

Binary →

Example 1

$$\begin{array}{cccc} 0 & 1 & 0 & 1 \\ \hline 8 & 4 & 2 & 1 \\ \hline 2^3 & 2^2 & 2^1 & 2^0 \\ \hline (8 \times 0) + (4 \times 1) + (2 \times 0) + (1 \times 1) \end{array}$$

Steps to convert binary to integer

→ write the binary

→ Multiply from left with $2^{(0,1,2,n)}$

→ Add All the results

Example 2

$$\begin{array}{cccccc} 1 & 0 & 0 & 1 & 1 \\ \hline 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ \hline 16 & 8 & 4 & 2 & 1 \\ \hline (16 \times 1) + (8 \times 0) + (4 \times 0) + (2 \times 1) + (1 \times 1) \\ 16 + 0 + 0 + 2 + 1 \\ \hline 19 \end{array}$$

what are binary numbers ?

- ★ Binary numbers are a system of numbers using only two digits **0 & 1** (base 2). They are crucial in computing & digital electronics because computers and electronic device operate using 2 states → on(1) and off(0).

Key points

- ★ used in computers for data storages.
- ★ used in digital circuits.
- ★ Data Transmission (eg: internet, networking)
- ★ Essential for programming, algos & error detection

steps to convert Int to Binary

- Divide number by 2
- Record the remainder

↓
If the result of division is not whole, the remainder will be 1. If divides evenly remainder will be 0.

- update the Quotient

↓
the Quotient becomes your new number, repeat the process until Quotient is zero

- Read all the remainders and reverse them. Those are the binary numbers.

Examples → 8

$$\begin{array}{l} 8 \div 2 \rightarrow 4, 0 \\ 4 \div 2 \rightarrow 2, 0 \\ 2 \div 2 \rightarrow 1, 0 \\ 1 \div 2 \rightarrow 0, 1 \end{array}$$

$$\therefore 8 = 1000$$

```
JavaScript
function intBinary(int) {
  let binary = []
  let quotient = int;

  while(quotient > 0) {
    let remainder = quotient % 2;
    binary.unshift(remainder);
    quotient = Math.floor(quotient / 2);
  }
  return binary
}

console.log(intBinary(10));
```

2 →

5

$$\begin{array}{l} 5 \div 2 \rightarrow 2, 1 \\ 2 \div 2 \rightarrow 1, 0 \\ 1 \div 2 \rightarrow 0, 1 \end{array}$$

$$\therefore 5 = 101$$

