CODE BLOG

- **Main**

```
;4 number values given in the question
num1        EQU 0x40000004
num2        EQU 0x40000002
num3        EQU 0x3FFFFFFE
num4        EQU 0x3FFFFFFC

;address initial values
adress1     EQU 0X20000040
adress2     EQU 0X20000060


            AREA MYCODE, CODE
            ALIGN
            ENTRY
            EXPORT __main
            EXTERN  mean
__main
            ;the given has been saved to the register
            LDR     R0, = num1
            LDR     R1, = num2
            LDR     R3, = num3
            LDR     R4, = num4
            LDR     R5, = adress1
            LDR     R7, = adress2
```

```
            ;r6 is offset value for the save process
            ;values recorded in registers R0, R2, R3, R4
            ;numbers saved starting from address 0X20000040
            MOV     R6,#0
            STR     R0,[R5,R6]
            ADD     R6,R6,#4
            STR     R1,[R5,R6]
            ADD     R6,R6,#4
            STR     R3,[R5,R6]
            ADD     R6,R6,#4
            STR     R4,[R5,R6]

            ;subroutine
            BL      mean

            ;We calculated the R2 value in subroutine
            ;Given the question; I subtract the average value from the given numbers
            SUB     R0,R0,R2
            SUB     R1,R1,R2
            SUB     R3,R3,R2
            SUB     R4,R4,R2
```

```
            ;r6 is offset value for the save process
            MOV     R6,#0

            ;The last step is the value of the subtraction operations, starting from the address 0X20000060.
            STR     R0,[R7,R6]
            ADD     R6,R6,#4
            STR     R1,[R7,R6]
            ADD     R6,R6,#4
            STR     R3,[R7,R6]
            ADD     R6,R6,#4
            STR     R4,[R7,R6]


loop        B       loop
            END
```

Subroutines

mean.s* | can_acar.s

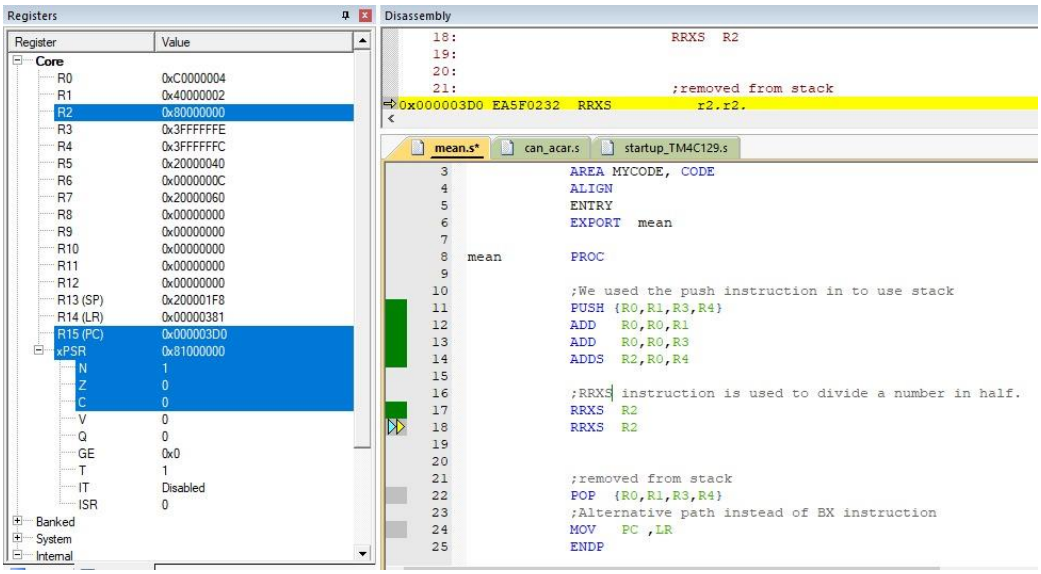
```
1
2
3               AREA MYCODE, CODE
4               ALIGN
5               ENTRY
6               EXPORT  mean
7
8   mean        PROC
9
10              ;We used the push instruction in to use stack
11              PUSH {R0,R1,R3,R4}
12              ADD   R0,R0,R1
13              ADD   R0,R0,R3
14              ADDS  R2,R0,R4
15
16              ;RRC instruction is used to divide a number in half.
17              RRXS  R2
18              RRXS  R2
19
20
21              ;removed from stack
22              POP  {R0,R1,R3,R4}
23              ;Alternative path instead of BX instruction
24              MOV   PC ,LR
25              ENDP
```

ALGORITHM and CODE

- First, I defined the values given in the question. And then these values are recorded in registers. **EQU** instruction was used for defining operations, and **LDR** instruction was used to register to the Register.
- The values given afterwards were recorded in the addresses with **STR** instruction. For example, R1 value is written to the address in R5, starting from the R6 offset.
- The most important part; BL instruction is used when entering subroutine. Here the LR of the next step is kept.
- On the Mean blog, numbers were collected and averaged. Adding 4 numbers, the number became 33 bits and 1 bit went to hand. Here, when making division, the **RRXS** instruction was used and the number was divided including the hand bit.
- When exiting subroutine, instead of BX; Actually, when entering the subroutine, we said that the BL instruction holds the LR of the next step. Program Counter ; It is the register that performs operation in programs. If the PC value is LR, the subroutine output is provided.(**MOV PC, LR**)
- Finally, the average value in the R2 register is subtracted from each element and stored starting at address 0x00000060.

- **PUSH** and **POP** commands provide input and output to stacks.
- **ADDS** instruction also adds by checking the hand bit.

RRXS insturaction



- The visual shows the status of the registers while running the RRXS instruction.

KODLAR
MAİN

```
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num4            EQU 0x3FFFFFFC

;address initial values
adress1         EQU     0X20000040
adress2         EQU     0X20000060


                AREA MYCODE, CODE
                ALIGN
                ENTRY
                EXPORT __main
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__main
                ;the given has been saved to the register
                LDR     R0, = num1
                LDR     R1, = num2
                LDR     R3, = num3
                LDR     R4, = num4
                LDR     R5, = adress1
                LDR     R7, = adress2

                ;r6 is offset value for the save process
                ;values recorded in registers R0, R2, R3, R4
                ;numbers saved starting from address 0X20000040
                MOV     R6,#0
                STR     R0,[R5,R6]
                ADD     R6,R6,#4
                STR     R1,[R5,R6]
                ADD     R6,R6,#4
                STR     R3,[R5,R6]
                ADD     R6,R6,#4
                STR     R4,[R5,R6]
```

```
                ;subroutine
                BL              mean


                ;We calculated the R2 value in subroutine
                ;Given the question; I subtract the average value from the given numbers
                SUB             R0,R0,R2
                SUB             R1,R1,R2
                SUB             R3,R3,R2
                SUB             R4,R4,R2

                ;r6 is offset value for the save process
                MOV             R6,#0

                ;The last step is the value of the subtraction operations, starting from the address 0X20000060.
                STR             R0,[R7,R6]
                ADD             R6,R6,#4
                STR             R1,[R7,R6]
                ADD             R6,R6,#4
                STR             R3,[R7,R6]
                ADD             R6,R6,#4
                STR             R4,[R7,R6]


loop            B               loop
                END
```

Subroutines

```
                AREA MYCODE, CODE
                ALIGN
                ENTRY
                EXPORT  mean

mean            PROC

                ;We used the push instruction in to use stack
                PUSH {R0,R1,R3,R4}
                ADD         R0,R0,R1
                ADD         R0,R0,R3
                ADDS  R2,R0,R4

                ;RRXS instruction is used to divide a number in half.
                RRXS  R2
                RRXS  R2


                ;removed from stack
                POP  {R0,R1,R3,R4}
                ;Alternative path instead of BX instruction
                MOV   PC ,LR
                ENDP
```