

# CSCI-UA 9102. Data structures

## Material for the Midterm

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### 1 Material covered

1. You must be able to understand basic programming concepts including [Base types](#), [Strings](#), [Wrappers](#), [Arrays](#), [Enum Types](#)
2. You must be able to use and understand all the java [modifiers](#) including:
  - Access control modifiers: [public](#), [private](#), [protected](#)
  - The [static](#), [abstract](#) and [final](#) modifiersYou must be able to [write a class](#), or a [method using those modifiers](#).
3. You must be able to understand and use [type conversion](#) (especially between Strings and numbers)
4. You must be able to know how to [import packages](#), [classes](#) and [methods from the classes](#) (e.g. the `Math` class or the `sqrt` method from the `Math` class)
5. You must be able to use and understand control flow in Java including [if else](#) and [switch](#) statements, [while](#) loops, [do while](#), [for](#) and [for each](#) loops as well as [break](#), [continue](#) and [return](#) statements.
6. You must be able to use and understand [how to prompt for user input](#) and [read command-line arguments](#) (i.e. `System.out.println`, `import java.util.Scanner` and `nextInt`, `nextDouble`,...)
7. You must be able to understand and explain [object oriented programming](#) (including the notion of constructor and the keyword `new`) and [inheritance](#) (including [abstract classes](#) and [interfaces](#), the keywords `extends` and `implements`)
8. You must be able to explain how to [catch](#) and [throw](#) an exception
9. You must be able to [use](#) and [manipulate multidimensional arrays](#).
10. You must be able to describe, compare and provide pseudo code for the implementation of [Singly Linked Lists](#), [Circularly Linked Lists](#) and [Doubly Linked Lists](#).
11. You must be able to explain the notion of [shallow](#) and [deep copies](#) and illustrate the difference between the two using simple examples.
12. You must be able to use and explain the [big-Oh](#), [big-Omega](#) and [big-Theta](#) notations for the asymptotic analysis of the running time of algorithms.
13. You must be able to use and explain the notion of [recursion](#). You must be able to provide a recursion based pseudo code for the following problems:

- Compute the value of simple series such as  $\sum_{i=1}^N \frac{1}{i}$  or  $\sum_{i=1}^N \frac{i}{i+1}$
- Compute the integer part of  $\log_2(n)$  for some integer  $n$
- Print the digits from an integer reversely