4	6	7	5	8
[3]	2	3	4	5	7	6	8
[4]	2	3	4	5	6	7	8
[5]	2	3	4	5	6	7	8

AP CS A: Operations and Algorithms

Implementation of a selection sort algorithm

```
1  /* a[0] to a[n-1] is the array to sort */
2  int i,j;
3  int n;
4
5  /* advance the position through the entire array */
6  /*   (could do j < n-1 because single element is also min element) */
7  for (j = 0; j < n-1; j++)
8  {
9      /* find the min element in the unsorted a[j .. n-1] */
10
11     /* assume the min is the first element */
12     int iMin = j;
13     /* test against elements after j to find the smallest */
14     for (i = j+1; i < n; i++) {
15         /* if this element is less, then it is the new minimum */
16         if (a[i] < a[iMin]) {
17             /* found new minimum; remember its index */
18             iMin = i;
19         }
20     }
21
22     if (iMin != j)
23     {
24         swap(a[j], a[iMin]);
25     }
26 }
```


AP CSP: Programming

Java

Lots and lots of Java...

AP CS A: Exam Format

Section I: Multiple Choice (50%)

40 questions

1 hour 30 minutes

Section II: Free Response (50%)

4 questions

1 hour 30 minutes

Resources

Website: <https://apcentral.collegeboard.org/courses/ap-computer-science-a>

old exams, professional development workshops, classroom resources...

code.org: <https://code.org/educate/curriculum/apcsa>

does not actually have materials

but, points to many excellent resources

What To Pick?

ECS

introductory course
appropriate for broad
range of students

less hassle re: College
Board

single curriculum base

AP CSP

can offer an AP without
doing Java

mix of programming/
critical thinking

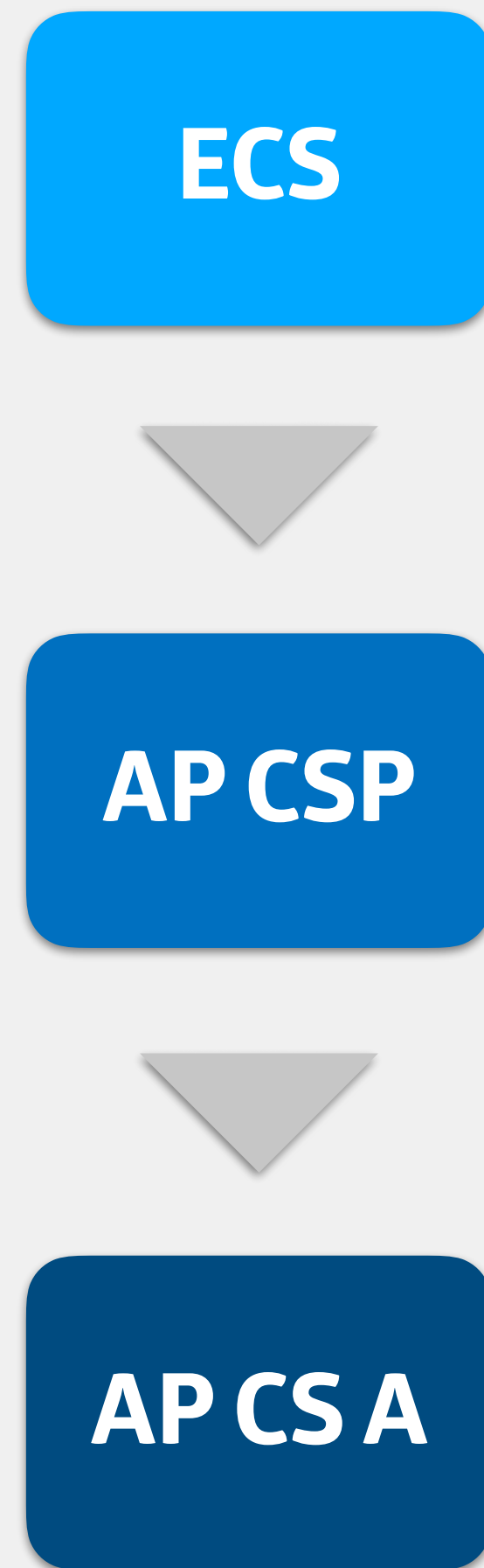
wide range of curricula
available

AP CS A

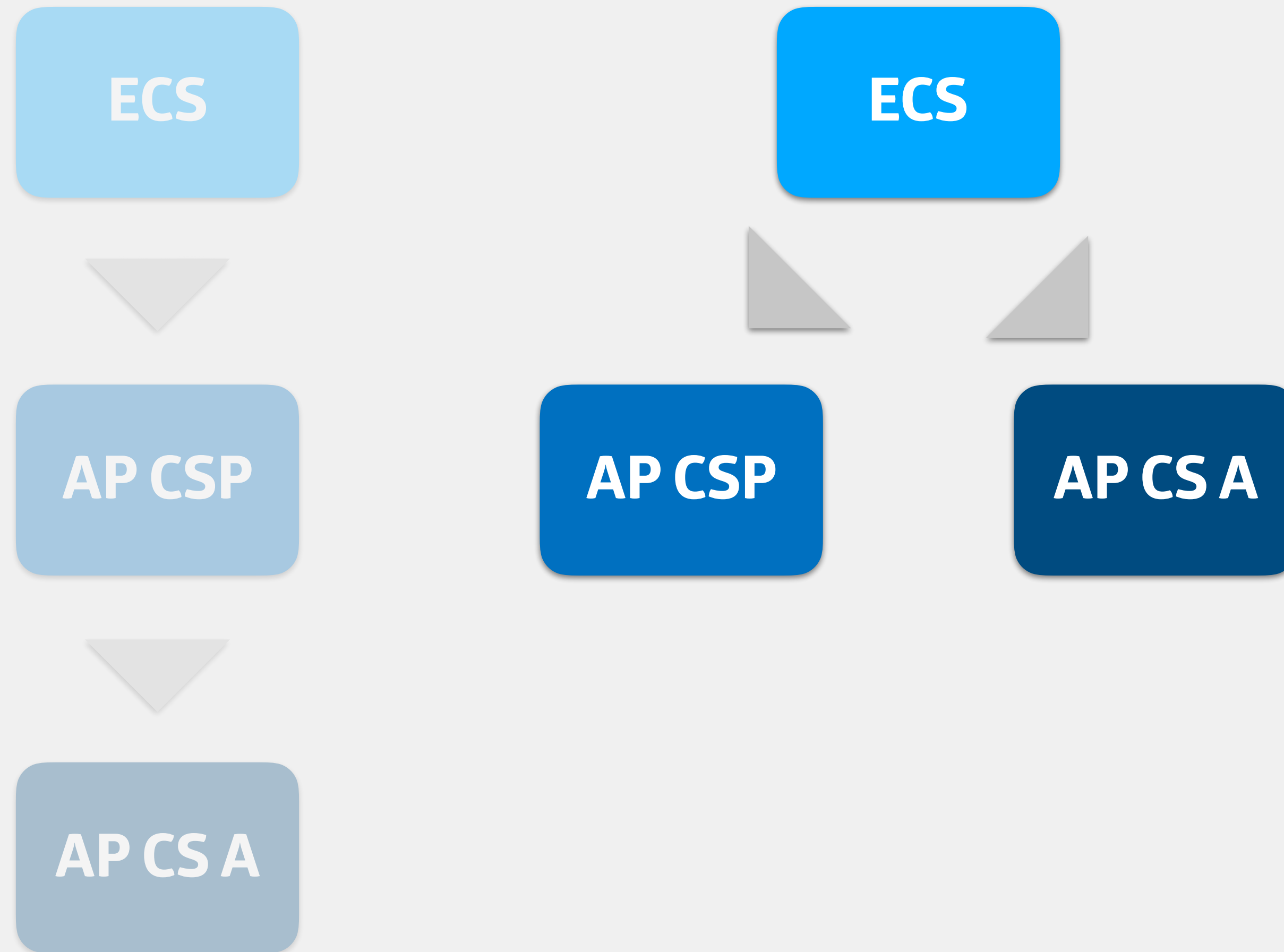
attractive option for
students looking for
STEM courses

requires basic
competency in Java/
programming

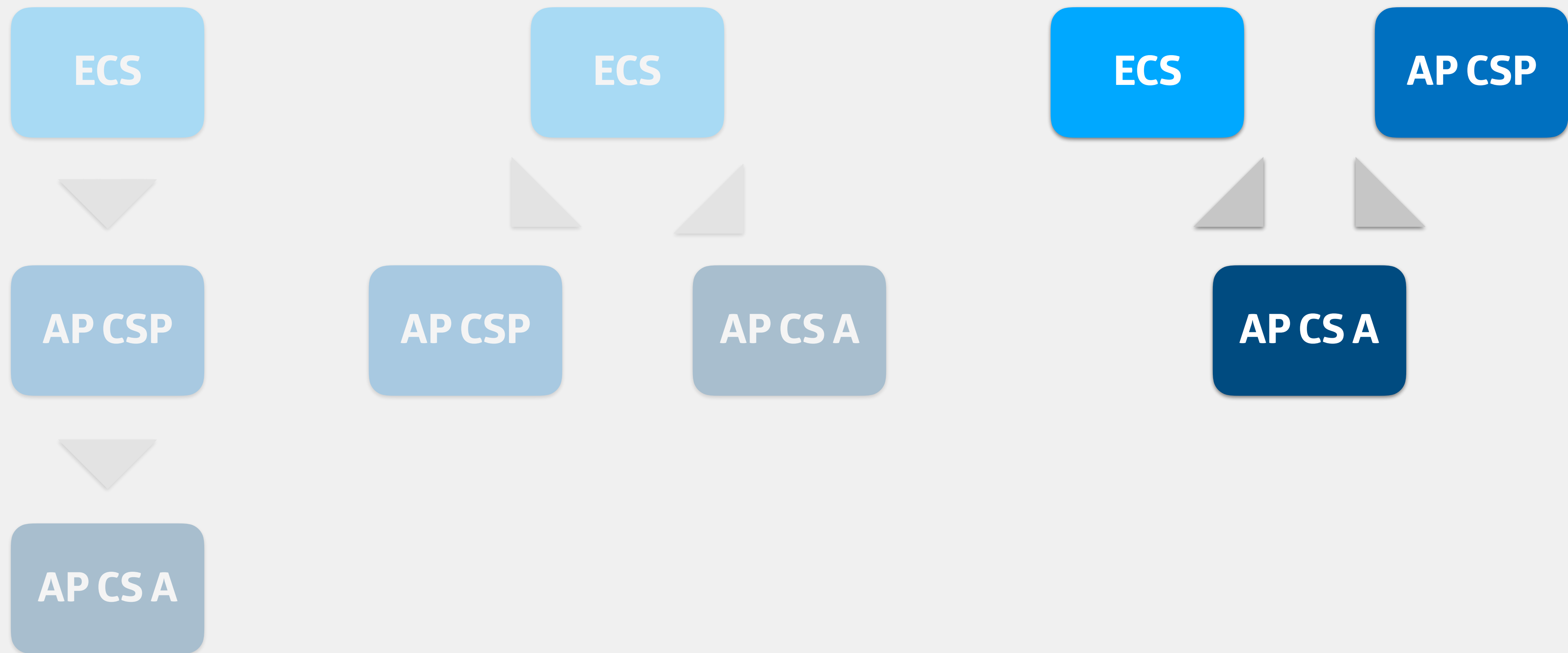
Possible Ordering Of Courses



Possible Ordering Of Courses



Possible Ordering Of Courses



ECS vs AP CSP

Many similarities in goals, much overlap in material covered

Questions to ask yourself

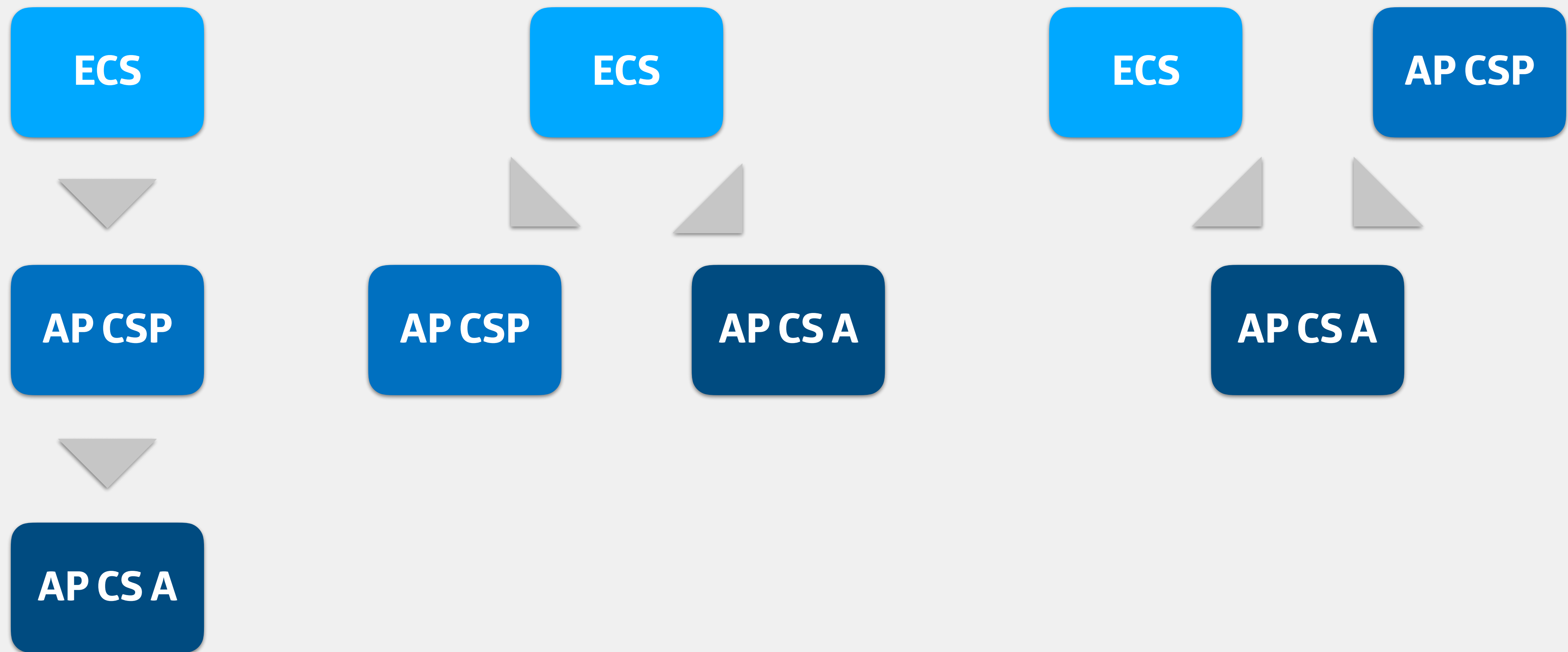
- institutional support?

- college credit?

- language?

- curriculum preference?

Possible Ordering Of Courses



CSTA

Computer Science Teachers Association

K-12 (mostly HS) CS teachers

What should students be learning in K-12?

offer pointers to third-party resources

CSTA K-12 CS Standards: <http://csta.hosting.acm.org/csta/csta/Curriculum/sub/K12Standards.html>