

COA

8086 MP | Branching Statement

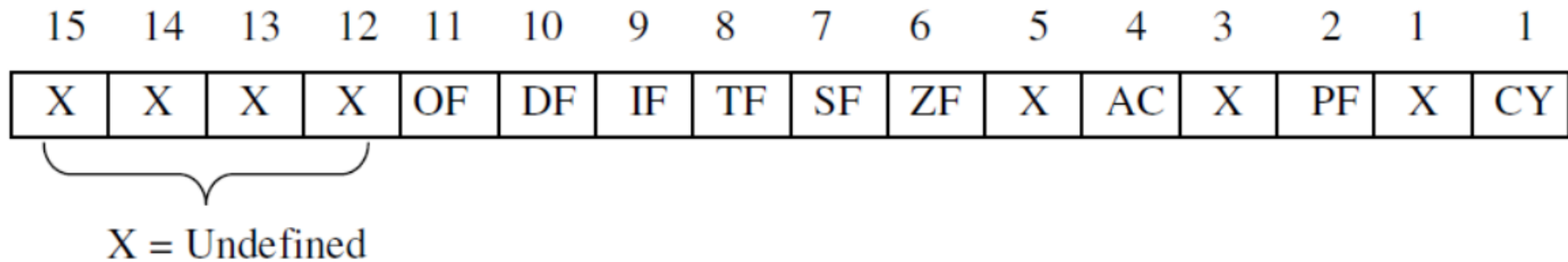
Prof. Dr. Mostafa Elhosseini

<https://youtube.com/drmelhosseini>

| AGENDA

- Review
- Branching statements

| Flag Register



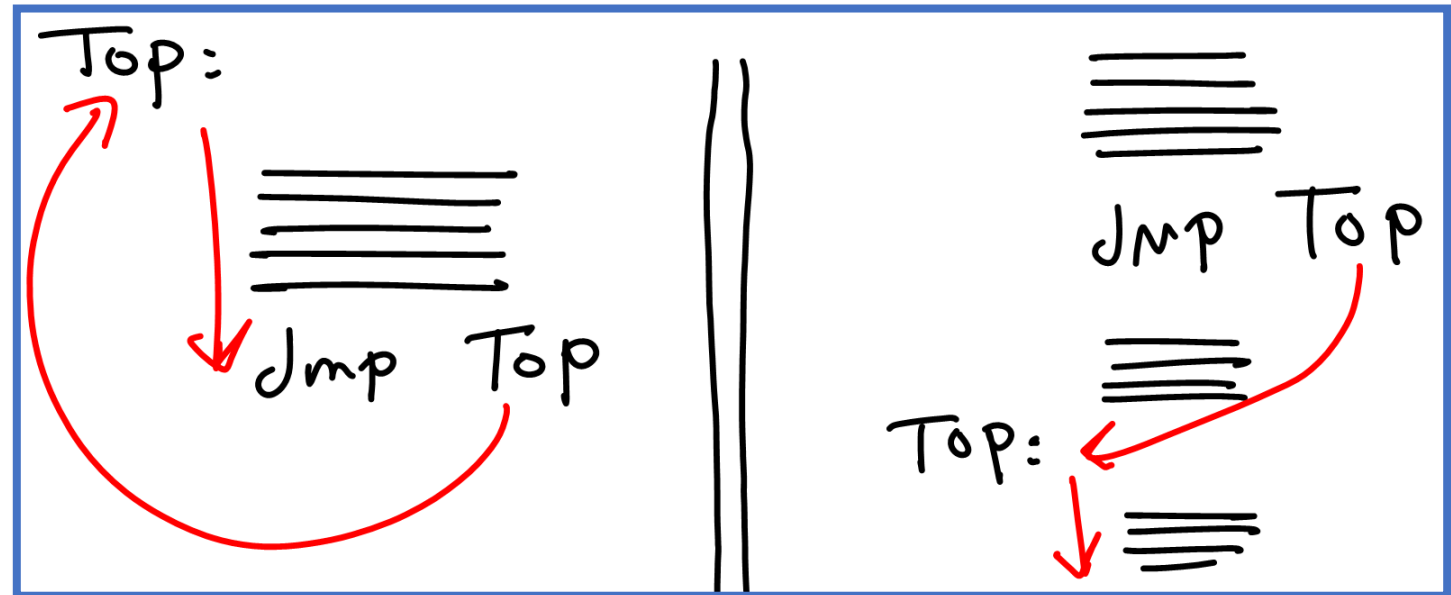
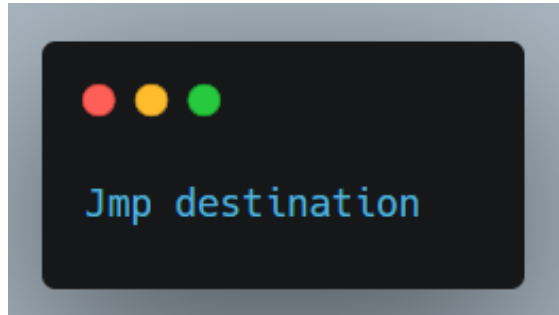
| Branch Statement

- These instructions are used to transfer/branch the control during program execution
 - Unconditional statement
 - Conditional Statements

| Unconditional Statement

- Instructions to transfer the instruction during an execution without any condition
 - unconditional jump
- **JMP** is used to **jump to the provided address** to proceed to the next instruction.
- **JMP label** is the unconditional jump in which control is transferred **unconditionally** to the target label

| Unconditional Statement



| Conditional Statement

- In the **conditional** jump, control is **transferred** to a new location if a **certain condition is met**, but where is the condition?
- Processor use the value of **certain flag bit** to decide how to branch and jump
- If the condition happened, the processor will **load the IP** with the **value of destination label**

| Conditional Statement

Print_loop :

```
    _____  
    _____  
    _____  
    _____  
    dec     CX  
    Jnz     Print_loop  
    _____  
    _____  
    _____  
    _____
```

①

②

| Unsigned Conditional Jump

Instruction	Flag tested	description
JA / JNBE	CF=0 and ZF=0	Jump if above // jump if not below or equal to
JAE / JNB	CF=0	Jump if above or equal to // jump if not below
JB / JNAE	CF=1	Jump if below // jump if not above or equal to
JBE / JNA	CF=1 OR ZF=1	Jump if below or equal to // jump if not above

| Signed Conditional Jump

Instruction	Flag tested	description
JG / JNLE	ZF=0 & SF=OF	Jump if Greater than // jump if not less or equal to
	((SF XOR OF) or ZF) = 0	
JGE / JNL	SF=OF	Jump if greater than or equal to // jump if not less than
	((SF XOR OF) = 0	
JL / JNGE	SF XOR OF = 1	Jump if less than // jump if not greater than or equal to
JLE / JNG	((SF XOR OF) or ZF) = 1	Jump if less than or equal to // jump if not greater

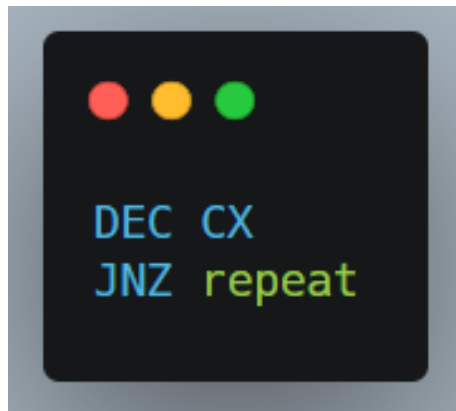
| Note...

- **above** and **below** refer to the relationship of two **unsigned** values
- **greater** and **less** refer to the relationship of two signed values.
- You should not worry about these mathematics and calculations
 - JG – jump if greater
 - Do not involve yourself with flags

| Single-flag Conditional Jump

JE / JZ	ZF = 1	Jump if equal // jump if zero
JNE / JNZ	ZF = 0	Jump if not equal // jump if not zero
JC	CF = 1	Jump if carry
JNC	CF = 0	Jump if no carry
JP / JPE	PF = 1	Jump if parity even
JNP / JPO	PF = 0	Jump if no parity // jump if parity odd
JS	SF = 1	Jump if sign (negative)
JNS	SF = 0	Jump if no sign (positive)
JO	OF = 1	Jump if overflow happened
JNO	OF = 0	Jump if no overflow

| Example



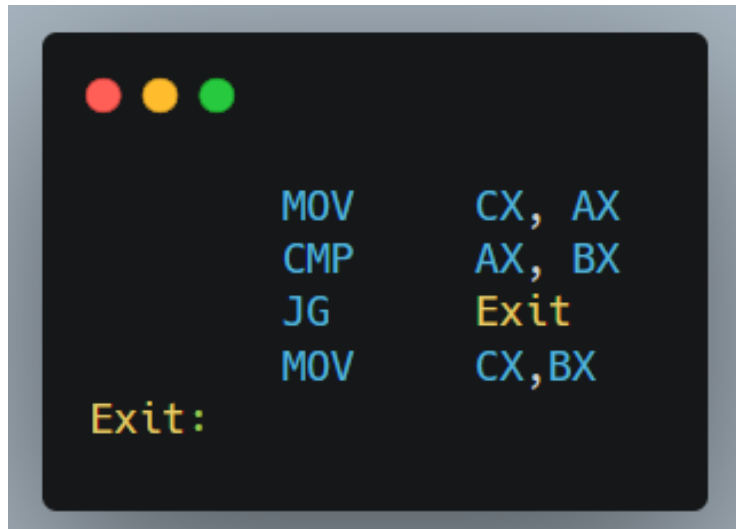
- Not only CMP used

| Example

- Assume that **AX**, and **BX** contain **signed** numbers, write a program to put the **maximum number in CX**

| Example

- Assume that **AX**, and **BX** contain **signed** numbers, write a program to put the **maximum number in CX**



```
MOV    CX, AX
CMP    AX, BX
JG     Exit
MOV    CX, BX
Exit:
```