

2 Binary numbers – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
Binary	二进制	_____

Recall

Computers store everything using only two symbols:

- Deep down, a computer uses only 0s and 1s.
- Text, pictures, and sound are all stored as numbers.
- You may have heard of "bits" and "bytes".

This sheet lines up binary numbers. Each idea has a worked example.

New ideas

■ 1 Bits and bytes

A **bit** is a single 0 or 1. A group of 8 bits is a **byte**. Everything a computer stores is made of bits.

■ 2 Binary place values

Binary 二进制 (base 2) uses place values that are powers of two: ..., 16, 8, 4, 2, 1 – instead of the ..., 100, 10, 1 of our usual base 10.

place value	128	64	32	16	8	4	2	1
bits	1	0	0	1	0	1	1	0

$$150 = 128 + 16 + 4 + 2 \Rightarrow 10010110$$

■ 3 Binary to decimal

To convert, add the place values that have a 1.

Worked example. Binary 1101 = $8 + 4 + 0 + 1 = 13$.

■ 4 Decimal to binary

Subtract the largest power of two that fits, and repeat.

Worked example. 19: take 16 (leaves 3), then 2 (leaves 1), then 1. So the 16, 2, and 1 places are on $\rightarrow 10011$.

Watch out: a computer has a **limited** number of bits, so it can only store numbers up to a point. A number too big to fit causes an **overflow** error.

Practice

Try these in order. The methods are all above.

2.1 State how many bits are in a byte. [1]

2.2 List the first five binary place values, from the right. [1]

2.3 Convert binary 1010 to decimal. [2]

2.4 Convert binary 1111 to decimal.

[2]

2.5 Convert the decimal number 6 to binary.

[2]