

Turn your soroban into a foot-inch calculator

By Dino Marcantonio

*a variation on this technique by Steve Treadwell:

<https://groups.yahoo.com/neo/groups/SorobanAbacus/conversations/messages/8590>

The soroban is easily converted into a very practical foot-inch calculator. With practice, you can add and subtract in Imperial units more quickly than you can with a foot-inch calculator. Here's how.

Pick one unit rod for feet (B, below), and pick a unit rod to the right of that for inches (E). To the right of the inch unit rod, we'll calculate fractions.

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•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

To add feet and inches, simply use the soroban as you normally would. This is what 24'-10" looks like:

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•	•	•		•	•	•	•	•	•	•
	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•		•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

Adding 9'-3" to 24'-10" looks like this at first:

•	•	•	•	•	•	•	•	•	•	•

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•	•	•	•	•	•	•	•	•	•	•
		•	•		•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

Note that it reads 33'-13". To fix that, simply subtract 12" from the inch unit rod, and add 1' to the foot unit rod, like so:

•	•	•	•	•	•	•	•	•	•	•

•	•			•						
•	•	•	•		•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
	•	•	•	•	•	•	•	•	•	•
•		•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

Now it reads properly: 34'-1".

Fractions of an inch are a little more involved. Note in the diagram below how I've annotated the rods to the right of the inch unit rod (under each letter designation). F represents $1/2''$ units, G represents $1/4''$ units, H represents $1/8''$ units, etc. The value of each column halves as you go to the right. This is what $1/2''$ looks like:

•	•	•	•	•	•	•	•	•	•	•

					•					
•	•	•	•	•		•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

This is what $1/4''$ looks like:

•	•	•	•	•	•	•	•	•	•	•

						•				
•	•	•	•	•	•		•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

And this is what $3/4''$ looks like:

•	•	•	•	•	•	•	•	•	•	•

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•	•	•	•	•			•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

It's like adding $1/2''$ and $1/4''$.

This is what $7/8''$ looks like:

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•	•	•	•	•				•	•	•
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•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

$1/2'' + 1/4'' + 1/8''$.

And this is what $15/32''$ looks like:

•	•	•	•	•	•	•	•	•	•	•

						•	•	•	•	
•	•	•	•	•	•					•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

$$1/4'' + 1/8'' + 1/16'' + 1/32''.$$

Note that for fractions, we will only use (normally) the top row of the earthly beads, essentially making calculations in binary. As a result, there's an easier way to figure out what fraction the soroban is showing than by trying to add all those fractions in your head. Here is how.

First, determine the denominator of the fraction by looking for the bead farthest to the right that's touching the reckoning bar. In the example below, the bead farthest to the right is on the $1/32''$ rod, so we know 32 is the denominator. Starting with that rod, as you move left rod by rod, the numerator values double, like this: 16-8-4-2-1.

•	•	•	•	•	•	•	•	•	•	•

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•	•	•	•	•			•			•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$
					16	8	4	2	1	

Now simply add the numbers where you have a bead touching the reckoning bar, in this case:

$$1 + 2 + 8 + 16 = 27.$$

So 27 is our numerator. The settings above indicate $27/32''$.

Here is another example:

●	●	●	●	●	●	●	●	●	●	●

					●			●		
●	●	●	●	●		●	●		●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"
					8	4	2	1		

Looking to the right, we see that our denominator is 16. For our numerator, simply add:

$$1 + 8 = 9$$

So the above represents $9/16''$. With practice, you will learn to recognize numerators easily.

Now, how do we add? The first step is to add as you normally would on the soroban.

Let's try $7/8'' + 15/32''$.

STEP 1: Set $7/8''$

●	●	●	●	●	●	●	●	●	●	●

					●	●	●			
●	●	●	●	●				●	●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

STEP 2: Add $15/32''$, which as we know from above is one bead on each of G-H-I-J.

•	•	•	•	•	•	•	•	•	•	•
	•			•			•			•
					•	•	•	•	•	
•	•	•	•	•		•	•			•
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•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

Now, we need to normalize the beads, as you can't have two beads touching the reckoning bar on any of the fraction rods. So starting from right and moving to the left, wherever you have more than one bead touching the reckoning bar, move two down, and add one bead onto the rod to the left. We'll start on the H rod where we are showing $2/8''$. $2/8''$ is the same as $1/4''$, of course. That's why we remove two, and add one to the left, on the $1/4''$ rod.

STEP 3: First normalizing pass

•	•	•	•	•	•	•	•	•	•	•
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•	•	•	•	•	•		•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			$1/2''$	$1/4''$	$1/8''$	$1/16''$	$1/32''$	$1/64''$

Now we repeat the operation on the G rod:

STEP 4: Second normalizing pass

•	•	•	•	•	•	•	•	•	•	•

					•	•		•	•	
•	•	•	•	•	•		•			•
•	•	•	•	•		•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"

And you keep repeating this operation until you have just a single bead touching the reckoning bar on each of the fraction rods.

STEP 5: Third normalizing pass

•	•	•	•	•	•	•	•	•	•	•

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•	•	•	•	•	•	•	•	•	•	•
A	B	C	D	E	F	G	H	I	J	K
Feet		Inches			1/2"	1/4"	1/8"	1/16"	1/32"	1/64"
					16	8	4	2	1	

And here is our answer: 1-11/32".

Subtraction works in reverse. With a little practice, you should be able to perform additions and subtractions more quickly than you can on a foot-inch calculator!

PRACTICE EXERCISES

- (1) $1-15/32'' + 2-3/8'' + 5/32'' + 11/16'' + 2-5/8'' + 1-9/32'' + 4-1/32''$
- (2) $3/4'' + 3-1/2'' + 1/2'' + 9/32'' + 2-9/16'' + 1-15/32''$
- (3) $17/32'' + 5/8'' + 13/16'' + 11/16'' + 3/4'' + 19/32''$
- (4) $1-5/16'' + 2-7/8'' + 1-3/4'' + 13/32'' + 2-13/16'' + 1-7/8''$
- (5) $1'-2-3/16'' + 14'-10-15/16'' + 17/32'' + 5/8'' + 3/16'' + 1'-0-15/16'' + 4'-10-5/32''$
- (6) $19/32'' + 5/32'' + 3/8'' + 13/16'' + 9/32'' + 11/16'' + 15/32'' + 9/16'' + 13/32''$
- (7) $1-5/8'' + 13/16'' + 13/32'' + 11/16'' + 3/8'' + 7/16'' + 5/32'' + 3/16''$
- (8) $13/32'' + 13/16'' + 17/32'' + 3/8'' + 5/32'' + 5/16'' + 23/32'' + 15/16''$

ANSWERS

- (1) $12-5/8''$
- (2) $9-1/16''$
- (3) $4''$
- (4) $11-1/32''$
- (5) $22'-1-9/16''$
- (6) $4-11/32''$
- (7) $4-11/16''$
- (8) $4-1/4''$