Homework Assignment 4

(Due 2:10pm, Dec. 9, email to daehyun.kim@wsu.edu or submit a hardcopy)

You should use the following instructions only.

- Instructions
    - ADD, SUB, AND, ORR, EOR, MOV, **MUL**
    - CMP, BGE/BLT/BGT/BLE/BEQ/BNE
    - B, BL, BX
    - LDR, STR, PUSH, POP

1. (100 points) Write an assembly code for the "for loop" in the following C code.

```
int x[10];
int* y = new int[10];
...

for ( int k = 0 ; k < 10 ; k++ ) {
  if ( x[k]%2 == 0 )
    y[k] = x[k];
  else
    y[k] = x[k] + 1;
}
```

R15	...
R14	...
R13 (SP)	0x0400
R12	...

RF

0x0414	x[0]
0x0410	...
0x040C	y
0x0408	...
0x0404	...
0x0400	...
0x03FC	...
0x03F8	...

Main memory

- R0-R12 are freely available.
- You can use any of R0-R12 for "int k" (i.e., you don't need to use the stack for k).

```
  LDR R9, =0x00000001
  MOV R0, #0
for:
 CMP R0, #10
 BGE for_end
 AND R1, R0, R9
 CMP R1, #0
 BNE if_else
 MUL R2, R0, #4
 ADD R3, R2, #20
 ADD R3, R3, SP
 LDR R3, [R3]
 LDR R4, [SP, #12]
 ADD R4, R4, R2
 STR R3, [R4]
 B for_post
if_else:
 MUL R2, R0, #4
 ADD R3, R2, #20
 ADD R3, R3, SP
 LDR R3, [R3]
 ADD R3, R3, #1
 LDR R4, [SP, #12]
 ADD R4, R4, R2
 STR R3, [R4]
for_post:
 ADD R0, R0, #1
 B for
for_end:
```

2. (100 points) Write an assembly code for the "for loop" in the following C code.
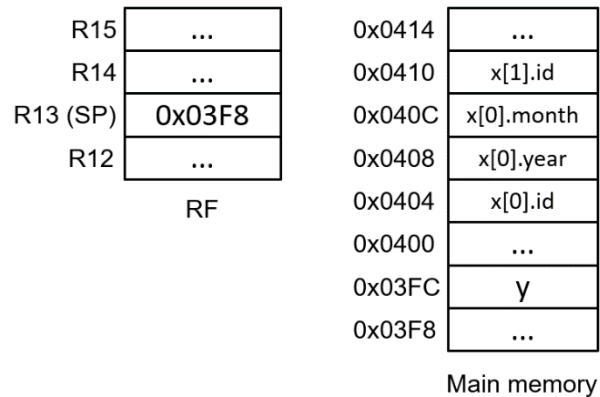
```
struct Student {
  int id;
  int year;
  int month;
};

Student x[10];
Student* y = new Student[10];

...

for ( int k = 0 ; k < 10 ; k++ ) {
  y[k].id = x[k].id;
  y[k].month = x[k].month;
}
```

R15	...
R14	...
R13 (SP)	0x03F8
R12	...

RF

0x0414	...
0x0410	x[1].id
0x040C	x[0].month
0x0408	x[0].year
0x0404	x[0].id
0x0400	...
0x03FC	y
0x03F8	...

Main memory

- R0-R12 are freely available.
- You can use any of R0-R12 for "int k" (i.e., you don't need to use the stack for k).

```
MOV R0, #0
for:
 CMP R0, #10
 BGE for_end
 MUL R2, R0, #12
 ADD R3, R2, #12
 ADD R3, R3, SP
 LDR R4, [R3]
 LDR R5, [SP, #4]
 ADD R5, R5, R2
 STR R4, [R5]
 ADD R3, R3, #8
 LDR R4, [R3]
 LDR R5, [SP, #4]
 ADD R5, R5, R2
 ADD R5, R5, #8
 STR R4, [R5]
 ADD R0, R0, #1
 B for
for_end:
```