**Chapter 7**

**7.7** Write an LC-3 assembly language program that counts the number of 0s in the value stored in R0 and stores the result into R1. For example, if R0 contains 0001 0011 0111 0000, then after the program executes, the result stored in R1 would be 0000 0000 0000 1010.

.ORIG x3000

LDI R0, A

AND R1, R1, #0

LD R2, X

LOOP ADD R0, R0, #0

BRn JUMP

ADD R1, R1, #1

JUMP ADD R0, R0, R0

ADD R2, R2, #-1

BRp LOOP

HALT

X .FILL x0010

A .FILL x3100

.END

**7.11** Not sure how to do this one, professor.

**7.13** The following program adds the values stored in memory locations A, B. and C, and stores the result into memory. There are two errors in the code. For each, describe the error and indicate whether it will be detected at assembly time or at run time.

Line no.

1. .ORIG X3000
2. ONE LD R1, A
3. ADD R0, R1, R0
4. TWO LD R1, B
5. ADD R0, R1, R0
6. THREE LD R1, C
7. ADD R0, R1, R0
8. ST R0, D (Error: D should be SUM, this will be detected at assembly.)
9. TRAP X25
10. A .FILL X0001
11. B .FILL X0002
12. C .FILL X0003
13. SUM .FILL X0004 (Trying to store in a location that cannot be stored in, SUM should be x3000 or higher, detected at runtime)
14. .END

**7.24** We want the following program fragment to shift R3 to the left by four bits, but it has an error in it. Identify the error and explain how to fix it.

.ORIG X3000

AND R2, R2, #0

LOOP ADD R2, R2, #4

BRz DONE

ADD R3, R3, R3

ADD R2, R2, #-1

BR LOOP (This should be BRp not just BR, there is no flag set.)

DONE HALT

.END