

Recommended Skills for Each Tier of Competition @CS Day

Scratch Competition

This competition is based on the Scratch Programming Tool. The goal of this competition is to teach programming fundamentals and get participants to create a fun, engaging, and interactive game.

Here is a list of skills that we will be expecting to enter this competition:

- Ability to navigate to a website
- A basic understanding of the X and Y Cartesian coordinate system
- Ability to thoroughly document thoughts
- Ability to comment on how something that they created works
- Moderate artistic ability (paint, drag-n-drop)
- Understanding of cause and effect relationships (e.g. “if this, then that”)

Intermediate Programming Competition

This competition is hosted on HackerRank.com and is a competition to see how many programming problems a pair of programmers can solve. The judging on HackerRank works by feeding input into a program and matching the output. In Java, this would be via System.in and System.out.

Here is a list of skills that we will be expecting to enter this competition:

- Ability to create an account on HackerRank.com
- Familiarity with at least one programming language (*i.e. ability to implement the following concepts in one language*)
- Ability to read inputs and write output
- Ability to create, assign, name, and use variables
- Understanding of flow control branching (*i.e. if/else blocks*)
- Understanding of loops (*e.g. for, while*)
- Basic understanding of string manipulation (*e.g. string concatenation*)
- Basic understanding of counting (*e.g. how to count with variables*)
- Ability to find patterns
- Basic algebra skills
- Can solve the sample problem below:

```
Given a number 'n', print "Fizz" if it is a multiple of 3; "Buzz" if it is a multiple of 5; "FizzBuzz" if it is a multiple of 3 and 5; and the number if it is not a multiple.
```

```
In:          Out:
  6           Fizz
 25           Buzz
  2           2
 225         FizzBuzz
```

If you can select a majority of these, then you are ready for the intermediate competition.

Advanced Programming Competition

This competition is the same as the Intermediate one, but requires more in depth analytical and problem solving skills, as well as deeper understanding of programming. Please review the intermediate requirements first.

In addition to the intermediate skills, we will also be expecting:

- Ability to solve word problems
- Familiarity with algebra 2 concepts (*e.g. solving quadratic functions, synthesizing functions*)
- The ability to work with different default data structures (*e.g arrays, lists, and dictionaries*)
- Ability to create your own data structures trees, linked lists, and stacks
- Understanding of recursive algorithms (*e.g. divide & conquer, tree traversal*)
- Ability to recognize and handle edge cases
- Can solve the example problem below using recursion:

```
Collatz Conjecture
Given a number 'n':
If the number is even, divide it by two.
If the number is odd, triple it and add one.

Repeat until n is 1 then return how many steps it took.

In:          Out:
  16           4
   5           5
  27          111
```

If you can select all of these then you will be comfortable in the advanced competition.

Web Dev Competition (NEW)

This is a new competition to give students another option, in which they may be more comfortable. This competition is designed to see who can listen to the needs of a “client”, and create a basic website that represents what they envision for their company.

Here is a list of skills that we will be expecting for this competition:

- Ability to create a static HTML5 webpage
- Ability to style an HTML5 webpage using CSS3
- Ability to listen to a narrative, and plan a website layout
- Ability to link web pages together (*i.e. able to use <a> tags*)
- Ability to add images to a webpage (*i.e. able to use tags*)

The ability to use a modern layout like flexbox or grid would be great, but will not be required.

Please note, we will not allow students of this competition to use any external libraries or frameworks. We will also not allow the use of any JavaScript in this competition.