



## Predetermining the Unit Rod and the Decimal Place

Before beginning soroban work an operator must first designate which rod will be the unit rod. Rods to the right of the unit rod carry the decimal numbers.

The following is a method that allows for placing both multiplicand and dividend onto the soroban in such a way that the unit and decimal numbers in both product and quotient fall naturally on predetermined rods. In other words you always know where your unit rod is which in turn allows you to simplify problems. Take the example  $0.000025 \div 0.05 = 0.0005$  Because you've already predetermined the decimal place, what looks like a rather complicated decimal problem involving a lot of zeros can be simplified to a much more manageable  $25 \div 5 = 5$

This method is a variation on one taught to me by Edvaldo Siqueira of Rio de Janeiro, Brazil. The method was developed by Professor Fukutaro Kato, a Japanese soroban teacher living in Brazil in the 1960's and was published in the Professor's book, \*SOROBAN pelo Método Moderno\*. (\*SOROBAN by the Modern Method\*)

As some of the following examples will reveal, the method works particularly well and helps to simplify problems having complicated decimal numbers.

### Counting Digits

Where digits are whole numbers or mixed decimal numbers, count only the whole number before the decimal. Consider the result positive.

Examples:

0.253.....count 0 digits.  
 2.703.....count +1 digit.  
 56.0092.....count +2 digits.  
 459.38.....count +3 digits.  
 1500.....count +4 digits, and so on.

Where digits are pure decimal numbers, count only the zeros that immediately follow the decimal. Consider the result negative.

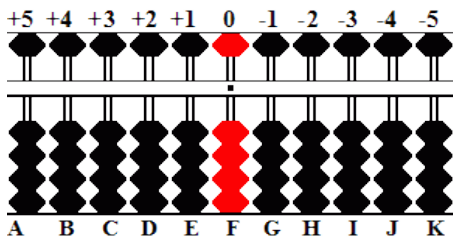
Examples:

0.40077.....count 0 digits.  
 0.02030.....count -1 digit.  
 0.0092.....count -2 digits.  
 0.00057.....count -3 digits, and so on.

### Setting Problems On The Soroban

#### Multiplication:

Soroban showing rods A through K with rod **F** acting as the unit rod. Rods to the left of the unit rod are considered positive (+) while rods to the right are considered negative (-)



**Formula for Setting the Multiplicand:** Rod = # of digits in multiplicand *PLUS* # of digits in multiplier.

Example:  $0.03 \times 0.001 = 0.00003$

For this example, the formula for this problem is: Rod =  $-1 + (-2) = -3$ .

Explanation:

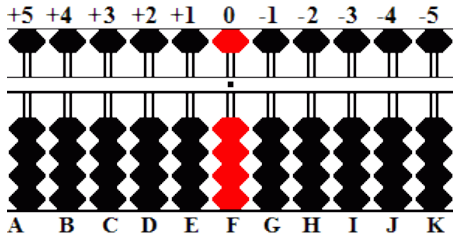
- a) The multiplicand has one zero after the decimal. Count -1
- b) The multiplier has two zeros after the decimal. Count -2. The equation becomes  $-1 + (-2) = -3$
- c) Count *MINUS* 3 from rod F. Set the multiplicand 3 on rod I and Multiply by 1. The product 03 naturally falls on rods JK. With rod F acting as the unit rod, the answer is 0.00003.

Further examples for multiplication

$30 \times 8 \dots\dots\dots R = 2 + 1 = 3$ , set multiplicand 30 on rods CD  
 $2 \times 3.14 \dots\dots\dots R = 1 + 1 = 2$ , set multiplicand 2 on rod D  
 $12 \times 0.75 \dots\dots\dots R = 2 + 0 = 2$ , set multiplicand 12 on rods DE  
 $0.97 \times 0.1 \dots\dots\dots R = 0 + 0 = 0$ , set multiplicand 97 on rods FG  
 $0.5 \times 0.004 \dots\dots\dots R = 0 + (-2) = -2$ , set multiplicand 5 on rod H

**Division:**

Soroban showing rods A through K with rod **F** acting as the unit rod. Rods to the left of the unit rod are considered positive (+) while rods to the right are considered negative (-)



**Formula for Setting the Dividend:** Rod = # of digits in dividend *MINUS* (# of digits in divisor + 2)

Example:  $0.0032 \div 0.00016 = 20$

For this example, the formula becomes: Rod =  $-2 - (-3 + 2) = -1$ .

Explanation:

- a) The dividend has two zeros after the decimal. Count -2.
- b) The divisor has three zeros after the decimal. Count *MINUS*  $(-3 + 2) = +1$ .\*

Putting it all together the equation becomes  $-2 + 1 = -1$ .

c) Count *MINUS* 1 from rod F. Set the dividend 32 on rods GH and divide by 16. Following "**Rule I**" for placing the first quotient number, the answer 2 naturally falls on rods E. With rod F acting as the unit rod, the answer shows 20.

For more on "**Rule I**", please see [Quotient Rules](#).

Further examples for division

$365 \div 0.5 \dots\dots\dots R = 3 - (0 + 2) = 1$ , set dividend 365 on rods EFG  
 $0.02 \div 0.4 \dots\dots\dots R = -1 - (0 + 2) = -3$ , set dividend 2 on rod I  
 $0.09 \div 0.003 \dots\dots\dots R = -1 - (-2 + 2) = -1$ , set dividend 9 on rod G  
 $64 \div 32 \dots\dots\dots R = 2 - (2 + 2) = -2$ , set dividend 64 on rods HI  
 $640 \div 32 \dots\dots\dots R = 3 - (2 + 2) = -1$ , set dividend 640 on rods GHI  
 $0.004 \div 0.0002 \dots\dots\dots R = -2 - (-3 + 2) = -1$ , set dividend 4 on rod G

\* Two negatives multiplied together equal a positive. ex.  $-(-3 + 2) = +1$

**Quick Glance Table - Cipherng the Divisor**

We know the formula for setting the dividend onto the soroban is **rod = # of digits in dividend MINUS (# of digits in divisor + 2)**

I've always broken the formula into two sections.

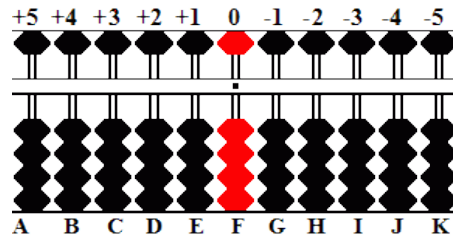
**The Dividend:** The first part of the formula is cipherng the rod count for the dividend and is the easy part. As shown above in the [counting digits](#) section, take the dividend and count either the whole numbers before the decimal or the trailing zeros after the decimal. It's that simple.

**The Divisor:** On the other hand, the second divisor portion of the formula takes a little more figuring. The following table illustrates how to easily cipher the rod count for the divisor. FYI, committing the table to memory isn't really necessary. I've found that all I really have to remember is that **0.00n has no count** after which everything falls into place and setting the dividend correctly onto the soroban takes but a moment.

n = any number or numbers in the divisor (#) = number of trailing zeros after the decimal

0.00000n (5)	0.0000n (4)	0.000n (3)	0.00n (2)	0.0n (1)	0.n	n.0	nn.0
3 to the left	2 to the left	1 to the left	no count	1 to the right	2 to the right	3 to the right	4 to the right

Adjusting Rods to the Left and Right



**Example 1:**  $0.0012 \div 0.3 = 0.004$

**The dividend:** 0.0012 is a pure decimal number with two trailing zeros after the decimal place. Count two rods to the right of the the unit rod. This takes us to rod H.

**The divisor:** 0.3 has neither whole numbers nor trailing zeros. It corresponds to **0.n** in the table. Therefore move the dividend two more rods to the right to rod J. Set 12 on rods JK. Divide 12 by 3 and the answer **0.004** falls naturally on rods EFGHI

**Example 2:**  $0.12 \div 0.00003 = 4000$

**The dividend:** 0.12 has no whole numbers nor trailing zeros. With nothing to count 12 stays on rods FG.

**The divisor:** 0.00003 is a pure decimal number with four trailing zeros. It corresponds to **0.0000n** in the table. Therefore move the dividend two rods to the left and place the dividend 12 on rods DE. Divide 12 by 3 and the answer **4000** falls naturally on rods CDEF.

**Example 3:**  $12 \div 300 = 0.04$

**The dividend:** 12 contains two whole numbers. Count two rods to the left of the unit rod taking us to rod D.

**The divisor:** 300 has three whole numbers. Even though the table doesn't show an example with three whole numbers it's easy enough to see the pattern. From rod D count 5 rods back to the right. This takes us to rod I. Place 12 on rods IJ and divide by 3. The answer **0.04** falls naturally on rods EFGH.

- [Back to Multiplication](#)
- [Back to Division](#)

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- [Back to Multiplication](#)
- [Back to Division](#)

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Two alternative methods  
[Locating the Decimal 1](#)  
 &  
[Locating the Decimal 2](#)