Another FREE SAMPLE LAB from TOPS LEARNING SYSTEMS!

This **TOPS Idea** is taken from an original series of black-and-white line masters, adapted to stand alone as an independent mini-lesson. Please purchase our original book to get the whole in-depth program.

make a slide rule

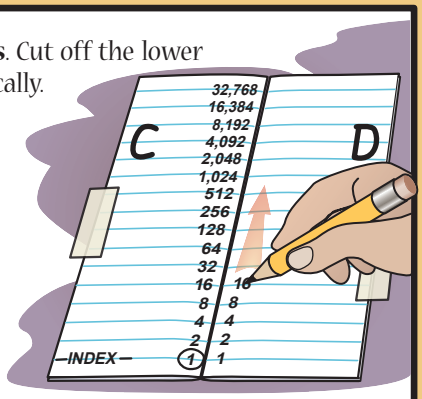
…adapted from **FAR OUT MATH #43** by TOPS Learning Systems

1. Fold notebook paper in **fourths**. Cut off the lower quarters and fold them in half vertically.

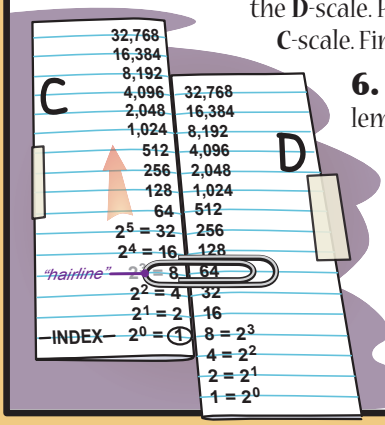
2. Tape those strips, folded edges together, on your table. Number the lines (not spaces) in a doubling pattern up each side.

3. Label the strips **C** and **D**. Circle **1** on **C**, and label the bottom line **index**.

4. Lift up **C** and fold the tape under. Leave **D** taped to your table.



5. Compute 8x8=64 on your **slide rule**: Move the **index** opposite 8 on the **D**-scale. Place a paper-clip **hairline** over 8 on the **C**-scale. Find 64 under the hairline on the **D**-scale.



6. Make up and solve multiplication problems, choosing numbers on your slide rule.

7. Write numbers on both scales as base-2 exponents, so each line has an **exponent** and equivalent **number**:

a. What does your slide rule add, and what does it multiply? Explain.

b. Tell how to use your slide rule to multiply. Use correct vocabulary.

OBJECTIVE

To make a slide rule. To understand how slide rules add and subtract exponents in order to multiply and divide numbers.

ANSWERS

6. 8 x 64 = 512, 4 x 32 = 128, etc.

7a. This slide rule *adds* equal distances numbered as base-2 exponents, thus *multiplying* equivalent numbers:

Distances: 3 spaces *[on D]* + 3 spaces *[on C]* = 6 spaces *[on D]*

Base-2 Exponents: $2^3 \times 2^3 = 2^{3+3} = 2^6$

Equivalent Numbers: 8 x 8 = 64

7b. *(1)* Slide the Index next to a number you want to multiply on the D-scale.

(2) Slide the hairline over the other number you want to multiply on the C-scale.

(3) The answer is under the hairline on the D-scale.

MATERIALS

- Copy of lab above for each student.
- Masking tape (clear tape can work).
- Lined notebook paper and scissors.
- A large paper clip to function as the slide rule's "hairline." Or hold thread in place.
- Optional calculator.

EVALUATION

Q: Compute 32^2 on your slide rule. Explain how you did this.

A: *Slide the index next to 32 on the D-scale. Slide the hairline over 32 on the C-scale. Read the product, 1,024, on the D-scale.*

EXTENSIONS

- Make up division problems and solve them on your slide rule. Explain how you did this. *Set the hairline on the D-scale over a larger number. Slide a smaller number on the C-scale under the hairline. Read your answer on the D-scale at the left index.*
- Construct a base-10 slide rule. *Fold, cut, and tape lined paper as before. Number up from the bottom line:*

  $10^0 = 1$, $10^1 = 10$, $10^2 = 100$, $10^3 = 1000$...,
- Extra credit for math wonks: Locate 3, 6 and 9 on your base-2 slide rule. Then solve problems involving these new numbers!

If $2^x = 3$, *then* $\log 2^x = \log 3$. *Solving for x:* $x \log 2 = \log 3$, $x = \log 3 / \log 2 = 1.58$. *Thus,* $2^{1.58} = 3$.

So, the number 3 is a bit more than halfway between exponents 1 and 2.

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