# ICS3UI Assignment 1: The World of Computer Science

* Turn in through Edmodo.
* Please type your responses **in blue font** directly into this document.
* For an exemplar, see *Exemplar.doc*, which I’ve also posted on Edmodo.

**Part A: Subfields of CS (30 marks)**

Choose a subfield of CS from the document *Subfields of CS.doc* that sounds interesting to you and research it online. Then answer the questions below.

**All descriptions must be in your own words. Copying and pasting from a website is not acceptable and will be treated as plagiarism**.

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| Subfield you picked:  Quantum Computing |
| Describe in 75-125 words (a) the sorts of problems people in this field work on, and (b) how you think their work benefits the rest of us **( / 10 marks)**  People who work in the field of quantum computing will work on a variety of tasks. Some of these tasks can include: Studying quantum mechanics in order to discover more ways to use them in computing and designing processor chips to make the computers even faster. The work of quantum computing affects us in many ways. Such as det |

## For your chosen field, find…

### …1 recent invention or software product in this field ( / 5 marks)

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| --- | --- |
| Invention or product:  Quantum Computer | Paste a photo of it here:  http://www.kurzweilai.net/images/dwaveone.png |
| Who makes it (include hyperlink):  D-Wave <http://www.dwavesys.com/> |
| Without copying and pasting, describe what it does in 50-80 words:  A quantum computer is simply a computer that uses the basis of quantum mechanics. It uses superposition to compare multiple possibilities at once. Where a normal computer can only test one possibility at a time, a quantum computer will take all the possibilities at once and compare them to get the best one. |

### …1 university that offers an undergraduate course in this field. ( / 5 marks)

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| --- | --- |
| University name:  University of Waterloo | Course name and number:  QIC 710 - Quantum Information Processing |
| Paste in the description of the course from the university’s course catalog:  Quantum Information Processing (also known as "quantum computing") seeks to harness the strange power of quantum mechanics to provide a qualitatively different and more powerful way of processing information than "classical" physics seems to allow. The objective of this course is to introduce this multidisciplinary subject at the graduate level. | |

### …What’s the most interesting thing you’ve read about this subfield so far? ( / 5 marks)

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| The most interesting thing I’ve learned is hard to pick out. One of the most interesting was learning about quantum mechanics. The thought of quantum superposition amazing and quantum entanglement is just as cool. Another thing I found interesting was that quantum processing cores are kept at 0.02 degrees above absolute 0. That’s -273 degrees Celsius, 9 degrees below the point where Oxygen freezes |

### …The subfields your group members picked

|  |  |
| --- | --- |
| **Group members besides yourself** | **Subfield he/she picked** |
| 1. |  |
| 2. |  |
| 3. |  |

### …Choose 1 of your group member’s subfields and describe what the field is about, in your own words, based on what he or she explained during your group-share. ( / 5 marks)

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**Part B: Algorithms (58 marks)**

1. Think of a task from daily life or from math or science that requires a **loop**.   
 (It must be different from the one you used in your homework.)   
  
Then write an algorithm for the task you chose.

|  |  |
| --- | --- |
| **Input** ( /3 marks) | **Output** ( /3 marks) |
| **Algorithm** ( /10 marks) | |

2. Think of a task from daily life or from math or science that requires a   
**nested if-statement**. (It must be different from the one you used in your homework.)   
  
Then write an algorithm for the task you chose.   
  
If your algorithm from Question 1 had a nested if-statement along with the loop, then you don’t have to do this question.

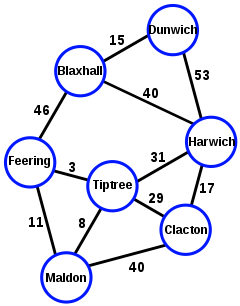
|  |  |
| --- | --- |
| **Input** ( /3 marks) | **Output** ( /3 marks) |
| **Algorithm** ( /10 marks) | |

3. This is a problem about algorithm correctness. (You don’t have to write any algorithms.)

The *shortest-path problem* is the following task:

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| **Input**  A map  A starting point *S*  A destination *D* | **Output**  The shortest route from *S* to *D* |

For example, in the map below, we might want to find the shortest path from Maldon (S) to the Blaxhall (D).



Suppose your friend Waldo suggests the following algorithm for the shortest path problem:

*Start at point S.*

*Repeat until you reach point D:*

*From wherever you are, move to the place that’s closest to you (and that you haven’t been to yet)*

Using an example from the map above, explain why Waldo’s algorithm is not correct.

( /7 marks)

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4. In Grade 10 you learned two algorithms for solving quadratic equations of   
 the form *ax2*  + *bx*  + *c* = 0:

* By factoring ([refresher on how to do this](http://www.webmath.com/quadtri.html))
* By the quadratic formula ([refresher on how to do this](http://www.purplemath.com/modules/solvquad6.htm))

For each equation below, determine if it can be solved using each algorithm. ( / 6 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| **Equation** | **Can it be solved by factoring?** | **Can it be solved by the quadratic formula?** | **The two solutions to the equation are:** |
| x2 – 15x + 44 = 0 |  |  | x =  and x = |
| x2 – 16x + 44 = 0 |  |  | x =  and x = |

Based on your answers above, is solving by factoring a *correct* algorithm? Why or   
why not? ( / 5 marks)

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5. In 75-125 words, explain what this statement means:   
  
“*In computer science, we work hard once, so that later we don’t have to*.”  
  
Include an example in your description. ( / 10 marks)

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6. Based on what we’ve done in the course so far, write your own definition of   
 computer science.   
  
 Please don’t copy and paste from anywhere. I want to know what *you* think.   
 ( / 10 marks)

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