

Computer Science (Assignment 1)

Question 1: List the four techniques of computational thinking that we saw in the first lecture (decomposition, etc.). For each technique, explain one new example of how you can apply it to something you are passionate about.

Technique #1.

Decomposition is not a simple system yet it is complex. In other words, this large and complicated system can be broken down into smaller and better parts. This will make the programming easier and understandable. Chemistry is a good example to explain this situation as there are decomposition reactions happening in our daily life. The proper definition of decomposition in Chemistry is the breakdown of a compound into two or more uncomplicated chemicals such as elements. For example, the decomposition of water is hydrogen and oxygen (H₂O). There are many other ways that involve decomposition but I preferred to use the study of chemistry as an example because it perfectly fits this situation.

Technique #2.

Pattern Recognition is when you input something like data then it forms a pattern or cycle showing what happens next and how it turns out to be in the end. As it started raining in Canada, the water cycle would be the best example for this technique and I am obsessed with rain. When the sun is very strong, it evaporates the water such as the sea, ocean or simply a pool of water on the streets. In the next stage, a group of clouds are created which they start forming rain drops and this is called precipitation. It's easy to figure out what will happen next because of the knowledge that we have.

Technique #3.

Pattern Generalization and Abstraction is a way of removing invalid and unrequired information in order to solve issues and simplify the information that is required. Abstraction is another way of saying removing and simplifying is the same way of saying generalization. This technique is very useful as it allows us to characterize a progression by eliminating problems so they can be solved and shortened. As food is essential, it can be a great example to explain what abstraction is. Let's use pizza as the object; a slice of it can be the abstraction because we are taking a small piece out of the main object. Snacks such as fries and other finger food can be described as the generalization.

Technique #4.

Algorithm Design is a progressive way like a flowchart in order to solve an issue and to accomplish an action. As I'm studying economics, I have to take five courses in this term in order to achieve 2.5 credits. This is required so I can graduate from university therefore I need to organize my chores and assignments to be able to complete all my courses' requirements. This is a strategy of an algorithm which I will track while studying.

Question 2: Explain with at least three good reasons why developing computational thinking skills is a useful endeavour for any person.

Reason #1.

Independence/ Understanding - As we know computational thinking is full of solving problems, each person has to act independently. This is because they have to figure out and understand how to solve their own problems as quickly as possible and in the correct way. Allowing someone else to solve your own problems won't take you anywhere. But by learning how and obtaining more computational knowledge, you will be able to do it self-sufficiently.

Reason #2.

Evaluation - The world is getting developed every single day including technology which makes it more complex, therefore, the human race has more tasks to do in order to assemble with whatever issue they have. Issues can be solved by technologies yet that doesn't mean humans can forget about working. In order to solve issues by technologies or machines, humans should understand how this system works in order to run it. Understanding how it functions, its restrictions and influence are also included.

Reason #3.

Design/Strategy - Computer science brings a lot of varied skills such as design. It can be used to help a lot of issues such as planning out a strategy in order to defeat someone in a game. Design plays a big role because it helps a person to organise his or her thoughts on a piece of paper.

Explain how you can use computational thinking skills specifically in your own field (e.g. commerce, psychology, etc.). Be sure to state what your field is.

Computational thinking is about having the knowledge of solving problems in any major. A lot of majors require having this knowledge and are expecting humans to have a clue about computational thinking. Let's take my major as an example. Economics is full of data and graphs that involve developing and understanding. This particular major is also linked to commerce and contains a variety of issues that must be solved because it's not all about money. It helps us to understand human behaviour as well. Mathematics plays a big role in this major as it is related to the computational thinking.

Question 3: Create a table with two columns. In the left column, list the numbers 1-20. In the right column, list the binary equivalents of those numbers.

1	0b1
2	0b10
3	0b11
4	0b100
5	0b101
6	0b110
7	0b111
8	0b1000
9	0b1001
10	0b1010
11	0b1011
12	0b1100
13	0b1101

14	0b1110
15	0b1111
16	0b10000
17	0b10001
18	0b10010
19	0b10011
20	0b10100

What pattern(s) do you notice in the binary numbers?

- The first digit is constantly a '1'
- The final digits going down the columns alternates between 1 and 0
- Starting from 4; every two numbers (4/5, 6/7, 8/9) share the same two center digits

Question 4

Decimal is a "base 10" system. What base is binary? (In other words, binary is base what?)

Binaries are base 2.

Decimal has the 1's column, 10's column, 100's column, and so on. What are the first five columns for binary?

Binary has the first five columns of one's, two's, four's, eight's, and sixteen's.

Decimal has 10 different digits that can be used in each column. How many digits can be used in binary, and what are they?

Binary has only 2; 0 and 1.

Question 5

Write down what the binary number 0b111111 is in decimal.

63

Then write down what the binary number 0b1000000 is in decimal.

64

What is the difference between the two numbers? That is, what do you get if you subtract them?

$$64 - 63 = 1$$

Suppose that somebody asks you to convert the number 0b111111 to decimal, but you have to do it in your head because there is no paper around. Considering your answer from above, what number could you convert to decimal instead of 0b111111 to make things easier?

$$0b1000000 = 64$$

$$0b1 = 1$$

$$0b1000000 - 0b1 = 0b111111$$

After you convert this new number, what would you have to do with the decimal result in order to know what 0b111111 is in decimal?

$$64 - 1 = 63$$

Bonus

Suppose you have exactly six weights of varying magnitude, as well as a balance scale. What would the magnitudes of the weights have to be in order to be able to measure how heavy an object up to a maximum of 63 pounds is?

Magnitudes of the weights are:

1. 1 pound
2. 2 pounds
3. 4 pounds

4. 8 pounds
5. 16 pounds
6. 32 pounds

All 6 weights add up to 63 pounds.