PREDETERMINING THE UNIT ROD

When I first began to solve problems of multiplication and division on my soroban, I found that decimal numbers could be confusing. 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.

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*)

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 *F* acting as the unit rod;

```
----A----B----C----D----E---*F*---G----H----I----J----K----
...+5...+4...+3...+2...+1....0...-1...-2...-3...-4...-5....
```

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

Example: 0.03 x 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 x 8...........R = 2 + 1 = 3
2 x 3.14.........R = 1 + 1 = 2
12 x 0.75........R = 2 + 0 = 2
0.97 x 0.1.......R = 0 + 0 = 0
0.5 x 0.004......R = 0 + (-2) = -2
```

Division:

Soroban showing rods A through K with *F* acting as the unit rod;

```
----A----B----C----D----E---*F*---G----H----I----J----K----
...+5...+4...+3...+2...+1....0...-1...-2...-3...-4...-5....
```

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

Example: 0.0032 ÷ 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 ÷ 0.5........R = 3 - (0 + 2) = 1
0.02 ÷ 0.4.......R = -1 - (0 + 2) = -3
0.09 ÷ 0.003.....R = -1 - (-2 + 2) = -1
64 ÷ 32..........R = 2 - (2 + 2)= -2
640 ÷ 32.........R = 3 - (2 + 2) = -1
0.004 ÷ 0.0002...R = -2 - (-3 + 2)= -1
```

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

Back to Multiplication
Back to Division

An alternative method for: Locating the Decimal