End of Ch # 7 Exercises

7.2 What are there two different registers (MAR and MDR) associated with memory? How much memory can this computer address?

The memory address register (MAR) holds the address of a memory location.
The memory data register (MDR), sometimes known as the memory buffer register, will hold a data value that is being stored to or retrieved from the memory location currently addressed by the memory address register.
For 32-bit machine: a 32-bit architecture is limited to addressing a maximum of 4 gigabytes of memory. This is because 2^{32} = 4Gb.
For 64-bit machine: a 64-bit architecture can address 16.8 million terabytes of memory, or 2^{64} bytes.

7.13 Generally, the distance that a programmer wants to move from the current instruction location on a BRANCH ON CONDITION is fairly small. This suggests that it might be appropriate to design the BRANCH instruction is such a way that the new location is calculated relative to the current instruction location. For example, we could design a different LMC instruction 8CX. The C digit would specify the condition on which to branch, and X would be a single-digit relative address. Using 10's complement, this would allow a branch of -5 to +4 locations from the current address. If we were currently executing this instruction at location 24,803 would cause a branch on negative to location 27. Write a fetch-execute cycle for this exercise, and you may also assume that the complementary addition is handled correctly. The single-digit address X, is still found in IR [address]

BRANCH:
PC -> MAR
MDR -> IR
IR[addr] -> PC
BRANCH on Condition:
PC -> MAR
MDR -> IR
If condition false: PC + 1 -> PC
If condition true: IR[addr] -> PC