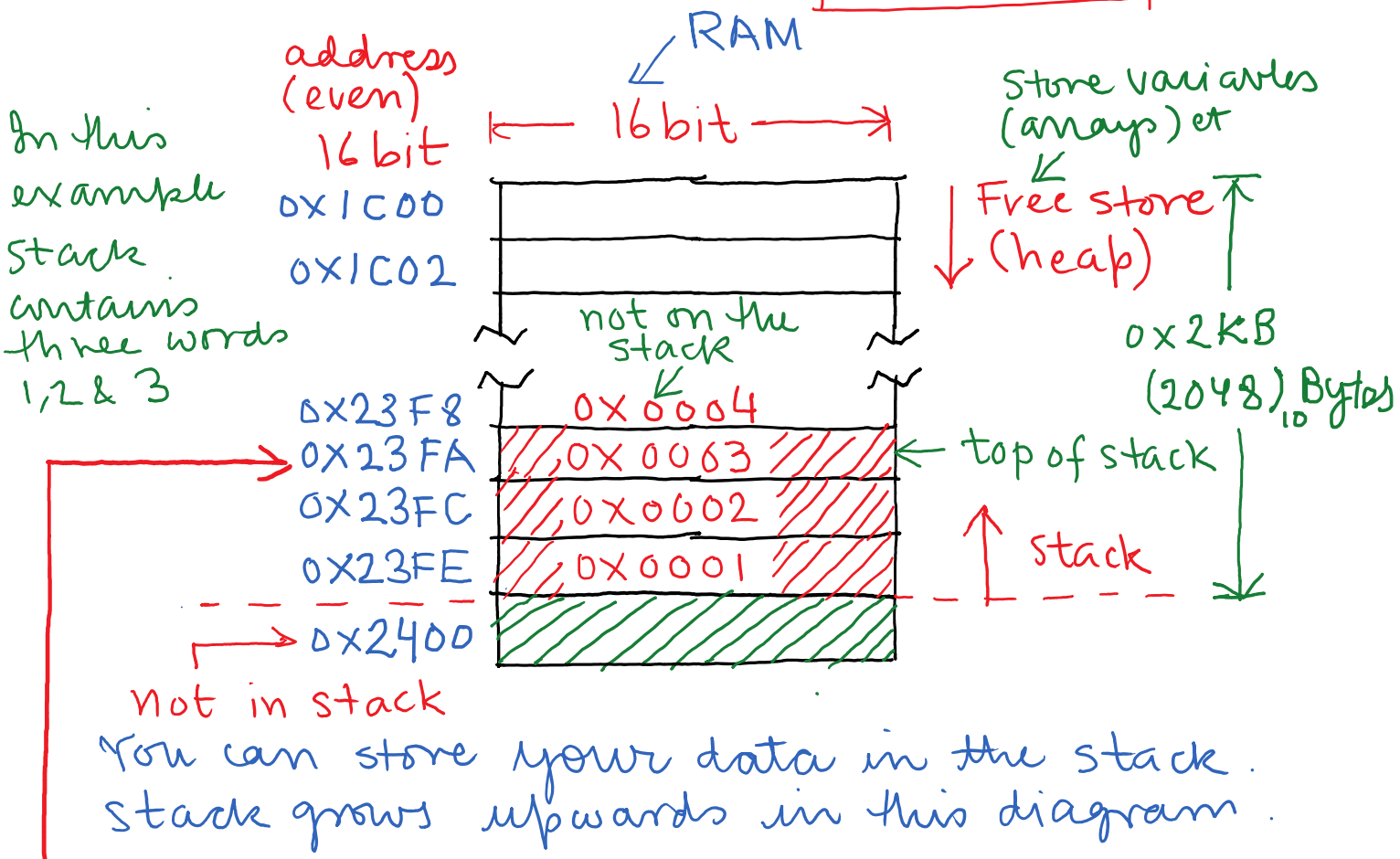
STACK



You can store your data in the stack.
Stack grows upwards in this diagram.

SP contains 0x23FA

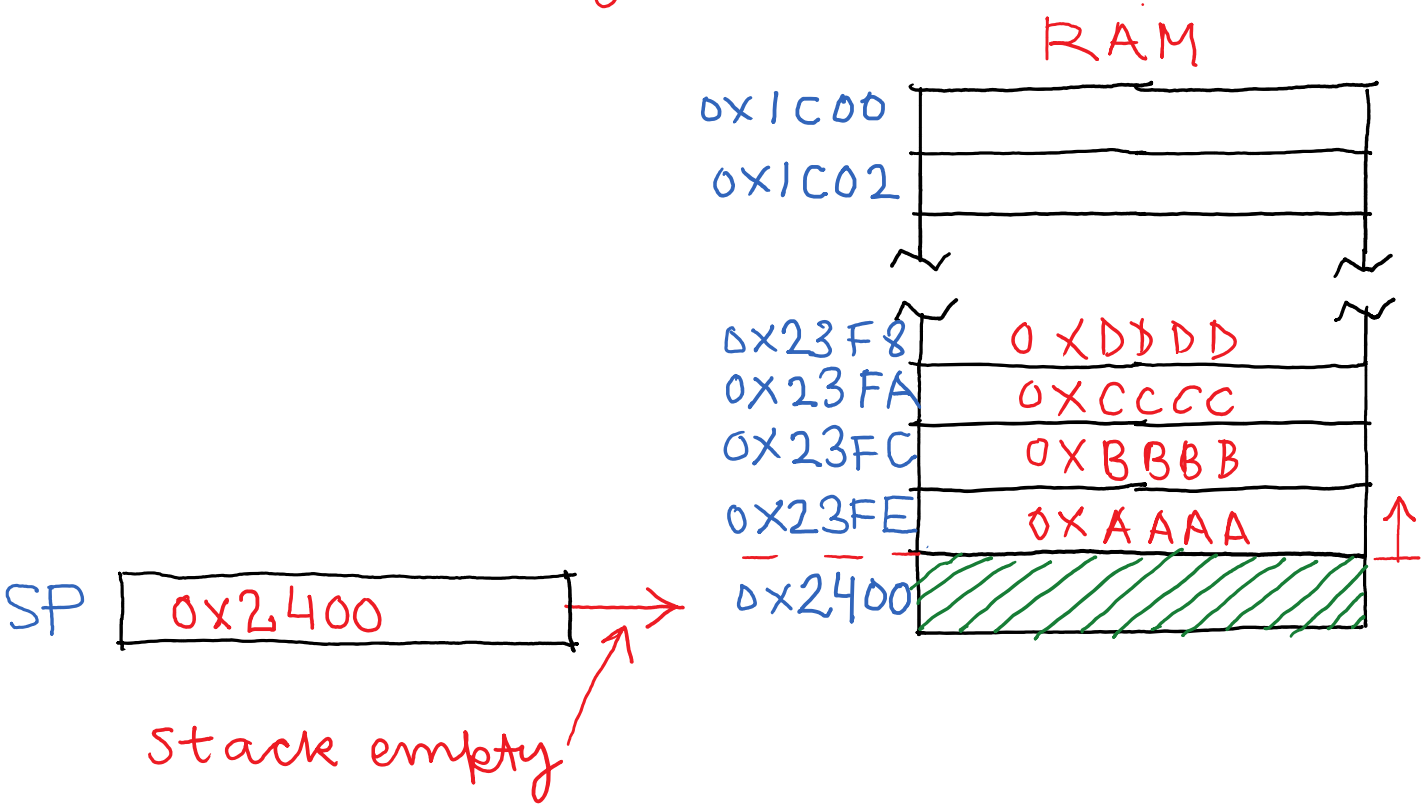
Program Counter	PC/R0
Stack Pointer	SP/R1
Status Register	SR/CG1/R2
Constant Generator	CG2/R3
General-Purpose Register	R4
General-Purpose Register	R5
General-Purpose Register	R6
General-Purpose Register	R7
General-Purpose Register	R8
General-Purpose Register	R9
General-Purpose Register	R10
General-Purpose Register	R11
General-Purpose Register	R12
General-Purpose Register	R13
General-Purpose Register	R14
General-Purpose Register	R15

SP contains the address (i.e points to) of the top of the stack

Core registers

SP determines where the top of the stack is i.e, it determines how many words are on the stack

Empty Stack

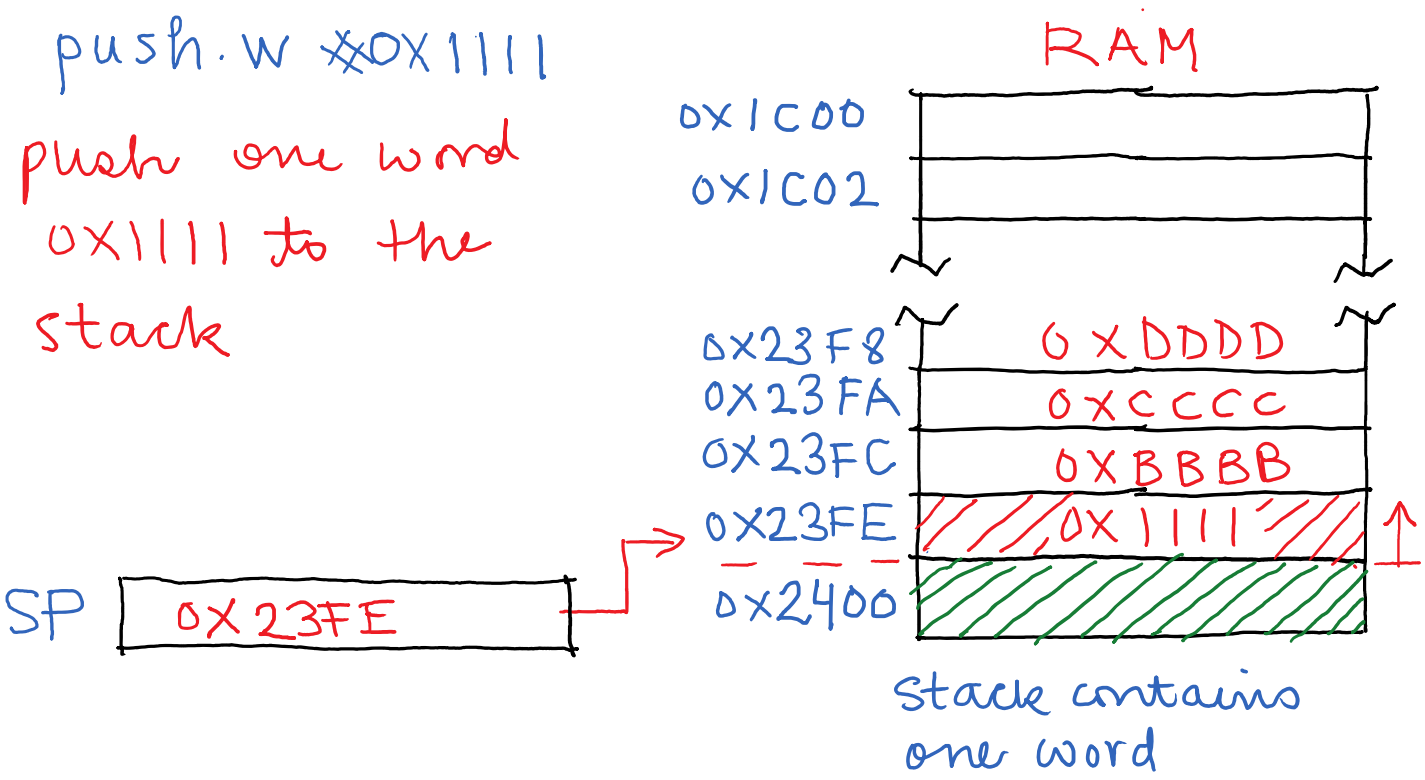



```
RESET     mov.w  #__STACK_END, SP      ; Initialize stackpointer
```

It is your job to initialize the stack pointer to 0x2400 at program startup

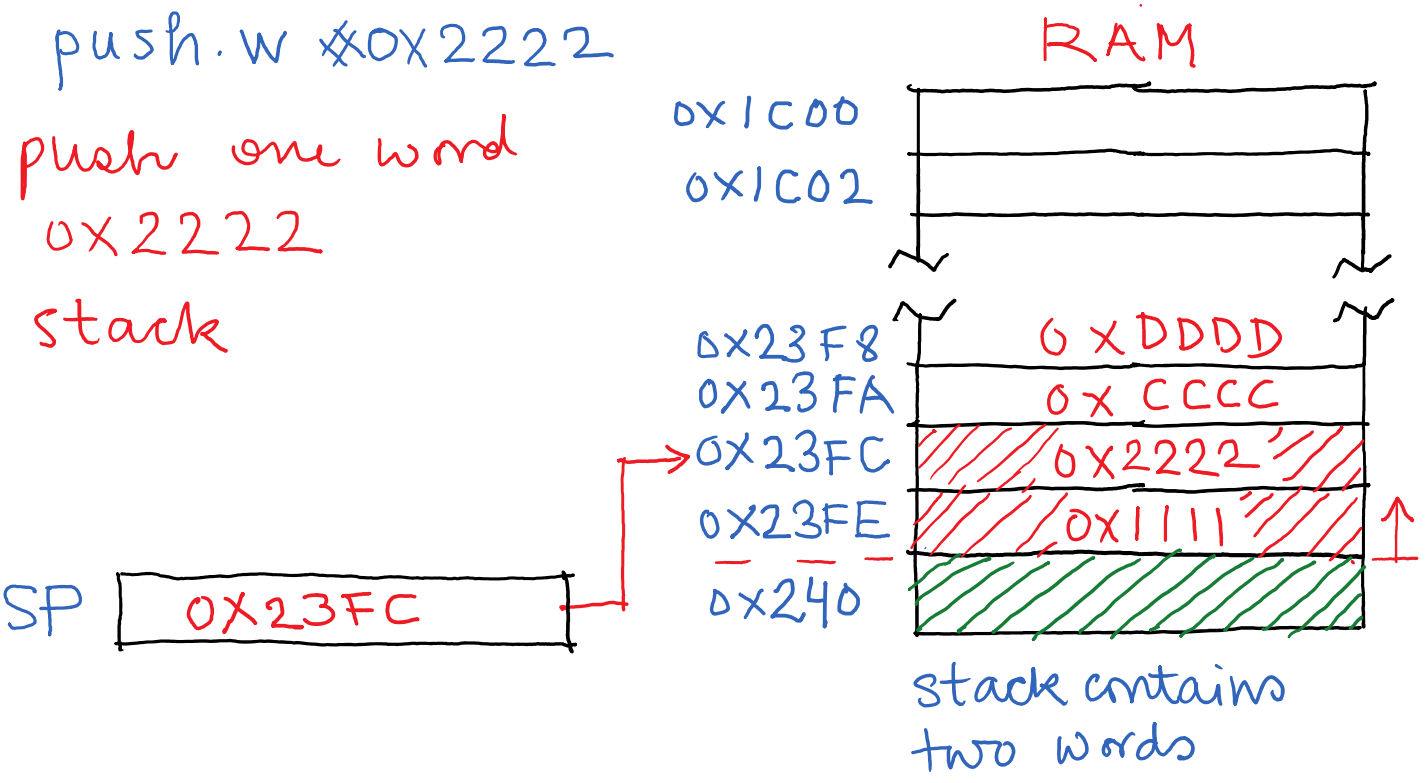
push.w #0X1111

push one word 0X1111 to the stack



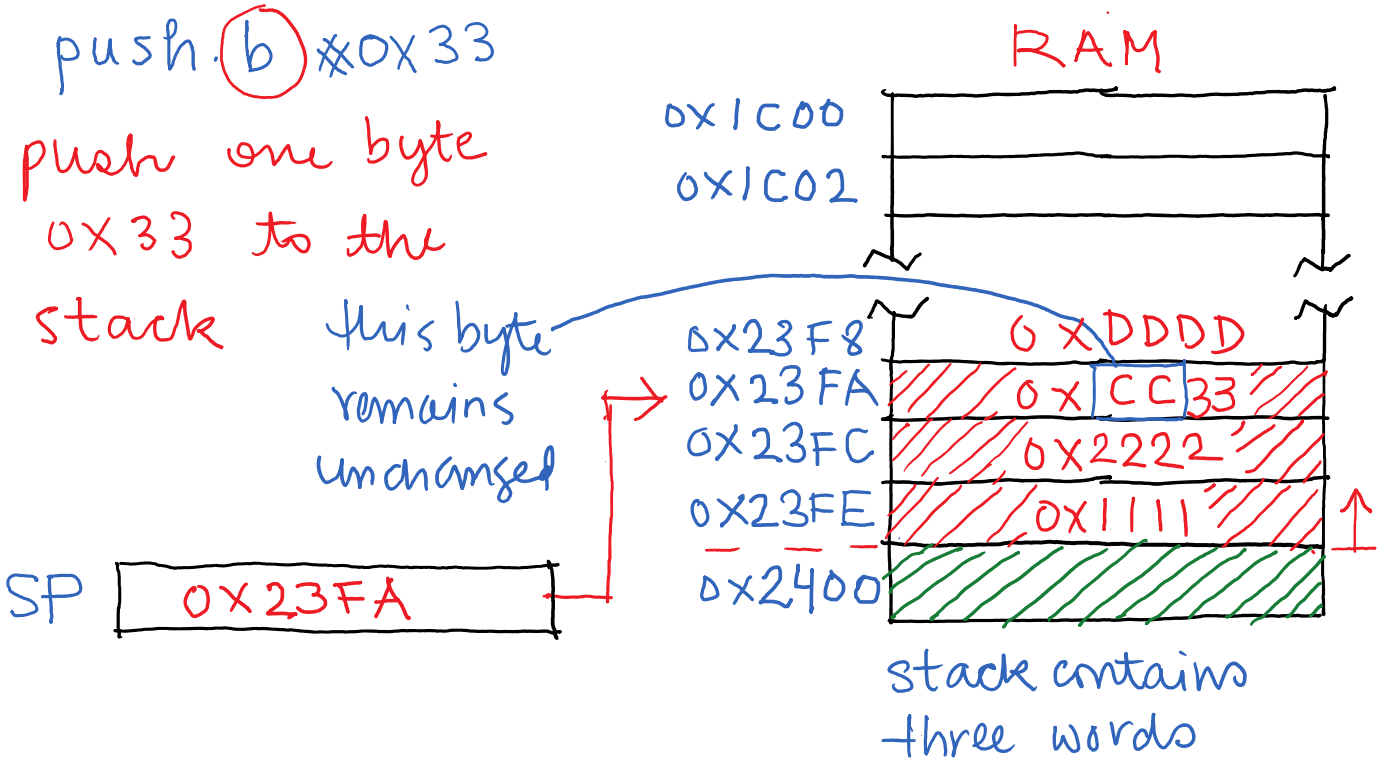
push.w #0X2222

push one word 0X2222 stack



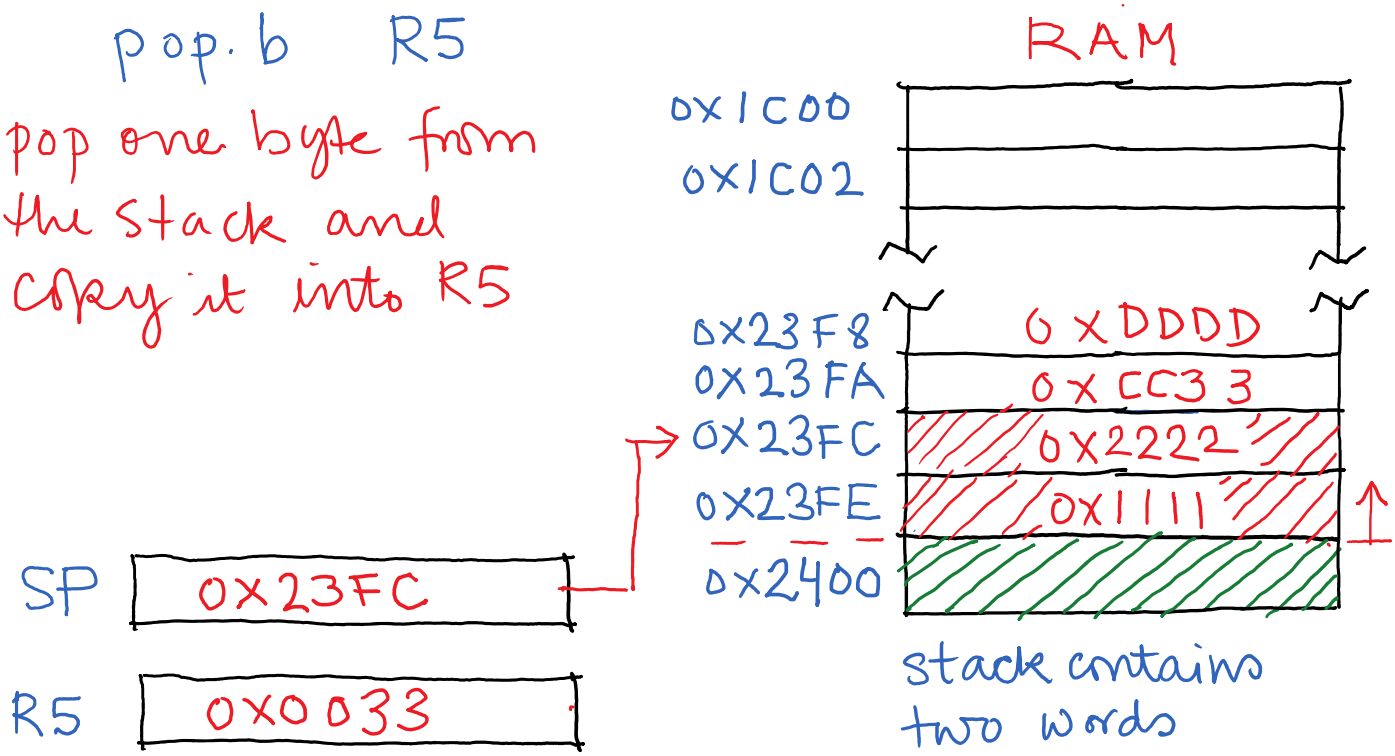
push.b #0x33

push one byte 0x33 to the stack



pop.b R5

pop one byte from the stack and copy it into R5

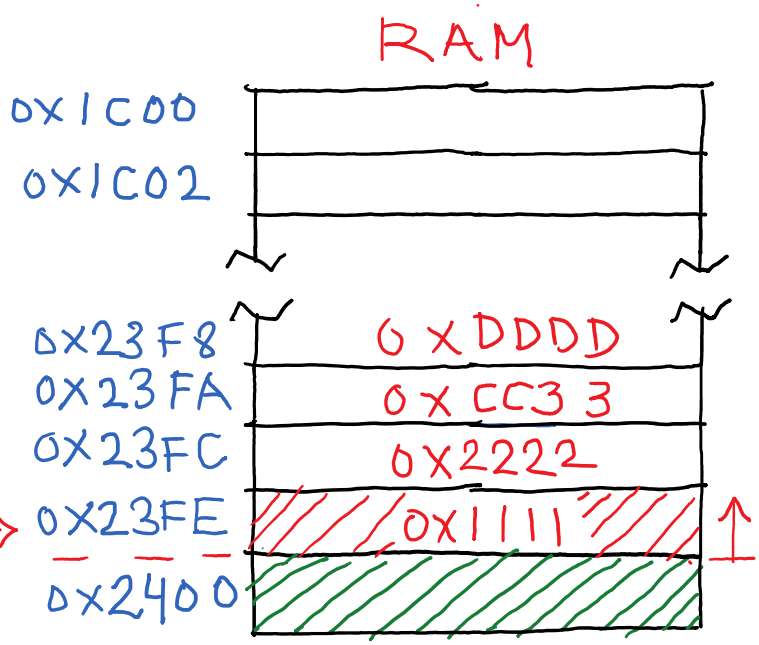


Note: R5 would contain 0xcc33 if we had used pop.W R5 instead

pop.W &x

pop one word from the stack and copy it into x

x contains 0X2222

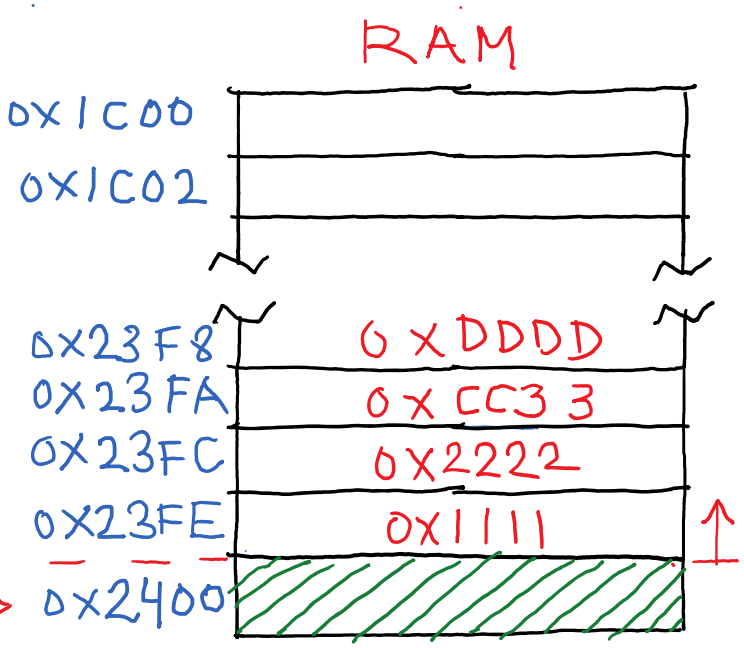


stack contains one word

pop.W &y

pop one word from the stack and copy it into y

y contains 0X1111



stack is empty

Program: Stack1

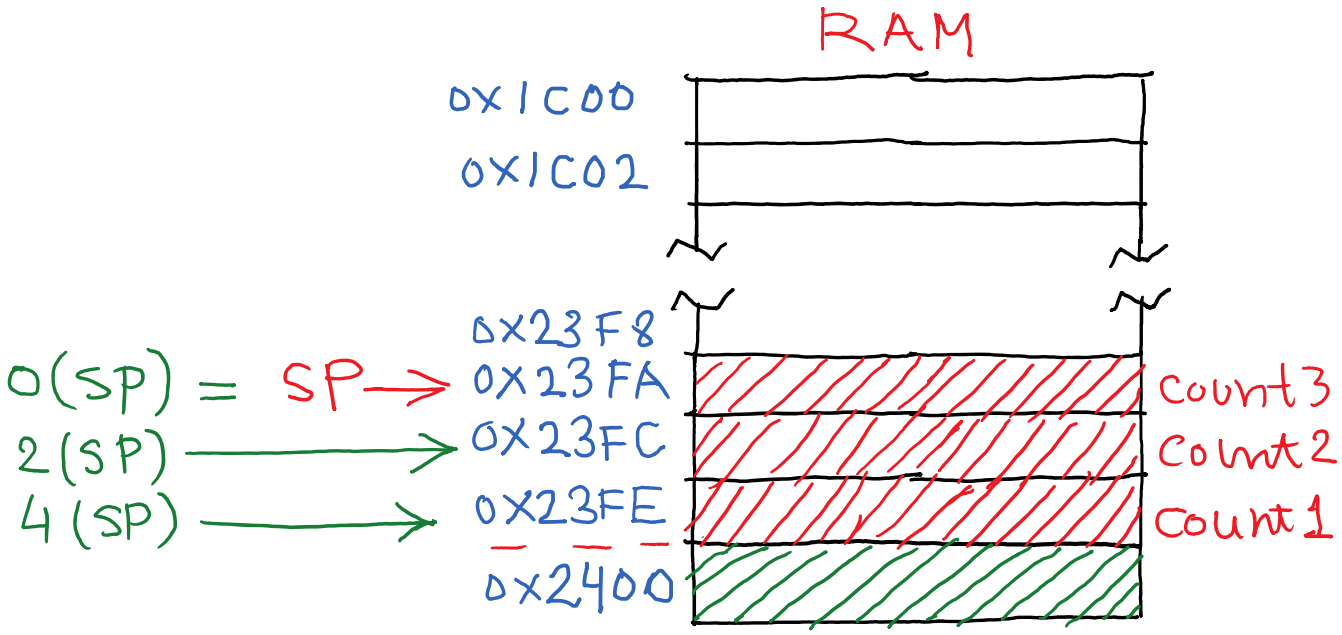
```
        .data
x:              .space      2
y:              .space      2

; To be consistent with the class lessons, before running the program use the
; memory browser to place 0xAAAA, 0xBBBB, 0xCCCC, and 0xDDDD at the
; bottom of the stack

;-------------------------------------------------------------------------
        .text
                    …
            push.w      #0x1111
            push.w      #0x2222
            push.b      #0x33
            pop.b       R5              ; 0033 gets copied to R5
            ;pop.w      R5              ; CC33 gets copied to R5
            pop.w       &x
            pop.w       &y

loop:       jmp   loop
```

Save local variables on the stack

Example: We need three word length Variables count1, count2 & count3

At the beginning of your program:

sub.w #6, SP ← set aside 3 words on the stack



Initialize variables

```
mov.w  #0, 0(SP)
mov.w  #0, 2(SP)
mov.w  #0, 4(SP)
```

Use the variables 0(SP), 2(SP) & 4(SP)

When done, always release space occupied by the variables

```
add.w  #6, SP
```

Example: Use local variables instead of global variables

```
        .data
a:              .byte       3, 6, 3, 1, 3, 6, 0, 3, 0, 3
```

Count how many elements of a are equal to 3, how many are equal to 6 and how many are not equal to either 3 or 6.

Pseudo-code:

Use local variables for count1, count2 and count3

```
count1 = 0
count2 = 0
count3 = 0

for( i = 0;   i < 10;   ++i)
{
   switch( a[i] )
   {
       case 3:
            ++count1
            break
       case 6:
            ++count2
            break
       default:
            ++count3
            break
     }
}
```

Program: StackVariables1

```
.data
a:                      .byte    3, 6, 3, 1, 3, 6, 0, 3, 0, 3
;-------------------------------------------------------------------------
        .text
                                ...
; create 3 word length local variables on the stack
                sub.w   #6, SP                  ; set aside space for 3 words on the stack
                mov.w #0, 0(SP)                 ; initialize count3
                mov.w #0, 2(SP)                 ; initialize count2
                mov.w #0, 4(SP)                 ; initialize count1

;--------------- for-loop (alternate implementation)---------------------------
                mov.w #0, R5                    ; i = 0
for_cond:
                cmp.w #10, R5                           ; (i >= 10) = ~(i<10)
                jge             for_break

;--------------- switch-case structure ----------------------------------------

                cmp.b  #3, a(R5)
                jeq             stuff1_label

                cmp.b  #6, a(R5)
                jeq             stuff2_label

                inc.w   0(SP)   ; defaultstuff
                jmp             switch_break

stuff2_label:
                inc.w   2(SP)
                jmp             switch_break
stuff1_label:
                inc.w   4(SP)
switch_break:
;--------------- switch-case structure end -------------------------------------
                inc.w   R5
                jmp     for_cond
for_break:
;--------------- for-loop end--------------------------------------------------
                add.w  #6, SP                   ; release space for 3 words from the stack

loop:           jmp     loop
```