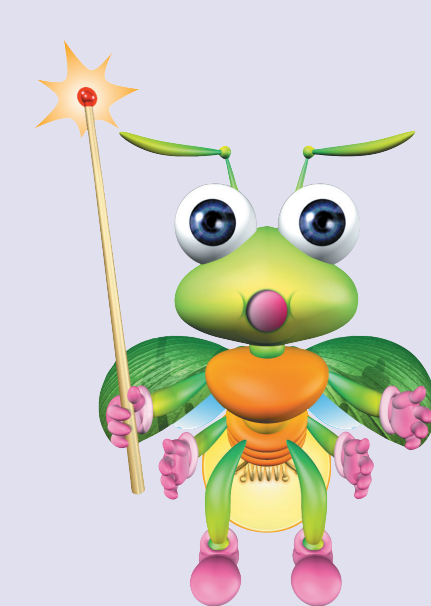


## The origin of 0, Arabic numerals, mathematical symbols and algebraic symbols



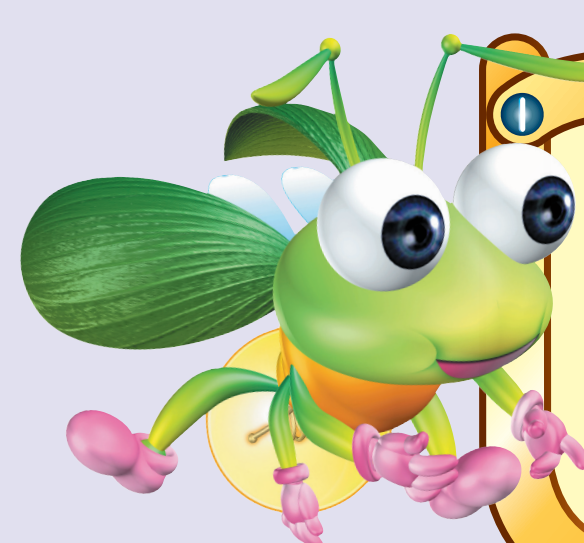
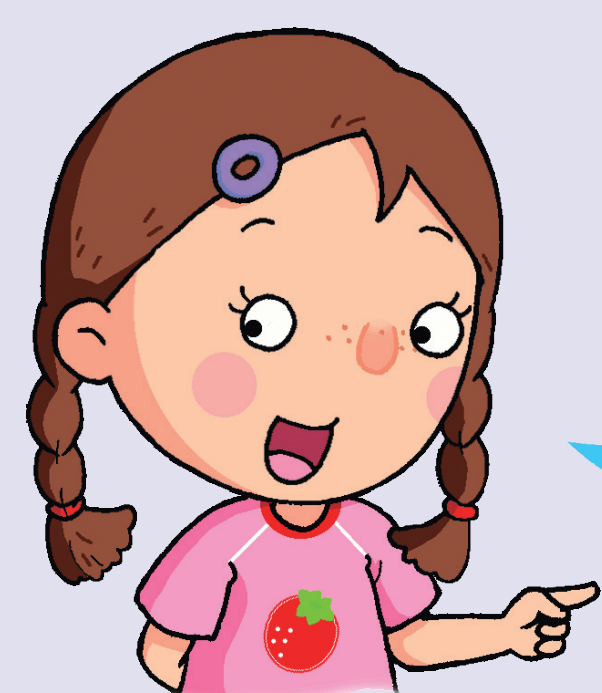
### The origin of 0

Originally the Arabic numerals did not include the numeral “0” and it came into use only after many years. During the time when there was no such a numeral “0”, leaving a blank space without writing anything was used to represent “0” at a certain place of a given number. Afterwards, the Indians used a small dot “.” among the numerals to represent the blank space. Only after a long time, the small dot was changed to the numeral “0”. When ancient Chinese used counting rods to record numbers, they also used a blank space to represent “0”. A missing word in ancient books was often represented by “□” and blank spaces in numbers were also represented by “□”. Hence, after some time, as “□” was easily written as a circle, “O” was used to represent zero.



### The origin of Arabic numerals

The 10 numerals “0, 1, 2, 3, 4, 5, 6, 7, 8, 9” were first created by the ancient Indians. Only till about the 7th century were these numerals spread to the Arabic regions. When it came to the 13th century, the Italian mathematician Fibonacci (斐波那契) completed his “Book of Abacus” (算盤書) or “Book of Calculation” (Liber Abaci). The word “Abacus” in the name of the book did not simply refer to the Roman abacus or sand plate, but actually referred to calculations in general. In this book, Fibonacci introduced the Arabic numerals in details. Afterwards, these numerals were further spread from the Arabic regions to Europe. At that time, the Europeans only knew that these numerals came from the Arabic regions, so they called them Arabic numerals. Since then, Arabic numerals were spread from Europe to other places around the world and became the commonly used symbols for numerals all over the world.



$+$   $-$   $<$   $>$   $=$

### The origin of mathematical symbols

Who invented the addition symbol “+” and subtraction symbol “-” that we use in mathematics?

The two symbols “+” and “-” for addition and subtraction were first used by the German mathematician Michael Stifel (1487 — 1567). The first time he used these symbols was in the year 1544. Before that time, westerners all used the Latin word “plus”, Italian word “più” or the alphabet “p” to represent addition; and “minus”, “mene” or “m” to represent subtraction.

The two symbols for greater than “>” and smaller than “<” were first used by the English mathematician Thomas Harriot (1560 — 1621), whereas the equal sign “=” was first used by the English mathematician Robert Recorde (1510 — 1558).



$X + 1 = 2$   $Y - 3 = 4$



### The origin of algebraic symbols

When handling mathematical problems, we often use algebraic symbols to represent numbers. Who invented the algebraic symbols?

In about 250 A.D., the ancient Greek mathematician Diophantus of Alexandria (丢番图) introduced the concept of an unknown in his mathematical masterpiece “Arithmetica” (算術) and created symbols for unknowns. In the 16th century, the French mathematician François Viète (1540 — 1603) used in his publication “Introduction to the Analytic Art” vowels *A, E, I*, etc. to represent unknowns and consonants *B, C, D*, etc. to represent known numbers. Till the 17th century, another French mathematician René Descartes (笛卡儿, 1596 — 1650) improved the system of algebraic symbols created by Viète. Descartes used *a, b, c, ...* to represent known numbers and *x, y, z, ...* to represent unknowns. Since then, the algebraic symbols *x, y, z* are widely used.

