UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

MODULE CSC1A10
Introduction to algorithm development (C++)
CAMPUS **APK**

EXAMINATION
SSA

DATE: 2016-06

ASSESSOR(S) **DR DA COULTER**

INTERNAL MODERATOR **MR A MAGANLAL**

DURATION 3 HOURS **MARKS 100**

SURNAME, INITIALS (or ID NUMBER): _____

STUDENT NUMBER: _____

COMPUTER NR: _____

CONTACT NR: _____

NUMBER OF PAGES: 3 PAGES

REQUIREMENTS: NON-PROGRAMMABLE CALCULATORS ARE PERMITTED

Marker:			Submission overseen by:	
Sort Rank	Result	Moderation	Correction	**Submission**
				CD:
				USB:
				EVE:

Mark sheet		
Surname:		
Initials:		
Computer:		
Competency	*Description*	*Result*
C0	Program Design	/10
C1	Boiler plate code • Standard namespace (1) • System library inclusion (3) • Indication of successful termination of program (1)	/5
C2	Coding style • Naming of variables (1) • Indentation (1) • Use of comments (1) • Use of named constants (1) • Program compiles without issuing warnings (1)	/5
C3	Functional Abstraction • Task decomposition (5) • Reduction of repetitive code (5)	/10
C4	Separate Compilation • Header file (1) • Guard conditions (2) • Inclusion of header file (1) • Appropriate content in header file (1) • Use of programmer defined namespace (5)	/10
C5	User Interaction • Menu System (5) • Appropriate use of input, output and error streams (5)	/10
C6	Command Line Argument Handling: • Appropriately overloaded main function (1) • Handling incorrect argument counts (1) • Use of supplied arguments (3)	/5
C7	Error Handling • Use of assertions (2) • Use of conventional error handling techniques (3)	/5
C8	Pseudo-random number generation (5)	/5
C9	Dynamically allocated two dimensional array handling • Allocation (5) • Initialisation (5) • Deallocation (5)	/15
C10	Algorithm implementation • Logical Correctness (5) • Effectiveness / Efficiency of approach (5) • Correct use of appropriate selection / iteration structures (5) • Correct output (5)	/20
B	Bonus	/10
Total:		**/100**

Markers Signature:_____

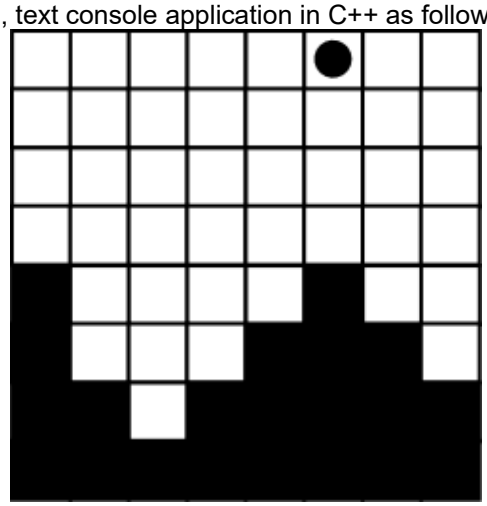
I declare that I am eligible to write this summative assessment according to the rules and regulations of the Academy of Computer Science & Software Engineering, the Faculty of Science and the University of Johannesburg. I declare that the work submitted is my own and that I have verified the correctness of my electronic submissions.

I UNDERSTAND THAT NON-COMPILING CODE CANNOT BE AWARDED A PASSING MARK

Student Signature:_____

TERRAIN SCULPTOR

The Utopian Land Reclamation Office has been investigating the possibility of using small drones to reshape the mountainous hinterland into a plateau suitable for human settlement you have been asked to develop a turn based, text console application in C++ as follows:



Player (Black Circle) Empty squares (open space) Ground (filled squares)

In the game you will need to move a player controlled character around a two dimensional playing area as seen from the side. The player will need to move left and right and use the patented Terrain Sculptor™ device. Your logic must be placed in the `TerrainSpace` **`namespace`**.

Initialisation:

- The size of the playing area is given as command line arguments.
- The player is placed in a random column in row 0.
- Every column contains a pile of ground with a randomly determined height in it. The height may not be more than half of the number of rows in the playing area.
- All remaining cells contain empty space.

Moving:

- The player may move left and right.
- Instead of moving the player may activate the device, The device will raise the hight of the ground in the column if it is higher than the average or lower it if it is less than the average.

End-game:

- The game ends when the ground is level (all columns have the same height).

Using your knowledge of good software engineering principles and C++ you must design and implement such a simulation as follows. Consider the competencies as laid out in the mark sheet.

- C0 – Create a program design. Your UML must model the activation of the device.
- C1 – Use your knowledge of basic C++ program structure and make sure to utilise the appropriate system libraries.
- C2 – Your program must be readable by human beings in addition to compiler software.
- C3 – Demonstrate your knowledge of the divide and conquer principle using functions.
- C4 – Your program must make use of programmer defined source code libraries.
- C5 – Create a menu system which will ask the user which action they wish to take.
- C6 – The user must provide the number of rows and columns used by the simulation (range checked based on terminal width).
- C7 – Provide assertion based error handling as well as conventional error handling.
- C8 – Random numbers are used when initialising the 2D arrays.
- C9 – Use dynamic 2D arrays to implement your simulation. The main array may be output to screen using printable ASCII characters.
- C10 – Pay careful attention to checking the legality of moves.
- Bonus – Make use of C++11/14 features, structures, and/or enumerations in your code.

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