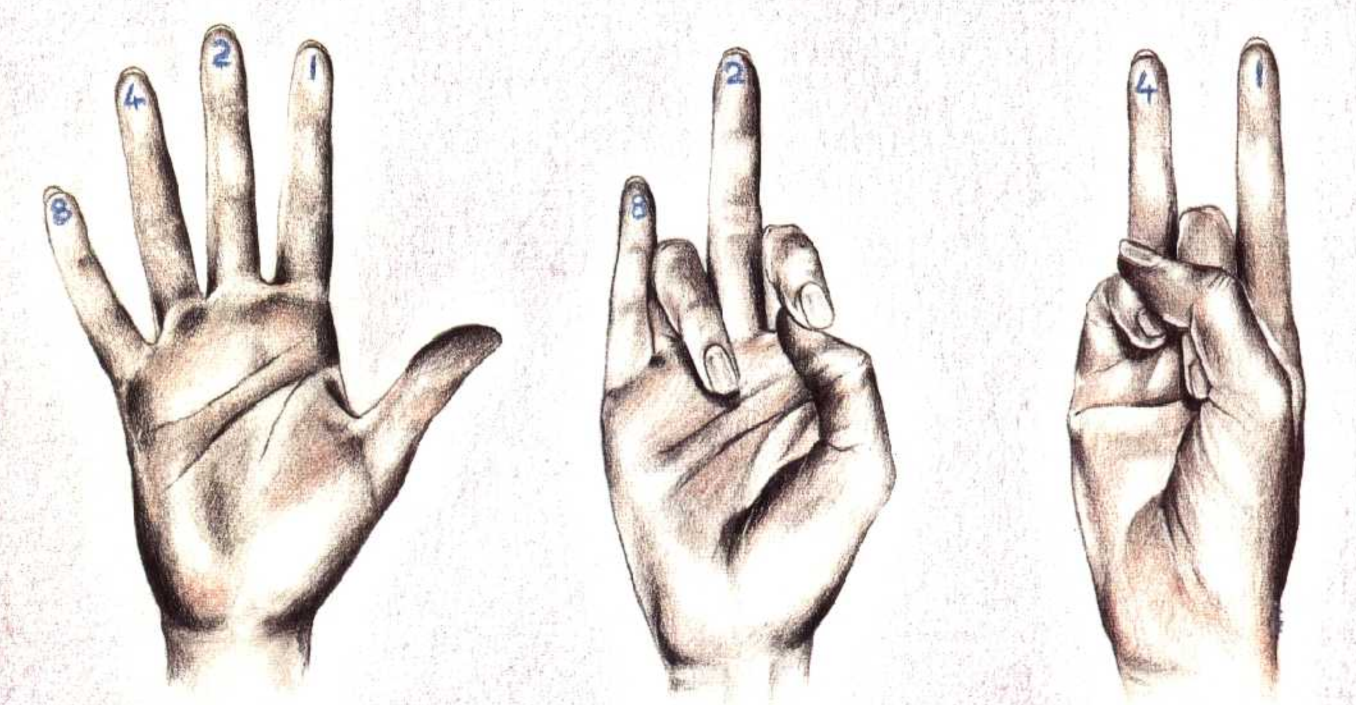
When 1 And 1 Is 10

Computers achieve their prodigies of calculation with just two digits — 0 and 1

Converting To Binary



The easiest way to convert small binary numbers to their decimal equivalent is to imagine writing the 'place value' of each binary column on the fingers of the right hand. As long as the binary number is not more than four digits long, all you have to do is to hold up the appropriate finger if the corresponding binary digit is a 1 and to hold the finger down if it is 0.

Hold up the appropriate fingers for 1010 and you get an 8 and a 2, which add together to give the decimal number 10. The third illustration shows how to decode 0101 — it gives a 4 and a 1, which comes to 5 in decimal form. Try using the method to compute the decimal equivalent of 1110 and 0110.

The method can be extended using both hands to figure out longer binary numbers. To do this, the fingers of the left hand (palm facing you) will need to be labelled 16, 32, 64 and 128, with the 16 on the little finger and the 128 on the index finger

ELAINE KEENAN

Most people take our system of using numbers so much for granted that it never occurs to them that any other system is possible.

The Romans thought up a system for representing numbers, using letters of the alphabet. X stood for 10, L stood for 50, C stood for 100, D stood for 500 and so on. The Roman system worked well enough as a way of recording simple numbers. It did not lend itself, however, to computations. Even additions in Roman numerals are difficult, for one reason: there is no concept of 'place value'. The position of a numeral in a Roman number tells us nothing about how much it is 'worth'.

Look at the two numbers 506 and 56. The only apparent difference is the zero in the middle. Its role is that in the number 506 it tells us that there are no 'tens', only five 'hundreds' and six 'ones'.

Every 'column' or position in a conventional number has a 'value' associated with it. The column on the right of the number is the 'ones' column, the next one (moving to the left) is the 'tens' column, the next one is the 'hundreds' column and so on. The digit used in any 'column' merely signifies how many of that column's value are involved.

You may be wondering what all this has to do with computers and the binary system. Computers are electronic machines, which can easily deal with numbers by using voltage levels. Five volts represent a one and zero volts represent a zero. As we learnt in Bits and Bytes (page 28), ones and zeros are perfectly adequate to represent any number, however big.

Using the familiar decimal system based on 10 (also known as the denary system) the number 506 is a concise way of representing the equivalent