ICS_HM06_solutions

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1.

- 256 . because the trap vector has 8 bits
- because the two routinues may be in different pages, the 9-bits pcoffset can't express the address.
- 3 .
    - Firstly, save pc and psr in Saved.ssr.
    - Next, get the content of the trap vector(extended).
    - Then jump to the instructions where the subroutinue locates.

2.

First in, last out.

3.

- push push pop push pop push push pop push pop pop pop push push push pop pop pop
- It's the catalan num $\frac{\binom{2n}{n}}{n+1}$ let n be 4, so the result is 14

4.

```
        ;R6 IS THE STACK POINTER
        ;THE DATA IS STORED IN R1,R0, TO FORM A NUM
        ;R5 STORES THE INFO THAT INDICATES SUCCESS(0) OR FAILURE(1)
POP     ST R2,SAVER2
        LD R2,BASE
        ADD R2,R2,R6
        ADD R2,R2,#2
        BRz     FAIL
        LDR R0,R6,#0
        ADD R6,R6,#1
        LDR R1,R6,#0
        ADD R6,R6,#1
        BRnzp EXIT

PUSH    ST R2,SAVER2
        ST R3,SAVER3
        LD R2,BASE
        ADD R2,R6,R2
        ADD R2,R2,#-2
```

```
        LD R3,MAX
        ADD R2,R2,R3
        BRn     FAIL
        STR R1,R6,#0
        ADD R6,R6,#-1
        STR R0,R6,#0
        ADD R6,R6,#-1
        LD R3,SAVER3

EXIT    LD R2,SAVER2
        AND R5,R5,#0
        RET
FAIL    LD R2, SAVER2
        AND R5, R5,#0
        ADD R5,R5,#1
        RET



SAVER3  .BLKW   1
SACER2  .BLKW   1
BASE    .FILL   XB000  ; -X4000
MAX     .FILL   X20
```

5.

output EE some

6.

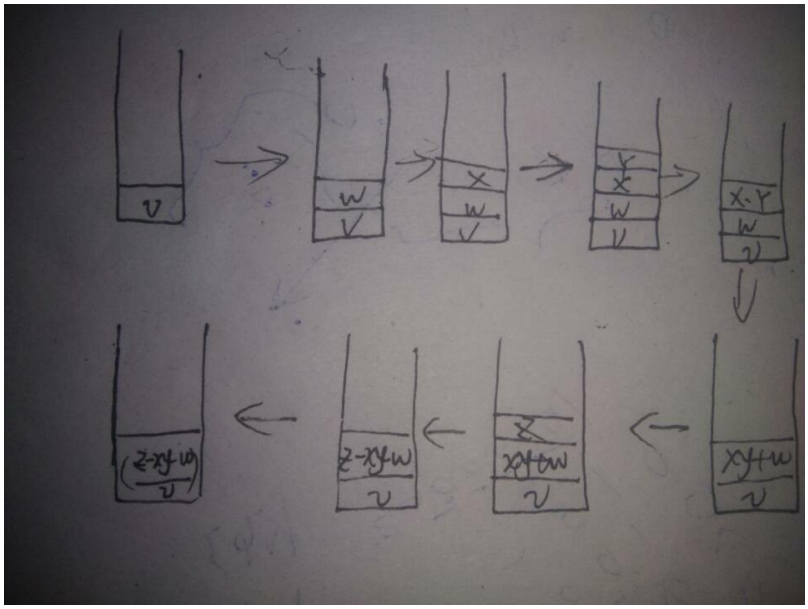
R7 stores the pc of the caller's next instruction. In the subroutine, Store the value of R7 wherever R7 is uesd (such as trap routinue)

the modified routine is as blow

```
        .ORIG x020F
START   LDR R1, R0, #0
        BRz DONE
        ST R0, SAVER0
        ADD R0, R1, #0
        ST R7,SAVER7
        TRAP x21
        LD R7,SAVER7
        LD R0, SAVER0
A       ADD R0, R0, #1
        BRnzp START
DONE    RET
```

```
SAVER7 .BLKW 1
SAVER0 .BLKW #1
        .END
```

7.

- a 

$$u = \frac{z-xy-w}{v}$$

- b

```
PUSH A
PUSH C
ADD
PUSH B
PUSH C
SUB
PUSH A
MUL
PUSH D
ADD
POP E
```