

## CPU Role Play

### Command Decoder Table (for the Control Unit)

Command (Bin)	Command (Dec)	Command (Assembly Language)
0000 0000	00000000	LOAD (address) -> A
0000 0001	00000001	LOAD (address) -> B
0000 0010	00000002	LOAD (address) -> D
0000 0011	00000003	LOAD A -> (address)
0000 0100	00000004	LOAD C -> (address)
0000 0101	00000005	ADD A,B -> C
0000 0110	00000006	DEC D
0000 0111	00000007	JMPDNZ (address)
0000 1000	00000008	OUT (address)

# Command Cards (for the Control Unit)

**00000000      LOAD (address) -> A**

Steps to execute:

1. Increase program counter by one
2. Give command read to control bus
3. Wait until the data (an address) appears on the data bus
4. Write the value from the data bus to the address register
5. Give command read to control bus
6. Wait until the data appears on the data bus
7. Write the data (number) to register A
8. Increase the program counter by one

**00000001      LOAD (address) -> B**

Steps to execute:

1. Increase program counter by one
2. Give command read to control bus
3. Wait until the data (an address) appears on the data bus
4. Write the value from the data bus to the address register
5. Give command read to control bus
6. Wait until the data appears on the data bus
7. Write the data (number) to register B
8. Increase the program counter by one

**00000002      LOAD (address) -> D**

Steps to execute:

1. Increase program counter by one
2. Give command read to control bus
3. Wait until the data (an address) appears on the data bus
4. Write the value from the data bus to the address register
5. Give command read to control bus
6. Wait until the data appears on the data bus
7. Write the data (number) to register D
8. Increase the program counter by one

**00000003      LOAD A -> (address)**

Steps to execute:

9. Increase the program counter by one
10. Give command read to control bus
11. Wait until the data (an address) appears on the data bus
12. Write the value from the data bus to the address register
13. Give the content of register A to the data bus
14. Give command write to control bus
15. Increase the program counter by one

**00000004      LOAD C -> (address)**

Steps to execute:

1. Increase the program counter by one
2. Give command read to control bus
3. Wait until the data (an address) appears on the data bus
4. Write the value from the data bus to the address register
5. Give the content of register C to the data bus
6. Give command write to control bus
7. Increase the program counter by one

**00000005      ADD A,B -> C**

Steps to execute:

1. Tell the ALU to add the contents of the registers A and B
2. Write the result into register C
3. Increase the program counter by one

**00000006      DEC D**

Steps to execute:

1. Decrease the content of register D by one (i.e. subtract one)
2. Increase the program counter by one

## **00000007      JMPDNZ (address)**

Steps to execute:

1. Increase the program counter by one
2. Give the command read to the control bus
3. Wait until the data (an address) appears on the data bus
4. Tell the ALU to check if the register D is equal to zero
5. If no: Write the address from the data bus to the program counter  
If yes: Increase the program counter by one

## **00000008      OUT (address)**

Steps to execute:

1. Increase the program counter by one
2. Give the command read to the control bus
3. Wait until the data (an address) appears on the data bus
4. Wait the value from the data bus to the address register
5. Give the command read to the control bus
6. Wait until the data appears on the data bus
7. Shout „The output equals to ...“ plus the value of your data (Output)!
8. Increase the program counter by one