

- You have approximately 80 minutes.
- This is a long exam, with many chances to demonstrate understanding. We encourage you to try the problems in the order that makes most sense to you, and to keep moving if you get stuck on one question.
- The exam is closed book, closed notes.
- Mark your answers ON THE EXAM ITSELF. If you are not sure of your answer you may wish to provide a *brief* explanation. All short answer sections can be successfully answered in a few sentences AT MOST.

First name	
Last name	
BMC/HC Email (What you use for gradescope)	
First and last name of student to your left	
First and last name of student to your right	

I agree to complete this exam without unauthorized assistance from any person, materials or device.

Signature:

For staff use only:

Total	/62
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Q1. [6 pts] Multiple Choice

(a) Terminal Commands

In the following questions, choose all options that describe what the bash command is used for: If none of the options describe what the command is used for, please write a brief description of what the command is used for (max: 1 sentence).

(i) [1 pt] `mv`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

(ii) [1 pt] `scp`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

(iii) [1 pt] `pwd`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

(iv) [1 pt] `ls ../`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

(v) [1 pt] `ls /`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

(vi) [1 pt] `wget`

- determine what contents are in a directory
- download a file from the internet
- print out the contents of a file
- find the absolute path

Q2. [9 pts] Errors

In the following problems, you are going to be shown error messages. Your task is to 1) identify whether the error is a compile error or run-time error, 2) briefly describe what the error message is in English and then 3) propose a solution to get the code to compile or run without throwing a runtime error (fixing the line of code that caused the error is sufficient for 3)).

(a) [3 pts]

```
Error.java:17: error: cannot find symbol
    System.out.println(x*5);
                       ^
```

(b) [3 pts]

```
Error.java:20: error: reached end of file while parsing
}
^
```

(c) [3 pts]

```
Exception in thread "main" java.lang.NullPointerException
at Error.main(Error.java:15)
```

Q3. [17 pts] Short Answers

(a) [4 pts] What are the steps to go from writing a java file to executing the program. Please write out the terminal commands and a brief description of how they are used.

(b) [5 pts] Imagine you see the following error message when you are working in vim: **No write since last change**. In one sentence, what might you have done to see this error? In another sentence, what are two possible solutions to deal with this error and what are the commands in vim for performing those solutions?

- (c) [4 pts] Your friend comes to you for help, they wrote the following code and are perplexed why their code prints out `false`:

```
String one = "hello";  
String two = "hello";  
System.out.println(one == two);
```

In one sentence, explain to your friend why this prints `false`. In another sentence, how would you fix the code to print `true` (dont just write `System.out.println(true);`).

- (d) [4 pts] What properties or attributes do methods have and what are the roles that each property or attribute plays?

Q4. [30 pts] Programming

Complete the following programming problems. I would recommend first sketching out your algorithm in pseudocode before writing java code. You can earn partial credit for having a correct algorithm in pseudocode

- (a) [10 pts] Write a recursive method called `indexOfMax` that takes an array of integers and returns the index of the largest element. You can assume the array has at least one integer in it. If the largest number in the array appears more than once, then return the index of the first time the number appears.

Examples:

- `indexOfMax(1,2,3,4) -> 3`
- `indexOfMax(4,3,2,1,2,3,0) -> 0`
- `indexOfMax(-1,-2,-3,-4,2,0,-3) -> 5`

If you can't come up with a recursive solution, you can use a loop for partial credit.

- (b) [10 pts] In Scrabble, each player has a set of tiles with letters on them. The object of the game is to use those letters to spell words. The scoring system is complex, but longer words are usually worth more than shorter words. Imagine you are given your set of tiles as a string, like "quijibo", and you are given another string to test, like "jib". Write a method called `canSpell()` that takes two strings and checks whether the set of tiles can spell the word. You might have more than one tile with the same letter, but you can use each tile only once.

Examples:

- `canSpell("quijibo", "jib") -> true`
- `canSpell("quijibo", "fib") -> false`
- `canSpell("bryn mawr", "bar") -> true`
- `canSpell("bryn mawr", "owl") -> true`

- (c) [10 pts] Write a method called `letterHist` that takes a string as a parameter and returns a histogram of the letters in the string. The zeroth element of the histogram should contain the number of a's in the string (upper and lowercase); the 25th element should contain the number of z's. Your solution should traverse the string only once.