

CSO Homework 2:

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Due 4th of March, 2024, 5 PM Paris Time

Submission Guidelines:

Submit through Brightspace.

Question 1: (30 points)

Translate each of the following combinations of 3-address instructions to the EISC code. Assume that the elements of the array are written over the length of 8 octets.

1. $x = a[i]$
 $y = b[i]$
 $z = x * y$
2. $x = a[i]$
 $y = b[x]$
 $a[i] = y$
3. Here suppose that p and q are addresses.
 $y = *q$
 $q = q + 4$
 $*p = y$
 $p = p + 4$

Question 2: (30 points)

Suppose that the city Town has 12 schools, named S1 to S12. The allocation of students to schools is done on the basis of the zodiac sign of the student, so that all students in one school at one time are born under the same zodiac sign. In addition, the students change school every year.

Develop an algorithm that achieves a school distribution over 3 years based on the information of the day and the month of the birth of the student. Use `struct` in C to implement this.

Ask the user to give the date of birth in the format day/month and give a distribution of schools over the following three years, assuming that only users that will actually be in school over the three years are answering the question.

Question 3: (40 points)

In this question we shall work with the lexicographic products of sequences of integers. The lexicographic product $\text{lex}(a, b)$ of two sequences a, b may be defined as the sequence that looks like

$$a[0] \frown b \frown a[1] \frown b \dots \frown a[n-1] \frown b,$$

if a is a sequence of length n and \frown is the sign for concatenation.

1. State what it would mean for lex to be (i) *commutative* (ii) *associative*. Show by finding examples that lex is neither commutative nor associative.
2. Given the lengths of a and b , what is the length of $\text{lex}(a, b)$?
3. Describe an algorithm to calculate $\text{lex}(a, b)$ for a and b whose length is known in advance, and implement the algorithm in C.
4. Modify the program so that you are able to deal with $\text{lex}(a, b)$ for a and b whose length is not known in advance.