

NCSSM CS Placement Exam

The purpose of this exam is to find the correct placement for students who have not had a 4 or a 5 on the APCS 'A' exam.

Before you begin, you must choose a language in which you will answer questions. Allowable languages include the following.

1. JavaScript
2. Python 2
3. Python 3
4. Java
5. C
6. C++
7. Ruby

You will answer your questions for your language; correct answers will, of course, vary by language.

You must use the same language throughout!

Submission Instructions You will create three files, one of which is a plain text file and two of which are programs (scripts). Attach the three files to an email with subject line CS Placement and send them to cs@ncssm.edu.

424 Level Questions Answer carefully and be as thorough as you can. These are for placement out of 352 and sibling introductory courses. Place your responses for questions 1-4 in a plain text file named part0.txt.

For the rest of this first part, put your responses in one script named part1.(py, rb, c, js, or cpp)

1. Describe four different types in your language. Give the name of the type and the sort of data it is meant to represent.
2. Give an example of an assignment to a newly created variable. Tell what that assignment does.
3. Do variables in your language have a type? What are the rules for the types of objects (or data) that can get assigned to them? Be as thorough as you can.
4. What are the rules for the scope (lifetime/visibility) of variables in your language?
5. Write an example of a valid function in your language that takes an integer and cubes it. Name the function `cube`.

6. If `x` and `y` are variables of string type, how do you test them for equality in your language?

7. Write a function that returns `true` if the integer (whole-number) value `x` passed it satisfies at all of these conditions.

- `x*x > 500`
- `3*x < 1000`
- `4x + 2 < 1050`

8. All of these languages have the concept of an array or list. Write a function that takes as an argument a list of strings and which returns a string containing the first letter of each item in the list.

9. Write a function `f` which takes four arguments, `a` and `b` that are floating-point numbers and an integer `n`. This function will find the average value of the function $g(x) = x^3$ at `n + 1` evenly spaced points starting at `a` and ending at `b`. You may assume as a precondition that `a < b`.

10. Write a function `contains(s1, s2)` where `s1` and `s2` are strings that returns `true` if `s2` is a contiguous substring of `s1`. Examples:

```
contains("coward", "cow") -> true
contains("abcdef", "acf") -> false
contains("moose", "") -> true
```

Do this from scratch; don't use methods of a string object to do this.

426/434 level questions You may stop here if you only wish to place into CSC424. What is next is the placement test to put you into the advanced sequences.

Answer carefully and be as thorough as you can. These are for placement out of 424, the intermediate course. You must still answer the above questions as well. Doing well at this portion depends upon having solid procedural programming skills.

First download the first five paragraphs of *Lorem ipsum* from <https://lipsum.com/> as a text file. Your solutions to the following problems must include a way of reading the text file and writing to a new text file if necessary. Place your responses in a file named `part2.(py, rb, c, js, or cpp)`.

1. Write a function that prints each sentence along with how many words are in it, e.g.,

"Lorem ipsum dolor sit amet, consectetur adipiscing elit." contains 8 words.

2. Write a function that prints the average position of a sentence each letter is first found at, e.g.,

"A" is first found at position 8. "Z" is not found.

3. Write a function that prints the word with the highest count of each letter, e.g.,

"amet" contains the most "A". "Z" is not found.

4. Write a function that prints the most common word to precede each word, e.g.,

"Lorem" is not preceded by anything. "ipsum" is most commonly preceded by "Lorem".

5. Write a function that recursively calculates large exponents based on the following examples.

$$3^{10} = 9^5 = 9 \times 9^4 = 9 \times 81^2 = 9 \times 6561 = 59049$$

and

$$5^7 = 5 \times 5^6 = 5 \times 25^3 = 5 \times 25 \times 25^2 = 5 \times 25 \times 625 = 78125$$

Negative exponents should be handled, with the division occurring only after all other calculations.

6. Write the same function using iteration without any recursive function calls. Negative exponents must also be handled with division occurring only at the end of the calculation.

428/436 level questions In addition to answering the above questions, you may indicate in your submission email to the computer science instructors if you are already proficient with Java GUIs and event-driven programming or C/C++. You will be given a additional tasks to skip the first course in their respective sequences.