Cmpe344 Fall 2021
Experiment #2: Multiplication and Direct Address

In this experiment, you will write a MIPS program which finds the maximum number in a **word** array and saves **the multiplication** of **the maximum number** and **its index** to the memory location at 0x10010130. This array can be of any length and finishes with a special value "0" (it should **not** be considered as an element of the array). If the maximum value is repeated in the array, choose the index of the **last** one for the multiplication. The first item in the array has the index 0.

You have two constraints:
1. You should **not** use any extra memory location,
2. Input values **must** remain the same, though their order can be changed.

You can assume that the given array will be non-empty and that the result of the multiplication will be representable as a signed word; we will ensure these in our test cases.

An example array is given below:

-1, 6, 4, -13, -5, 18, 0, 3, 20

Resulting value in the memory (in decimal view):

90

Questions

Question 1

Can you implement your program without using any registers? Explain why.

No, we cannot implement our program without registers, because we have to hold our data in the registers.

Question 2

Consider two different implementations P1 and P2, of the same instruction set that includes three different classes of instructions namely A, B, and C. P1 has a clock rate of 4GHz. P2 has a clock rate of 5GHz. The average number of cycles for each instruction class for P1 and P2 is as follows:

Class	CPI on P1	CPI on P2
A	1	4
B	3	3
C	2	1

The number of instructions executed in a certain program is divided equally among the instruction classes except for class A, which occurs **three times** as often as each of the others. Fill in the table below.

Average CPI on P1	1.6
Average instruction execution time on P1	0.40 ns
Average CPI on P2	3.2
Average instruction execution time on P2	0.64 ns
Is P2 faster than P1?	No
If P2 is faster than P1, how much faster?	-