2.1 Question 1

a. Determine the real number of the single-precision floating-point value `0x41A8CCCD`.

b. What is the hex value in a register storing a 32-bit floating-point value that represents the number `20.21`?

c. Represent real number `0.1`, `0.2`, `0.3` in double-precision floating-point format, then perform an addition of `0.1 + 0.2`. Compare the double floating-point result of the addition with the floating-point value of `0.3`.

Answer: a.

→ Sign: 0

→ Exponent: 10000011

→ Mantissa: 010100 011001 100110 01101

→ Decimal representation: 21.1000003815

→ Actually stored in float: 21.1000003814697265625

b. Hex representation: 0x41A1AE14

c. → represent in double-precision floating-point format

0.1:

Binary: 0 01111111011 1001100110011001100110011001100110011001100110011001100110011010

Hex: 0x3FB999999999999A

0.2:

Binary: 0 01111111100 1001100110011001100110011001100110011001100110011001100110011010

Hex: 0x3FC999999999999A

0.3:

Binary: 0 01111111101 0011001100110011001100110011001100110011001100110011001100110011

Hex: 0x3FD3333333333333

→ perform an addition of 0.1 + 0.2

Hex: 0x3FD3333333333334

Decimal: 0.30000000000000004

→ compare the double floating-point result of the addition with the floating-point value of 0.3 the floating-point value of 0.3

Hex: 0x3e99999A

Decimal: 0.300000011920928955078125

⇒ the floating-point value of 0.3 > the double floating-point result of the addition (0.300000011920928955078125 > 0.30000000000000004)

2.2 Question 2

Given the MIPS code below:

```
1   addi $a0, $zero, 100 // upper threshold
2   addi $a1, $zero, 0 // count variable
3   add  $a2, $zero, $zero // sum initialization
4 loop:
5   beq  $a0, $a1, exit
6   add  $a2, $a2, $a1
7   addi $a1, $a1, 1
8   j loop
9 exit:
```

a. What is the value of $a2 after the program is executed.

b. How many clock cycle does the program cost? Suppose that CPI of all instructions is 1.

c. If the *.text* segment starts from address `0x10080000`, what is the machine code of the instruction '**`j loop`**' (in hexadecimal representation)

Answer:

a. 1 + 2 + 3 + ... + 98 + 99 = 4950

b. Clock Cycle = 3 + 100 + 3 * 99 = 400

c. Hex representation: 0x0880000C