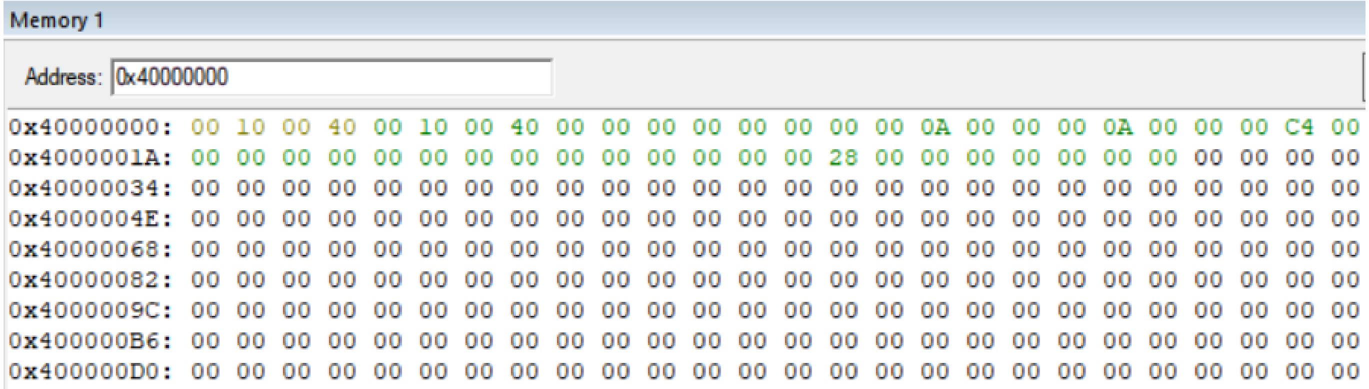
Cristian Robles
ECE425#16103
Project 3

Program Assembly Code:

```
        AREA Reset, CODE, Readonly
        ENTRY
ADD1  EQU 0x40000000
MLOC  EQU 0x40001000
ALOC  EQU 0x40002000
MULOC RN R2
AVLOC RN R3
TOTAL RN R4
DIVID RN R5
COUNT RN R8
POINT RN R9
POIN2 RN R10
NEXT  RN R11
NEX2  RN R12

   ; uses 0x40000000 as top of stack pointer
   LDR sp, =ADD1
   ; load address into r2
   LDR MULOC, =MLOC
   LDR AVLOC, =ALOC
   MOV COUNT, #10
   MOV DIVID, #0
   LDR POINT , =List1
   LDR POIN2 , =List2

   MOV TOTAL, #0

        STMIA sp!, {r2-r12, lr}
        BL multFun
        LDMDB sp!, {r2-r12}

        LDR MULOC, =MLOC
        MOV COUNT, #10

        STMIA sp!, {r2,r4,r6-r12, lr}
        BL avgFun
        LDMDB sp!, {r2,r4,r6-r12}
        BL sav
```

```
;multiply function
multFun
mult    LDR NEXT, [POINT]
            LDR NEX2, [POIN2]
            MUL R7, NEXT, NEX2
            STR R7, [MULOC]
            ADD POINT, POINT, #4
            ADD POIN2, POIN2, #4
            ADD MULOC, MULOC, #4

            SUBS COUNT, COUNT, #1
            BNE mult

            BX LR
avgFun
total   LDR NEXT, [MULOC]

            ADD TOTAL, TOTAL, NEXT
            ADD MULOC, MULOC, #4
            SUBS COUNT, COUNT, #1
            BNE total

            MOV COUNT, #10

avg     SUBS TOTAL, TOTAL, COUNT
            ADD DIVID, DIVID, #1
            BNE avg

            BX LR
sav

            LDR AVLOC, =ALOC
            STR DIVID,[AVLOC]
;end save function

stop B stop

List1 DCD 100, 300, 200, 900, 100, 400, 500, 600, 400, 150
List2 DCD   3,   5,   7,   8,   2,   4,   1,   3,   6,   9
        END
```

SRAM Memory Locations:

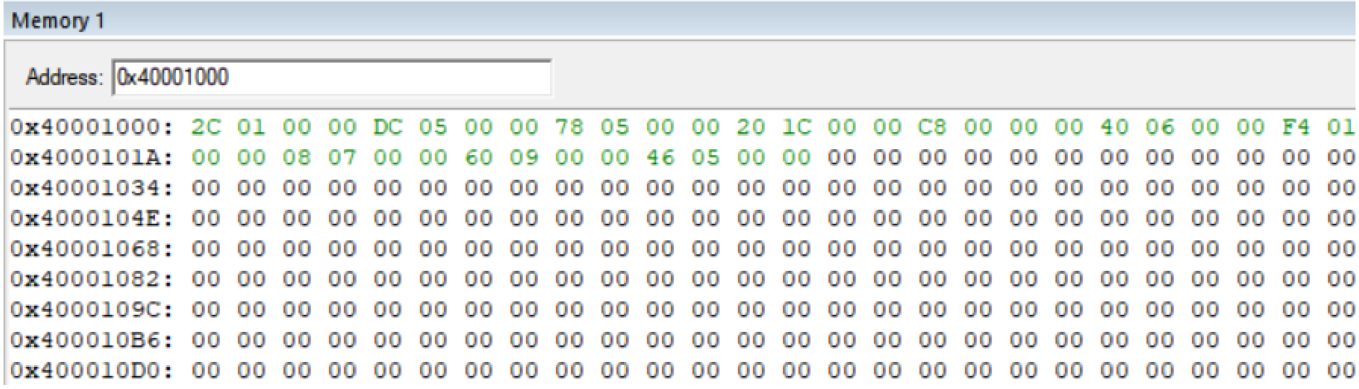

Memory 1

Address: 0x40000000

```
0x40000000: 00 10 00 40 00 10 00 40 00 00 00 00 00 00 00 00 0A 00 00 00 0A 00 00 00 C4 00
0x4000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 28 00 00 00 00 00 00 00 00 00 00 00
0x40000034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000004E: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40000068: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40000082: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000009C: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400000B6: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400000D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Figure 3.1 - SRAM Location at 0x40000000

The address 0x40000000 was used as the top of the stack pointer. In figure 3.1 you can see all the values being loaded onto the stack

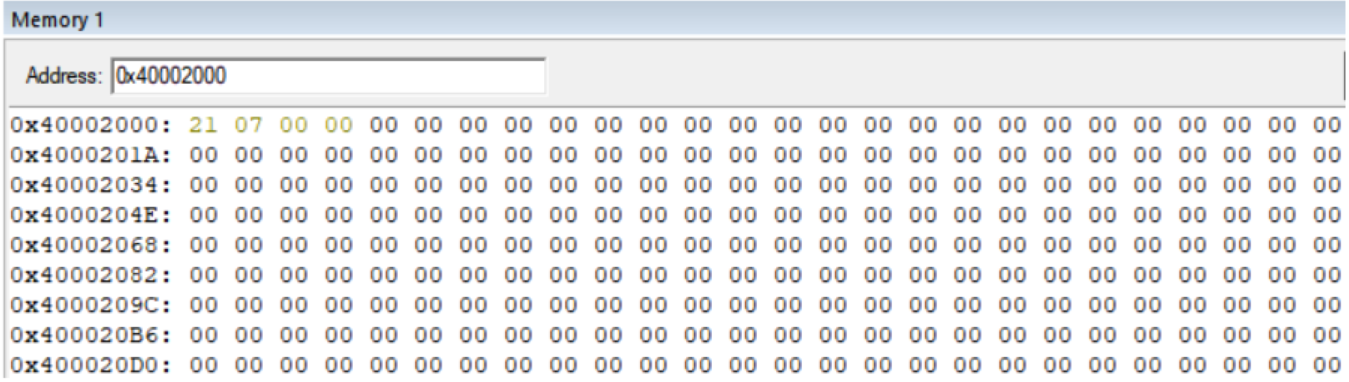

Memory 1

Address: 0x40001000

```
0x40001000: 2C 01 00 00 DC 05 00 00 78 05 00 00 20 1C 00 00 C8 00 00 00 40 06 00 00 F4 01
0x4000101A: 00 00 08 07 00 00 60 09 00 00 46 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40001034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000104E: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40001068: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40001082: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000109C: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400010B6: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400010D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Figure 3.2 - SRAM Location at 0x40001000

The address 0x40001000 was used to store the list of the multiplied numbers from the multiply function. The numbers in green in figure 3.2 are the numbers from the two lists represented in hex format


Memory 1

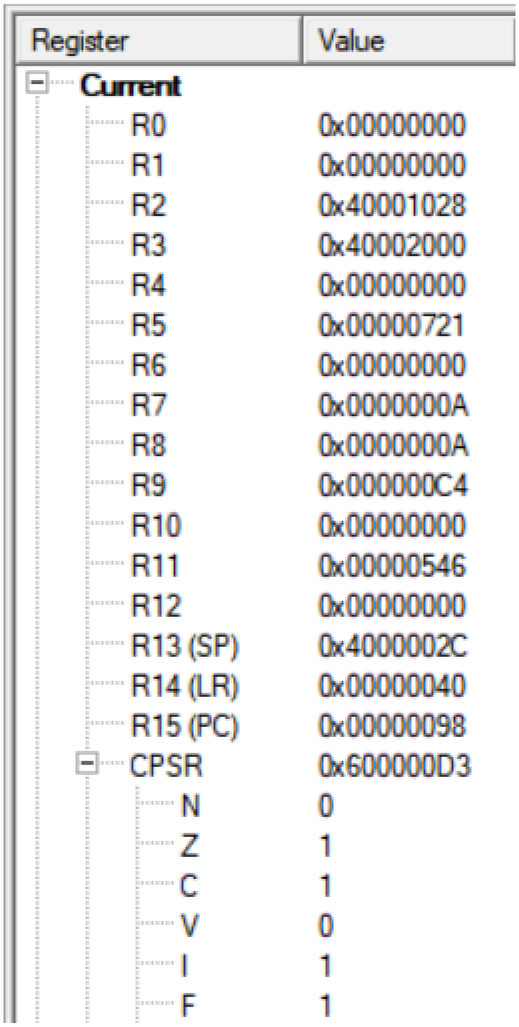
Address: 0x40002000

```
0x40002000: 21 07 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000201A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40002034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000204E: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40002068: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x40002082: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x4000209C: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400020B6: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x400020D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Figure 3.3 - SRAM Location at 0x40002000

The address 0x40001000 was used to store the average of the list from figure 3.2. The average of the numbers was 1825 in decimal and the hex number stored here is 721 which is the hex equivalent of 1825 in decimal.

Used Registers after Code Execution:



Register	Value
Current	
R0	0x00000000
R1	0x00000000
R2	0x40001028
R3	0x40002000
R4	0x00000000
R5	0x00000721
R6	0x00000000
R7	0x0000000A
R8	0x0000000A
R9	0x000000C4
R10	0x00000000
R11	0x00000546
R12	0x00000000
R13 (SP)	0x4000002C
R14 (LR)	0x00000040
R15 (PC)	0x00000098
CPSR	0x600000D3
N	0
Z	1
C	1
V	0
I	1
F	1

Figure 3.4 - Snapshot of Code in Keil