

- **Conditional Jumps & Control Flow**

1- CMP (Compare)

CMP A, B = Subtracts B from A internally, does not store the result, only sets flags.

💡 Example1:

```
MOV AL, 5
```

```
MOV BL, 5
```

```
CMP AL, BL
```

Explanation:

- AL = 5 , BL = 5
- CMP AL, BL → internally does $AL - BL = 0$
- So the Zero Flag (ZF) is set to 1 because the result is zero.

💡 Example2:

```
MOV AL, 6
```

```
CMP AL, 4
```

Explanation:

- AL = 6
- CMP AL, 4 → internally does $AL - 4 = 2$
- So the Zero Flag (ZF) is set to 0 because the result is not zero.

2- TEST (Bitwise AND test)

TEST A, B = Performs a bitwise AND (A AND B), sets flags, does not store result

💡 Example3:

MOV AL, 1010b

TEST AL, 0001b

Explanation:

- AL = 1010
- TEST AL, 0001 → 1010 AND 0001 = 0000
- So Zero Flag = 1 because result is zero → means: *no common bits are 1*

3. JZ and JNZ (Jump if Zero / Not Zero)

These are **used after CMP or TEST**

Instruction	Meaning
JZ	Jump if Zero Flag = 1
JNZ	Jump if Zero Flag = 0

💡 Example 4: JZ

MOV AX, 3

CMP AX, 3 ; AX - 3 = 0 → ZF = 1

JZ EQUAL ; Jump if ZF = 1

MOV BX, 1 ; This won't execute if jump occurs

JMP END

EQUAL:

MOV BX, 2 ; This executes

END:

Example 5: JNZ

```
MOV AX, 4
CMP AX, 5 ; AX - 5 = -1 → ZF = 0
JNZ NOT_EQUAL
```

```
MOV BX, 3 ; This won't execute if jump occurs
JMP END
```

```
NOT_EQUAL:
MOV BX, 2 ; This executes
```

```
END:
```

4. JE and JNE (Jump if Equal / Not Equal)

These are the same as JZ and JNZ, just different names.

JE Jump if Equal (ZF = 1)

JNE Jump if Not Equal (ZF = 0)

Example 6: JE

```
MOV AL, 10
CMP AL, 10 ; ZF = 1
JE MATCH
```

```
MOV BL, 0
JMP END
```

```
MATCH:
MOV BL, 1
```

```
END:
```

💡 Example 2: JNE

```
MOV AL, 10  
CMP AL, 20 ; ZF = 0  
JNE NO_MATCH
```

```
MOV BL, 0  
JMP END
```

```
NO_MATCH:  
MOV BL, 1
```

```
END:
```

✅ Summary Table

Instruction	What it Does	Based on Flag
CMP A, B	Subtract B from A (sets flags only)	-
TEST A, B	A AND B (sets flags only)	-
JZ	Jump if result = 0	ZF = 1
JNZ	Jump if result ≠ 0	ZF = 0
JE	Jump if Equal (same as JZ)	ZF = 1
JNE	Jump if Not Equal (same as JNZ)	ZF = 0