Chinese Abacus (算盘 Suànpán)

Introduction to the Ancient Chinese Calculator

Welcome to the Abacus Booth in Chinese New Year Celebration Event! Are you curious about how the Chinese people perform calculations in their daily lives before the invention of modern electronic calculator and computer? How did the businessman calculate a huge amount of numbers in the leger?

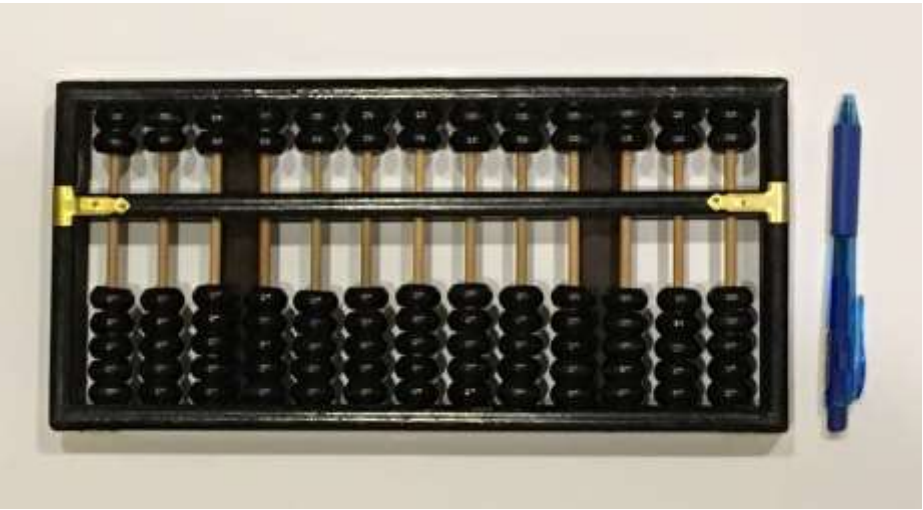
Let's start the journey of learning the history and how to use this fantastic ancient invention – the Chinese abacus. At the end of the journey, you will know how it is used, learn how to make your own abacus, and find links to explore more about Chinese abacus.

Brief History of Chinese Abacus

The Chinese abacus, called Suanpan (simplified Chinese: 算盘; traditional Chinese: 算盤; pinyin: suànpán) in Chinese, is an ancient "calculating tablet" with a history of over 2,500 years. The known literature that first describes the current form of Suanpan is the book, "Supplementary Notes on the Art of Figures (數術紀遺)", written by Xu Yue in Eastern Han Dynasty around 190 CE. Suanpans can perform addition, subtraction, multiplication, and division at high speed, and even square root and cube root operations. Chinese abacus can be used for both decimal and hexadecimal computation.

The Chinese Abacus

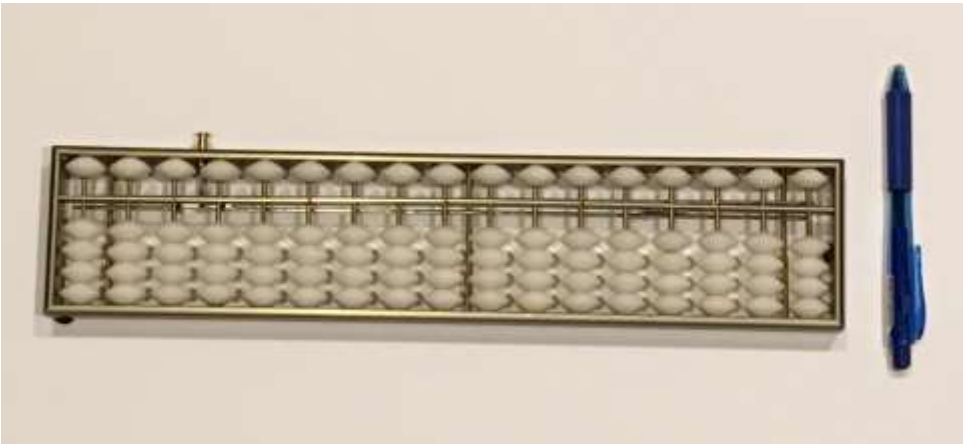
The Chinese abacus (suanpan) usually has thirteen rods of beads and two decks separated by a beam. The upper deck, which is known as heaven, has two beads on each rod. These beads each have the value of five. There are five beads on the bottom deck, known as earth. Each of these has the value of one. The beads are slide up and down during calculation. The beads are counted when moved toward the beam, and cleared when moved away from it.



Chinese abacus (suanpan)

Soroban vs. Suanpan

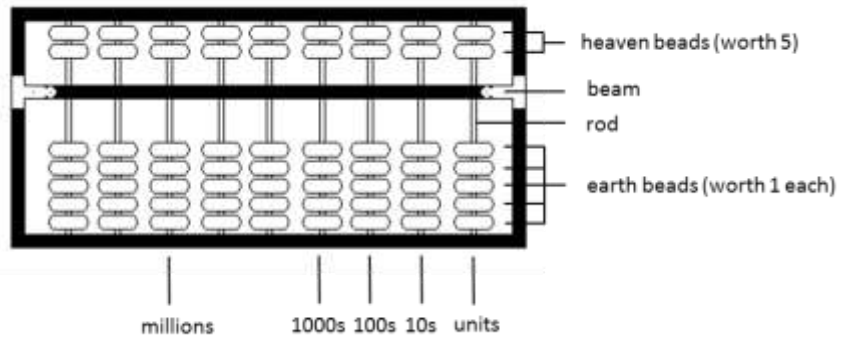
Soroban is the Japanese abacus derived from the Chinese suanpan. In the 14th century, Chinese suanpan was imported to Japan via the Korean peninsula. In around 1850, one heaven bead was removed from the suanpan configuration of two heaven beads. In 1891, Irie Garyū further removed one earth bead, forming the modern configuration of one heaven bead and four earth beads in the soroban. In normal use, both the Chinese suanpan and Japanese soroban function under the same rules. One could just ignore the upper and lower rows of beads in Chinese suanpan.

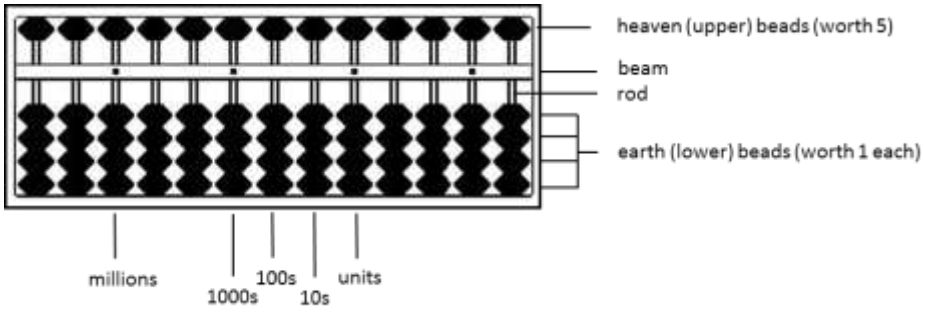


Japanese abacus (soroban)

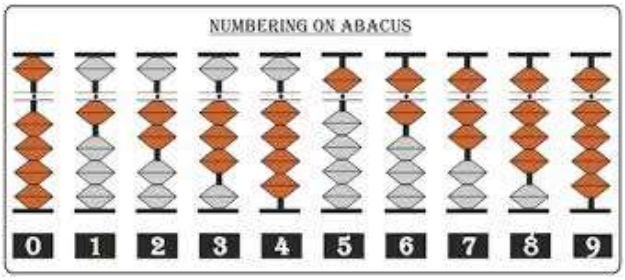
Abacus Fundamentals

The abacus has many rods of beads. The upper (heaven) beads worth 5, and the lower (earth) breads worth 1. The value of the beads depends on the rod to which they belong. The starting column represents a single unit or "1", and progresses leftwards by value in multiples of 10. The same representation applies to both Chinese and Japanese abacuses. In the pictures below, the abacuses are "cleared", representing zero, because all beads are moved away from the beam.



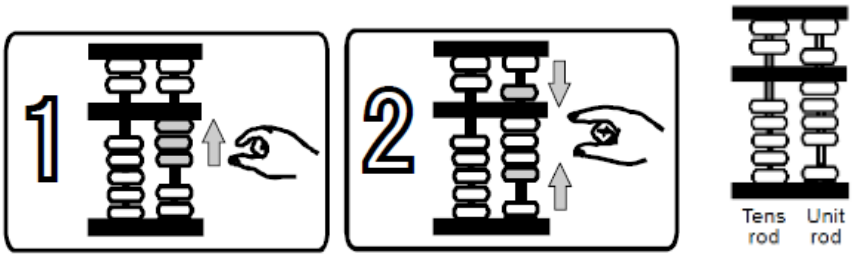


The following picture illustrates the numbering on a Japanese soroban. The beads are slide toward the beam to be “activated” or counted.

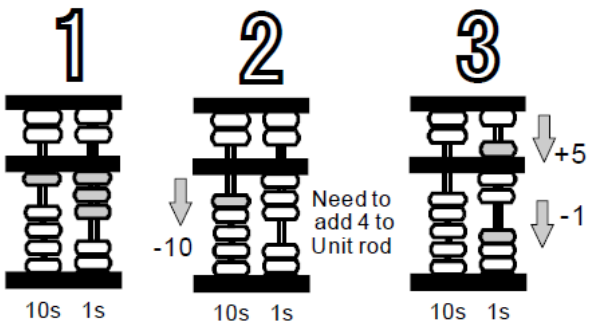


Basic Addition and Substation Operations

A basic addition of “3+6” is shown in the picture below. The first step is to “set” the initial number “3” by moving three lower beads in the unit rod toward the beam. The second step is to add “6” by moving one upper bead and 1 lower bead toward the beam. The result of the addition is “9”.



The picture below demonstrates the substation operation of “13-6”. The first step is to “set” the initial number of “13” by moving one lower bead in the ten rod and three lower beads in the unit rod toward the beam. The second step is to “rid” “10” by moving one lower bead in the ten rod away from the beam, because there is not enough beads in the unit rod to substrate 6. Since 10-6=4, the third step is to add 4 to the unit rod by setting one upper bead and ridding 1 lower bead in the unit rod. The result of the substation is “7”.



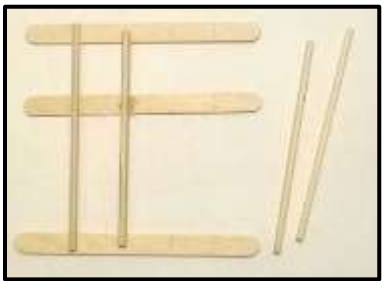
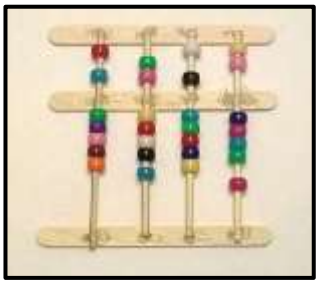
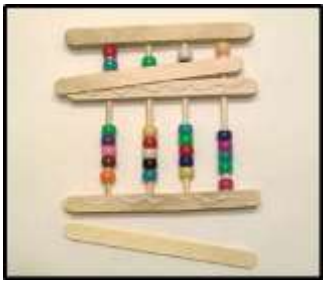
If you would like to learn more about the operation of an abacus, you can read this “Learn Abacus in Ten Minutes” comic in PDF file LearnAbacusIn10Min-All.pdf .

Make Your Own Abacus

Are you interested in playing with an abacus? Actually, you do not have to spend much money to purchase one. You could make your own abacus and have more fun!

You can prepare craft sticks, bamboo skewers or coffee stirs, craft beads, and glue. Then follow a few steps in the PDF file to make a Chinese abacus.

Make Your Own Abacus.pdf


Links to More Resources

Are you interested in learning more about how to use an abacus or want to watch how fast the abacus can perform the calculation? The following are links to more resources and video you can explore.

History of Abacus

- The Abacus: The Art of Calculating with Beads
  http://www.ee.ryerson.ca:8080/~elf/abacus/
- Suanpan and Soroban in Wikipedia
  https://en.wikipedia.org/wiki/Suanpan
  https://en.wikipedia.org/wiki/Soroban

Chinese Abacus and Japanese Abacus User Guides

- Abacus Handbook
  https://www.pssurvival.com/PS/Education/Ancient_Calculators/Abacus_Handbook_2004.pdf
- Mystery of the Bead: Abacus Instruction Manual
  http://webhome.idirect.com/~totton/abacus/
- THE BEAD UNBAFFLED - An Abacus Manual
  http://totton.idirect.com/abacus/Abacus_Mystery_of_the_Beada.pdf

Chinese Abacus Tutorial in YouTube

- Chinese abacus (Hello China #89)
  https://www.youtube.com/watch?v=cJvNtiRygY8
- World Record Soroban (Japanese Abacus)
  https://www.youtube.com/watch?v=3g63WR_PelY
- Abacus Tutorial: 1 Basic function
  https://www.youtube.com/watch?v=FTVXUG_PngE&list=PLZS9DSDWNsAZrWVceX8unV47vy1jVfBKw
- Abacus Tutorial: 2 The "exchange method" - calculating up to 5
  https://www.youtube.com/watch?v=I8EZvig5fOU&list=PLZS9DSDWNsAZrWVceX8unV47vy1jVfBKw&index=2
- Abacus Tutorial: 3 Complementary numbers - calculating up
  https://www.youtube.com/watch?v=YQLjDD9SzGA&list=PLZS9DSDWNsAZrWVceX8unV47vy1jVfBKw&index=3
- Abacus Tutorial: 4 The exchange method -calculating up to 10 and more -
  https://www.youtube.com/watch?v=22NdwzuEZi4&index=4&list=PLZS9DSDWNsAZrWVceX8unV47vy1jVfBKw
- Abacus Tutorial: 5 Complementary numbers - calculating up to 10 -
  https://www.youtube.com/watch?v=r0aKV3HqDzA&index=5&list=PLVYm4hbKyOudk5Mjuw6pv_pKJmJIwDD1O
- Abacus Tutorial: 6 Calculating 10 and higher using complementary numbers -
  https://www.youtube.com/watch?v=ua32YWTC9Yk&index=6&list=PLVYm4hbKyOudk5Mjuw6pv_pKJmJIwDD1O

- Abacus Tutorial: 7 Difficult positions on the modern abacus - https://www.youtube.com/watch?v=EdXNla0QRBA&index=7&list=PLVYm4hbKyOudk5Mjuw6pv_pKJmJIwDD1O