# Binary System cheatsheet

binary
decimal
hexadecimal

```
DEC - 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 ...
HEX - 0 1 2 3 4 5 6 7 8 9 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B ...
```

| 80 | 40 | 20 | 10 | 08 | 04 | 02 | 01 |
|---|---|---|---|---|---|---|---|
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

Start

`1*8 + 0*4 + 1*2 + 0*1`
`dec = 10 -> hex = A0`

`0*8 + 1*4 + 1*2 + 0*1`
`dec = 6 -> hex = 06`

**A0** and **06** = **A6**

$10*16^1 + 6*16^0 = 166$

For every n bits there are $2^n$ patterns

| | |
|---|---|
| 1 | 01 |
| 2 | 02 |
| 4 | 04 |
| 8 | 08 |
| 16 | 10 |
| 32 | 20 |
| 64 | 40 |
| 128 | 80 |
| 256 | 10 0 |
| 512 | 20 0 |
| 1024 | 40 0 |
| 2048 | 80 0 |
| 4096 | 10 00 |
| 8192 | 20 00 |
| 16,384 | 40 00 |
| 32,768 | 80 00 |

**1** *byte* = **8** *bits*
0000 0000

**2** *bytes* = **16** *bits*
0000 0000 0000 0000

**4** *bytes* = **32** *bits*
0000 0000 0000 0000
0000 0000 0000 0000

**8** *bytes* = **64** *bits*
0000 0000 0000 0000
0000 0000 0000 0000
0000 0000 0000 0000
0000 0000 0000 0000

| | |
|---|---|
| 65,536 | 10 00 0 |
| 131,072 | 20 00 0 |
| 262,144 | 40 00 0 |
| 524,288 | 80 00 0 |
| 1,048,576 | 10 00 00 |
| 2,097,152 | 20 00 00 |
| 4,194,304 | 40 00 00 |
| 8,388,608 | 80 00 00 |
| 16,777,216 | 10 00 00 0 |
| 33,554,432 | 20 00 00 0 |
| 67,108,864 | 40 00 00 0 |
| 134,217,728 | 80 00 00 0 |
| 268,435,456 | 10 00 00 00 |
| 536,870,912 | 20 00 00 00 |
| 1,073,741,824 | 40 00 00 00 |
| 2,147,483,648 | 80 00 00 00 |
| 4,294,967,296 | 10 00 00 00 0 |
| 8,589,934,592 | 20 00 00 00 0 |
| 17,179,869,184 | 40 00 00 00 0 |
| 34,359,738,368 | 80 00 00 00 0 |
| 68,719,476,736 | 10 00 00 00 00 |
| 137,438,953,472 | 20 00 00 00 00 |
| 274,877,906,944 | 40 00 00 00 00 |
| 549,755,813,888 | 80 00 00 00 00 |
| 1,099,511,627,776 | 10 00 00 00 00 0 |
| 2,199,023,255,552 | 20 00 00 00 00 0 |
| 4,398,046,511,104 | 40 00 00 00 00 0 |
| 8,796,093,022,208 | 80 00 00 00 00 0 |
| 17,592,186,044,416 | 10 00 00 00 00 00 |
| 35,184,372,088,832 | 20 00 00 00 00 00 |
| 70,368,744,177,664 | 40 00 00 00 00 00 |
| 140,737,488,355,328 | 80 00 00 00 00 00 |