



## Modern Chinese Multiplication Techniques

Rather than use the more traditional 2:5 bead suan pan, more and more Chinese are switching over to a 1:4 bead instrument. Nowhere is this more evident than here in Toronto where abacus classes are regularly held at several venues throughout the city. Most of the young pupils who attend these classes are children of Chinese heritage and most use a Japanese style 1:4 bead soroban. Although this technique is just as easily performed on a more traditional Chinese suan pan, the following examples will use a 1:4 bead frame.

While there are older, more [traditional multiplication techniques](#), this is the one most often used by modern day Chinese abacists. It's a technique that was also common to Japan around 1930 before being replaced by the [standard method](#) used today. Takashi Kojima mentions this technique in his 1963 book 'Advanced Abacus - Japanese Theory and Practice'. Of the technique he says, "[This] variant is still favored by quite a few experts including entrants in abacus contests because it is a little faster than the standard method."

**Advantages:** In addition to being faster, the nice thing about this technique is that predetermining the unit rod is very simple and decimals numbers are easily dealt with. To predetermine the unit rod one has only to count whole numbers or decimal numbers in the multiplier and \*shift\* the multiplicand left or right of the designated unit rod accordingly.

**Disadvantages:** The only real difficulty with this technique is that the operator must remember numbers in the multiplicand from one step to the next as they are removed from the frame. (See [examples below for an explanation.](#))

### Predetermining the Unit Rod - Counting Digits in the Multiplier

- Where digits in the multiplier are whole numbers or mixed decimal numbers, count only the whole number before the decimal. For every whole number shift the multiplicand one rod to the left.
- Where digits in the multiplier are pure decimal numbers, count only the trailing zeros after the decimal. For every trailing zero shift the multiplicand on rod to the right.

### The Unit Rod & Where to Shift the Multiplicand

1.03....One whole number - shift the multiplicand 1 rod left.  
45.003...Two whole numbers - shift the multiplicand 2 rods left.  
0.75....No whole numbers, no trailing zeros. The multiplicand does \*not\* shift.  
0.0125...One trailing zero - shift the multiplicand 1 rod to the right.  
0.003....Two trailing zeros - shift the multiplicand 2 rods to the right...etc.

**Example 1:**  $23 \times 45 = 1035$

**Step 1:** Designate rod I to be the unit rod. With rod I as the designated unit rod, one might think that the multiplicand 23 will be set on rods HI. However, the multiplier consists of two whole numbers. Therefore shift the multiplicand two rods to the left. Set 23 on rods FG. This ensures that the unit

number in the product will fall neatly on unit rod I. Set the multiplier 45 on rods BC. (Fig.1)

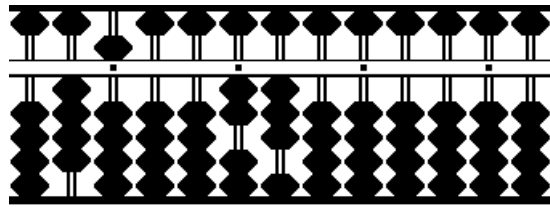


Fig.1

Step 1

A	B	C	D	E	F	G	H	I	J	K	L	M
0	4	5	0	0	2	3	0	0	0	0	0	0

**Step 2:** Multiply the 3 on G by 4 on rod B and add the product 12 to rods GH. Notice the technique in this step. It requires changing the multiplicand from 3 on G to 1 in the product. For the next step you must remember that the multiplicand was 3.

**2a:** Multiply multiplicand 3 by 5 on rod C and add the product 15 to rods HI. This leave 2 on F and the partial product 135 on rods GHI. (Fig.2)

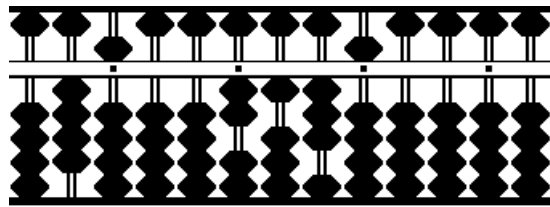


Fig.2

Step 2

A	B	C	D	E	F	G	H	I	J	K	L	M
0	4	5	0	0	2	3	0	0	0	0	0	0
					+	(1) 2						
						+	1 5					
0	4	5	0	0	2	1	3	5	0	0	0	0

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Step 2a

Step 2b

**Step 3:** Multiply the 2 on F by 4 on B and place the product 08 on rods FG. Once again this step requires changing the multiplicand. This time the 2 on F becomes 0. For the next step remember that the multiplicand was 2.

**3a & the answer:** Multiply the 2 on F by 5 on rod C and add the product 10 to rods GH. This leaves the answer 1035 on rods FGHI.

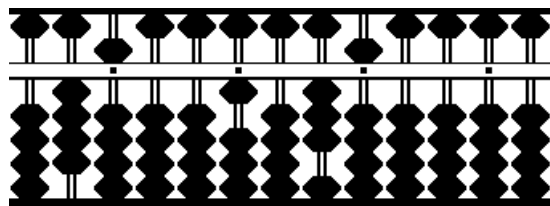


Fig.3

Step 3

A	B	C	D	E	F	G	H	I	J	K	L	M
0	4	5	0	0	2	1	3	5	0	0	0	0
					+	(0) 8						
						+	1 0					
0	4	5	0	0	1	0	3	5	0	0	0	0

Step 3a

Step 3b

**Example 2:**  $0.0023 \times 0.45 = 0.001035$

**Step 1:** Because the multiplier 0.45 has neither whole numbers nor trailing zeros no adjustments in setting of the multiplicand will be necessary. Designate rod F as the unit rod and set 23 on rods IJ. Set the 45 on rods DE. (Fig.4)

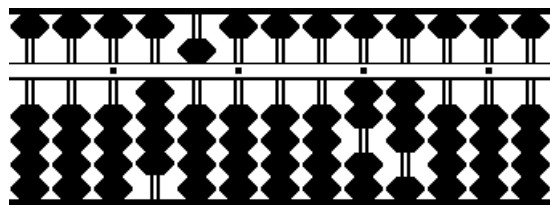


Fig.4

Step 1

A	B	C	D	E	F	G	H	I	J	K	L	M
0	0	0	4	5	0	0	0	2	3	0	0	0

**Step 2:** Multiply the 3 on J by 4 on D and add the product 12 to rods JK. Again this step requires changing the multiplicand. This time the 3 on J becomes 1. Remember that the multiplicand was 3.

**2a:** Multiply multiplicand 3 by 5 on E and add the product 15 to rods KL. This leave 2 on I and the partial product 135 on rods JKL. (Fig.5)

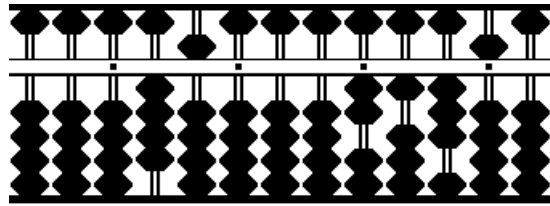


Fig.5

**Step 2**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	0	0	4	5	0	0	0	2	3	0	0	0
									+	(1)2		
									+	15		
0	0	0	4	5	0	0	0	2	1	3	5	0

Step 2  
Step 2a

**Step 3:** Multiply the 2 on I by 4 on D and place the product 08 on rods IJ. Once again change the multiplicand. This time the 2 on I becomes 0. For the next step remember that the multiplicand was 2

**3a & the answer:** Multiply the multiplicand 2 on I by 5 on rod E and add the product 10 to rods JK. This leaves 1035 on rods IJKL. Because rod F was designated as the unit rod, the answer actually reads 0.001035. (Fig.6)

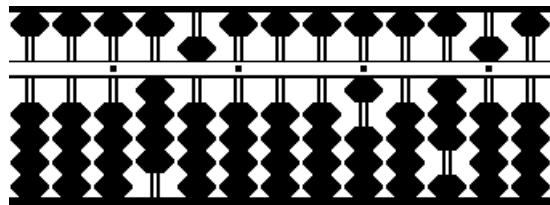


Fig.6

**Step 3**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	0	0	4	5	0	0	0	2	1	3	5	0
									+	08		
									+	10		
0	0	0	4	5	0	0	0	1	0	3	5	0

Step 3  
Step 3a

**Example 3:**  $486 \times 0.0075 = 3.645$

**Step 1:** The multiplier 0.0075 has two trailing zeros after the decimal. Therefore the multiplicand will have to shift two rods to the right of the designated unit rod. Designate rod F as the unit rod and set 486 on rods FGH. Set 75 on rods BC. (Fig.7)

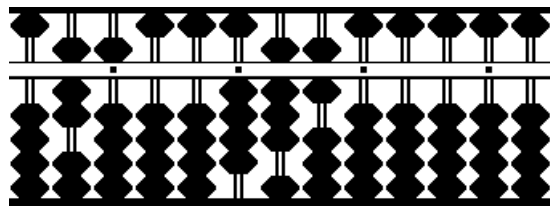


Fig.7

**Step 1**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	7	5	0	0	4	8	6	0	0	0	0	0

**Step 2:** Multiply the 6 on H by 7 on B and changing the 6 on H to 4 add the product 42 to rods HI. For the next step remember that the multiplicand was 6.

**2a:** Multiply multiplicand 6 by 5 on C and add the product 30 to rods IJ. This leave 48 on rods FG and the partial product 45 on rods HI. (Fig.8)

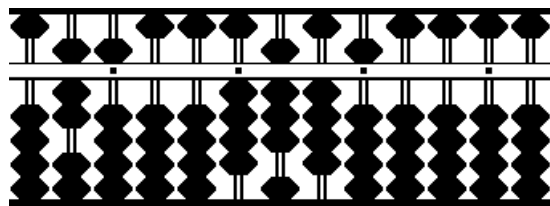


Fig.8

**Step 2**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	7	5	0	0	4	8	6	0	0	0	0	0
									+	(4)2		
									+	30		
0	7	5	0	0	4	8	4	5	0	0	0	0

Step 2  
Step 2a

**Step 3:** Multiply the 8 on G by 7 on B and changing the 8 on G to 5 add the product 56 to rods GH. For the next step remember that the multiplicand was 8.

**3a:** Multiply multiplicand 8 by 5 on C and add the product 40 to rods HI. This leaves 4 on rod F and the partial product 645 on rods GHI. (Fig.9)

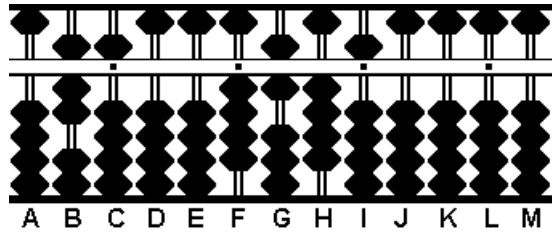


Fig.9

**Step 3**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	7	5	0	0	4	8	4	5	0	0	0	0
						+	(5) 6					
						+	4 0					
0	7	5	0	0	4	6	4	5	0	0	0	0

Step 3  
Step 3a

**Step 4:** Multiply the 4 on F by 7 on B and changing the 4 on F to 2 add the product 28 to rods FG. For the next step remember that the multiplicand was 4.

**4a & the answer:** Multiply multiplicand 4 by 5 on C and add the product 20 to rods GH. This leaves 36454 on rods FGHI. Because rod F is the designated unit rod the answer reads 3.645 (Fig.10)

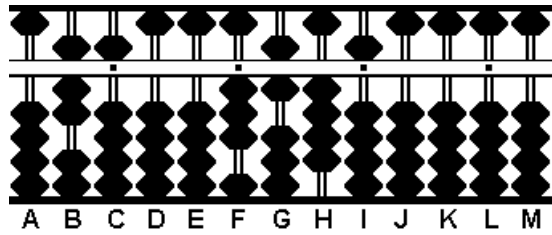


Fig.10

**Step 4**

A	B	C	D	E	F	G	H	I	J	K	L	M
0	7	5	0	0	4	6	4	5	0	0	0	0
					+	(2) 8						
					+	2 0						
0	7	5	0	0	3	6	4	5	0	0	0	0

Step 4  
Step 4a

- [Abacus: Mystery of the Bead](#)
- [Advanced Abacus Techniques](#)