ABACUS Help Contents:

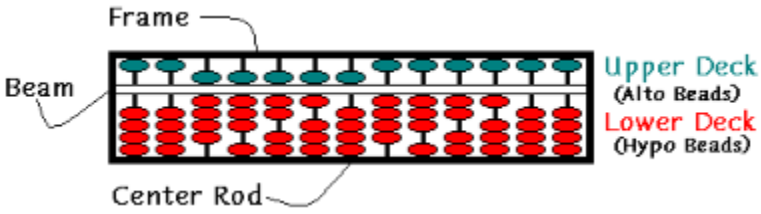
Sources:

Abacus Arithmetic by W.J. Crook, © Pacific Books, Palo Alto, CA.
The New Grolier Multimedia Encyclopedia © Grolier Inc. 1993

History Of The Abacus (ab'-uh-kuhs):

Historically, the most important early computing instrument is the abacus. It was invented by the Chinese around 500 BC. This simulation is based on a Japanese version of the abacus which was adapted from the Chinese approximately 20 centuries later. (1500 AD)

The name, abacus, is derived from the Greek word ***abax***, which means ***counting board***. It is a simple wooden frame holding parallel rods on which beads are strung. In more ancient times, however, the abacus was composed of a row of grooves in sand into which pebbles were placed. Later, the use of a slate or a board (remember what the Greeks called it?) made it a portable device.



The abacus works on the principle of place-value notation**:** *the location of a bead determines its value*. In this way, relatively few beads are required to depict large numbers. When these beads are manipulated, all ordinary arithmetic operations can be performed. Both the Chinese and Japanese abacuses have two decks which are separated by a beam. **The Chinese version** has 2 beads in the upper deck and 5 beads in the lower deck. In the Japanese version (and in this program), there is a single bead on the upper deck which has a value of 5, and there are 4 beads on the lower deck which each have the value of one. The beads are counted, or given numerical values, by shifting them ***towards*** the beam. The values are erased (canceled) by shifting the beads ***away*** from the beam. The *center rod* is the *ones place* or *10 to the zero power* and is used to represent the numbers 1 through 9. The rods to the **left** of the *center rod* (including the *center rod* itself) are used to represent the integer portion of the number, with each rod being the next higher power of 10. The rods to the **right** of the *center rod* are used to represent the decimal portion of the number, with each rod representing the next negative power of 10. The number represented in the diagram (above) is **98765.4321**.

How To Use The Abacus:

Addition:

During the following discussion, assume that the 13 rods of the abacus are numbered **1** through **13** from left to right.

Addition is always performed from left to right, therefore to add 13 and 21, you must raise 1 hypo-bead on rod **6** and 3 hypo-beads on rod **7** (center rod). Next, raise 2 more hypo-beads on rod **6** and 1 more hypo-bead on rod **7**. The total is then read by counting all the beads along the beam, resulting in **34** and is represented by the 3 beads on rod **6** and the 4 beads on rod **7**!

When adding numbers that exceed the number of beads remaining unused on any rod, you must forward (raise) one hypo-bead on the next rod to the left. This bead always equals 10, so you must now cancel enough beads on the original rod to leave the difference between 10 and the number you were adding. There are 17 rules to use as a reference until you become familiar with the various ways that a number can be obtained. Note that to obtain a number in some cases, it is necessary to go through as many as three steps! Also note that the words **Lower Alto** mean moving the alto-bead towards the beam; the word **Raise** means moving hypo-beads towards the beam; the word **Cancel** means moving either type of bead away from the beam; and the words **Forward 10** mean adding one bead to the rod immediately to the left.

1) One: Lower Alto, Cancel 4
2) Two: Lower Alto, Cancel 3
3) Three: Lower Alto, Cancel 2
4) Four: Lower Alto, Cancel 1
5) One: Cancel Alto, Cancel 4, Forward 10
6) Two: Cancel Alto, Cancel 3, Forward 10
7) Three: Cancel Alto, Cancel 2, Forward 10
8) Four: Cancel Alto, Cancel 1, Forward 10
9) Five: Cancel Alto, Forward 10
10) Six: Cancel 4, Forward 10
11) Seven: Cancel 3, Forward 10
12) Eight: Cancel 2, Forward 10
13) Nine: Cancel 1, Forward 10
14) Six: Cancel Alto, Raise 1, Forward 10
15) Seven: Cancel Alto, Raise 2, Forward 10
16) Eight: Cancel Alto, Raise 3, Forward 10
17) Nine: Cancel Alto, Raise 4, Forward 10

Lets do another example (28 + 93). Place a 2 on rod **6** and an 8 on rod **7**. Since you only have 7 left on rod **6** and you need 9, you must use rule 13 and **forward 10** (raise one hypo-bead on rod **5**), then cancel one hypo-bead on rod **6**. Next, add 3 to rod **7** using rule 7, by raising one hypo-bead on rod **6** and canceling one alto-bead (5) and two hypo-beads (2) on rod **7**. The resulting number is **121**.

Occasionally, all beads will be in use on a rod. When this happens, **forward 10** by raising one hypo-bead on the next rod to the left and canceling all beads on the original rod.

Subtraction:

To do subtraction on an abacus, ***reverse*** all procedures including the 17 rules! Note that the words **Remove 10** mean subtracting one bead from the rod immediately to the left! Occasionally, all beads will be canceled on a rod. When this happens, **remove 10** by canceling one hypo-bead on the next rod to the left, and set a value of 9 on the original rod by lowering the alto-bead and raising 4 hypo-beads.

1) One: Cancel Alto, Raise 4
2) Two: Cancel Alto, Raise 3
3) Three: Cancel Alto, Raise 2
4) Four: Cancel Alto, Raise 1
10) Six: Remove 10, Raise 4
11) Seven: Remove 10, Raise 3
12) Eight: Remove 10, Raise 2
13) Nine: Remove 10, Raise 1

5) One: Remove 10, Lower Alto, Raise 4
6) Two: Remove 10, Lower Alto, Raise 3
7) Three: Remove 10, Lower Alto, Raise 2
8) Four: Remove 10, Lower Alto, Raise 1
9) Five: Remove 10, Lower Alto
14) Six: Remove 10, Lower Alto, Cancel 1
15) Seven: Remove 10, Lower Alto, Cancel 2
16) Eight: Remove 10, Lower Alto, Cancel 3
17) Nine: Remove 10, Lower Alto, Cancel 4

Lets do one last example (24 - 19). Like addition, subtraction is also performed from left to right, therefore to subtract 19 from 24, you must raise 2 hypo-beads on rod **6** and 4 hypo-beads on rod **7** (center rod). Next, cancel 1 hypo-bead on rod **6**. Now, since there are only 4 beads left on rod **7** and you need 9, you must use rule 17 and **remove 10** (cancel one hypo-bead from rod **6**), then lower the alto-bead and cancel 4 hypo-beads from rod **7**. The total is then read by counting all the beads along the beam, resulting in **5** and is represented by the single alto-bead on rod **7**!

For a detailed explanation of addition, subtraction, multiplication, and division, refer to a book such as Abacus Arithmetic by W.J. Crook, Pacific Books - Palo Alto, CA.

Features Of The Abacus Program:

Menu Items:

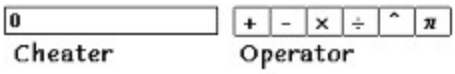
There are only a few menu items, and most of them are pretty self explanatory. Under ***Options***, you can clear (set to zero) all of the rods of the abacus by selecting ***Clear (Ctrl-C)***, or you can remove or add the cheat functions at the bottom of the abacus by selecting ***CheatS (Ctrl-S)***. This is also where you will find the ***Exit (Ctrl-X)*** button. Under ***Help***, you will find a button to bring up this help, **F1**, and an option to bring up the ***About*** dialog box.

Moving The Beads:

To move the beads, simply position the mouse pointer over the bead you wish to move, and click the left mouse button. If the bead is currently canceled, it and any beads above it will be counted (moved towards the beam). If the bead is currently counted, it and any beads below it will be canceled (moved away from the beam). When the beads are moved, a number (0 through 9) will appear in a text box above to indicate the sum of all the beads on that particular rod. *(A feature that doesnt exist on a real abacus!)* Remember that the first seven rods represent the integer portion of the number, and the last six rods represent the decimal portion of the number.

Another way to move the beads is to simply type the number you wish to represent in the text box above the rod. The beads will be moved automatically, but this is cheating! Speaking of cheating...

Cheats:



These cheats will allow you to perform all of the basic mathematical functions with the abacus program, just like a modern day calculator! For the purpose of this discussion, the ***Result*** is the number appearing on the abacus. Plus, minus, multiply, divide and power (**^**) operations are all handled as follows:

Result = Result (Operator) Cheater

Example: If the number 2 appeared on the abacus and the number 0.5 was entered as the cheater, the result of the power operation would be 2**^**0.5 or the square root of 2. **(1.414214)** While the result of the divide operation would be 2/0.5 or 4.

The π button does not perform an operation, but instead sets the cheater to the value of Pi. **(3.141593)**

The ABACUS Programmer:

Hi! I'm David Brown, creator of this unique program! This is freeware, so feel free to pass this out to your friends (and/or enemies), but remember that nothing is ever truly free! If you find this program useful, donations would be very welcome. Mail your contributions to:

David A. Brown
5631 N. Rosslyn Ave.
Indianapolis, IN 46220
U.S.A.
email: mcdoc@juno.com

At the very least, please send me a postcard with some feedback. I always enjoy getting postcards from the far away places where my programs are being enjoyed. Thanks. Gracias. Merci. Danke.

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Users are free to install and run the program on any system or systems they wish (subject only to the program's hardware requirements). Users are also free to copy and distribute the original files in any manner and via any means available to them.

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This program requires *Microsoft Windows* 3.1 or higher. No other special hardware or software is needed (except a trusty mouse).

Special thanks goes out to ***Gilleys Antique Mall*** (5831 E. US 40 Plainfield, Indiana 46168) who sold me the abacus that got me started! I hope they appreciate the free advertising! Also a big hand to my wife, who puts up with me on a daily basis!

The Classic Chinese Abacus:

The Chinese abacus was invented over 20 centuries before the Japanese adapted the design. The Chinese abacus had an extra bead in both the upper and lower decks...