



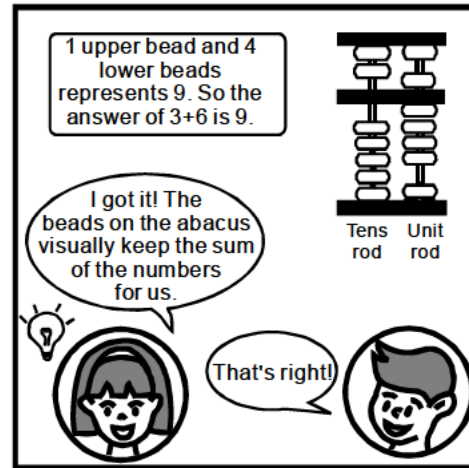
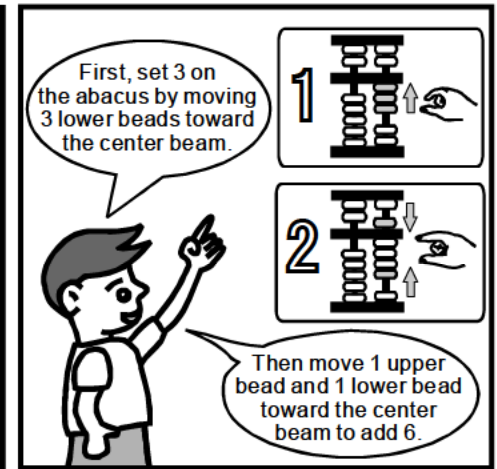
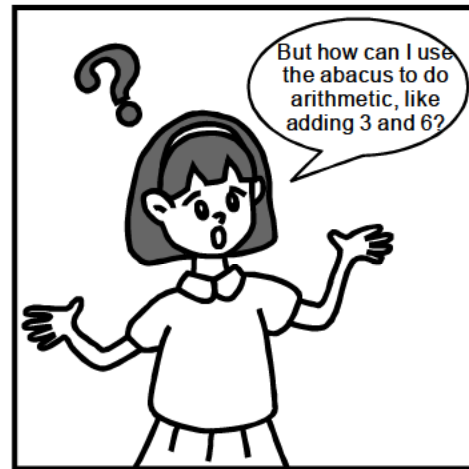
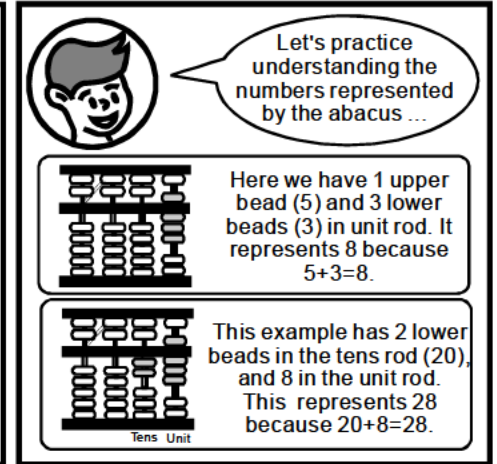
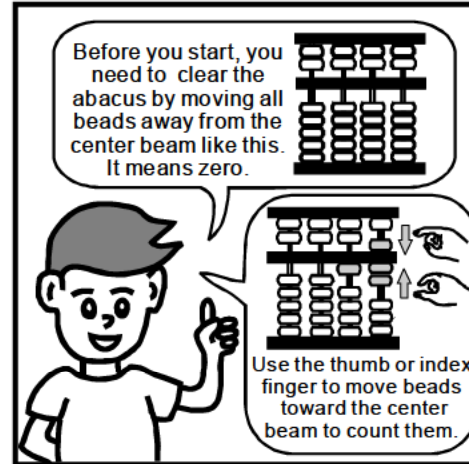
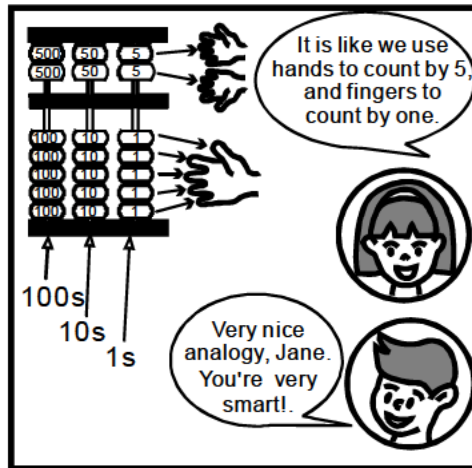
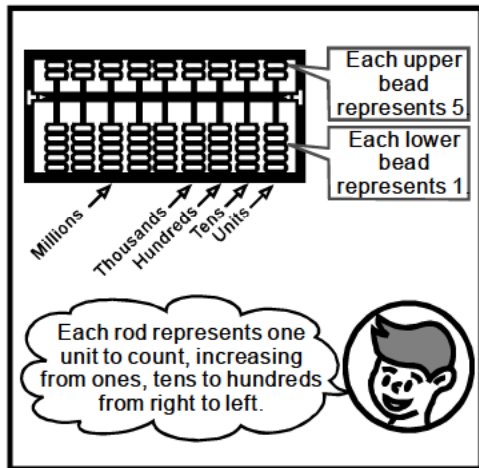
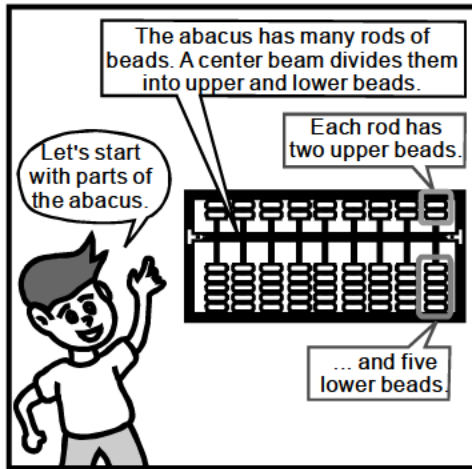
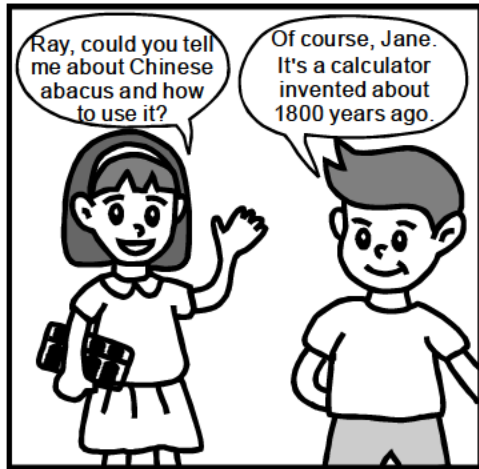
Learn Abacus In Ten Minutes

十分鐘學算盤

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Exercise Answers : (1) B, (2) D, (3) E, (4) A, (5) C



1

10s 1s

Set 58 on the abacus.

2

10s 1s

Add 30 by moving 3 lower beads up in Tens rod.

3

10s 1s

Not enough lower beads to add 4 to Unit rod. Add one upper bead and remove one lower bead because $4=5-1$.

4

10s 1s

Both upper beads are counted in Unit rod. Exchange them with a lower bead in Tens rod.

5

10s 1s

The beads on the abacus represent 92, so $58+34=92$.

Let's practice $4+8$. First, set 4 on the abacus. You can see there is not enough beads in Unit rod to add 8.

1

10s 1s

2

10s 1s

$+10$

-2

The complementary number of 8 with respect to 10 is 2. We can substrate 2 from the unit rod and carry one to Tens rod. The answer is 12. The whole operations can be done quickly in one movement. ($4+8=4-2+10=12$)

Let's try $13-6$. We can see Unit rod doesn't have enough beads to substrate 6.

$13-6=3+(10-6)$
 $=3+4$
 $=3+(5-1)$

1

10s 1s

2

10s 1s

-10

3

10s 1s

$+5$

-1

Need to add 4 to Unit rod

Fantastic! How about subtraction? For example, $12-4$.

1

10s 1s

Set 12 on the abacus.

2

10s 1s

Not enough beads in Unit rod to subtract 4. Exchange 1 lower bead in Tens rod with 2 upper beads in Unit rod.

3

10s 1s

We know $5-4=1$. We can remove 1 upper bead and add one lower bead in Unit rod.

4

10s 1s

The beads on the abacus represent 8, so $12-4=8$.

Wow! Only 4 lower beads and 1 upper bead are needed if we know complementary numbers and combine finger movements.

Chinese abacus (Suan Pan)

Japanese abacus (Soroban)

It is the exact reason Japanese modified Chinese abacus around 1850 AD to have only 1 upper bead and 4 lower beads.

Thank you, Ray. You have been really helpful.

You are welcome. Don't forget that practice makes perfect.

I'm good at mental calculation. I know $10-4=6$. Can I skip the exchange of 10 with 2 upper beads in Unit rod, and just add 6 to Unit rod?

New Step 2

-10

$+6$

Sure you can! It's using the concept of complementary numbers to speed up abacus operations.

Tell me more about complementary numbers ...

Complementary numbers with respect to 5 are 4&1 and 3&2, because $4+1=5$, and $3+2=5$. Those with respect to 10 are 9&1, 8&2, 7&3, 6&4, and 5&5.

When we add a number and there aren't enough beads, we can substrate its complementary number and carry the bead to the upper or next rod. For subtraction, it becomes adding the complementary number.

Show me examples.

Exercises: Connect the abacus answer to the question.

(1) $11+6$ (2) $15+62$ (3) $24+38+11$ (4) $48-14$ (5) $63-24$

A

B

C

D

E

(Answers are in page 1)