Early Chinese Mathematics

China's mathematical history dates back 3000 years or more. Around 220 BC, the ancient Chinese built the Great Wall, which was a major triumph of engineering skill and mathematical calculation.

The Chinese may have been the first to develop a decimal place-value system, similar to the one we use today. For their calculations, the Chinese used a form of **counting board**, a box with separate compartments for units, tens, hundreds, etc., into which small bamboo rods were placed. Each symbol from 1 to 9 had two forms, horizontal and vertical, enabling the calculator to distinguish easily between the numbers in adjacent compartments.

Most ancient Chinese mathematics was written on bamboo or paper, which has perished with time. An outstanding

work that survives, possibly from 200 BC, is the *Jiu zhang suan shu* (*Nine Chapters on the Mathematical Art*), containing the calculation of areas and volumes, the evaluation of square and cube roots, and the systematic solution of simultaneous equations (now called Gaussian elimination).

Several Chinese mathematicians devoted their energies to estimating π . Around AD 100, **Zhang Heng**, inventor of the seismograph for measuring earthquakes, proposed the value $\sqrt{10}$ (about 3.16). Around 264, using Archimedes's method for estimating π by approximating a circle with polygons, **Liu Hui** (in an edition of the *Nine Chapters*) calculated the areas of polygons with 3072 sides, obtaining the estimate $\pi = 3.14159$. This Chinese fascination with π reached its climax in the 5th century when **Zu Chongzhi** and his son considered polygons with 24,576 sides and deduced that $3.1415926 < \pi < 3.1415927$. They also found the estimate of $3^{16/113} (= 355/113)$, which gives π to six decimal places; this approximation was not rediscovered in Europe until the 16th century.

A remarkable work of 1303, the *Siyuan yujian* (*Jade Mirror of Four Elements*) shows an early version of the **arithmetical triangle** of binomial coefficients. The triangle was later analyzed by Blaise Pascal and is now named after him.

Counting board

Zhang Heng

Liu Hui

Liu Hui's *Nine Chapters*

Zu Chongzhi

Arithmetical triangle

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