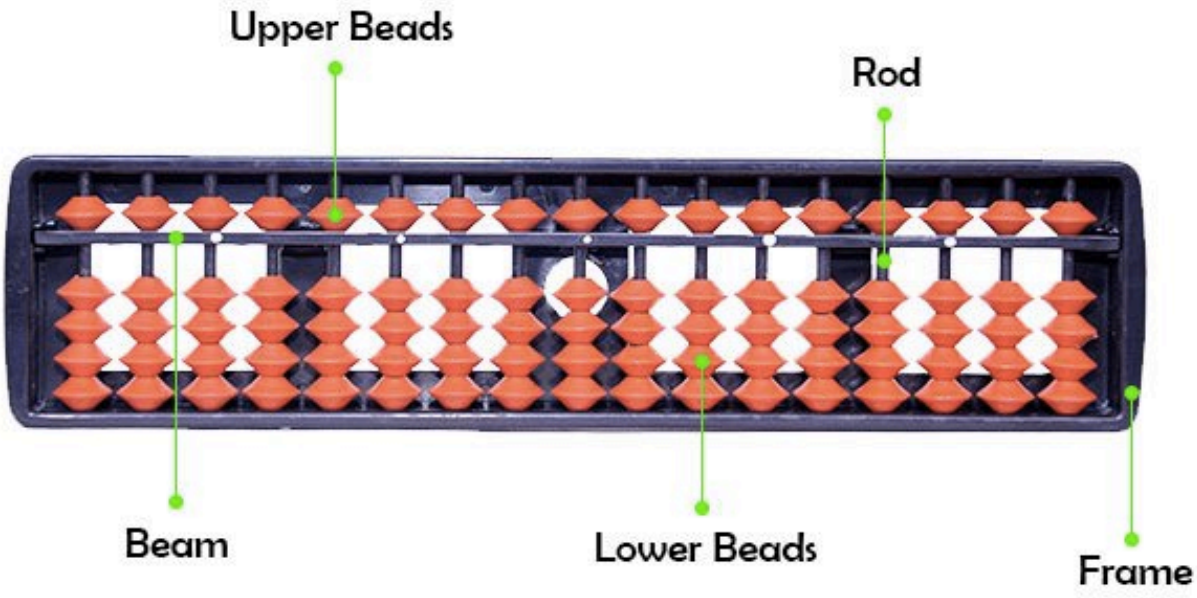
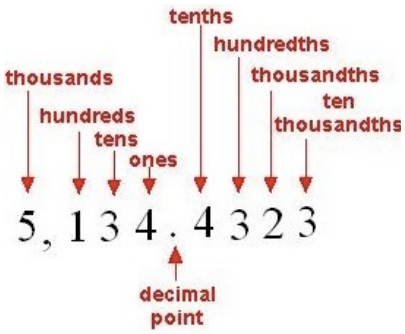
Fast Calculations with Abacus!

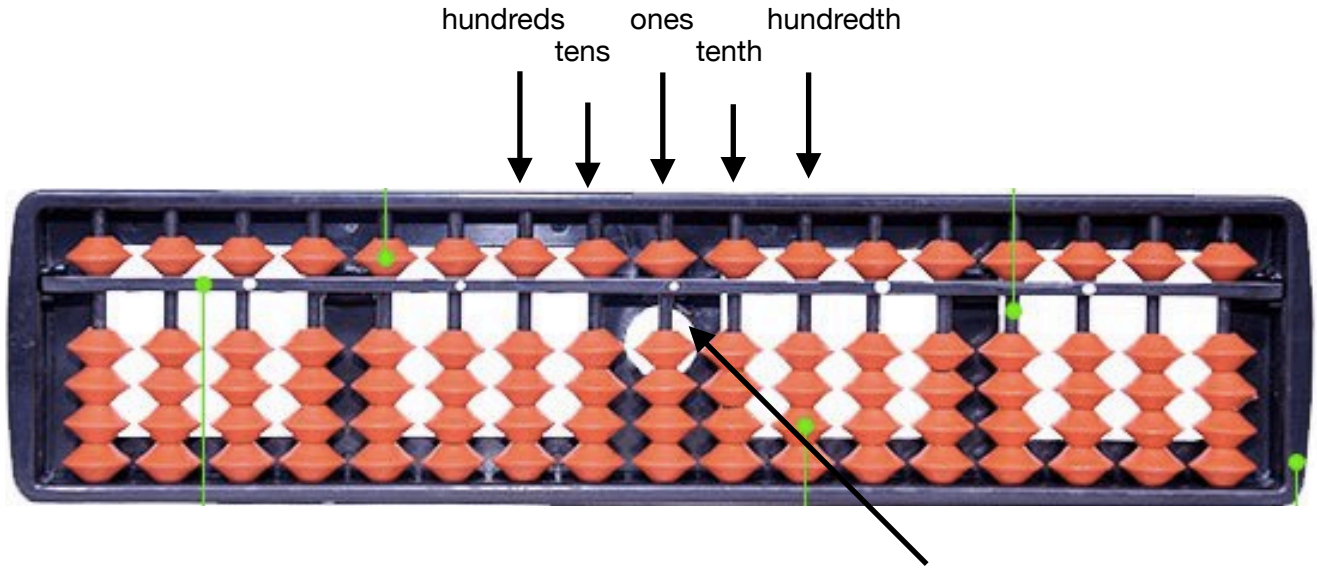
Abacus is a useful counting tool in Europe, Russia, and China for centuries. The idea is to minimize mental work as much as possible and to perform the physical task of adding and subtracting beads mechanically, without thought or hesitation.



The beads are counted by **moving them up or down towards the beam**. If you move them toward the beam, you count their value. If you move away, you don't count their value. It can be reset to the **starting position** instantly by a quick movement along the horizontal axis to spin all the beads away from the horizontal beam at the center.

I. The Beam
   A. Upper Beads (Heaven Beads): each has value of 5; (upper bead is worth 5)
   B. Lower Beads (Earth Beads): each has value of 1; (lower bead is worth 1)
   C. Every Third Rod is marked with a dot.
   D. Always remember to choose the **zero position** as “ones”. (marked with a dot) On the left of ones is tens, hundreds (from right to left); On the right is tenths, hundredths (from left to right).





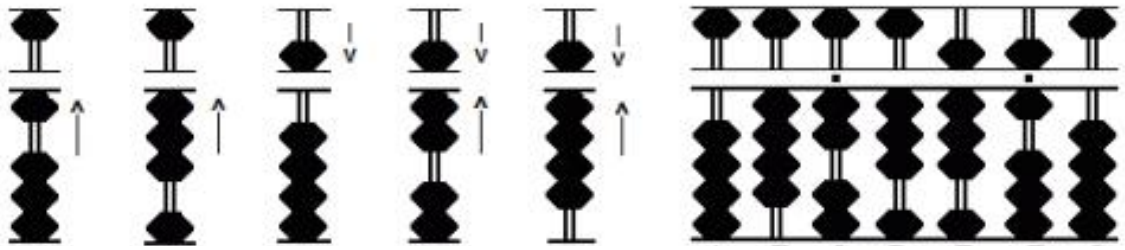
- If I move 1 lower bead up, the answer is 1;
- If I move 2 lower beads up, the answer is 2.
- If I move 1 upper bead down, the answer is 5.

IT'S YOUR TURN!!
(Set at the zero position)

- If I move 1 upper bead down and 3 lower beads up, the answer is __.
- If I move 1 upper bead down, 4 lower beads up, and 2 lower beads down, the answer is __.
- If I move 1 upper bead down, 3 lower beads up, 1 upper bead up, and 1 lower bead down, the answer is __.
- I have rod B at the zero position and rod A on the left of rod B. If I move 1 upper bead down on the rod B, 3 lower beads up on the rod B, 3 lower beads up on the rod A, and 1 lower bead down on the rod B, the answer is __.

(*Hint: move the beads when you do the questions!!)*

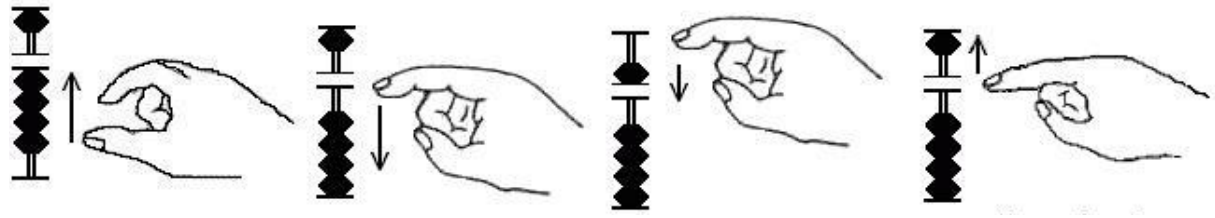
Practice Reading Numbers!



___ ___ ___ ___ ___ _____

II. Setting Numbers

A. Use only **thumb** and **index fingers** to manipulate beads.
B. The **thumb** moves the earth beads **up toward** the beam.
C. The **index finger** moves everything else (all lower beads down away from the beam and all upper beads up & down).
D. Always work from **LEFT to RIGHT.**



+ 4 - 4 + 5 - 5

IV. Complementary Numbers

One technique employed by the operator is the use of **complementary numbers** with respect to 5 and 10.
Convert all the numbers into 1,2,3,4,5,10
Simple Calculation Rules: Do it with your abacus!!

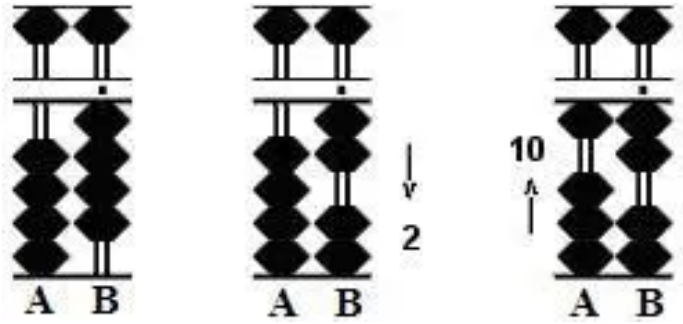
A. With respect to 5

1) +1= - 4 + 5
2) +2= - 3 + 5
3) +3= - 2 + 5
4) +4= - 1 + 5

B. With respect to 10

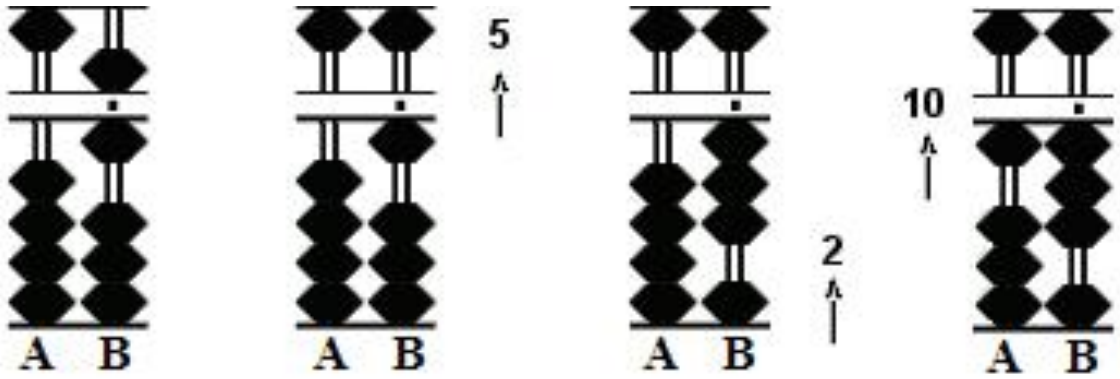
1) +1= - 9 + 10 = - 5 - 4 +10
2) +2= - 8 + 10 = - 5 - 3 +10
3) +3= - 7 + 10 = - 5 - 2 +10
4) +4= - 6 + 10 = - 5 - 1 +10
5) +5= - 5 + 10
6) +6= - 4 + 10 = - 5 +1+10
7) +7= - 3 + 10 = - 5 +2+10
8) +8= - 2 + 10 = - 5 +3+10

9) +9= - 1 + 10 = - 5 +4+10
Example 1:
Add: 4+8 = 12



Steps:
1) set 4 on rod B.
2) Add 8.
- Rod B doesn't have a value of 8 available, so use the complementary number.
- The complementary number for 8 **with respect to 10 is 2**.
- **+8 = - 2 + 10**
- subtract 2 from 4 on rod B and carry 1 to tens rod A, leaving the answer 12.

Example 2:
Add: 6+7=13



1) Set 6 on rod B.
2) Add 7.
- subtract the complement because rod B doesn't have the required beads.
- The complementary number for 7 **with respect to 10 is 3.**
- **7= -3+10 (NOT ENOUGH LOWER BEADS!)**
  = +2-5+10

- subtract 3 (= add 2 subtract 5) from 6 on rod B and carry 1 to tens rod A leaving the answer 13
- 6 + 7 = 13 becomes 6 - 5 + 2 + 10 = 13

III. In-Class Simple Addition Practice (Do it with Abacus!)

11 + 4	13 + 2	14 + 1
12 + 3	14 + 11	12 + 13
21 + 14	32 + 23	40 + 17
2 + 43	11 + 54	51 + 44
54 + 1	45 + 13	22 + 36

MORE CHALLENGING!!!

1) 43+51+12=
2) 232+61=
3) 143+524=
4) 126+23+840=
5) 1324+321+53+200=