The Slide Rule Ruler!

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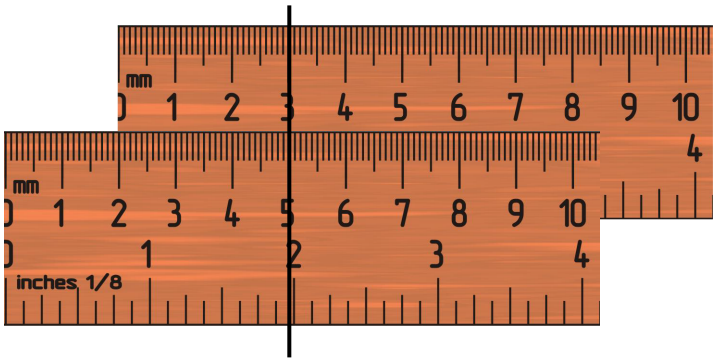
Today we are going to learn about slide rules, which are calculators. These are not like any calculators you've ever seen however! How they work is interesting, but before we tackle slide rules we'll warm up looking at ordinary rulers.

You will need 2 standard 12 inch rulers. We will learn how to use these two rulers to add up numbers. We show by example how to add $2+3$, and leave you to experiment with other combinations! I recommend using the metric side (cm) of the ruler, since it's easier to locate numbers with decimals.

To add two numbers using rulers, stack them on top of one another. First, move the top ruler so that it's left edge is above the number you wish to add to your second number. Then, find the second number on the top ruler and you can read the result on the bottom ruler directly below the second number. For our example, $2+3$, we line up the top ruler with 2 on the bottom ruler, and then find 3 on the top ruler, and notice that directly below the 3 on the bottom ruler is 5, which we know is the result of $2+3=5$. There are many questions you can ask, including how to subtract



two numbers.

Can you figure out how to subtract one number from another?

Here are some problems for you to try and work out on your own (I know you can do these by other means, but for fun try using the rulers!!)

1. $3+4=$
2. $5-2=$
3. $2.4+3.5=$

Introducing, the Slide Rule!

A slide rule is a calculator. It can multiply numbers, divide them, take square roots, and can be used to compute tons of other things! You will find using a slide rule similar to how to used the rulers to add numbers above, but instead of adding the numbers, it will multiply them! On a separate sheet is instructions for making your own slide rule, so get to work! You'll need one to continue! There are a lot of numbers on here, but we will focus on only a small set of these. Look on the left and right sides for the letters "C" and "D". Those form the basis of most of what we will do, but we'll eventually use a couple more to do fun stuff!

Now, we'll go through examples on how to perform various operations using slide rules. I note which scales each ones use, and provide some examples to try out yourself.

Simple Multiplication (uses C and D scales)

Example: Calculate 2.3×3.4

- Move the cursor to 2.3 in the D scale.
- Slide the leftmost '1' on C to the cursor.
- Move the cursor to 3.4 on the C scale.
- The cursor is on the D scale at 7.8. This is the answer.

When multiplication gives us a value less than 10, then the above instructions will work. But how can we multiply numbers when the product is greater than 10?? Are we stuck? Of course not! Compare the above computation with the following.

'Wrap-Around' Multiplication (uses C and D scales)

Example: Calculate 2.3×4.5

- Move the cursor to 2.3 on the D scale.
- Slide the rightmost '1' on C to the cursor.
- Move the cursor to 4.5 on the C scale.
- The cursor is now at 1.04 on the D scale.
- We know the correct answer is near $2 \times 5 = 10$, so we adjust the decimal place to get 10.4.

The first thing to notice is that it doesn't matter which '1' on which side we use, you get the same result (but off by a decimal point). The other thing to notice is that we need to sometimes adjust where the decimal point is. We usually move the decimal point so that a number like 18 becomes 1.8, then use the slide rule and when you are done, move it back in the final answer. You can get an estimate for the problem 2.3×4.5 by multiplying $2 \times 4 = 10$, so your answer should also be close to 10. Therefore we adjust the decimal point in 1.04 to 10.4 to get our answer.

Here are some examples of multiplication to try out. I'll leave it to you to figure out which of the above methods to use!

1. 2×3
2. 3×4
3. 5×6
4. 2.5×2.5
5. 16×5
6. 9.5×2
7. 0.16×0.05
8. 63.5×18.12
9. $2 \times 6 \times 9$

Now we should also figure out how to divide two numbers. Can you figure it out from the above? If not, the instructions below should help!

Simple Division (uses C and D scales)

Example: Calculate $\frac{4.5}{7.8}$ (which is the same as $4.5 \div 7.8$)

- Move the cursor to 4.5 on the D scale.
- Slide 7.8 on the C scale to the cursor.
- Move the cursor to either the leftmost or rightmost '1' on the C scale, whichever is in range. In this case, you would move it to the rightmost '1'.
- The cursor is now at 5.8 on the D scale.
- We know that the correct answer is near $4 \div 8 = 0.5$, so we adjust the decimal place to get 0.58.

Now here are some division problems to practice with!

1. $\frac{25}{5}$
2. $\frac{18.2}{13}$
3. $\frac{76}{5.85}$
4. $\frac{102}{0.0109}$
5. $\frac{99.6}{22.3}$

Now you can come up with your own problems to challenge each other! See who can find them faster!

Contest Problems

Older Kids

1. $2.4 \times 3.6 = 8.64$
2. $4.3 \times 5.1 = 21.93$
3. $.12 \times .34 = .0408$
4. $17 \times 41 = 697$
5. $3.75 \times 2 = 7.5$
6. $64 \times 400 = 25,600$
7. $1080 \times 0.003 = 0.008$
8. $0.2 \times 0.7 \times 3.5 = 0.049$
9. $\frac{125}{17} \approx 7.353$
10. $\frac{18}{6.67} \approx 2.699$
11. $\frac{34}{53.8} \approx 0.632$
12. $\frac{1785}{47.4} \approx 37.658$

Younger Kids

1. $2 \times 4 = 8$
2. $2 \times 4 \times 3 = 24$
3. $4 \times 2.6 = 10.4$
4. $3 \times 68 = 204$
5. $0.6 \times 12 = 7.2$
6. $1.3 \times 2.3 = 2.99$
7. $5 \times 2 \times 3 = 30$

8. $\frac{36}{6} = 6$
9. $\frac{7}{2} = 2.5$
10. $\frac{14}{4} = 3.5$
11. $\frac{3.6}{12} = 0.3$

a Cut here

c Cut here

CHRIS HAMANN AND NANCY SHAW

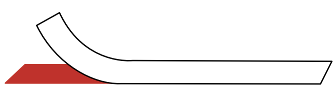
ASSEMBLY INSTRUCTIONS

1 Cut out the entire white panel (*a*). Cut along line between parts A and B (*b*), then remove excess (*c*).

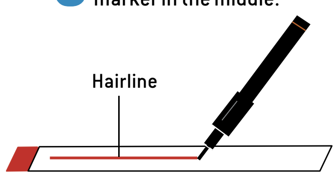
2 Fold part A along the dotted lines.

3 Slip part B into the folded part A.

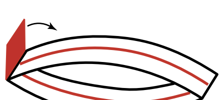
4 To make the cursor (the sliding window that is inscribed with a hairline), use the guides to the left to measure two pieces of transparent tape. Make one section the length of the black line and the other the length of the red line. Place the adhesive sides together.



5 Draw a line with a fine marker in the middle.

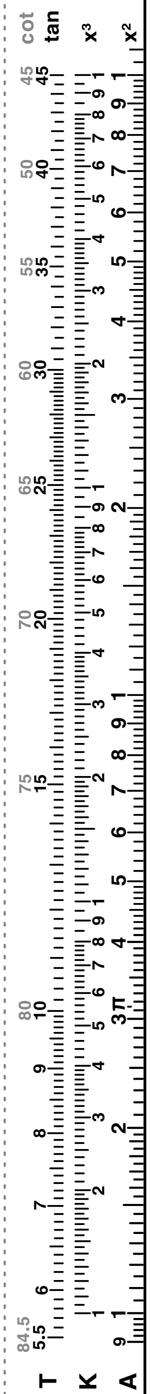


6 Wrap the folded tape around the slide rule for sizing. Use the adhesive end to complete the cursor. Slide cursor onto the rule.

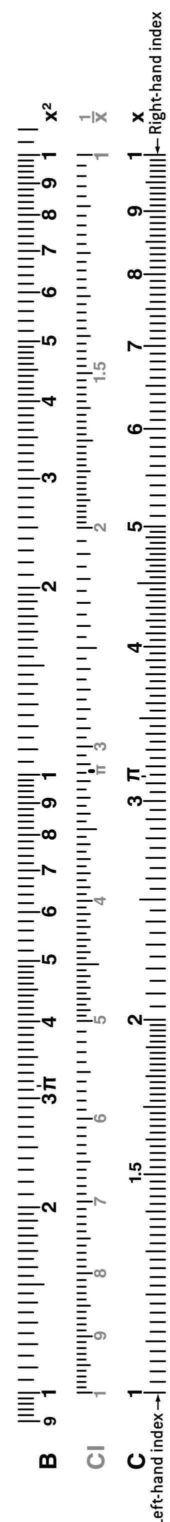


Completed cursor

Part **A**



b Cut here



(Slider)

Part **B**