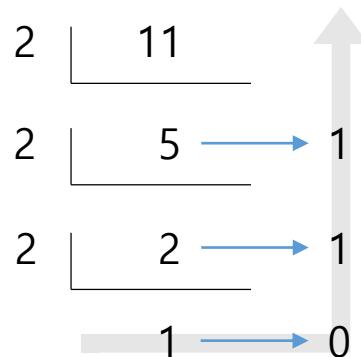


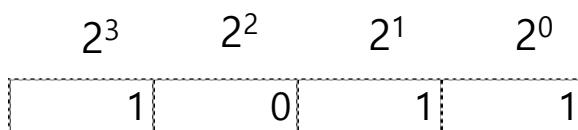
# **NUMBER SYSTEM (1)**

# Number System (1)

- Number System Conversion
  - 10 진수를 2 진수로 변환
  - $11_{(10)} \rightarrow 1011_{(2)}$



- 2진수를 10진수로 변환



$$\begin{aligned} & 2^3 * 1 + 2^2 * 0 + 2^1 * 1 + 2^0 * 1 \\ & = 8 + 2 + 1 \\ & = 11_{(10)} \end{aligned}$$

- Lab.01
  - 파일명: bin\_dec.py
- 개선할 점은 없는가?

```
num_bin = "1101"
print(f"Binary number = {num_bin}")

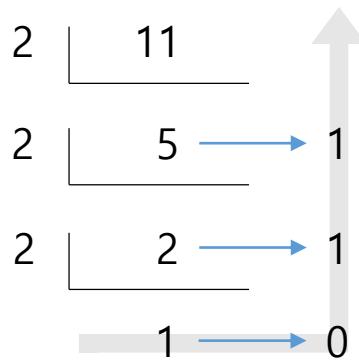
exp = 0
num_dec = 0

cnt_iter = len(num_bin)
while cnt_iter > 0:
    num_dec += 2**exp * int(num_bin[cnt_iter - 1])
    exp += 1
    cnt_iter -= 1

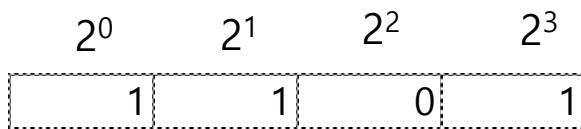
print(f"Decimal number = {num_dec}")
```

# Number System (1)

- Number System Conversion
  - 10 진수를 2 진수로 변환
  - $11_{(10)}$   $\rightarrow 1011_{(2)}$



- 2진수를 10진수로 변환



$$\begin{aligned}2^0 * 1 + 2^1 * 1 + 2^2 * 0 + + 2^3 * 1 \\= 1 + 2 + 8 \\= 11_{(10)}\end{aligned}$$

- Lab.02
  - 파일명: bin\_dec\_02.py
  - 문제를 재구성하여 논리를 좀 더 단순화하자.

```
num_bin = "1011"
print(f"Binary number = {num_bin}")

num_dec = 0

num_bin = num_bin[::-1]

cnt_iter = 0
while cnt_iter < len(num_bin):
    num_dec += 2**cnt_iter * int(num_bin[cnt_iter])
    cnt_iter += 1

print(f"Decimal number = {num_dec}")
```

# Number System [1]

- 2진수를 8진수로 변환

- $1011_{(2)} \rightarrow 13_{(8)}$

$2^0 \quad 2^2 \quad 2^1 \quad 2^0$

|   |   |   |   |
|---|---|---|---|
| 1 | 0 | 1 | 1 |
|---|---|---|---|

$$\begin{aligned} & \{2^0 * 1\} + \{2^2 * 0 + 2^1 * 1 + 2^0 * 1\} \\ &= \{1\} + \{3\} \\ &= 13_{(8)} \end{aligned}$$

$2^0 \quad 2^1 \quad 2^2 \quad 2^0$

|   |   |   |   |
|---|---|---|---|
| 1 | 1 | 0 | 1 |
|---|---|---|---|

$$\begin{aligned} & \{2^0 * 1 + 2^1 * 1 + 2^2 * 0\} + \{2^3 * 1\} \\ &= \{1\} + \{3\} \\ &= 13_{(8)} \end{aligned}$$

- Lab.03
  - 파일명: bin\_oct.py
- 개선할 점은 없는가?

```
num_bin = "1011"
print(f"Binary number = {num_bin}")

BIT = 3
num_bin = num_bin[::-1]
num_oct = ""

cnt_bit = 0
while cnt_bit < len(num_bin):
    cnt, sum_ = 0, 0

    while cnt < BIT:
        if cnt_bit >= len(num_bin):
            break
        sum_ += 2**cnt * int(num_bin[cnt_bit])
        cnt += 1
        cnt_bit += 1

    num_oct = str(sum_) + num_oct

print(f"Octal number = {num_oct}")
```

# Number System [1]

- 2진수를 8진수로 변환

- $1011_{(2)} \rightarrow 13_{(8)}$

$2^0 \quad 2^2 \quad 2^1 \quad 2^0$

|   |   |   |   |
|---|---|---|---|
| 1 | 0 | 1 | 1 |
|---|---|---|---|

$$\begin{aligned} & \{2^0 * 1\} + \{2^2 * 0 + 2^1 * 1 + 2^0 * 1\} \\ &= \{1\} + \{3\} \\ &= 13_{(8)} \end{aligned}$$

$2^0 \quad 2^1 \quad 2^2 \quad 2^0$

|   |   |   |   |
|---|---|---|---|
| 1 | 1 | 0 | 1 |
|---|---|---|---|

$$\begin{aligned} & \{2^0 * 1 + 2^1 * 1 + 2^2 * 0\} + \{2^0 * 1\} \\ &= \{1\} + \{3\} \\ &= 13_{(8)} \end{aligned}$$

- Lab.04

- 파일명: bin\_oct\_04.py
  - 순환문 내에 조건문에 의한 제어문은 가급적 피하자.

```
num_bin = "1011"
print(f"Binary number = {num_bin}")

BIT = 3
num_bin = num_bin[::-1]
num_oct = ""

cnt_bit = 0
while cnt_bit < len(num_bin):
    cnt, sum_ = 0, 0

    while cnt < BIT and cnt_bit < len(num_bin):
        sum_ += 2**cnt * int(num_bin[cnt_bit])
        cnt += 1
        cnt_bit += 1

    num_oct = str(sum_) + num_oct
    print(f"Octal number = {num_oct}")
```

# Number System (1)

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- HW
  - 파일명: bin\_hex\_학번.py
- 구현 시 고려사항
  - 아래를 참고

| Dec' | Hex |
|------|-----|
| 0    | 0   |
| 1    | 1   |
| ...  | ... |
| 10   | A   |
| 11   | B   |
| 12   | C   |
| 13   | D   |
| 14   | E   |
| 15   | F   |

- 이전 코드 bin\_oct\_04.py 를 이용할 것!