

lab1-report

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Algorithm Explanation

First, we start at the location 0x3000. Then we set R2=0, which will show the result: 1 for yes and 0 for no. Set R1=4, which is a counter to see if test-number is F-word. R0's value is the value at location 0x3100, namely our test number. Now cc =R0.

Then we construct a Loop as below , and break when R0 ==0,which means every bits of test number have been tested.

```
0000 010 000001010    ;; if R0 == 0 break   (BRZ)
...
0000 111  111110101    ;; return if      (BR)
```

Then we judge the highest bit of R0(test-number), by the 2's complement, the highest bit is 1 if it's negative.

The core of my algorithm is that if the highest bit is 1,then R1 = R1 - 1; if is 0,then R1 = 4. Bitwise left shift after every judgement until R0(test-numbe) is 0 or R1 is 0

Thus if R0<0, we do as below:

```
0001 001 001 1 1111    ;; R1 = R1 - 1      (ADD)
0001 000 000 0 00 000   ;; R0 = R0 + R0      (ADD)
```

otherwise, we do as below:

```
0101 001 001 1 00000    ;;R1 <- 0   (AND)
0001 001 001 1 00100     ;;R1 = R1 + 4   (ADD)

0001 000 000 0 00 000    ;; R0 = R0 + R0   (ADD)
```

What's more, if R1 is 0, we need break:

```
0001 001 001 1 00000    ;; R1 = R1 + 0, setcc (ADD)
0000 010 000000010      ;; if R1 == 0 ,break (BR)
0001 000 000 1 00000     ;; R0 = R0 + 0, setcc (ADD)
```

Finally, after the loop is stop, we need to check if R1 is 0 or not. If R1 is 0, test number have 4 continuous 1 and is a F-words, we need to set R2 = 1. Otherwise R2 =0:

```
0001 001 001 1 00000    ;; R1 = R1 + 0 , setcc (BRp)
0000 001 000000001      ;; if R1 > 0 ,jump one step (BR)
0001 010 010 1 00001     ;; R2 = R2 + 1 (ADD)
```

Questions And Answers

1.briefly describe the algorithm.

answer: The core of my algorithm is that if the highest bit is 1, then $R1 = R1 - 1$; if it is 0, then $R1 = 4$. Bitwise left shift after every judgement until $R0$ (test-number) is 0 or $R1$ is 0

2. why your last line is x3100.

answer: To use the LDI instruction. Then we can Load the value at location x3100.

Code

```
;; Check the F-words
0011 0000 0000 0000    ;;put the code to 0x3000
0101 010 010 1 00000    ;;R2 <- 0 ,(show the result: 1 for yes and 0 for no)
0101 001 001 1 00000    ;;R1 <- 0 , (use R1 to judge if it is F-words) (AND)
0001 001 001 1 00100    ;;R1 = R1 + 4 , (use R1 to judge if it is F-words) (ADD)
1010 000 000001111      ;;R0<-M[x3100], setcc (put the test number to R0) (LDI)

0000 010 000001010      ;; if R0 == 0 break (BRz)
0000 100 000000011      ;; if R0 < 0 ,jump three step (BRn)

0101 001 001 1 00000    ;;R1 <- 0 (AND)
0001 001 001 1 00100    ;;R1 = R1 + 4 (ADD)
0000 111 000000001      ;;jump one step (BR)

0001 001 001 1 11111    ;; R1 = R1 - 1 (ADD)
0001 000 000 0 00 000    ;; R0 = R0 + R0 (ADD)
0001 001 001 1 00000    ;; R1 = R1 + 0, setcc (ADD)
0000 010 000000010      ;; if R1 == 0 ,break (BR)
0001 000 000 1 00000    ;; R0 = R0 + 0, setcc (ADD)
0000 111 111110101      ;; return if (BR)

0001 001 001 1 00000    ;; R1 = R1 + 0 , setcc (BRp)
0000 001 000000001      ;; if R1 > 0 ,jump one step (BR)
0001 010 010 1 00001    ;; R2 = R2 + 1 (ADD)

1111 0000 0010 0101     ;; HALT (trap 25)
0011 0001 0000 0000     ;;0x3100
```