Ollscoil Mhá Nuad
Maynooth University

AUTUMN
2021-2022

CS210
Algorithms & Data Structures 1

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Time allowed: 2 hours

Answer all four questions

Your mark will be based on your ***four*** answers

All questions carry equal marks

Instructions

	Yes	No	N/A
Formulae and Tables book allowed *(i.e. available on request)*		X	
Formulae and Tables book required *(i.e. distributed prior to exam commencing)*		X	
Statistics Tables and Formulae allowed *(i.e. available on request)*		X	
Statistics Tables and Formulae required *(i.e. distributed prior to exam commencing)*		X	
Dictionary allowed *(supplied by the student)*		X	
Non-programmable calculator allowed		X	
Students required to write in and return the exam question paper		X	

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[25 marks]

1 A palindromic number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is 9009 = 91 × 99.

Write a Java program which prints out the largest palindrome made from the product of two 3-digit numbers.

[25 marks]

2 Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

Write a Java program which prints out the 1,000th term of the above Fibonacci sequence.

[25 marks]

3 Given *n* students in a class, how likely is it that some of them share the same birthday?

Write a Java program which uses a Monte Carlo simulation to determine to the nearest percent the probability that at least *x* number of students in a class of size *n* have the same birthday. The program should take in *x* and *n* as inputs.

[25 marks]

4 Write a Java program which takes in an array of Strings and prints them out ordered according to their size, with the shortest Strings being printed first. If two Strings have the same size, then they should be printed out in alphabetical order.