Data Representation

ASCII

- American Standard Code for Information Interchange
- 7 or 8 bit code that defined 128 or 256 character set
- 8 bits used for each character (1 byte)
- One of the bits used for check bit (parity bit)
- 2^7 = 128 different characters available
- Mirrors available characters on the keyboard (digits, alphabets, punctuation)
- Python: **ord( )** and **chr( )** converts characters to and from **ASCII**

Unicode

- ASCII has been superseded by unicode
- 16 bits used for each character (2 bytes)
- Store and display a much wider range of characters
- 2^{16} = 65,536 characters
- Able to represent foreign language characters, mathematical symbols, etc

Numerical Representations:

Data Type	Base	Digits Used
Decimal	10	0 - 9
Binary	2	0 & 1
Octal	8	0 - 7
Hexadecimal	16	0 - 9, A - F

- Convert Decimal to another base:
  1. Divide number by base and find the remainders until 0 is reached
  2. Reverse remainder
  - E.g. convert 19 to binary

Divisor (Base 2)	Quotient	Remainder
2	19	-

2	9	1
2	4	1
2	2	0
2	1	0
-	0	1

    - 19 in base 2 = 1 0 0 1 1 (Go up the table of remainders)

- Convert from another base to Decimal:
    - Steps:
        1. Find position of each digit
        2. Sum all (digit x base^position)
    - E.g. convert binary (1 1 0 1) to decimal

Binary Digit	**1**	**1**	**0**	**1**
Position	3	2	1	0
Value	1 x 2^3 = 8	1 x 2^2 = 4	0 x 2^1 = 0	1 x 2^0 = 1

    - Binary(1 1 0 1) = 8 + 4 + 1 = 13 in decimal

- Convert from Binary to Octal:
    - Steps:
        1. Form groups of 3 digits from the back
        2. Add 0s to the front if not enough digits
        3. Convert to base 8
    - E.g. convert Binary(1 0 1 1 0 = 0 1 0 1 1 0) to Octal

Group into 3s	**0 1 0**	**1 1 0**
Octal Value	0 + (1 x 2^1) + 0 = 2	(1 x 2^2) + (1 x 2^1) + 0 = 6

    - Binary(1 0 1 1 0) = Octal(2 6)

- Convert from Binary to other bases:
    - Octal: group into 3s
    - Hexadecimal: group into 4s