Abacus Calculation

Guo Genfu, 70, uses a suanpan or an abacus in a convenience store which he has run for 48 years in Xinchuang village of Taicang City in Jiangsu Province. Guo still keeps the old habit of calculate with a suanpan when doing business. — IC

By Peter Zhang and Chen Jie | March 12, 2017, Sunday | Print Edition

IN China, zhusuan refers to a millennia old method of performing arithmetic calculations with an abacus, which is called suanpan (or literally “counting tray”) in Chinese.

In 2013, UNESCO honored Chinese zhusuan by adding it to its Representative List of the Intangible Cultural Heritage of Humanity.

“Zhusuan is widely used in Chinese life and is an important symbol of traditional Chinese culture, providing a strong sense of cultural identity,” said UNESCO.

According to some legends, the counting device suanpan was invented by Huangdi or Yellow Emperor (2698–2598 BC), a legendary ancestor of the Chinese people and the father of Chinese civilization.

However, other folk stories say the calculation tool was actually invented by Li Shou, who served the Yellow Emperor as his inventory keeper. As first, Li tied knots on a string or cut notches on a wood stick to keep track of the number of animals hunted, and fruits and other food harvested. But his method of counting soon became inadequate as the inventory grew rapidly during years of bumper harvest.

Then Li used stones and pebbles to keep his records, but it was inconvenient to keep piles of stones and one stone representing one object was not an efficient way to representing big numbers.

So, the inventory keeper sought a better method of calculation. One day, Li bored holes in pebbles and strung 10 each together with a twig. Then he planted the twigs in a line on the ground and defined from right to left a decimal place for each twig.

With this, an embryonic abacus came into being.

As far as we know today, the term zhusuan first appeared in a book entitled “Supplementary Notes on the Art of Figures,” written by Xu Yue, a well-known mathematician and astronomer of the Eastern Han Dynasty (AD 25-

220).

In his book, Xu named zhusuan as one of 14 traditional methods of counting and calculation in China. He described the Chinese counting tool suanpan as “having a rectangular wooden frame with thin rods fixed vertically inside the frame. On each rod, there are seven wooden beads: five beads are placed below a horizontal bar that divides the frame into two unequal parts, and two above the bar.”

This means that nearly 2,000 years ago, the Chinese suanpan had already taken the shape that we know today.

A modern suanpan is about 20 centimeters tall and usually has more than seven vertical rods, with two beads on the upper deck and five on the lower. The upper two beads represent five units each and the lower beads indicate a single unit each. From right to left, each rod is defined as a decimal place.

Calculating with a suanpan is easy to learn. Ancient Chinese created zhusuan oral formulas that have “easy-to-learn rhymes that represent specific calculation rules and summarize the arithmetic operations,” says UNESCO in its appraisal of the traditional Chinese counting method.

“Beginners can make quick calculations after some fairly basic training, while proficient practitioners develop an agile mind,” it adds.

The world organization also points out that zhusuan has been handed down in China through generations by traditional methods of oral teaching and self-learning.

Aside from basic counting, the ancient suanpan can also be used for multiplication, division, addition, square roots and cube foot operations.

Before electronic calculators became popular in the 1970s, the suanpan remained the most widely used calculating tool in China and some other East Asian countries.

In more recent years, calculation competitions have been organized in various places around China between teams using suanpan and teams using computers. And it’s not uncommon that the suapan team wins in complicated calculation contests.

Because of its long tradition and wide application in China, zhusuan also has “a far-reaching influence in various fields of cultural creativity, including folk customs, language, literature, sculpture and architecture” in the country, says UNESCO.

For instance, Chinese speakers today still quote phrases from zhusuan oral formulas as idioms in daily conservation, though most don’t use this ancient calculating method anymore.

One such saying is san xia wu qu er or “plus three equals plus five minus two.” This is a basic rule in zhusuan: To add three to a rod in suanpan, move down one bead on the upper deck and two beads on the lower deck of the same rod if there are already two or more beads there.

This is because a bead on the upper deck represents five units, while a bead on the lower deck indicates a single unit, and moving down beads on the upper deck means adding, moving down beads on the lower deck means subtraction.

This is such a basic rule in zhusuan that one is supposed to be able to do it in calculation without thinking. So, the phrase means “quick and decisive.”

Other zhusuan related idioms include ru yi suan pan or “perfect suanpan,” meaning indulging in wishful thinking; tie suan pan or “iron suanpan,” meaning a calculation wizard; and xiong you cheng suan or “calculated in mind,” meaning having a ready plan in one’s mind.

This last saying exemplifies a unique feature of zhusuan — greatly improving one’s capability in mental calculations.

As a time-honored traditional method of calculation, zhusuan today continues to contribute to “the advancement of calculating techniques, cognitive schemas, educational psychology and intellectual development,” concludes UNESCO.