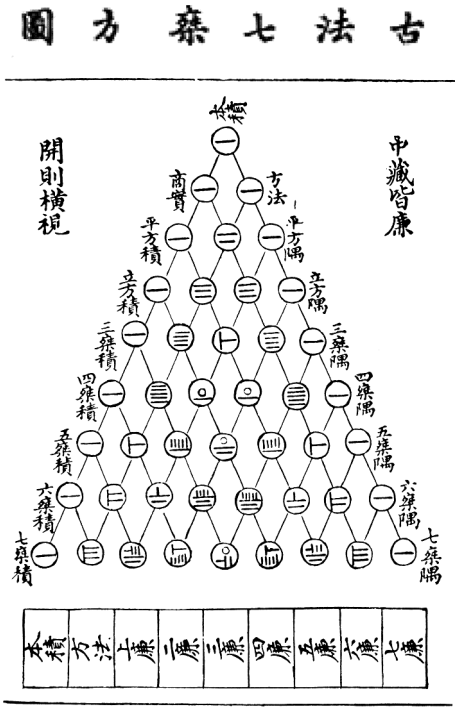
Épreuve de section européenne

A Chinese precursor of Pascal's triangle

Each Chinese numeral (other than the 1s on the left and right sides of the triangle) equals the sum of the two numerals to the left and right above it in the triangle. Only nine rows are shown, but the pattern can be continued indefinitely. The numerals across the nth row give the coefficients of the expansion of $(x+y)^{n-1}$. For example, $(x+y)^3 = x^3+3x^2y+3xy^2+y^3$; these coefficients are the entries in the fourth row of the triangle.



From the *Encyclopedia Brittanica* and *Wikipedia*

Questions

1. **a.** Use the information given in the text to find out the Chinese notations used in this picture for the numbers 1, 5, 6, 7, 10, 15, 20 and 35.

b. Explain the Chinese numeral system used in this picture, highlighting the differences and common points with our own decimal system.

2. **a.** Translate the eighth and ninth lines into decimal numbers.

b. Compute the decimal numbers that should appear in the tenth line.

3. Expand the expressions $(x+y)^4$ and $(x+y)^7$.

4. The following questions are for students in the scientific section only.

a. The number $\binom{5}{3}$ can be found somewhere on this figure. Where?

b. What does the number $\binom{5}{3}$ represent?