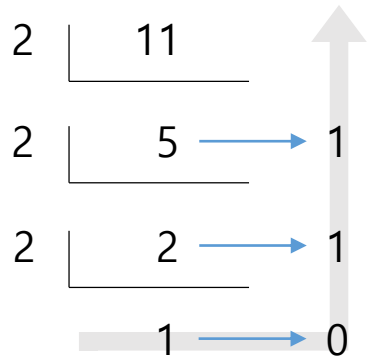


NUMBER SYSTEM (1)

Number System ^[1]

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



- 2진수를 10진수로 변환

2^3	2^2	2^1	2^0
1	0	1	1

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

- Lab.01
 - 파일명: bin_dec.py
- 개선할 점은 없는가?

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

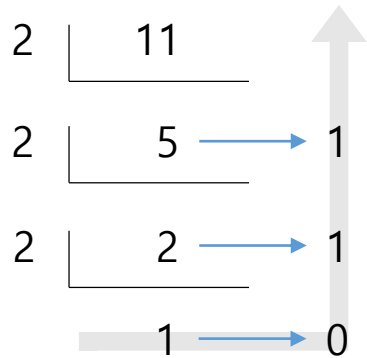
exp = 0
num_dec = 0

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

2^0	2^1	2^2	2^3
1	1	0	1

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

- 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	2^2	2^1	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	2^1	2^2	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	2^2	2^1	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	2^1	2^2	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⁾

- 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!