

# Number Classification

## Essential information

**Real number** The real number system consists of whole numbers, fractions, decimals and irrational numbers (see below). These numbers may be positive, zero, or negative.

The set of real numbers is denoted by  $\mathbb{Q}$ .

**Rational number** Any number of the form  $\frac{m}{n}$  when  $n$  and  $m$  are integers and  $n \neq 0$ .  
The set of rational number is denoted by  $\mathbb{Q}$ .

For example,  $\frac{8}{6} \left( = \frac{4}{3} \right)$ ,  $5 \left( = \frac{5}{1} \right)$ ,  $-\frac{7}{2}$ , etc.

**Irrational number** Any real number that is not rational.  
For example,  $\sqrt{2}$ ,  $\sqrt{3}$ ,  $\sqrt{5}$ ,  $2\sqrt{2}$ ,  $\pi$ ,  $3\pi$ , etc.

That is

....  $2^4$ ,  $2^3$ ,  $2^2$ ,  $2^1$ ,  $2^0 (= 1)$ ,  $2^{-1}$ ,  $2^{-2}$ , ... etc.

**Natural (or counting) numbers** these are 1, 2, 3, ... ; the set of natural numbers is denoted by  $\mathbb{N}$ .

**Binary number system** The number system in which any number is expressed in terms of powers of 2.

The binary number system uses only the digits 0 and 1; for example,

$$101 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 5$$

**Integer** The positive and negative whole numbers and zero; for example,

..., -3, -2, -1, 0, 1, 2, 3, ...,

The set of integers is denoted by  $\mathbb{Z}$ .

**Positive natural numbers** the set of positive rational numbers is denoted by  $\mathbb{Q}^+$ .

### Roman numerals

In Roman numerals:

'I' is placed before 'V' and 'X' to make 4 (IV) and 9 (IX) respectively;

'X' is placed before 'C' to denote 40 (XL) and 90 (XC) respectively;

'C' is placed before 'D' and 'M' to make 400 (CD) and 900 (CM) respectively.

So every whole number has a unique representation as a set of Roman numerals, using

|   |    |   |      |
|---|----|---|------|
| I | 1  | C | 100  |
| V | 5  | D | 500  |
| X | 10 | M | 1000 |
| L | 50 |   |      |