
CMSC 201 Fall 2016

Homework 01 – Algorithms in English

Assignment: Homework 01 – Algorithms in English

Due Date: Wednesday, September 14th, 2016 by 8:59:59 PM

Value: 40 points

Collaboration: For Homework 1, collaboration is allowed. Make sure to consult the syllabus about the details of what is and is not allowed when collaborating. You may not work with any students who are not taking CMSC 201 this semester. If you work with someone, remember to note their name, email address, and how you collaborated at the top of your file.

If you did not work with anyone else on this assignment, your collaboration statement should state that

I did not collaborate with anyone on this assignment.

If you did work with someone else (or multiple other people), your collaboration statement should state something *similar* to the following:

I collaborated with Fox Mulder (fmulder1@umbc.edu); I helped him understand the loop.

Homework 1 is an exercise in thinking algorithmically, and consists of writing out simple algorithms in English. This homework is similar to the “Explaining a Peanut Butter & Jelly Sandwich to an Alien” exercise we did in class.

Instructions

For each question below, write out a series of *clear, ordered* steps that *fully* solve the problem given. **Make sure to number each step**, and to keep individual steps simple.

For example, the following is what we are looking for:

1. Get a bag of bread and open it.
2. Reach into the bag and remove two slices of bread.

Yes!

Something like this, however, is not acceptable and will lose you points:

Grab a bag of bread and take some out, then open the jar of jelly and stick the spoon in the jelly, and then put the jelly on the bread, and then put the knife in the peanut butter and put peanut butter on the other piece...

NO!

You should also avoid breaking steps into excessively small pieces:

1. Get a bag of bread.
2. Untwist the twist tie on the bag of bread.
3. Open the bag of bread.
4. Reach into the bag of bread.
5. Grab two slices of bread.
6. Remove the two slices of bread you grabbed.

NO!

The algorithms you will be designing for this assignment are more complex than those we created in class, so make sure you spend adequate time on them. Collaboration is allowed, and if you get stuck you can go to any TA or instructor’s office hours for help.

Example

An example question with answer is presented in the box below; this should give you a better idea of what type of formatting and language we expect to see in your answers. Like the example answer, your answers should be clear and concise, and the order in which the steps are taken should also be plainly stated.

Example Question

You are given a positive number greater than zero. You need to calculate the sum of all of the natural (whole) numbers up to and including that one. What steps do you take?

Example Answer

1. Obtain the positive number from the user.
2. Initialize a variable called “answer” to 0.
3. Until the positive number changes to zero:
4. Add the positive number to the variable “answer”
5. Subtract 1 from the positive number.
6. Go back to step 3, and check if the number is now 0.
7. Present the final “answer” to the user.

Some explanation: (you don't need to include this in your answers)

The algorithm we've written here simply counts down from the given number, and adds the value to an answer. For example, if we were given the number 5, we would repeats steps 4 through 6 five times:

$$5+0 = 5 \quad 4+5 = 9 \quad 3+9 = 12 \quad 2+12 = 14 \quad 1+12 = 15$$

We also could have solved this by adding from 1 up to the number, rather than subtracting until we reached 0. There are many ways to solve these sorts of problems – coming up with your own solution is part of the fun!

When you are writing your solutions, you can use loops (which we discussed in class during Lecture 2). For example, if we wanted to make five peanut butter and jelly sandwiches, we might use this:

1. For each sandwich:
2. Get a bag of bread and open it.
- ...
13. Put the two pieces of bread together, jelly side to peanut butter side.
14. Repeat (starting from step 2) until you've made 5 sandwiches in total.

Homework 1 should be completed on the GL server. Use emacs to create and complete a file called `hw1.txt`. Put your name, the date, your section number, and your collaboration statement at the top of the file. This will be the file that you submit. If you have already completed Lab 1, you should make sure to place the `hw1.txt` file inside a `hw1` directory (which is itself inside the `Homeworks` directory, which is inside the `201` directory).

Finally, some of the questions may use words you aren't very familiar with. If this is the case, please look at the Explanations section directly after the list of questions.

Questions

Each question is worth 9 points. Following the directions is worth 4 points.

Question 1

You are volunteering at the library, and need to sort a single shelf of books (alphabetically by the author's last name). What steps do you take?

(Hint: "Put them in the right order" is not a solution. Think about how you can compare two books to see if they are "in order" already. If a book isn't in order, where do you move it and why? There are many solutions to this one.)

Question 2

You have a physical dictionary, and need to find a specific word and its definition. What steps do you take?

(Hint: "Look through the dictionary until you find the word you want" is not a solution. How do you determine whether or not you've found the word? How do you determine where to look next in the dictionary if you haven't found it?)

Question 3

You are given a word, and need to decide if it is a palindrome or not. What steps do you take?

(Hint: How do you keep track of which two letters in the word you are comparing? How do you know when you've checked the entire word?)

Question 4

The alien for whom you explained how to make a peanut butter and jelly sandwich returns, and wants to know how to make waffles. You can assume that they'll start with a box mix. If you don't know how to make waffles, find and watch a tutorial on YouTube (waffles are a good "adult skill" to have). What steps should the alien take?

IMPORTANT: Make sure that you write all of your answers out in English! Using lots of mathematical equations, code, or pseudocode in your answer will lose you points.

Explanations

Palindromes

A palindrome is a word that is the same forward as it is backwards. For example, “Anna” is a palindrome. (The first and last letters are ‘a’ and the second and second-to-last letters are ‘n’.) Other examples include words like “kayak” and “redder”.

However, the word “moon” is *not* a palindrome. (The first letter of the word is ‘m’ while the last letter is ‘n’.) The words “racecars” and “computer” are also not palindromes.

Submitting

NOTE: How to submit is covered in Lab 1. If you have not completed Lab 1, you should do so before completing this part of the homework.

Once your `hw1.txt` file is complete, it is time to turn it in with the `submit` command.

You must be logged into your GL account, and you must be in the same directory as the `hw1.txt` file. To double check this, you can type `ls`.

```
linux1[3]% ls
hw1.txt
linux1[4]% █
```

To submit your `hw1.txt` file, we use the `submit` command, where the class is `cs201`, and the assignment is `HW1`. Type in `submit cs201 HW1 hw1.txt` and press enter.

```
linux1[4]% submit cs201 HW1 hw1.txt
Submitting hw1.txt...OK
linux1[5]% █
```

If you don't get a confirmation like the one above, check that you have not made any typos or errors in the command.

You can check that your homework was submitted by following the directions in Homework 0. Double-check that you submitted your homework correctly, since **an empty file will result in a grade of zero for this assignment.**