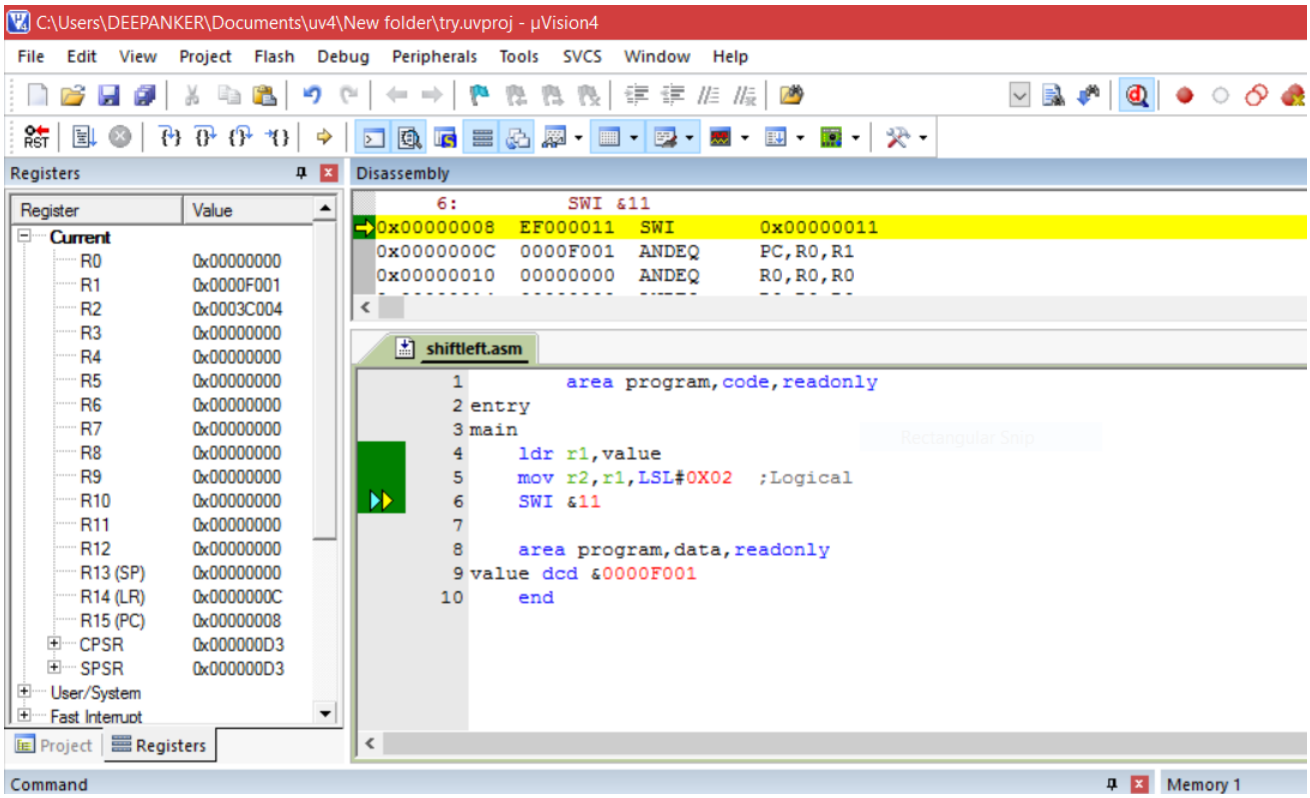
List of Experiments

1. Write a program in ARM assembly language to load any register with 32-bit data and perform the following:
   A) Shift left by 2 bits
   B) Shift right by the number of bits stored in register R2
   C) Shift left 5 bits conditionally when zero flag is set
   D) Arithmetic shift right by the value contained in register R2
2. Write a program in ARM assembly language to add two 32 bit numbers using:
   A) Direct addressing mode
   B) Indirect addressing mode (2 consecutive values)
   C) Offset Addressing Mode, Immediate Addressing Mode, Barrel Shift.
3. Write a program in ARM assembly language to copy & consecutive words from source to destination in memory using:
   a) Multiple register transfer instructions
   b) Load and store instructions in a loop
4. Write a program to verify how many bytes are present in a given set which resemble 0xAC.
5. Write a program to count the number of 1's and 0's in a given bytes and verify the result.
6. Write a program in ARM assembly language to perform multiplication using repeated addition.
7. Write a program in ARM assembly language to perform division using repeated subtraction.
8. Write a program in ARM assembly language to find the factorial of a number using lookup table.
9. Write a program in ARM assembly language to find the Fibonacci of a number using lookup table.
10. Write a program in ARM assembly language to find the number of occurrences of a letter in a given string.
11. Write a program in ARM assembly language to implement the equation:
    A) $ax^2 + by^2$
    B) $6(x+y) + 2z+4$
12. Write a program in ARM assembly language to find the length of a given string.
13. Write a program in ARM assembly language to construct STACK.
14. Write a program in ARM assembly language to add two 64 bit registers.

1. Write a program in ARM assembly language to load any register with 32 bit data and perform the following:

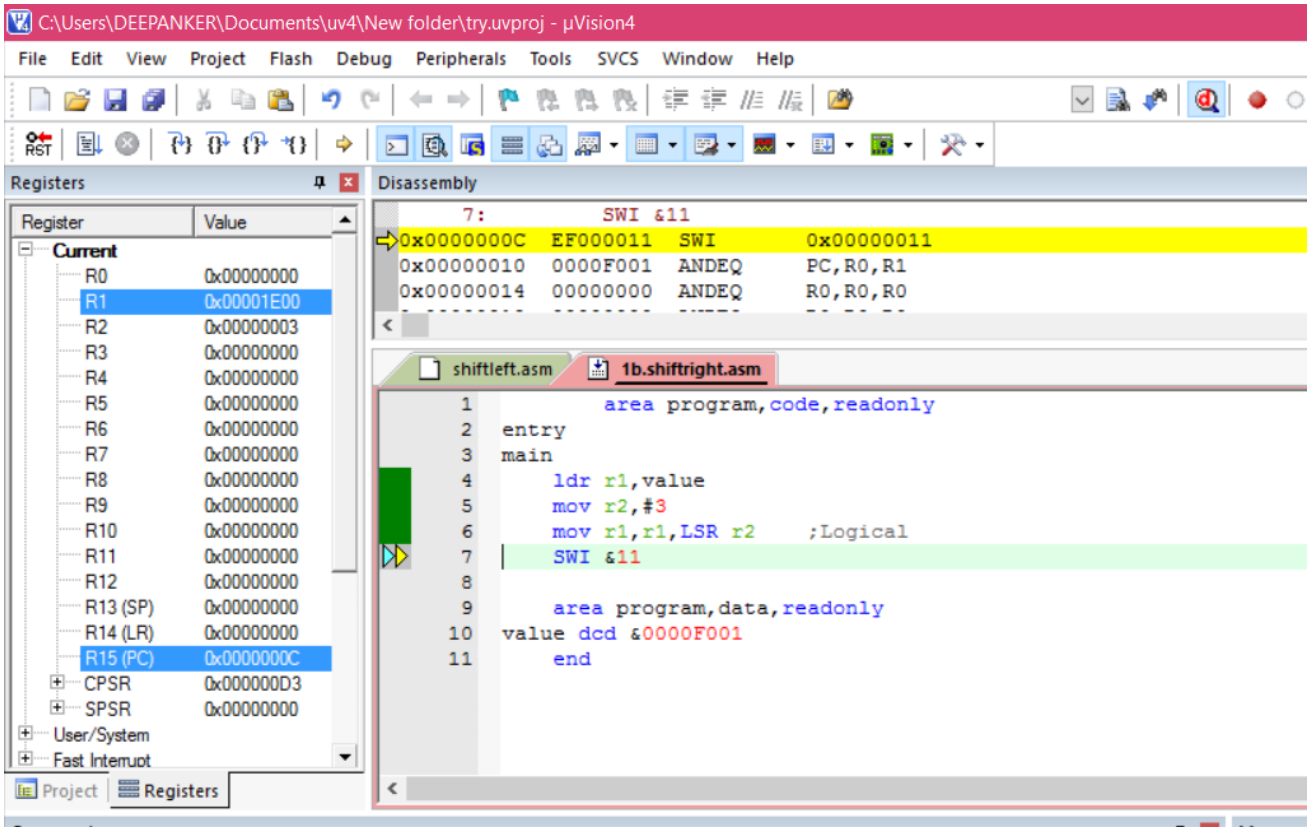
A) Shift left by 2 bits

```
        area program,code,readonly

entry
main
        ldr r1,value
        mov r1,r1,LSL#0X02     ;Logical
        SWI &11
```



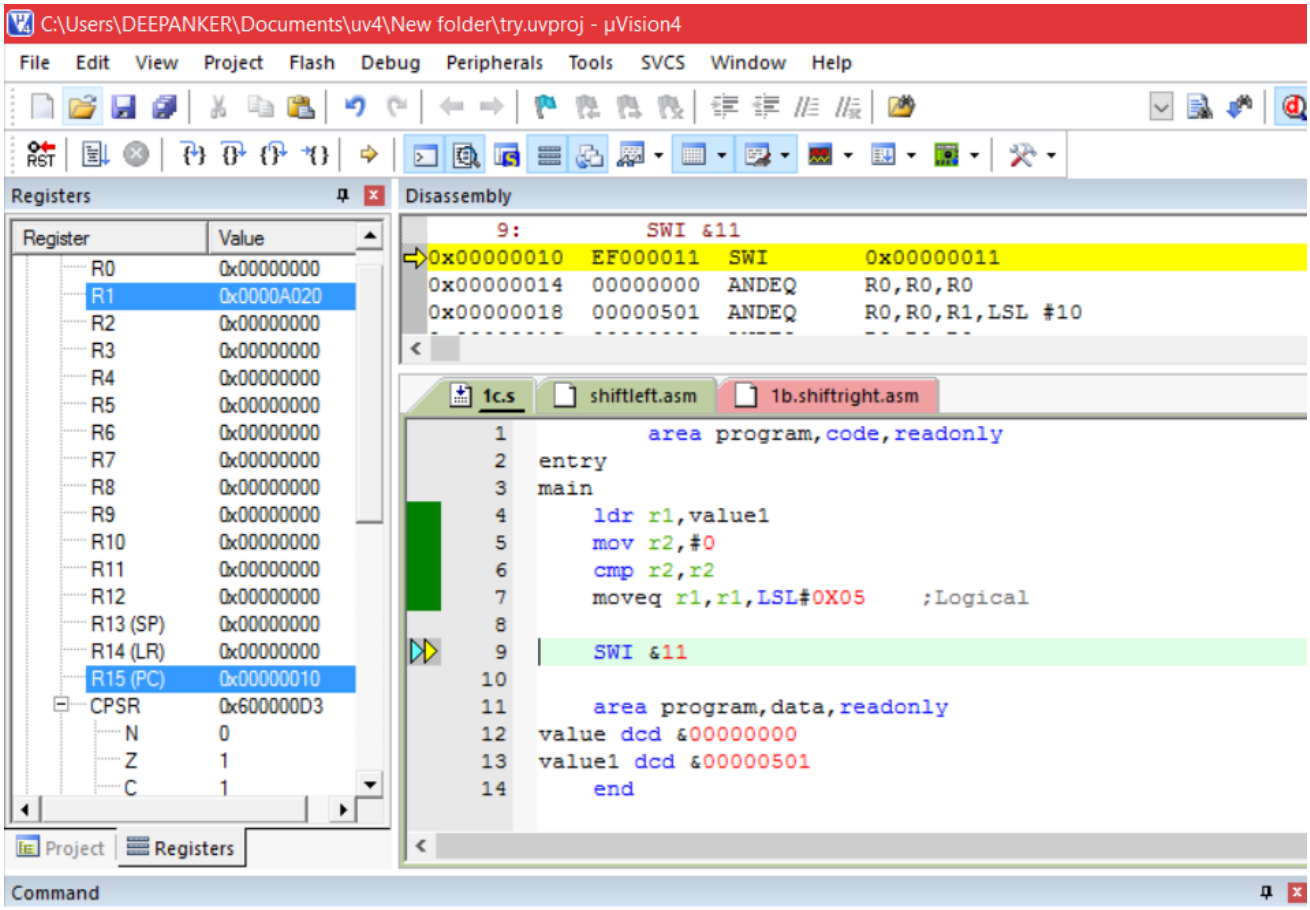
B) Shift right by the number of bits stored in register R2

```
                area program,code,readonly
entry
main
        ldr r1,value
        mov r2,#3
        mov r1,r1,LSR r2        ;Logical
        SWI &11

        area program,data,readonly
value dcd &0000F001
        end
```



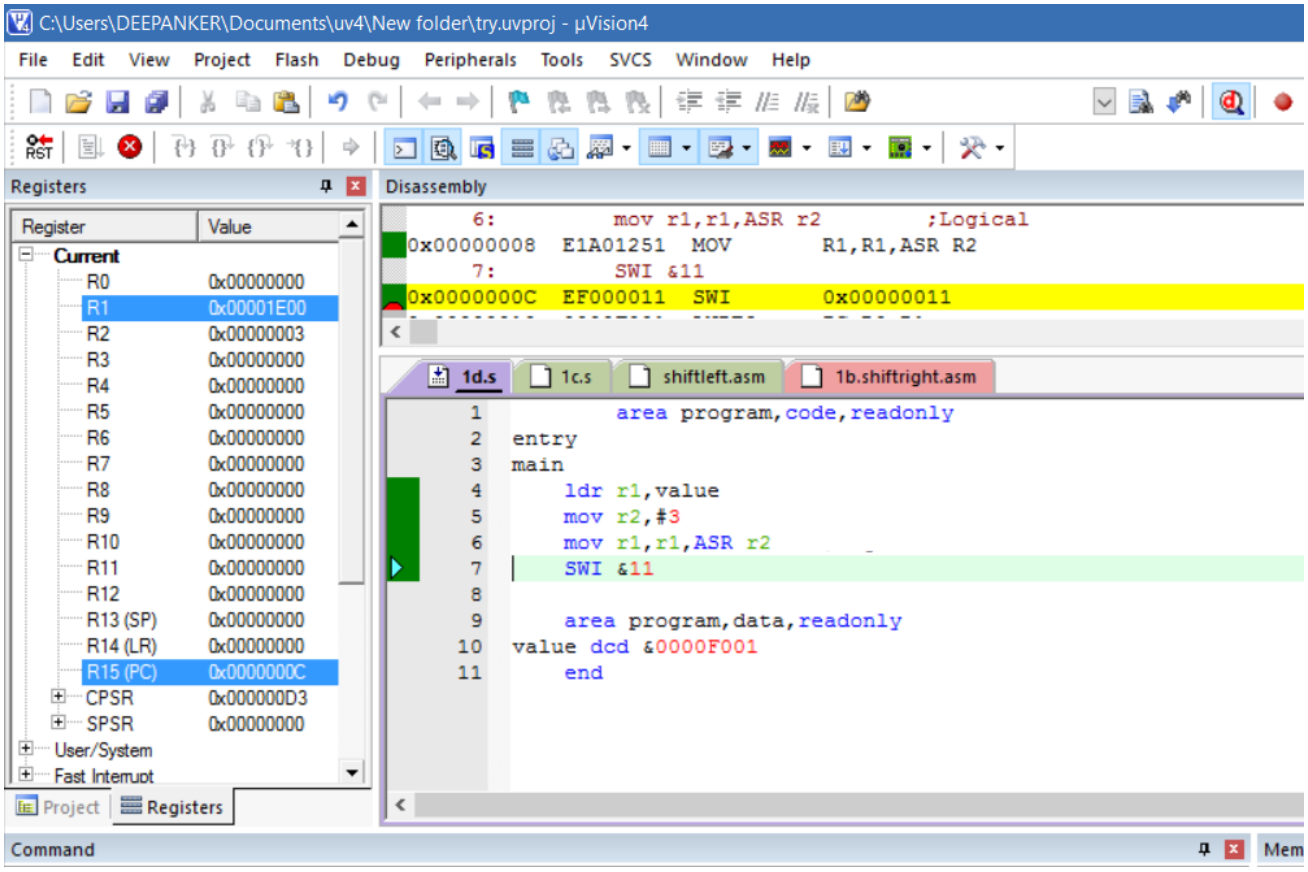
C) Shift left 5 bits conditionally when zero flag is set

```
        area program,code,readonly
entry
main
        ldr r1,value1
        mov r2,#0
        cmp r2,r2
        moveq r1,r1,LSL#0X05 ;Logical

        SWI &11

        area program,data,readonly
value dcd &00000000
value1 dcd &00000501
        end
```



D) Arithmetic shift right by the value contained in register R2

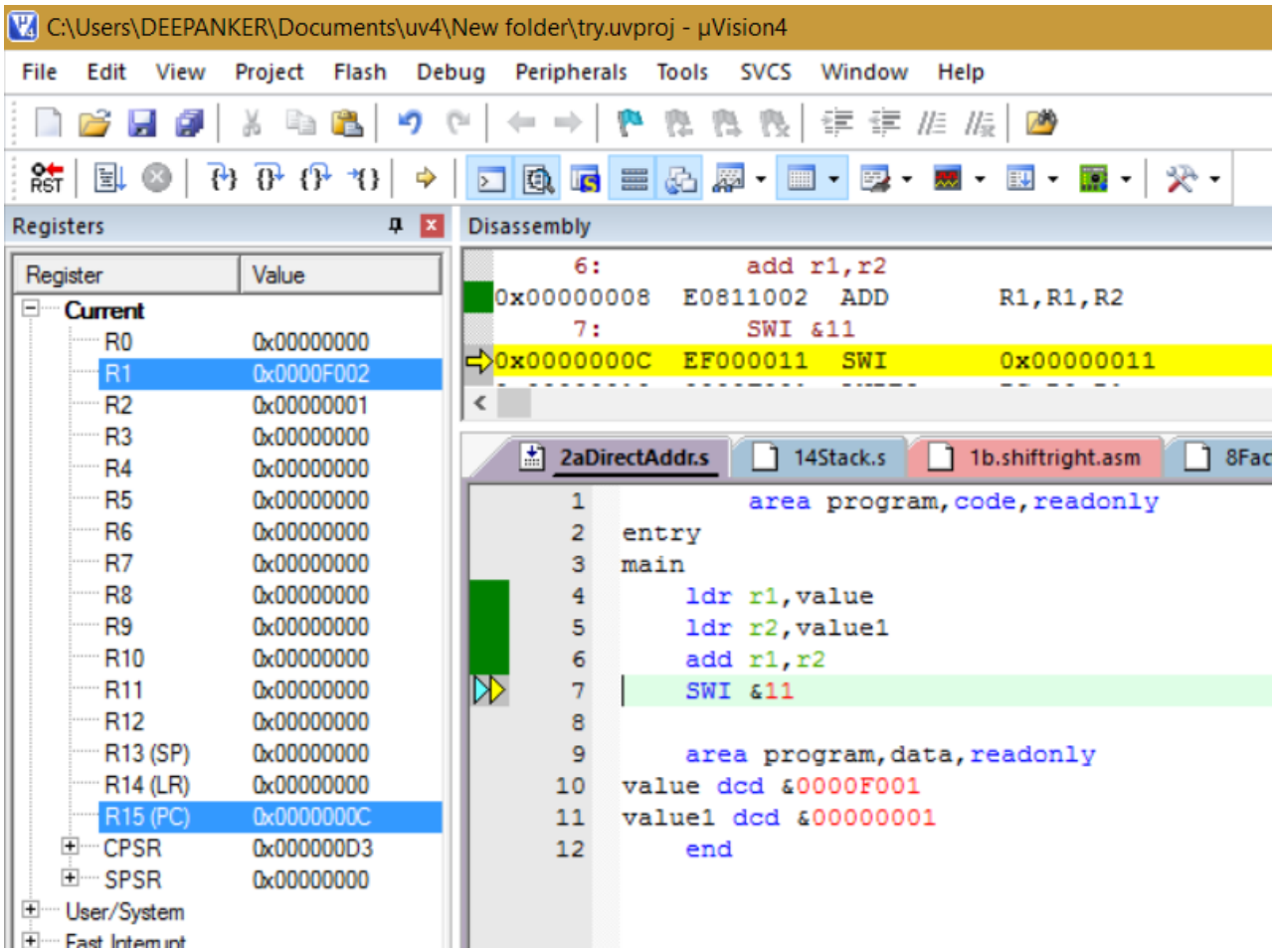
```
                    area program,code,readonly
entry
main
        ldr r1,value
        mov r2,#3
        mov r1,r1,ASR r2
        SWI &11

        area program,data,readonly
value dcd &0000F001
        end
```



2. Write a program in ARM assembly language to add two 32 bit numbers using:

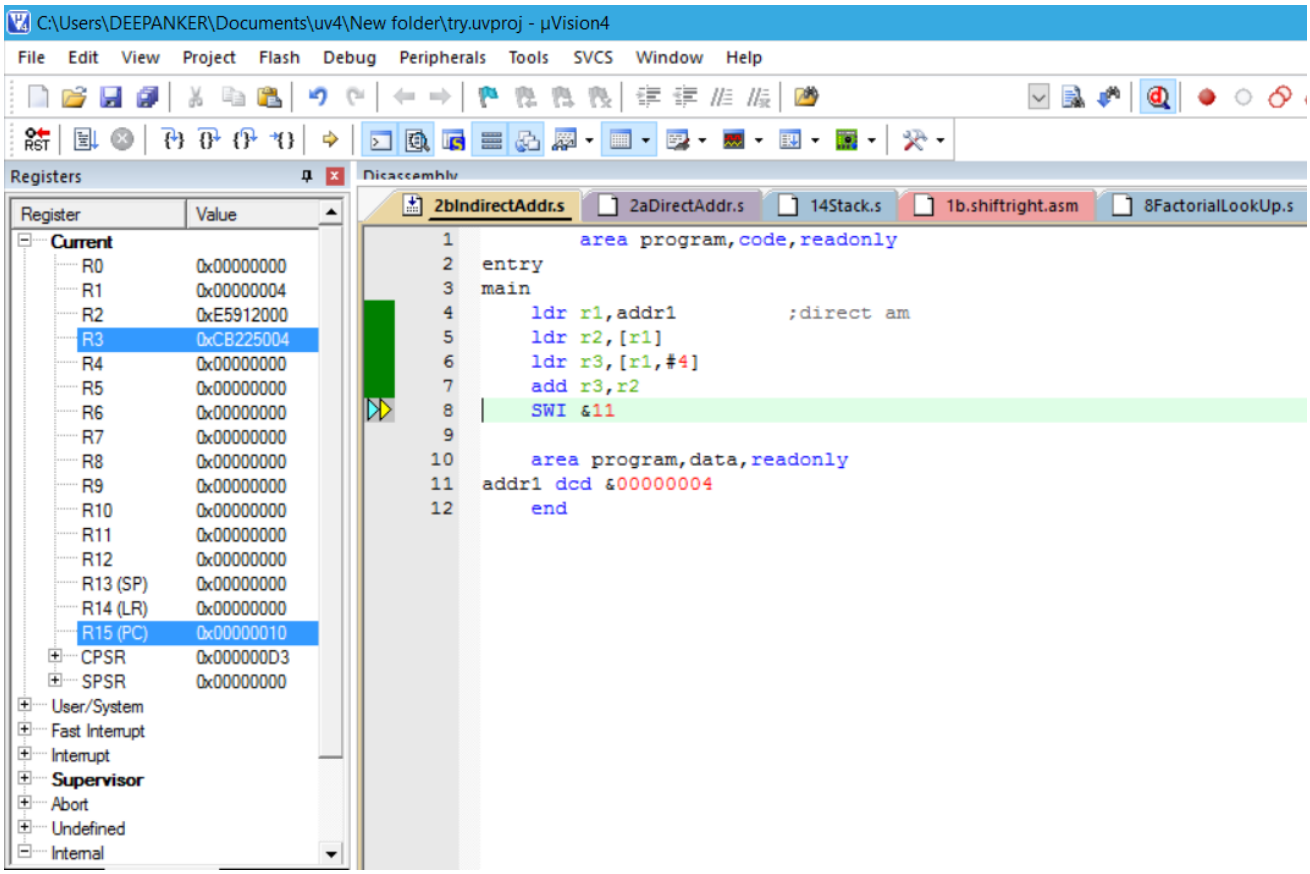
A) Direct addressing mode

```
                    area program,code,readonly
entry
main
        ldr r1,value
        ldr r2,value1
        add r1,r2
        SWI &11

        area program,data,readonly
value dcd &0000F001
value1 dcd &00000001
        end
```



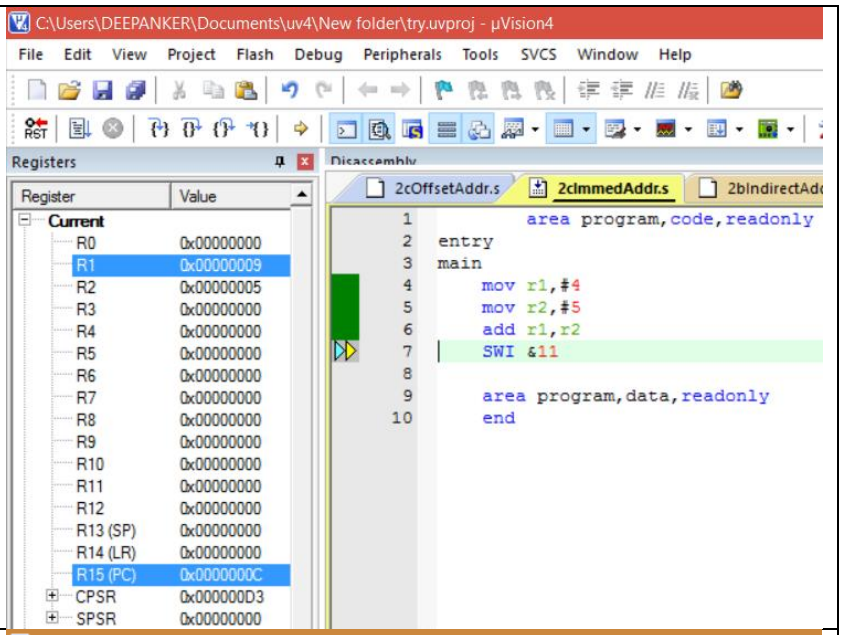
B) Indirect addressing mode (2 consecutive values)

```
                area program,code,readonly
entry
main
        ldr r1,addr1            ;direct am
        ldr r2,[r1]
        ldr r3,[r1,#4]
        add r3,r2
        SWI &11

        area program,data,readonly
addr1 dcd &00000004
        end
```

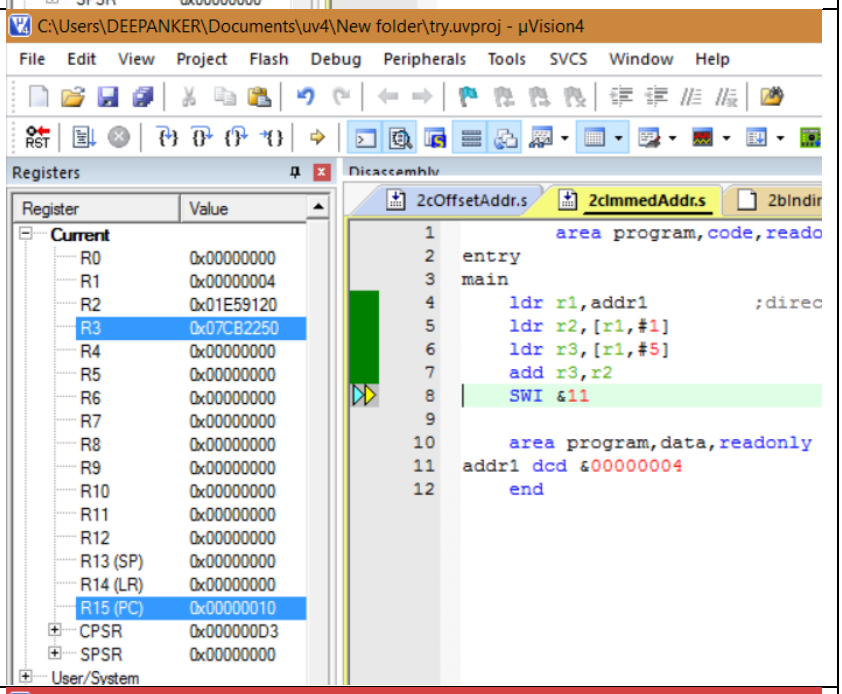


C) Offset Addressing Mode, Immediate Addressing Mode, Barrel Shift.

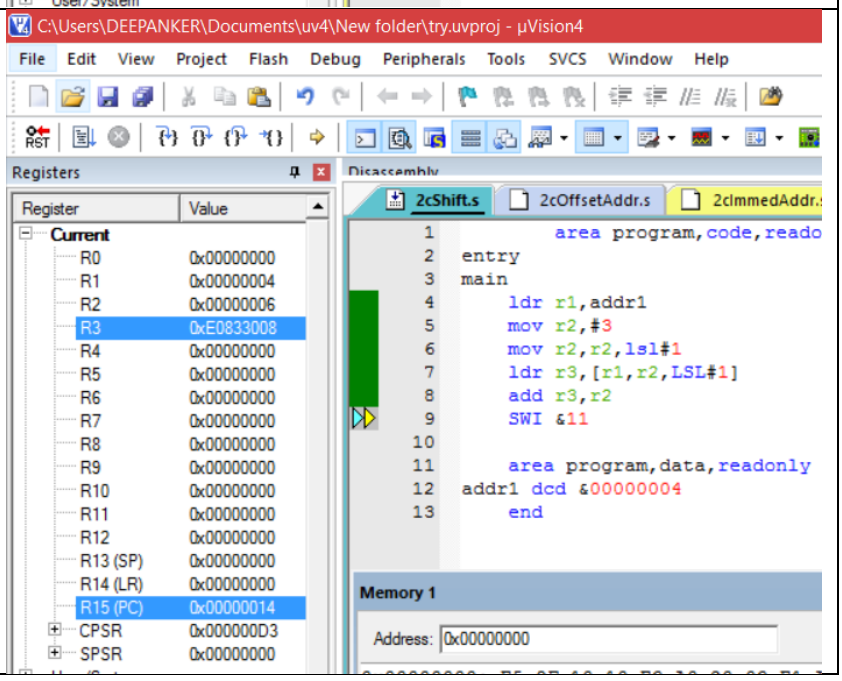
```
        area program,code,readonly
entry
main            ;Immediate
        mov r1,#4
        mov r2,#5
        add r1,r2
        SWI &11

        area program,data,readonly
        end
```




```
        area program,code,readonly
entry
main            ;Offset
        ldr r1,addr1
        ldr r2,[r1,#1]
        ldr r3,[r1,#5]
        add r3,r2
        SWI &11

        area program,data,readonly
addr1 dcd &00000004
        end
```



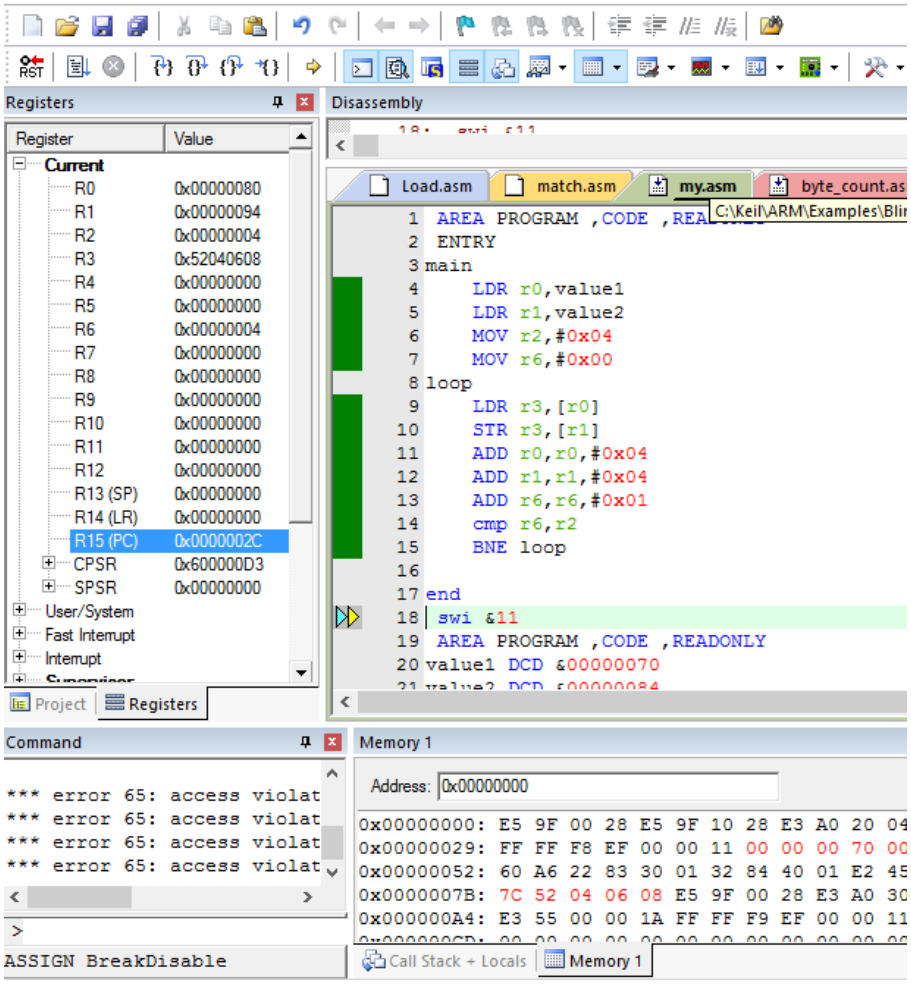

```
        area program,code,readonly
entry
main

        ldr r1,addr1
        mov r2,#3
        mov r2,r2,lsl#1
        ldr r3,[r1,r2,LSL#1]
        add r3,r2
        SWI &11

        area program,data,readonly
addr1 dcd &00000004
        end
```



3. Write a program in ARM assembly language to copy consecutive words from source to destination in memory using:

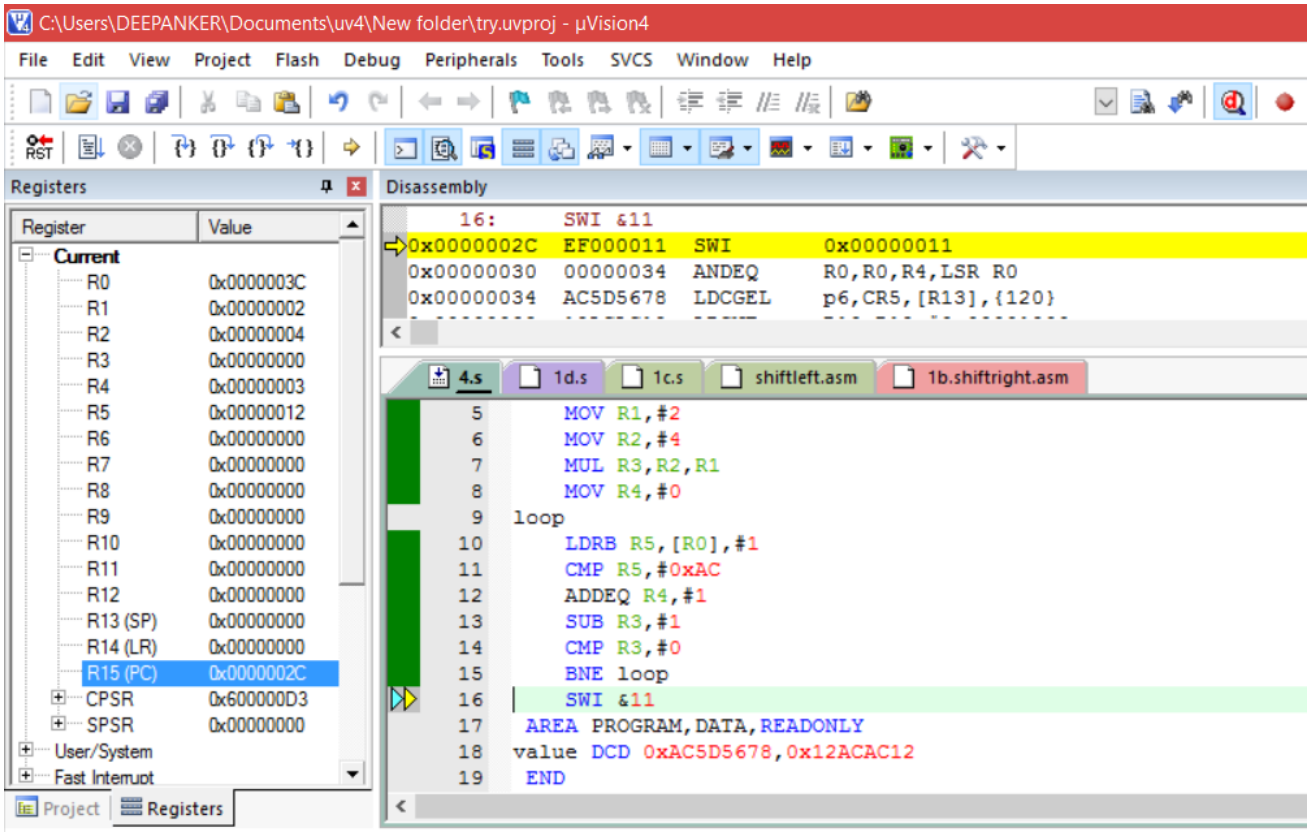
a) **Load and store instructions in a loop**

```
AREA PROGRAM ,CODE ,READONLY
 ENTRY
main
        LDR r0,value1
        LDR r1,value2
        MOV r2,#0x04
        MOV r6,#0x00
loop
        LDR r3,[r0]
        STR r3,[r1]
        ADD r0,r0,#0x04
        ADD r1,r1,#0x04
        ADD r6,r6,#0x01
        cmp r6,r2
        BNE loop
end
 swi &11
 AREA PROGRAM ,CODE ,READONLY
value1 DCD &00000070
value2 DCD &00000084
 END
```



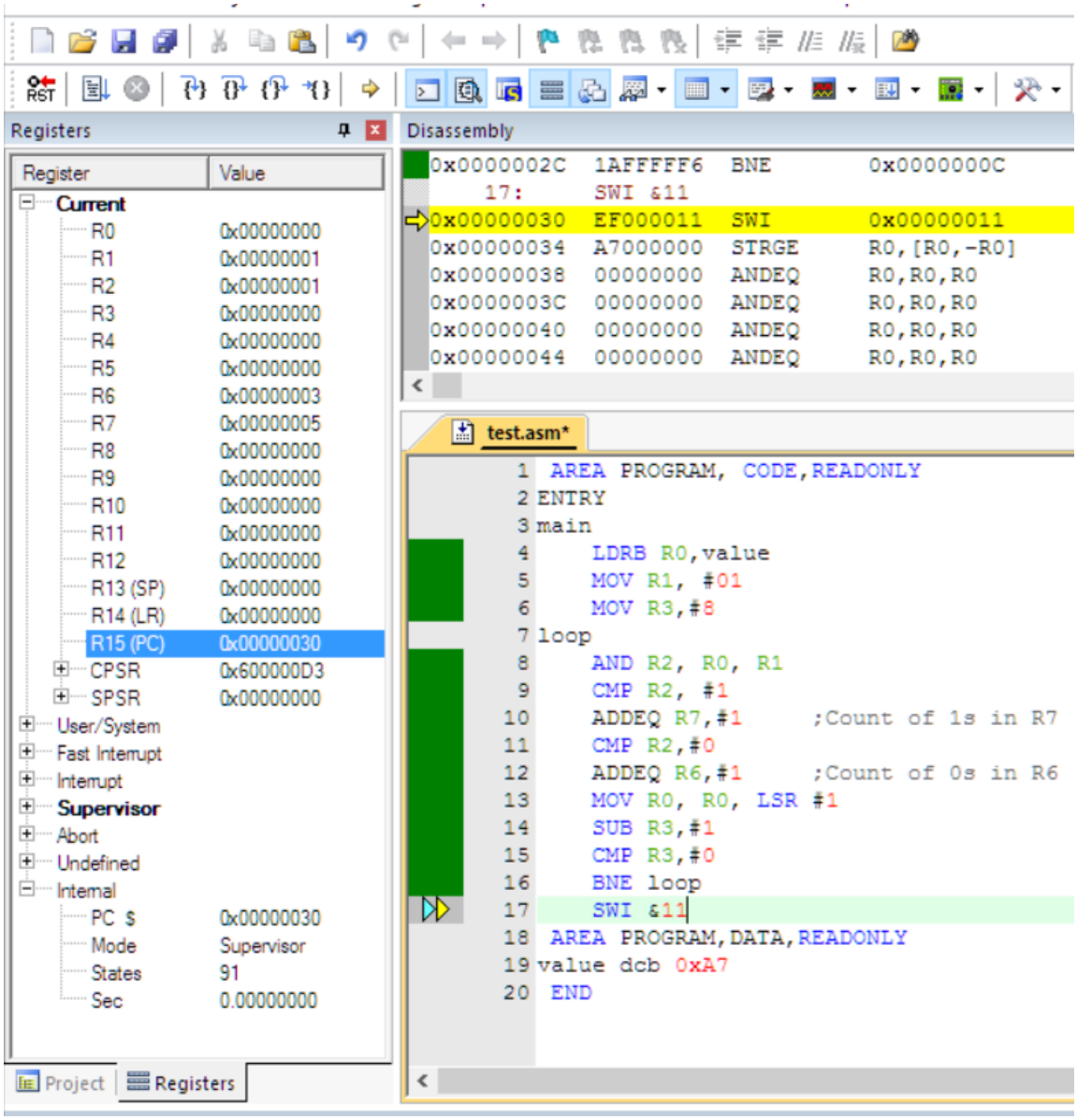
4. Write a program to verify how many bytes are present in a given set which resemble 0xAC.

```
AREA PROGRAM, CODE,READONLY
ENTRY
main
   LDR R0,=value
   MOV R1,#2                    ; Size of the array
   MOV R2,#4                    ; No of bytes in one cell of array. Every memory word is of 32 bits, so 4 bytes
   MUL R3,R2,R1
   MOV R4,#0
loop
   LDRB R5,[R0],#1
   CMP R5,#0xAC
   ADDEQ R4,#1
   SUB R3,#1
   CMP R3,#0
   BNE loop
   SWI &11
 AREA PROGRAM,DATA,READONLY
value DCD 0xAC5D5678,0x12ACAC12
 END
```



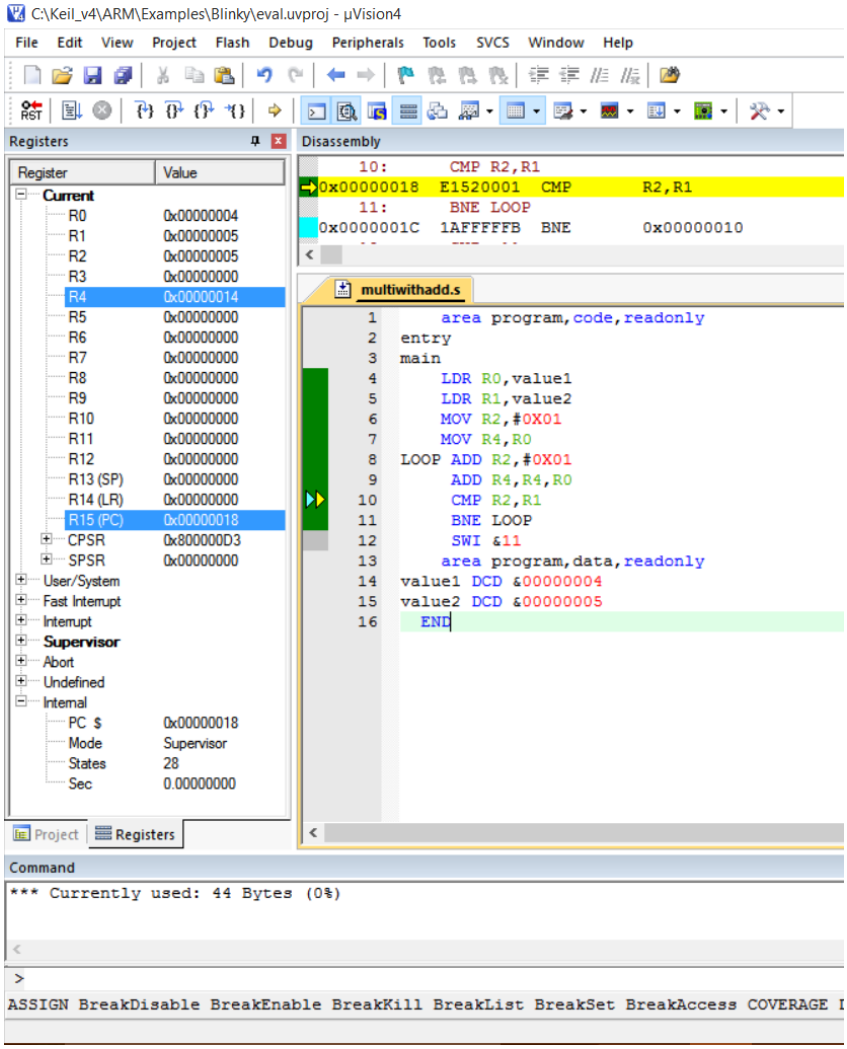
5. Write a program to count the number of 1's and 0's in a given bytes and verify the result.

```
AREA PROGRAM, CODE,READONLY
ENTRY
main
   LDRB R0,value
         MOV R1, #01
   MOV R3,#8
loop
         AND R2, R0, R1
         CMP R2, #1
         ADDEQ R7,#1          ;Count of 1s in R7
         CMP R2,#0
         ADDEQ R6,#1          ;Count of 0s in R6
         MOV R0, R0, LSR #1
   SUB R3,#1
   CMP R3,#0
   BNE loop
   SWI &11
 AREA PROGRAM,DATA,READONLY
value dcb 0xA7
 END
```



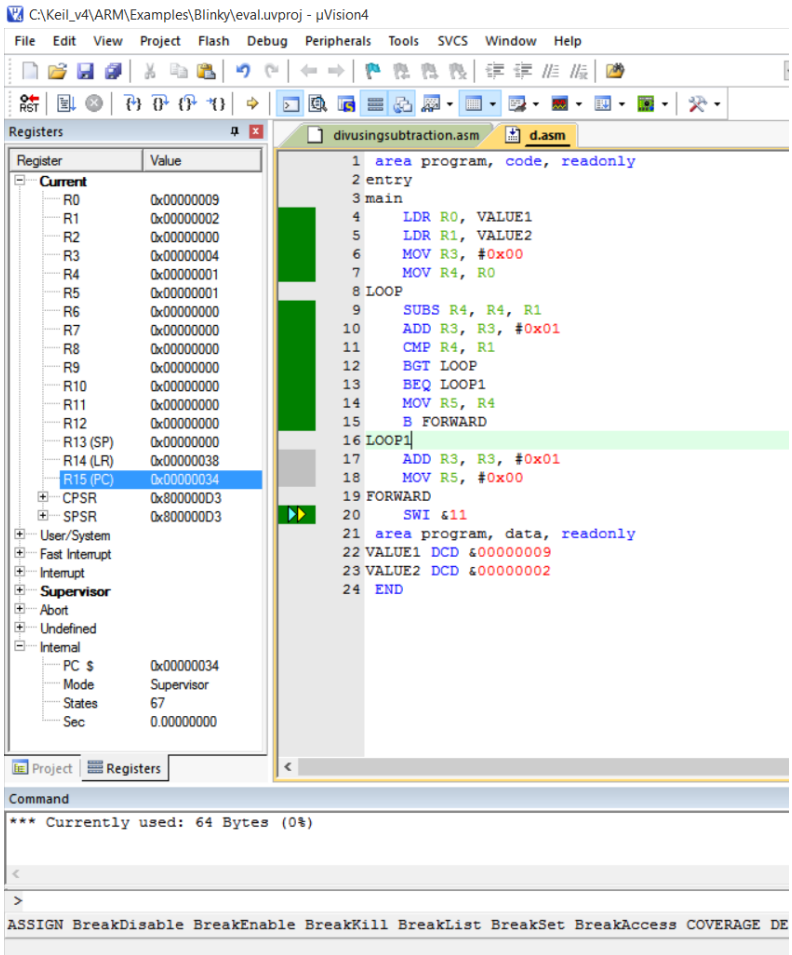
6. Write a program in ARM assembly language to perform multiplication using repeated addition.

```
                    area program,code,readonly
entry
main
   LDR R0,value1
         LDR R1,value2
         MOV R2,#0X01
   MOV R4,R0
LOOP ADD R2,#0X01
    ADD R4,R4,R0
    CMP R2,R1
    BNE LOOP
    SWI &11
         area program,data,readonly
value1 DCD &00000004
value2 DCD &00000005
  END
```



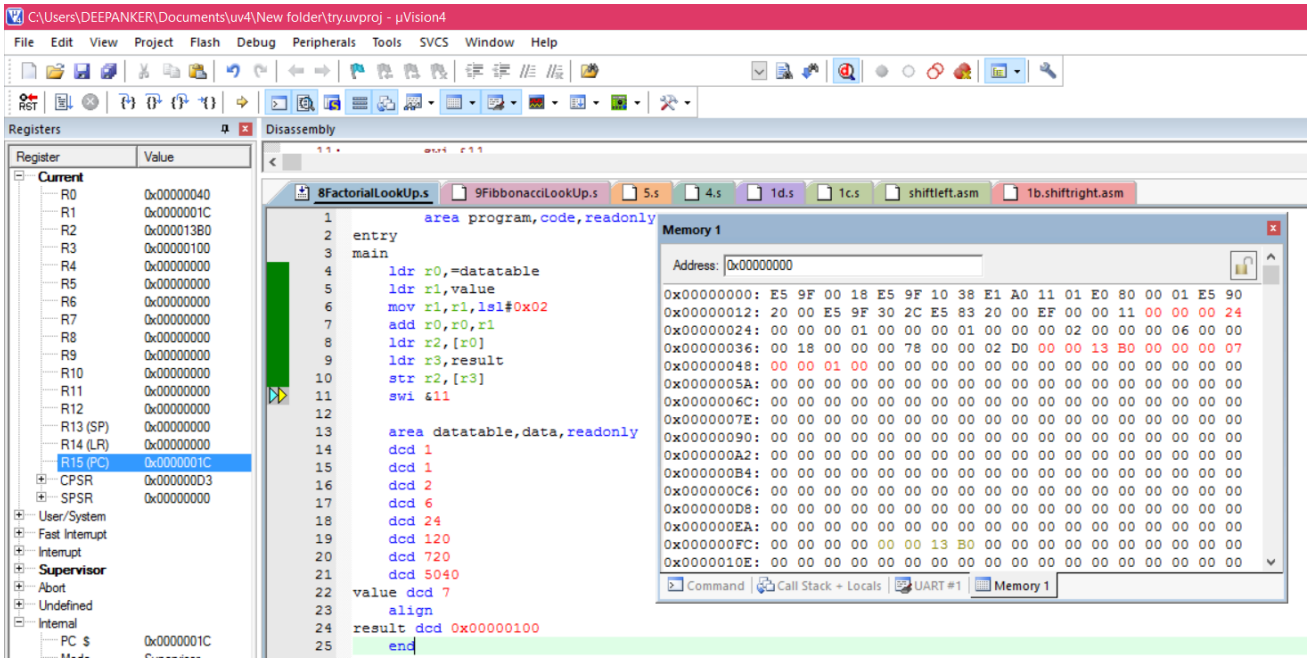
7. Write a program in ARM assembly language to perform Division using repeated subtraction.

```
        area program, code, readonly
entry
main
   LDR R0, VALUE1
   LDR R1, VALUE2
   MOV R3, #0x00
   MOV R4, R0
LOOP
   SUBS R4, R4, R1
   ADD R3, R3, #0x01
   CMP R4, R1
   BGT LOOP
   BEQ LOOP1
   MOV R5, R4
   B FORWARD
LOOP1
   ADD R3, R3, #0x01
   MOV R5, #0x00
FORWARD
   SWI &11
 area program, data, readonly
VALUE1 DCD &00000009
VALUE2 DCD &00000002
 END
```



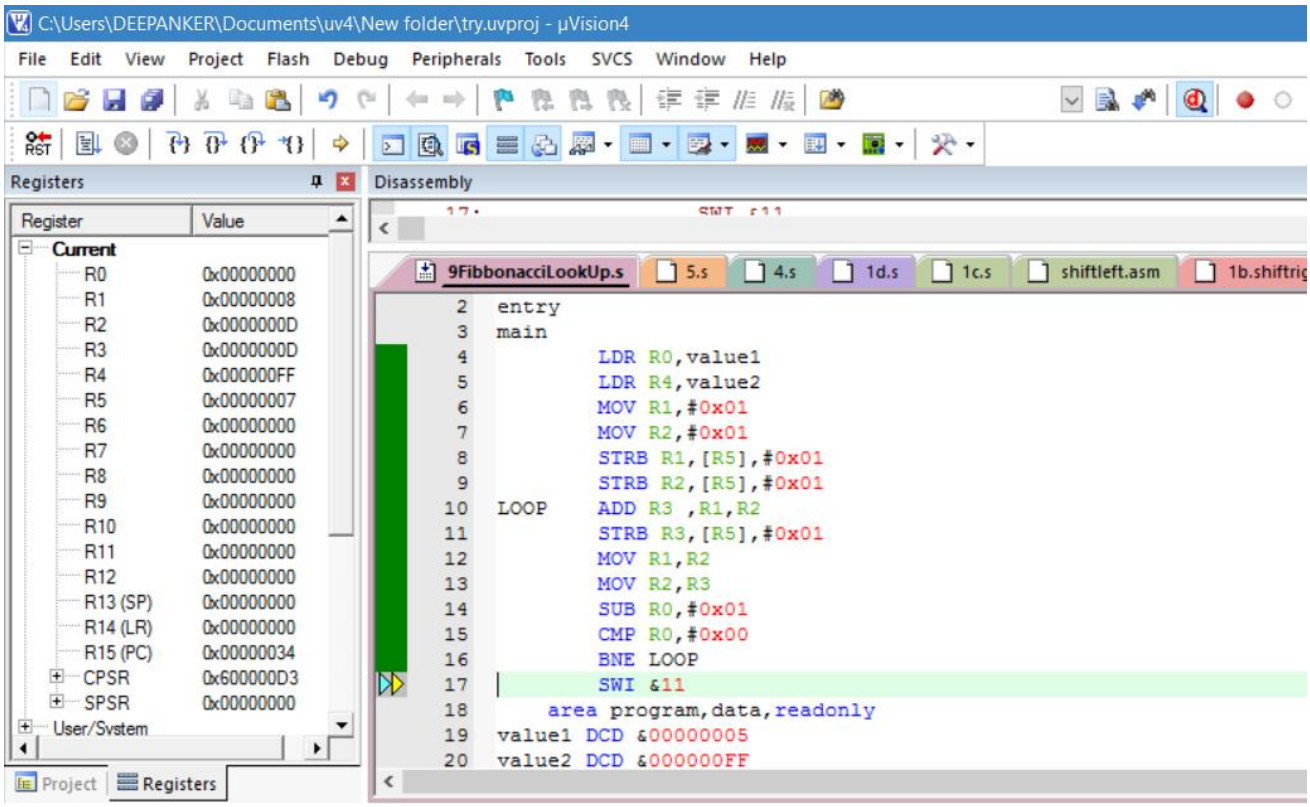
8. Write a program in ARM assembly language to find the factorial of a number using lookup table.

```
                area program,code,readonly
entry
main
        ldr r0,=datatable
        ldr r1,value
        mov r1,r1,lsl#0x02
        add r0,r0,r1
        ldr r2,[r0]
        ldr r3,result
        str r2,[r3]
        swi &11

        area datatable,data,readonly
        dcd 1
        dcd 1
        dcd 2
        dcd 6
        dcd 24
        dcd 120
        dcd 720
        dcd 5040
value dcd 7
        align
result dcd 0x00000100
        end
```



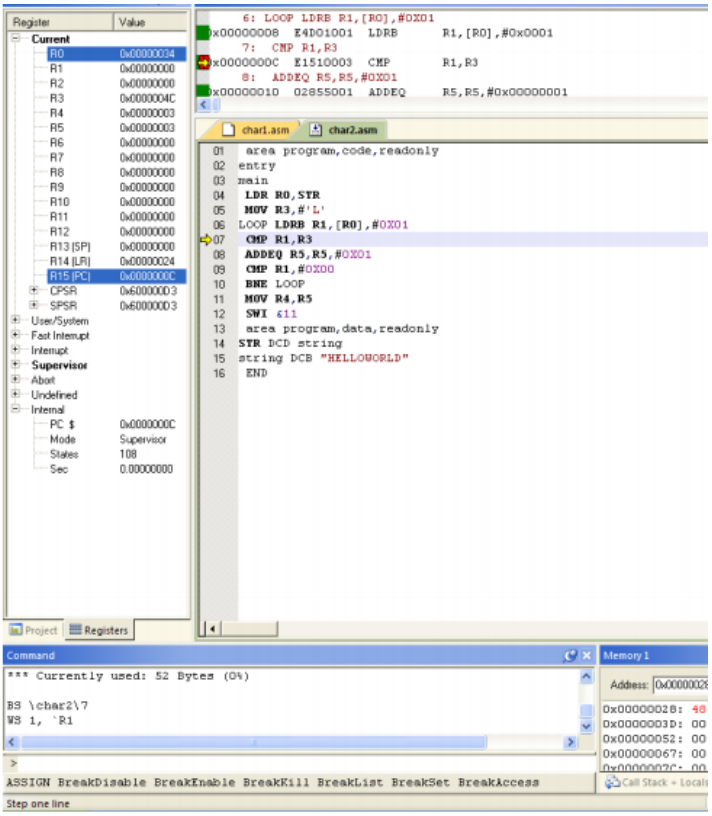
9. Write a program in ARM assembly language to find the Fibonacci of a number using lookup table.

```
                area program,code,readonly
entry
main
                LDR R0,value1
                LDR R4,value2
                MOV R1,#0x01
                MOV R2,#0x01
                STRB R1,[R5],#0x01
                STRB R2,[R5],#0x01
LOOP   ADD R3 ,R1,R2
                STRB R3,[R5],#0x01
                MOV R1,R2
                MOV R2,R3
                SUB R0,#0x01
                CMP R0,#0x00
                BNE LOOP
                SWI &11
        area program,data,readonly
value1 DCD &00000005
value2 DCD &000000FF
        END
```



10. Write a program in ARM assembly language to find the number of occurrences of a letter in a given string.

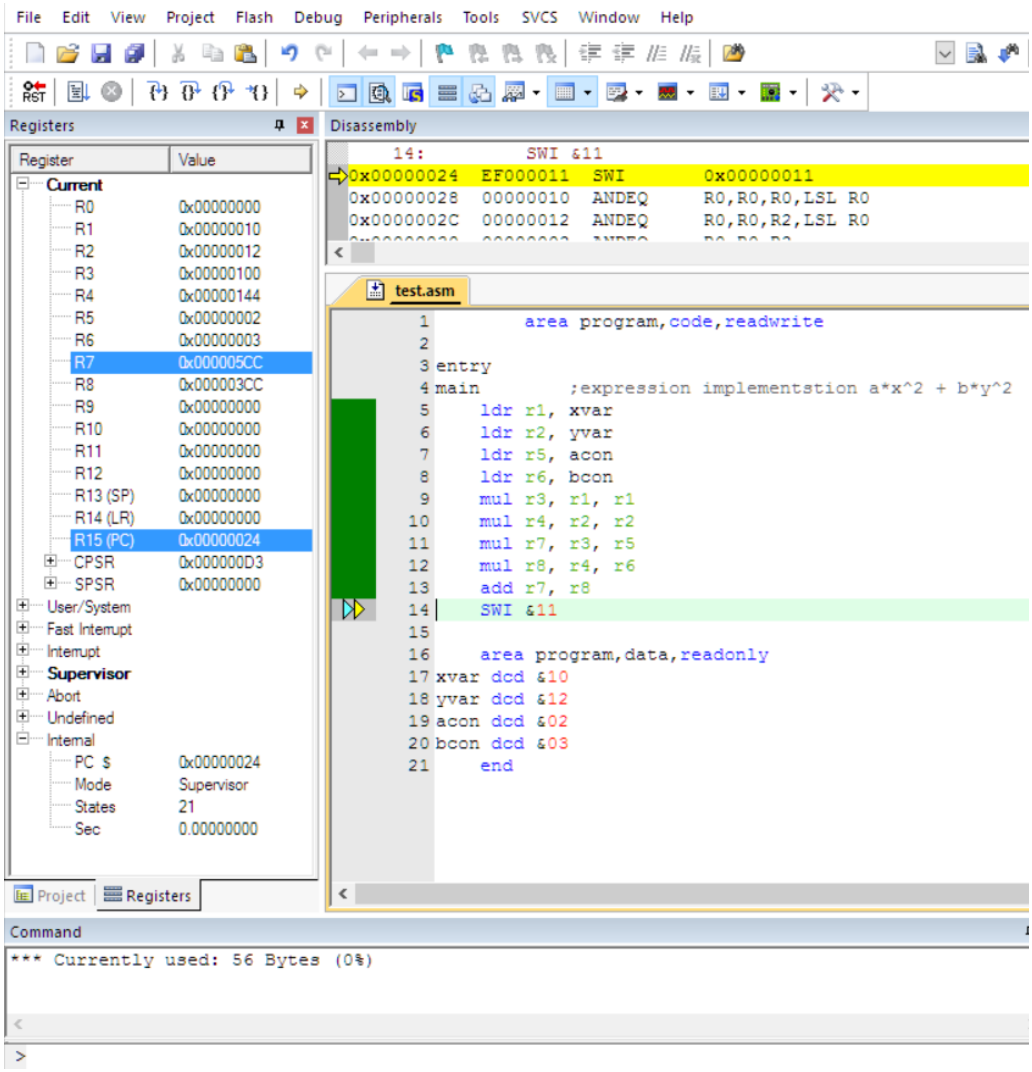
```
 area program ,code ,readonly
entry
main
        LDR r0,value1
        MOV r2,#0x00
        MOV r3,#'L'
loop
        LDRB r1,[r0],#0x01
        cmp r1,r3
        ADDEQ r2,r2,#0x01
        BNE loop
end
 swi &11
 area program ,data ,readonly
value1 DCD value2
value2 DCB "HELLOWORLD"
 end
```



11. Write a program in ARM assembly language to implement the equation:

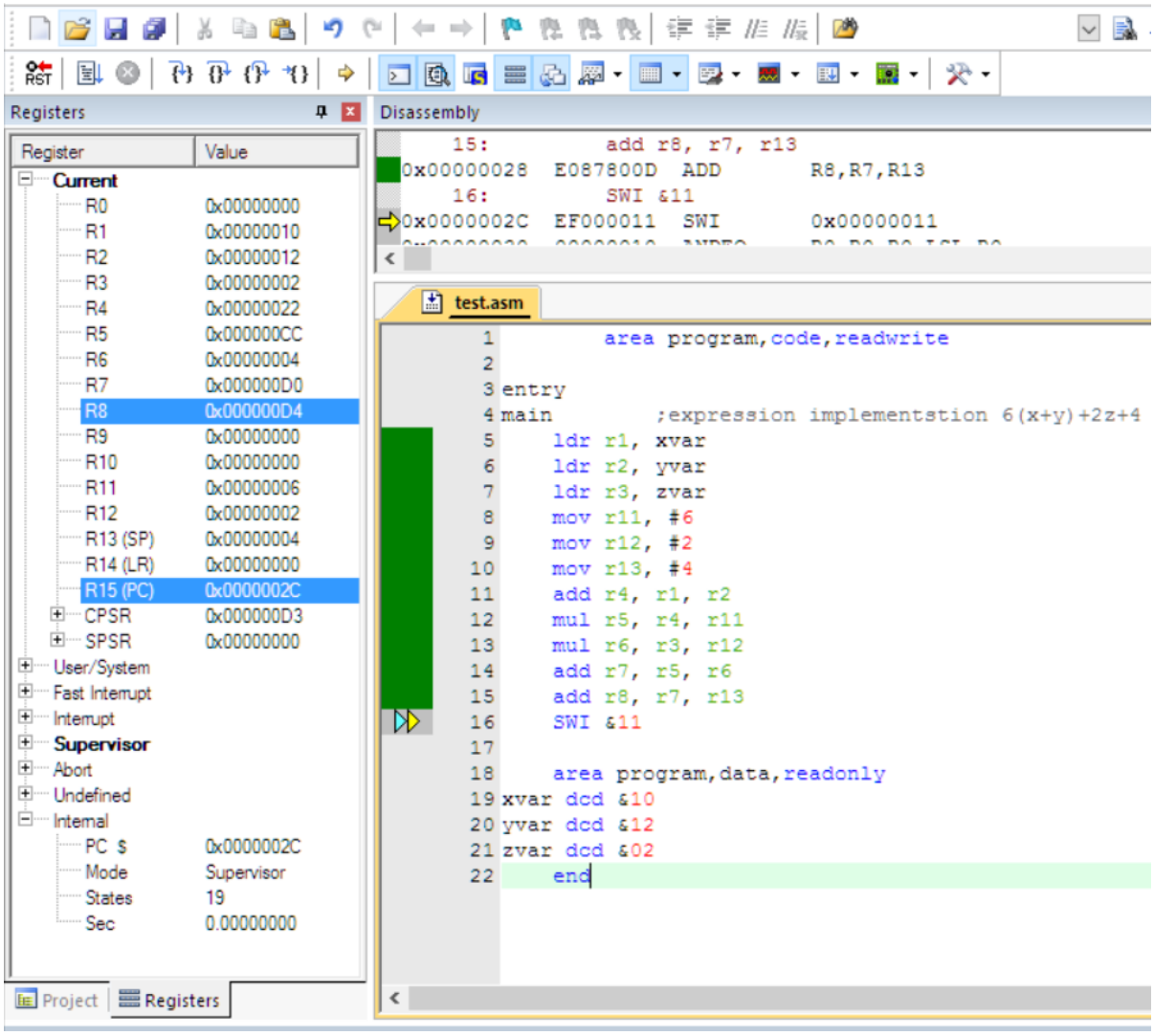
A) $ax^2 + by^2$

```
                area program,code,readwrite
entry
main            ;expression implementation a*x^2 + b*y^2
        ldr r1, xvar
        ldr r2, yvar
        ldr r5, acon
        ldr r6, bcon
        mul r3, r1, r1
        mul r4, r2, r2
        mul r7, r3, r5
        mul r8, r4, r6
        add r7, r8
        SWI &11

        area program,data,readonly
xvar dcd &10
yvar dcd &12
acon dcd &02
bcon dcd &03
        end
```



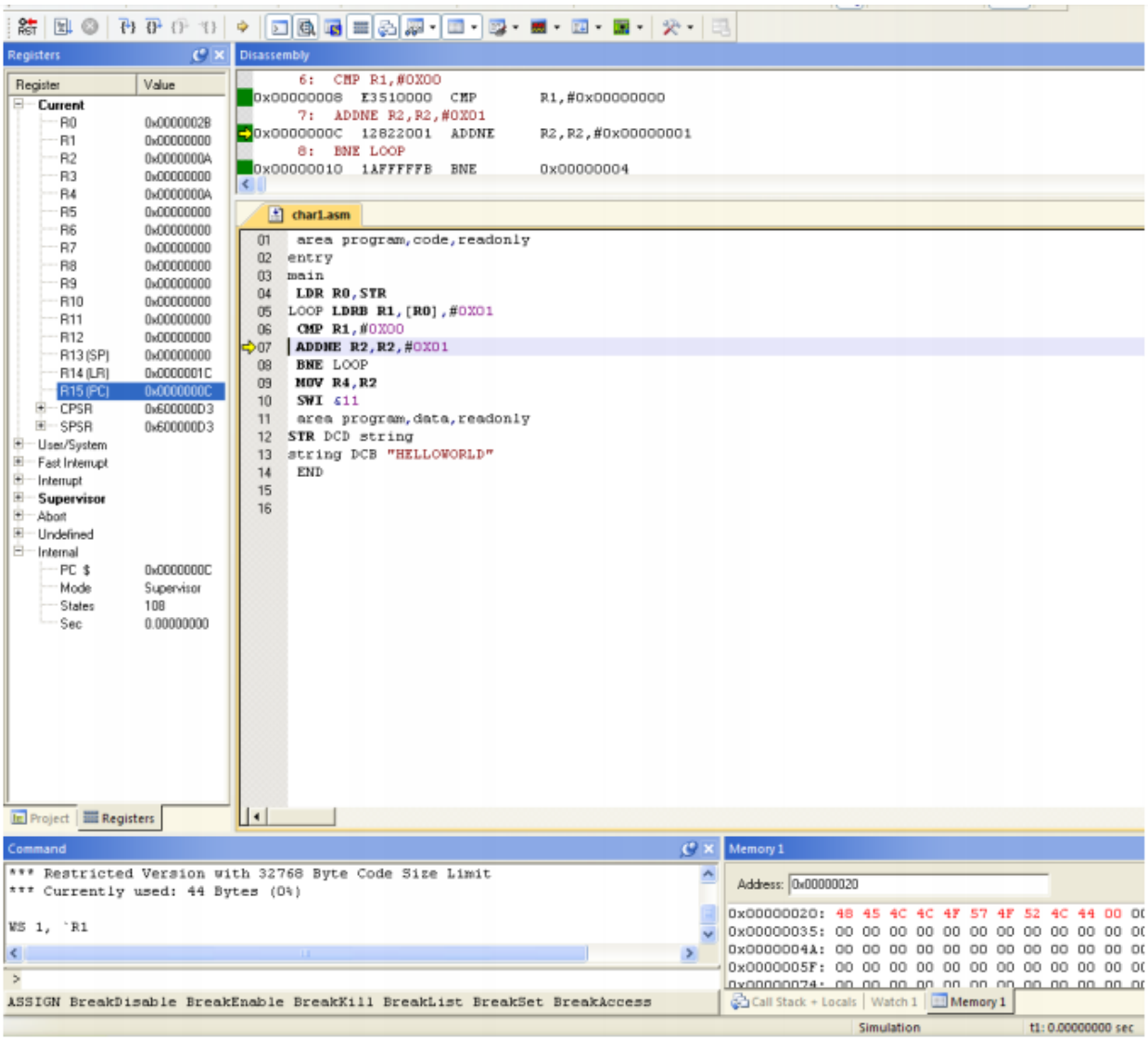
B) 6(x+y)+2z+4

```
                area program,code,readwrite

entry
main            ;expression implementstion 6(x+y)+2z+4
        ldr r1, xvar
        ldr r2, yvar
        ldr r3, zvar
        mov r11, #6
        mov r12, #2
        mov r13, #4
        add r4, r1, r2
        mul r5, r4, r11
        mul r6, r3, r12
        add r7, r5, r6
        add r8, r7, r13
        SWI &11

        area program,data,readonly
xvar dcd &10
yvar dcd &12
zvar dcd &02
        end
```



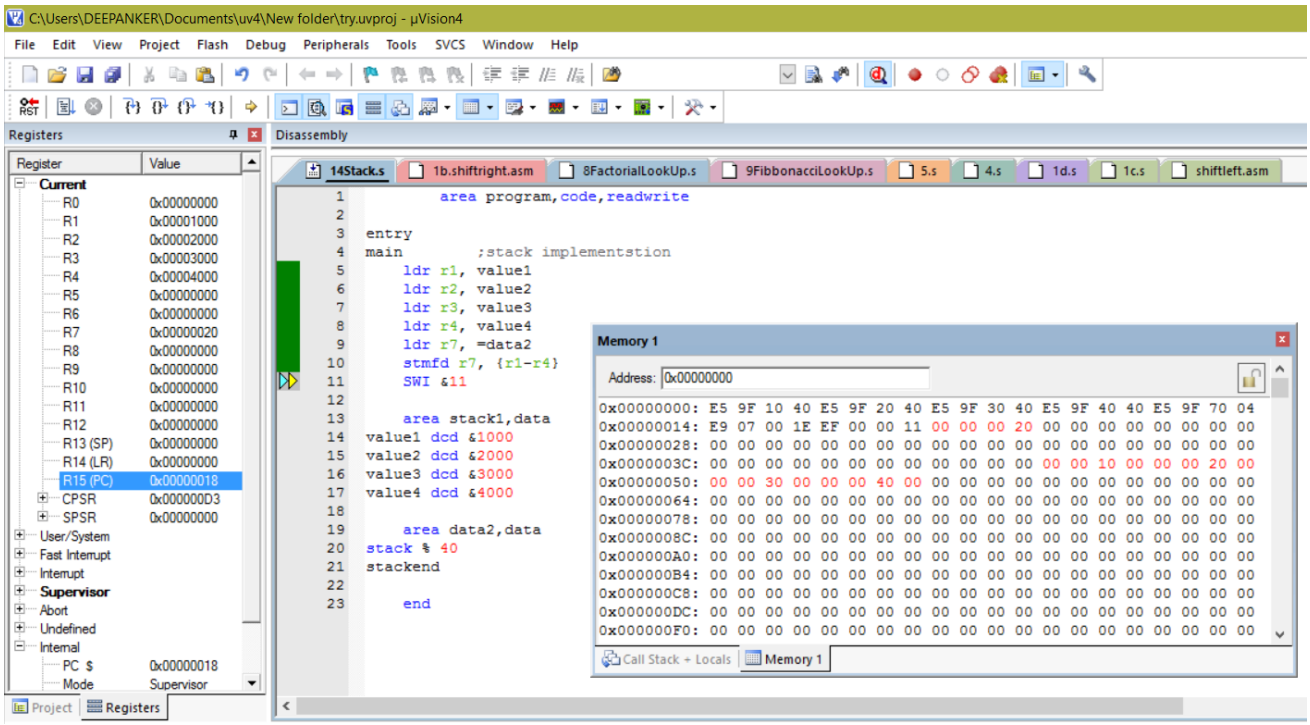
12. Write a program in ARM assembly language to find the length of a given string

```
        area program,code,readonly
entry
main
        LDR R0,STR
LOOP
        LDRB R1,[R0],#0x01
        CMP R1,#0x00
        ADDNE R2,R2,#0x01
        BNE LOOP
        SWI &11
        area program, data, readonly
STR DCD string
string DCB "HELLOWORLD"
 END
```



13. Write a program in ARM assembly language to construct STACK.

```
                area program,code,readwrite
entry
main            ;stack implementation
        ldr r1, value1
        ldr r2, value2
        ldr r3, value3
        ldr r4, value4
        ldr r7, =data2
        stmfd r7, {r1-r4}
        SWI &11

        area stack1,data
value1 dcd &1000
value2 dcd &2000
value3 dcd &3000
value4 dcd &4000

        area data2,data
stack % 40
stackend
        end
```



14. Write a program in ARM assembly language to add two 64 bit registers.

```
                    area program,code,readwrite
entry
main
        ldr r0, =value1
        ldr r1, [r0]
        ldr r2, [r0, #4]
        ldr r0, =value2
        ldr r3, [r0]
        ldr r4, [r0, #4]
        adds r6, r2, r4
        adc r5, r1, r3
        ldr r0, =result
        str r5, [r0]
        str r6, [r0, #4]
        SWI &11

        area program,data,readwrite
value1 dcd 0x1249A375,0x1375120D
value2 dcd 0x0137A147,0xF2173FAB
result dcd 0,0
        end
```