Week 2 Exercises

- If somebody asked you what a computer is, how would you identify/describe that?
- Based on your understanding so far of the computer, what are the main requirements of designing a Computing Machine?
- All computers, regardless of their implementation technology, have five basic units or subsystems. What are these units?
- How do computers execute programs?
- In The von Neumann Architecture the CPU contains some registers. What is the main purposes of having these registers? What will happen if the CPU had to rely on the RAM instead of these registers?
- Why is it not quite true to say that 1,000 instructions are executed in 1,000 ticks?
- What is the main difference between the von Neumann Architecture and the Harvard Architecture?
- Convert the following Higher-level code to MIPS assembly language code [Discuss it on MS Teams]

```
y=0;
for (i=1; i<=x; i++) {
    y = y + i;
}
```

- Given the MIPS Instruction set, convert the following MIPS assembly code into Java-like code. Note that “bgt” instruction is for “branch greater than” and is used to jump to a label, if a register value is more than the provided constant. You are expected to consider the following register assignment while writing Java code.

MIPS Register	Java Variable
$1	i
$2	tmp
$3	sum

The MIPS Assembly Code is given below

```
   and $1,$1,$0
   and $2,$2,$0
   and $3,$3,$0
label:
   bgt $1,14,exit
   multi $2,$1,2
   add $3,$3,$2
   addi $1,$1,1
```

```
    j label
exit
```

- Using the Little Man Computer Simulator (**http://peterhigginson.co.uk/LMC/**), write LMC assembly programs to compute the following expressions:
  - `e = (a+b)-(c+d)`
  - `z = 3x + y`
  - `c = a^2 + b^2`
- Have a look at the above link to read about the LMC and see the instruction set of LMC with some examples.