

## *Number systems*

### 1. Convert binary to decimal:

- $(111011101)_2 = 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 256 + 128 + 64 + 0 + 16 + 8 + 4 + 0 + 1 = 477$
  - $(10101010111)_2 = 1 \times 2^{10} + 0 \times 2^9 + 1 \times 2^8 + 0 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 1024 + 0 + 256 + 0 + 64 + 0 + 16 + 0 + 4 + 2 + 1 = 1367$
  - $(111100000)_2 = 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0 = 256 + 128 + 64 + 32 = 480$
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### 2. Convert octal to decimal:

- $(3754)_8 = 3 \times 8^3 + 7 \times 8^2 + 5 \times 8^1 + 4 \times 8^0 = 1536 + 448 + 40 + 4 = 2028$
  - $(7777)_8 = 7 \times 8^3 + 7 \times 8^2 + 7 \times 8^1 + 7 \times 8^0 = 3584 + 448 + 56 + 7 = 4095$
  - $(247)_8 = 2 \times 8^2 + 4 \times 8^1 + 7 \times 8^0 = 128 + 32 + 7 = 167$
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### 3. Convert hexadecimal to decimal:

- $(4FB2)_{16} = 4 \times 16^3 + 15 \times 16^2 + 11 \times 16^1 + 2 \times 16^0 = 16384 + 3840 + 176 + 2 = 20402$
  - $(88BAE)_{16} = 8 \times 16^4 + 8 \times 16^3 + 11 \times 16^2 + 10 \times 16^1 + 14 \times 16^0 = 524288 + 32768 + 2816 + 160 + 14 = 560046$
  - $(DC4)_{16} = 13 \times 16^2 + 12 \times 16^1 + 4 \times 16^0 = 3328 + 192 + 4 = 3524$
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### 4. Convert decimal to binary, octal, and hexadecimal:

$(3479)_{10}$

- Binary: 11011001111
- Octal: 6617
- Hex: D9F

$(642)_{10}$

- Binary: 1010000010
- Octal: 1202
- Hex: 282

$(555)_{10}$

- Binary: 1000101011
  - Octal: 1053
  - Hex: 22B
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5. AND operation:

- 101010  
  & 110011  
  = 100010
  - 11110000  
  & 10101010  
  = 10100000
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6. OR operation:

- 101010  
  | 110011  
  = 111011
  - 11110000  
  | 10101010  
  = 11111010
- 

7. XOR operation:

- 101010  
  + 110011  
  = 011001
  - 11110000  
  + 10101010  
  = 01011010
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## 8. Hex Addition & Subtraction

A3 + 1F

- $A3 = 163, 1F = 31 \rightarrow 163 + 31 = 194 \rightarrow C2$  in hex

FE - B4

- $FE = 254, B4 = 180 \rightarrow 254 - 180 = 74 \rightarrow 4A$  in hex