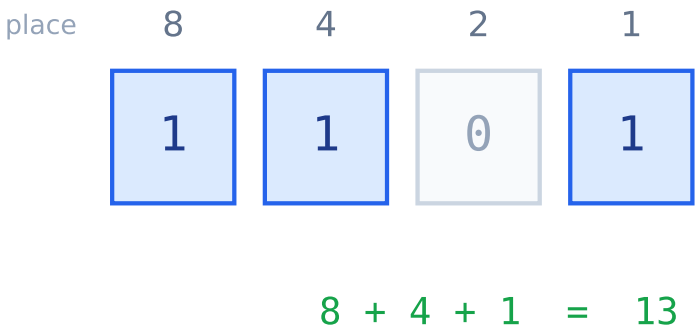
Data representation

Python Reference

Bits & binary

A bit 比特 is a single `0` or `1`. Binary 二进制 is the base-2 number system: each place is worth twice the one to its right (1, 2, 4, 8, ⋯). Denary 十进制 (base-10) is our normal numbers.



Binary place values: 1101 means 8 + 4 + 1 = 13

```
print(bin(13))          # 0b1101
print(int("1101", 2))   # 13
```

- 8 bits make a byte 字节. A fixed width can overflow 溢出 (wrap around) when the number is too big.

```
x = 250
x = (x + 10) % 256      # one byte wraps at 256
print(x)                # 4
```

Compression

Compression 压缩 makes data smaller. Lossless 无损 compression keeps every bit, so you rebuild the original exactly. Lossy 有损 compression throws away detail —smaller but not exact —and is used for photos and music.

Run-length encoding 游程编码 is a simple lossless method: store a run 游程 (a repeat) as a count plus the value.

```
def rle(text):
    out = ""
    i = 0
    while i < len(text):
```

```
        run = 1
        while i + run < len(text) and text[i + run] == text[i]:
            run += 1
        out += str(run) + text[i]
        i += run
    return out

print(rle("AAAABBBCCD"))   # 4A3B2C1D
```