

Python

Type conversion and number system



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Agenda

- ① Type conversion
- ② Number System
- ③ Conversion of number system
- ④ Unicode

Type Conversion

a=5 → int

b="5" → str

number
= int, float,
Complex, bool

a+b int + str Error

a + int(b)
10 → int int + int No error

str(a) + b str + str No error

"55" → str

Type Conversion functions

int()

float()

complex()

bool()

str()

Number System

Binary Number System - 0, 1

Octal Number System - 0, 1, 2, 3, 4, 5, 6, 7

Decimal Number System - 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Hexadecimal Number System - 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C
D, E, F

Counting

Dec	Oct	Hex	Bin	Dec	Oct	Hex	Bin
0	0	0	0	21	25	15	10101
1	1	1	1	22	26	16	10110
2	2	2	10	23	27	17	10111
3	3	3	11	24	30	18	11000
4	4	4	100	25	31	19	11001
5	5	5	101	26	32	1A	11010
6	6	6	110	27	33	1B	11011
7	7	7	111	28	34	1C	11100
8	—	8	1000	29	35	1D	11101
9	10	9	1001	30	36	1E	11110
10	—	A	1010			1F	
11	11	B	1011			20	
12	12	C	1100				
13	13	D	1101				
14	14	E	1110				
15	15	F	1111				
16	—	10	10000				
17	17	11	10001				
18	20	12	10010				
19	21	13	10011				
20	22	14	10100				

place value

Decimal

$$\begin{array}{r} 2 \ 1 \ 4 \ 8 \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 10^3 \quad 10^2 \quad 10^1 \quad 10^0 \end{array} = 2 \times 1000 + 1 \times 100 + 4 \times 10 + 8$$

Octal

$$\begin{array}{r} 3 \ 1 \ 4 \ 5 \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 8^3 \quad 8^2 \quad 8^1 \quad 8^0 \end{array} = 3 \times 512 + 1 \times 64 + 4 \times 8 + 5 \\ = 1536 + 64 + 32 + 5 \\ = 1637 \\ = A \times 16^3 + 1 \times 16^2 + 0 \times 16^1 + F$$

Hexadecimal

$$\begin{array}{r} A \ 1 \ 0 \ F \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 16^3 \quad 16^2 \quad 16^1 \quad 16^0 \end{array}$$

Binary

$$\begin{array}{r} 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 2^6 \quad 2^5 \quad 2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0 \end{array} = 2^6 + 2^3 + 2^2 + 2^1$$

Conversion of Number System

Dec \rightarrow Bin

$$25 \rightarrow 11001$$

$$\begin{array}{ccccccccc} & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\ 2^7 & 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 128 & 64 & 32 & 16 & 8 & 4 & 2 & 1 \end{array}$$

$$\begin{array}{r}
 2 | 25 \\
 2 | 12 \\
 2 | 6 \\
 2 | 3 \\
 2 | 1 \\
 \boxed{0}
 \end{array}
 \quad \uparrow$$

25

76

100

0

1

1

1

1

1

1

1

1 1 0 0 1

1 0 0 1 1 0 0

1 1 0 0 1 0 0

1 1 0 0 1 0 0 = 196

1 1 0 0 0

128 64

1 0 1 0 1 0 1 = 85

64 16 4 1

Number System Conversion functions

$x = 25$

$\text{bin}(x) \rightarrow '0b11001'$

$\text{oct}(x) \rightarrow '0o31'$

$\text{hex}(x) \rightarrow '0x19'$

$x = 0b11001$

$x = 0o31$

$x = 0x19$

Unicode

The unicode is character encoding, and its goal is to replace the existing character sets with its standard UTF.

UTF - Unicode Transformation Format

UTF-8 is the most commonly used character encoding.

It is also backward compatible with ASCII

character to unicode

$x = 'A'$

$\text{ord}(x) \rightarrow 65$

unicode to character

$x = 65$

$\text{chr}(x) \rightarrow 'A'$