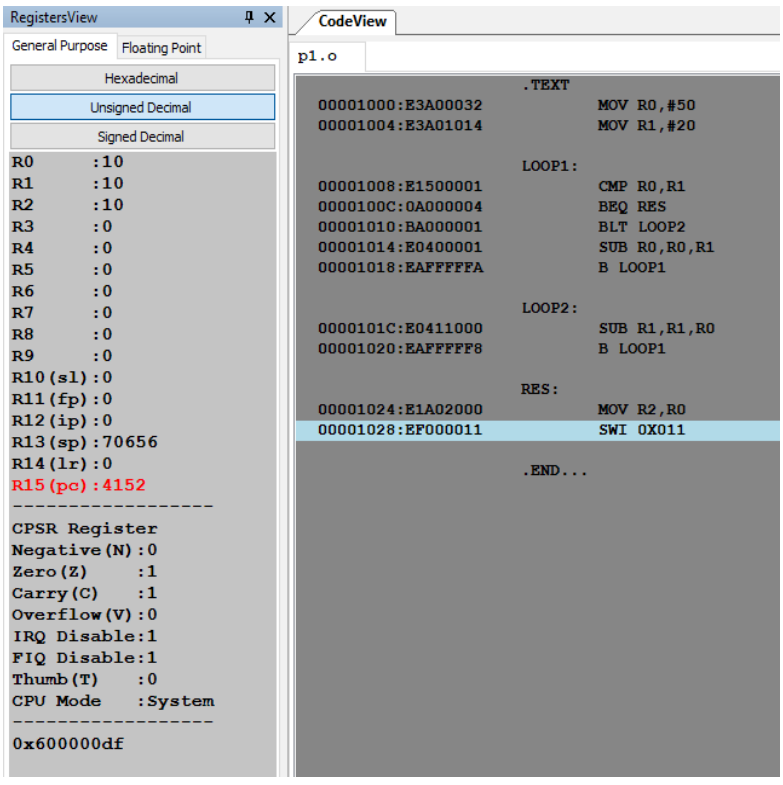
H M Mythreya
PES2UG20CS130
MPCA-Lab Week-3

Task 1: Write a program in ARM7TDMI-ISA to find GCD of two numbers.

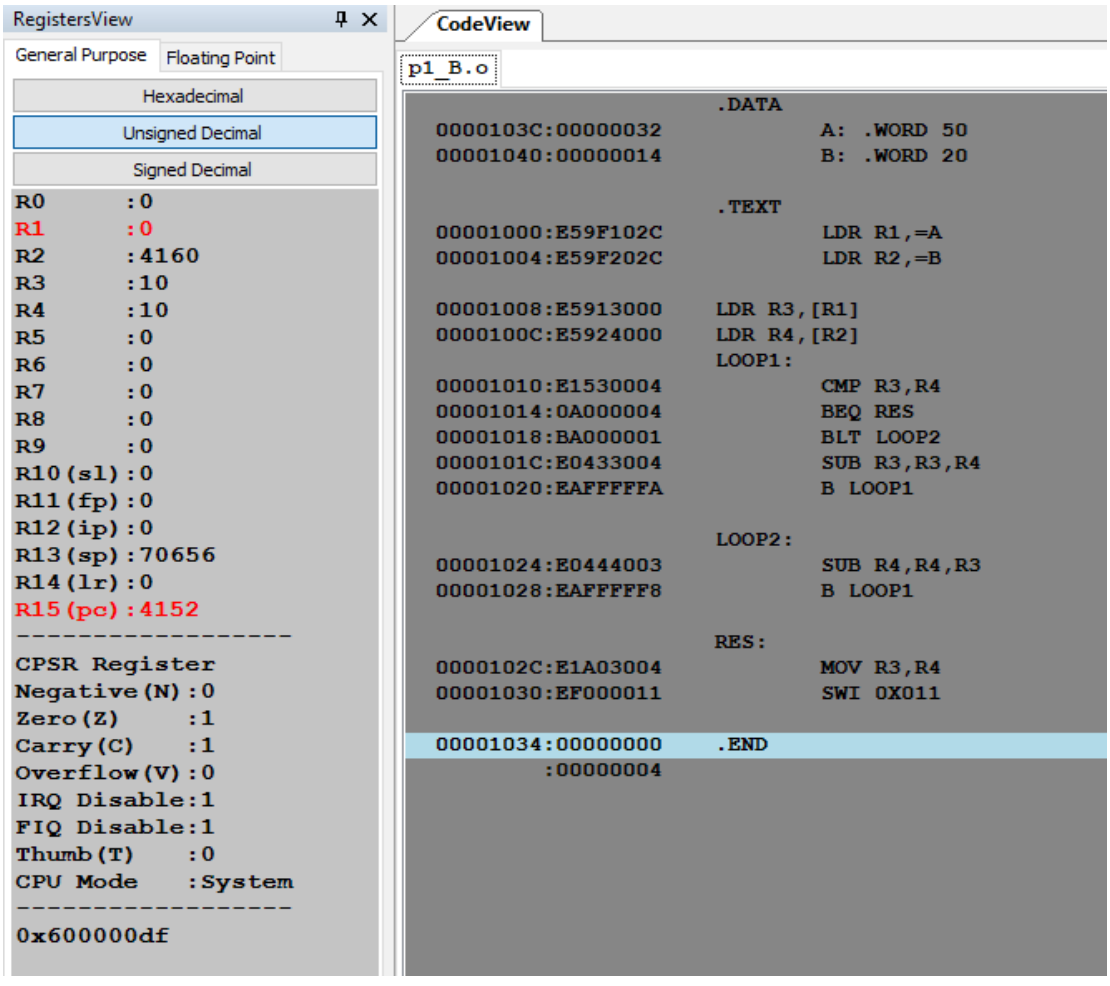
a) Operands in CPU registers

```
.TEXT
      MOV R0,#50
      MOV R1,#20

LOOP1:
      CMP R0,R1
      BEQ RES
      BLT LOOP2
      SUB R0,R0,R1
      B LOOP1

LOOP2:
      SUB R1,R1,R0
      B LOOP1

RES:
      MOV R2,R0
      SWI 0X011

.END
```



b) Operands in memory locations.

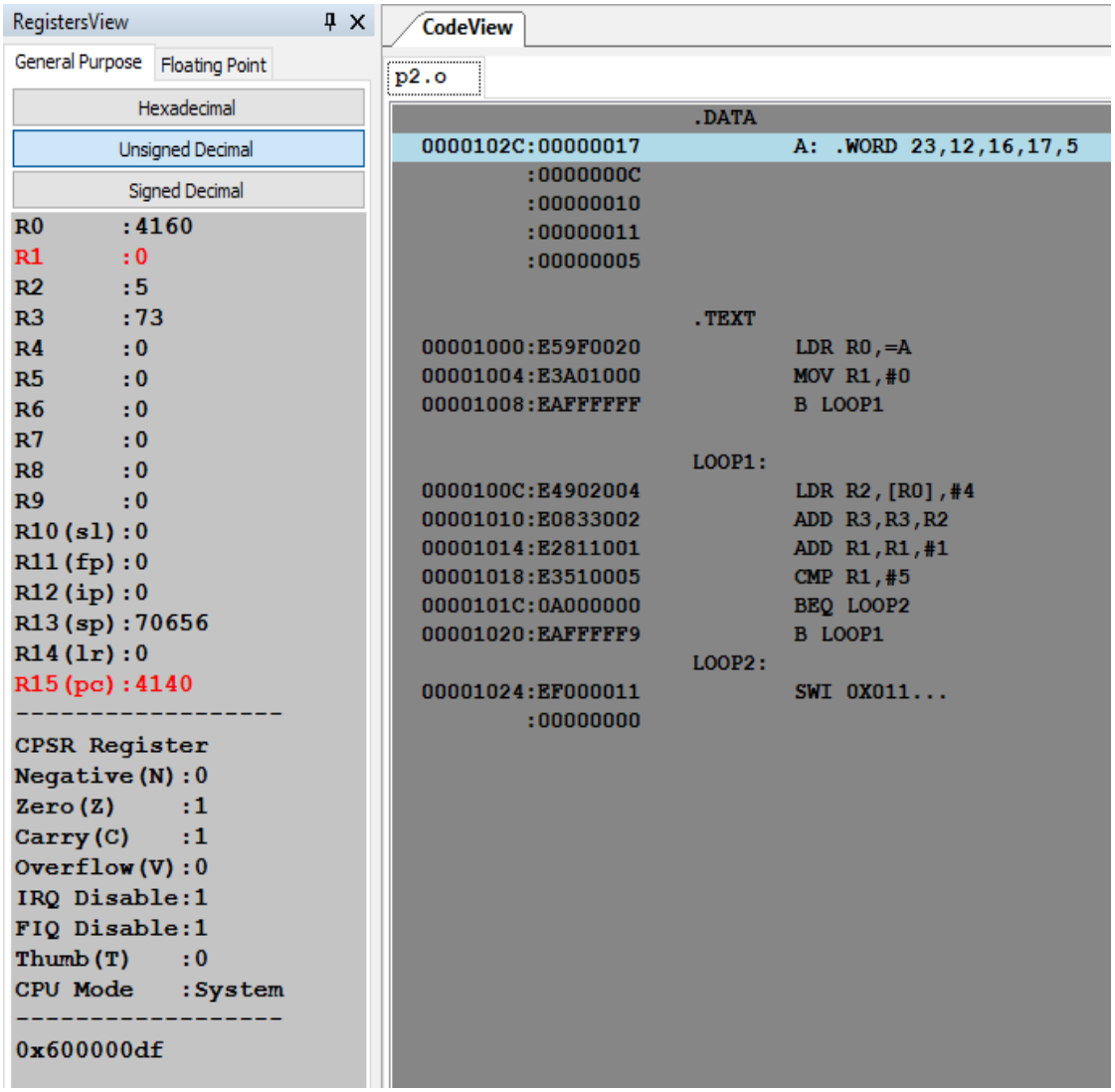
```
.DATA
      A: .WORD 50
      B: .WORD 20

.TEXT
      LDR R1,=A
      LDR R2,=B

LDR R3,[R1]
LDR R4,[R2]
LOOP1:
      CMP R3,R4
      BEQ RES
      BLT LOOP2
      SUB R3,R3,R4
      B LOOP1

LOOP2:
      SUB R4,R4,R3
      B LOOP1

RES:
      MOV R3,R4
      SWI 0X011

.END
```



2) Write a program in ARM7TDMI-ISA to find the sum of N data items in the memory. Store the result in the memory location

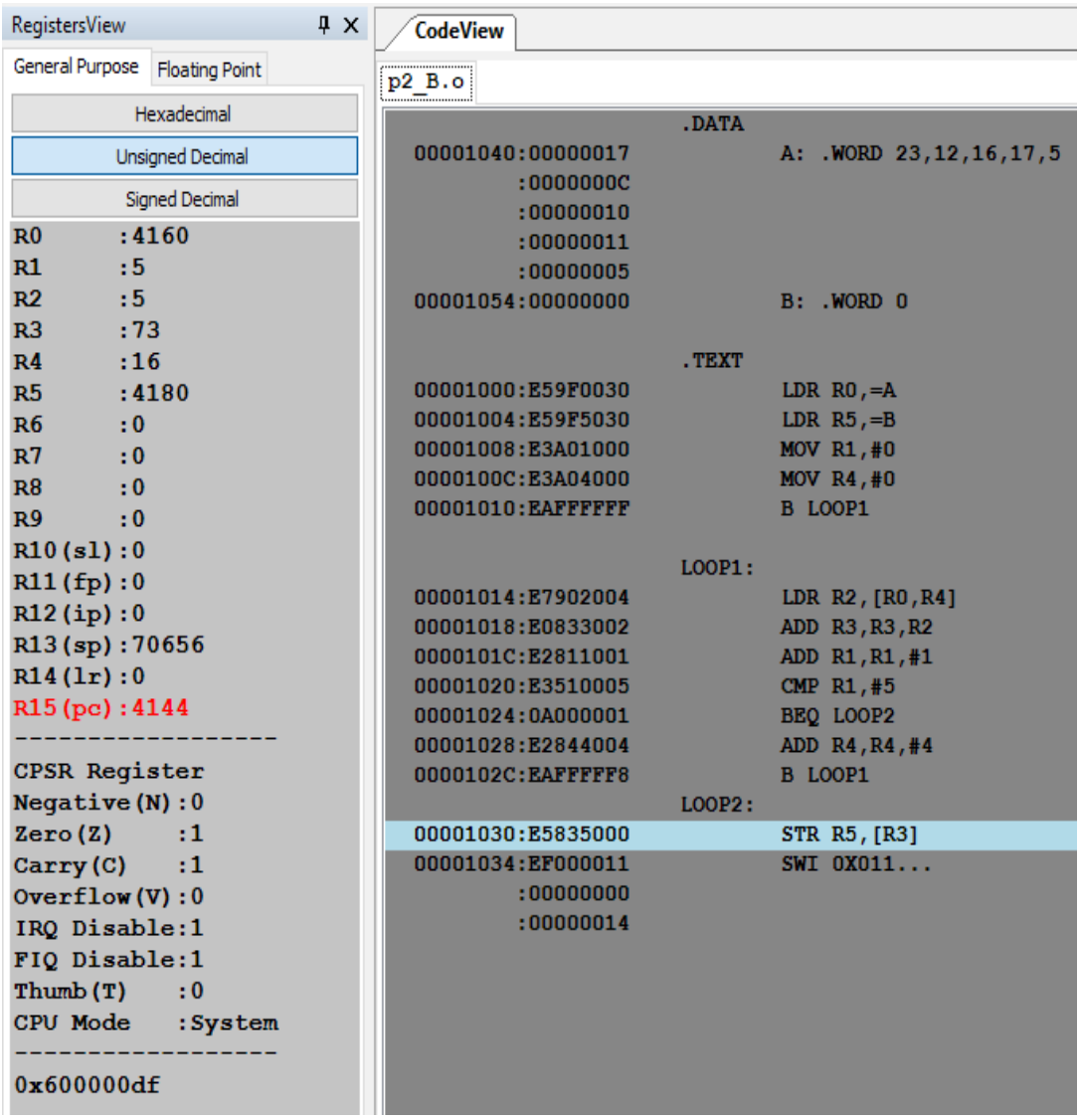
a) Post-indexing addressing mode.

```
.DATA
      A: .WORD 23,12,16,17,5

.TEXT
      LDR R0,=A
      MOV R1,#0
      B LOOP1

LOOP1:
      LDR R2,[R0],#4
      ADD R3,R3,R2
      ADD R1,R1,#1
      CMP R1,#5
      BEQ LOOP2
      B LOOP1
LOOP2:
      SWI 0X011
```



b) Pre-indexing addressing mode.

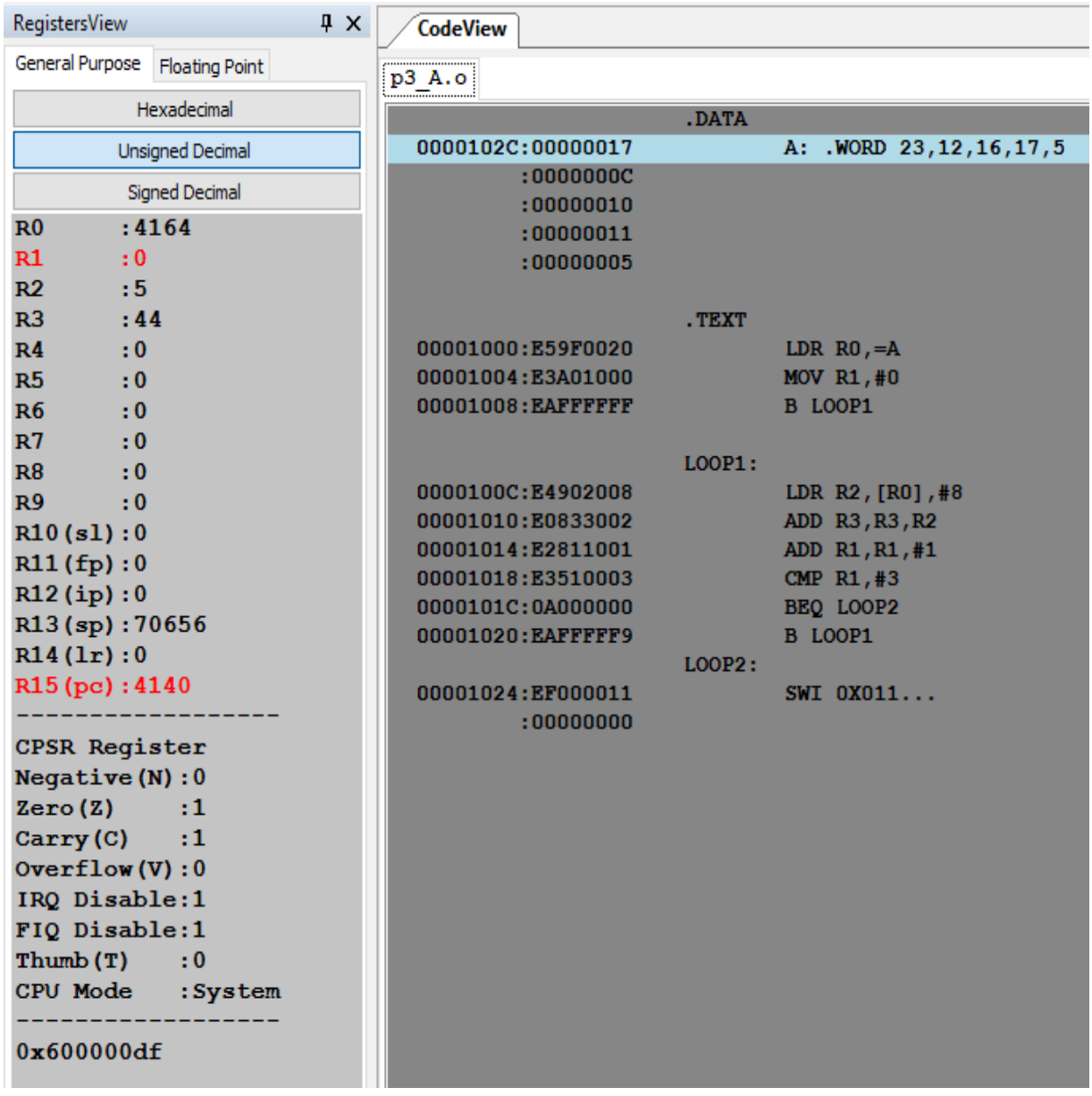
```
.DATA
      A: .WORD 23,12,16,17,5
      B: .WORD 0
.TEXT
      LDR R0,=A
      LDR R5,=B
      MOV R1,#0
      MOV R4,#0
      B LOOP1
LOOP1:
      LDR R2,[R0,R4]
      ADD R3,R3,R2
      ADD R1,R1,#1
      CMP R1,#5
      BEQ LOOP2
      ADD R4,R4,#4
      B LOOP1
LOOP2:
      STR R5,[R3]
      SWI 0X011
```



3) Write a program in ARM7TDMI-ISA to find the sum of N data items at alternate [odd or even positions] locations in the memory. Store the result in the memory location

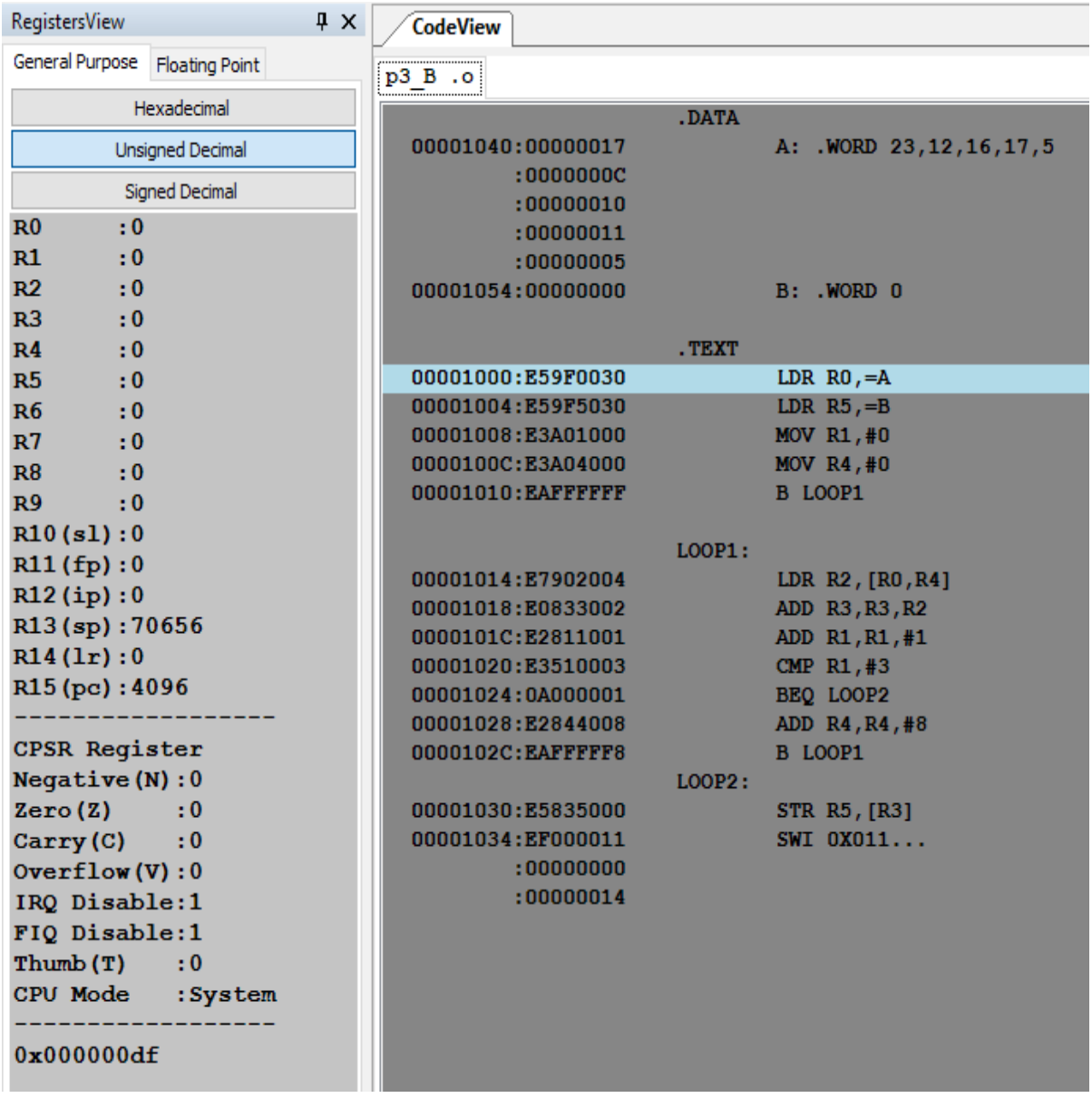
a) Post-indexing addressing mode.

```
.DATA
      A: .WORD 23,12,16,17,5

.TEXT
      LDR R0,=A
      MOV R1,#0
      B LOOP1

LOOP1:
      LDR R2,[R0],#8
      ADD R3,R3,R2
      ADD R1,R1,#1
      CMP R1,#3
      BEQ LOOP2
      B LOOP1
LOOP2:
      SWI 0X011
```



b) Pre-indexing addressing mode.

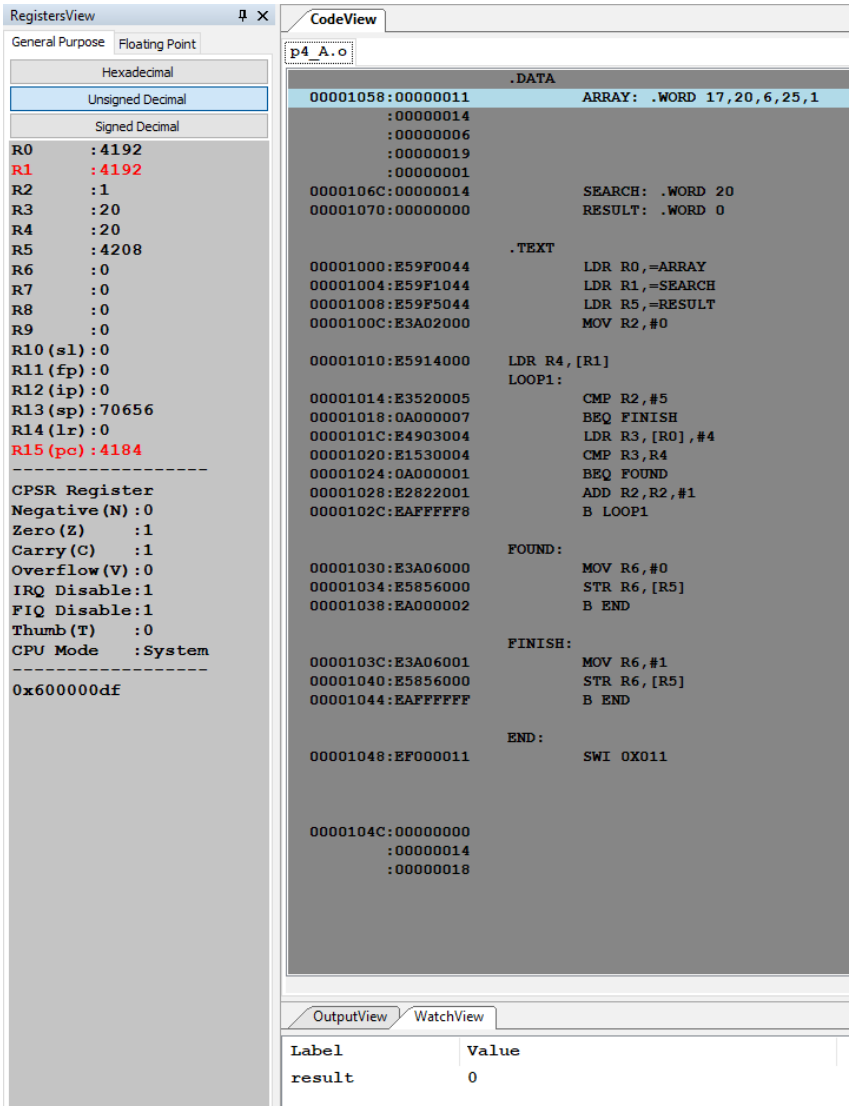
```
.DATA
      A: .WORD 23,12,16,17,5
      B: .WORD 0

.TEXT
      LDR R0,=A
      LDR R5,=B
      MOV R1,#0
      MOV R4,#0
      B LOOP1

LOOP1:
      LDR R2,[R0,R4]
      ADD R3,R3,R2
      ADD R1,R1,#1
      CMP R1,#3
      BEQ LOOP2
      ADD R4,R4,#8
      B LOOP1
LOOP2:
      STR R5,[R3]
      SWI 0X011
```



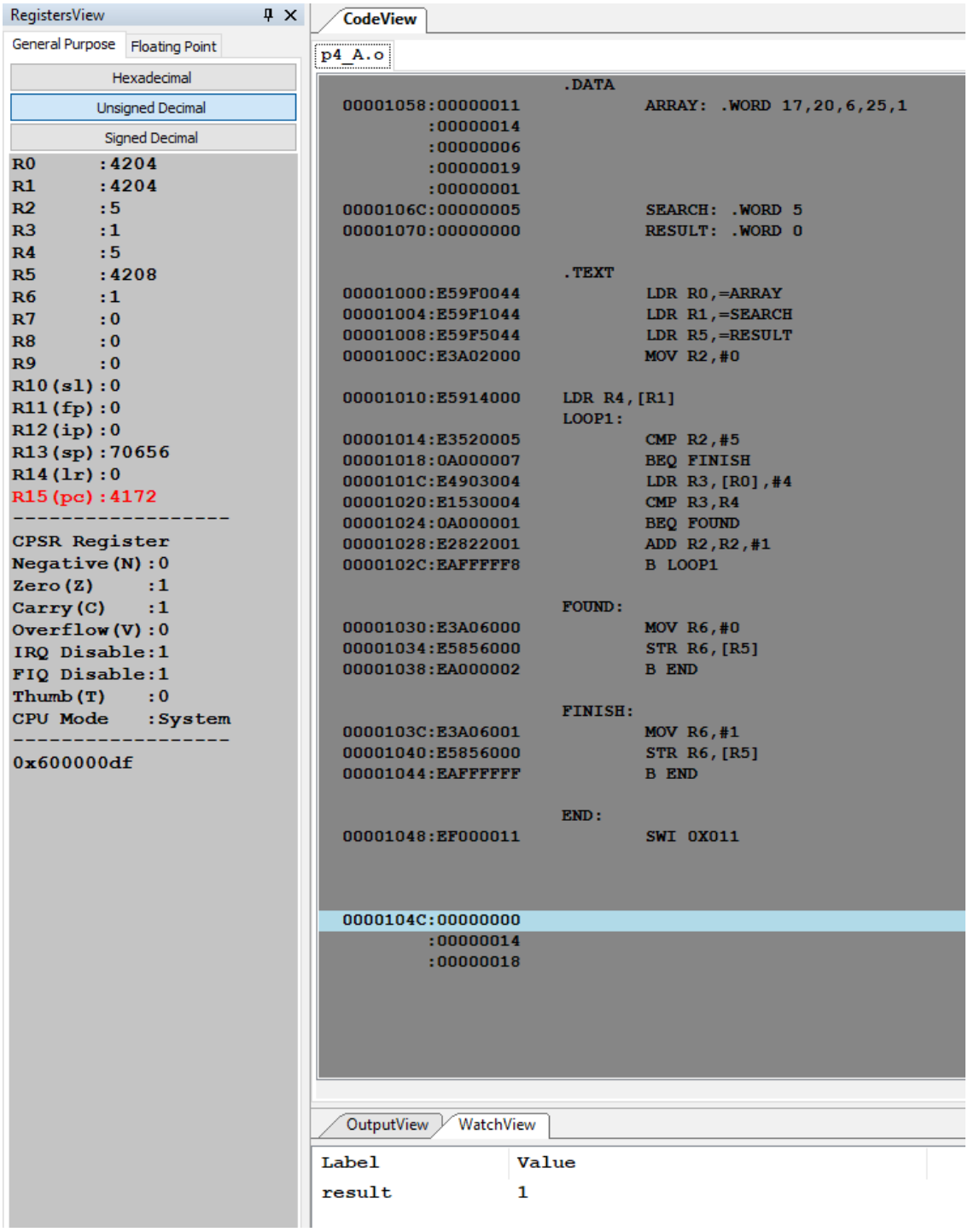
4)Write a program in ARM7TDMI-ISA to search for an element in an array. Store 00 if the search is unsuccessful and 01 if the search is successful in the register.

a) Linear-Search (Found condition)

```
.DATA
      ARRAY: .WORD 17,20,6,25,1
      SEARCH: .WORD 20
      RESULT: .WORD 0

.TEXT
      LDR R0,=ARRAY
      LDR R1,=SEARCH
      LDR R5,=RESULT
      MOV R2,#0

LDR R4,[R1]
LOOP1:
      CMP R2,#5
      BEQ FINISH
      LDR R3,[R0],#4
      CMP R3,R4
      BEQ FOUND
      ADD R2,R2,#1
      B LOOP1

FOUND:
      MOV R6,#0
      STR R6,[R5]
      B END

FINISH:
      MOV R6,#1
      STR R6,[R5]
      B END

END:
      SWI 0X011
```

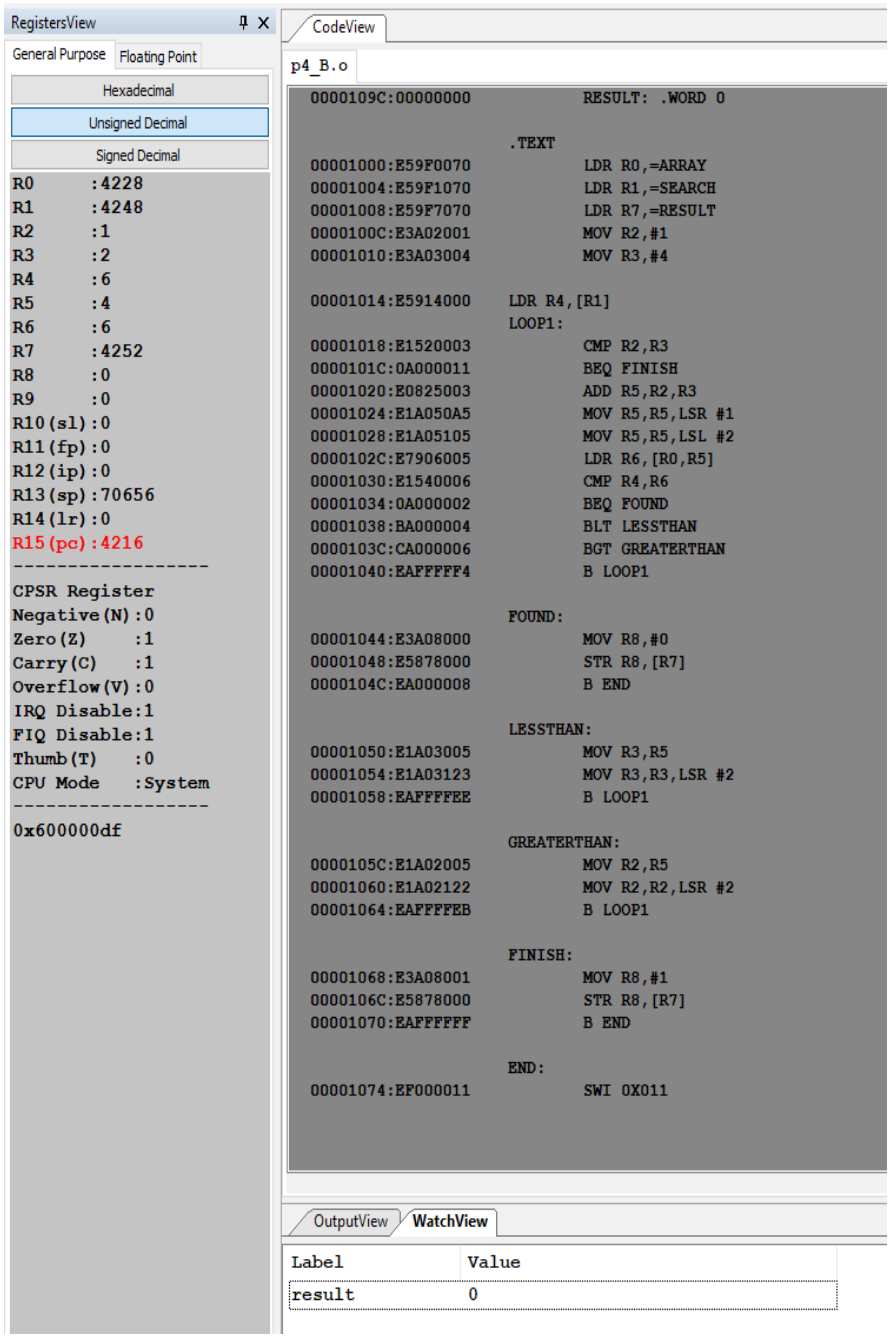


Not found Condition:



a) Binary-Search (Found condition)

```
.DATA
	ARRAY: .WORD 1,6,17,20,25
	SEARCH: .WORD 6
	RESULT: .WORD 0

.TEXT
	LDR R0,=ARRAY
	LDR R1,=SEARCH
	LDR R7,=RESULT
	MOV R2,#1
	MOV R3,#4

LDR R4,[R1]
LOOP1:
	CMP R2,R3
	BEQ FINISH
	ADD R5,R2,R3
	MOV R5,R5,LSR #1
	MOV R5,R5,LSL #2
	LDR R6,[R0,R5]
	CMP R4,R6
	BEQ FOUND
	BLT LESSTHAN
	BGT GREATERTHAN
	B LOOP1
FOUND:
	MOV R8,#0
	STR R8,[R7]
	B END

LESSTHAN:
	MOV R3,R5
	MOV R3,R3,LSR #2
	B LOOP1

GREATERTHAN:
	MOV R2,R5
	MOV R2,R2,LSR #2
	B LOOP1

FINISH:
	MOV R8,#1
	STR R8,[R7]
	B END

END:
	SWI 0X011
```



Not Found Condition: