Introduction to Computing Systems
Homework 5

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1

The instruction is 0010 001 111111111. So R1 will contains x23FF.

2

The #30 cannot be represented as a signed number in 5 bits.

To fix it, we can use the ADD twice. Like this:

```
1    ADD R3, R3, #15
2    ADD R3, R3, #15
3
```

3

a

As following:

Symbol	Address
LOOP	x3003
L1	x300A
NEXT	x300B
DONE	x300D
NUMBERS	x300E

b

After the program is finished, R0 contains the amount of the numbers; R3 contains the amount of the numbers that the last bit is 0; R4 contains the amount of the numbers that the last bit is 1.

4

(a). LDR R3, R1, #0
(b). NOT R4, R4
(c). ADD R4, R4, #1

5

a

They will be as following:

R0	x300B
R1	x300D
R2	x000A
R3	x1263
R4	x300B

b

They will be as following:

Addr1	x300B
Addr2	x000A
Addr3	x000A
Addr4	x300B
Addr5	x300D

6

The R2 contains the data in x3500, instead of the address x3500. So when storing the number, we shall use "LD R2, VECTOR", then "STR R0, R2, #1".

7

Count the amount of the data in which at least one 1 locates at the same position with R1(from MASK), ranging from x4000 to x4009. Then store it into x5000.

8

Interrupt-driven I/O is more efficient. Because it avoids the trouble that the CPU need to keep asking whether there is an I/O in Polling Mode.

9

a

Keep outputing x0032 in ASCII code, which is 2.

b

It output the key striked in twice.

c

It will still keep outputing 2.

10

Output ”ABCDEFGHIJ”(exclude the quotation marks)