Q1. Convert the hexadecimal number 973D4 to base 11. You must show your work. (2 points)

973D4 = 619476	
619476	
56316	0
5119	7
465	4
42	3
3	9
0	3

$973D4_{16} = 393470_{11}$

Q2. Error Finding (4 points)

Each of the following 68K assembly language instructions will cause an assembler error. Examine each instruction and explain why the assembler would flag it as an error

1) MOVE.B $A000, A3 * Destination is address direct, MOVE destination

2) ADD.B #$1000, D2 * $1000 hex exceeds the size Byte, .B can only accept $00-$FF, 0-256

3) MOVEA.W $1234, D0 * Destination is Data , MOVEA requires address direct

4) ANDI.B #23, #$100 *Invalid Addressing Mode, can't move result into the hexadecimal 100

Q3. What is the WORD VALUE (not byte, or longword) of the data in memory location $4000 when the program is just about to loop back to the beginning and start over again? (3 Points)

The Word value in address $4000 is 4515. Found this by using 68k memory viewer as well as tracing the program logic (F7 – Trace Into) to find this. To check that 4515 is correct I step by stepped the program seeing AND.W D3, (A1) was comparing $4F17 and $5555 which when I wrote it out was 0100 0101 0001 0101 or 4515.

Q4. Two's complement (6 points)

1. **Convert the decimal numbers -102 and -87 into hexadecimal number**

   -102 is FF9A. -87 is FFA9.

   102 = 0110 0110 -> Two's complement = 1001 1010 || FF9A (8 leading 1's for 16bit)

   87 = 0101 0111 -> Two's complement = 1010 1001 || FFA9

2. **Add two numbers of the previous question as hexadecimal, and state,**

     1111 1111 1001 1010

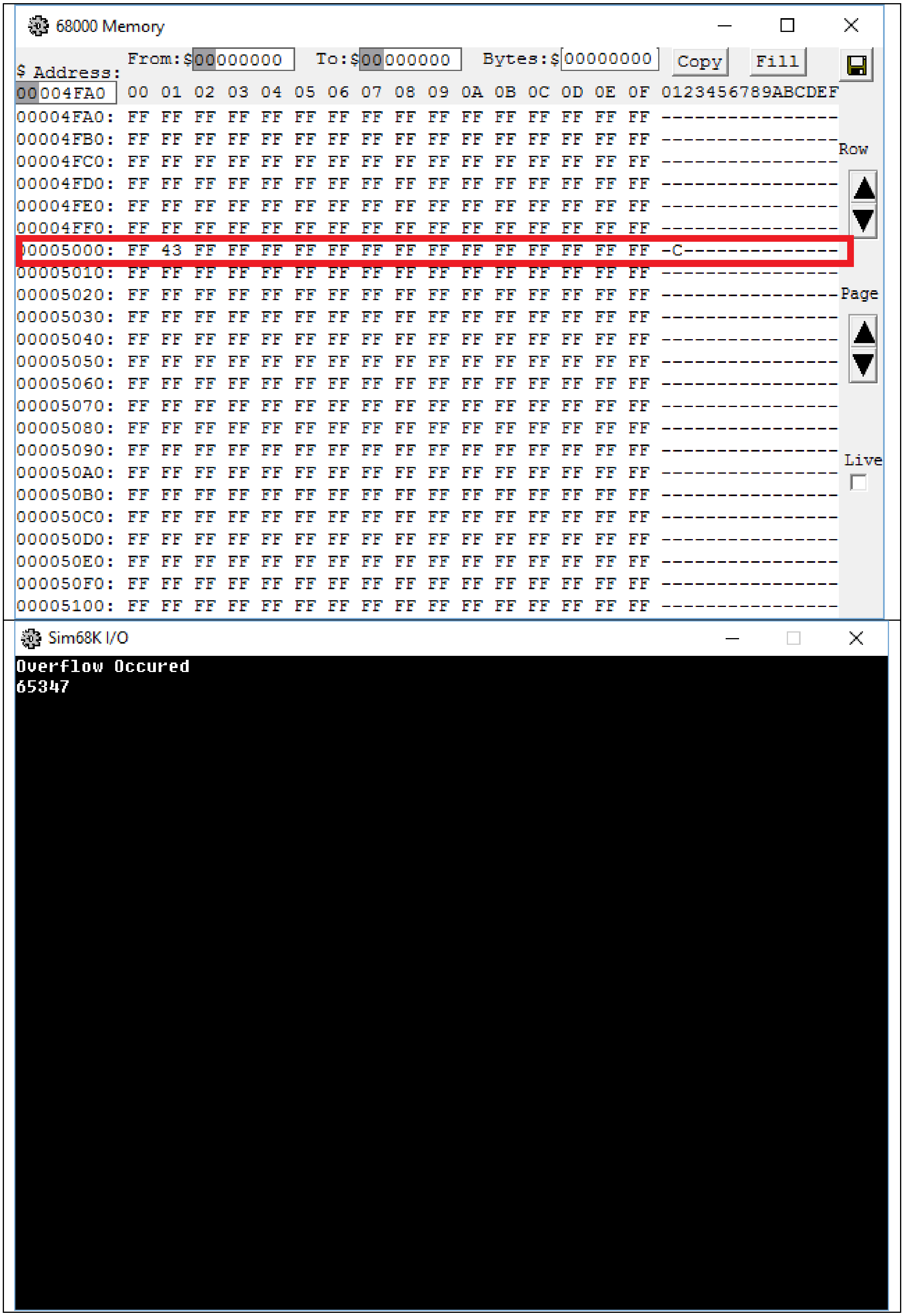
     1111 1111 1010 1001

   1 1111 1111 0100 0011 -> FF43

   a. **Whether the sign bit of the result is 1?** Yes it is
   b. **Whether an overflow occurred.** Yes, it did

3. Source Code

```
data1   EQU $FF9A   *-102
data2   EQU $FFA9   *-87
addr1   EQU $5000
    ORG    $1000
START:                  ; first instruction of program

    MOVE.W  #data1, D1  *Load data1(FF9A) into D1
    MOVE.W  #data2, D2  *Load data2(FFA9) into D2
    ADD.W   D2, D1      *ADD D1 and D2, put result in D2
    BCS OVERFLOWERR     *If carry flag is set, branch to OVERFLOWERR
DISPLAY
    MOVEA.W #addr1, A1  *Load addr1(5000) into A1
    MOVE.W  D1, (A1)    *Move result into A0 ($5000)
    MOVE.B  #3, D0      *Task 3 for Trap 15 (displays as decimal)
    TRAP    #15         *Display whatever is in A1

    SIMHALT             ; halt simulator

OVERFLOWERR *OVER FLOW ERROR FOUND
    LEA overflmsg, A1   *Give Address A1 the Error msg
    MOVE.B  #14, D0     *Task 14 for TRAP 15
    TRAP #15            *Display Error Msg
    JMP DISPLAY         *Jump back up and display result

CR  EQU $0D             ;ASCII code for Carriage Return
LF  EQU $0A             ;ASCII code for Line Feed
overflmsg DC.B 'Overflow Occured',CR,LF,0
* Put variables and constants here

    END    START        ; last line of source
```



```
$ Address:
00004FA0   00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 0123456789ABCDEF
00004FA0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004FB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004FC0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004FD0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004FE0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004FF0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005000: FF 43 FF FF FF FF FF FF FF FF FF FF FF FF FF FF -C--------------
00005010: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005020: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005030: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005040: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005050: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005060: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005070: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005080: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005090: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050A0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050B0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050C0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050D0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050E0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
000050F0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00005100: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
```

```
Overflow Occured
65347
```