Slide Rule Help Contents:

Sources:

The Post VERSALOG Slide Rule Instruction Manual by E. I. Fiesenheiser, 1962.
The New Grolier Multimedia Encyclopedia © Grolier Inc.

History Of The Slide Rule:

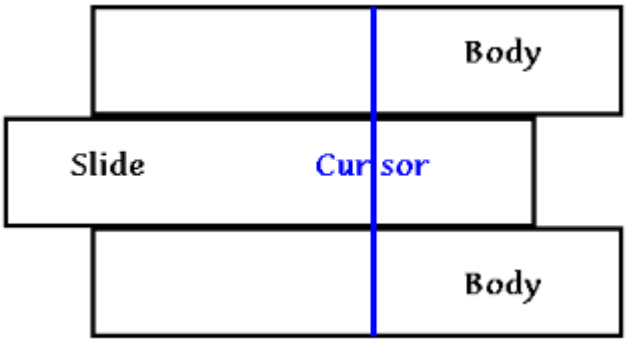
The slide rule is a mechanical device for making rapid mathematical calculations other than ***addition and subtraction.*** It can be used to multiply, divide, find powers and roots, and perform more complex operations involving logarithms and trigonometric functions. The history of the slide rule essentially began in 1614, when John Napier published his first table of logarithms, but the device in its present form was designed in 1850 by a French army officer, Amedee Mannheim. The invention of hand-held electronic calculators made the slide rule obsolete.

This simulation program is based on a model of slide rule produced by the *Frederick Post Company*. The various scales are the same as the scales on a model known as the ***VERSALOG*** Slide Rule. This slide rule was designed by engineers, for engineers. It was not only an instrument for mathematics, but it was designed with engineering problems in mind.

This slide rule was common during the years that **JFK** was President. The space program used instruments such as these to build the *Apollo 11* rocket and **LEM** which allowed Neil Armstrong to set foot on the moon on July 20, 1969. Interestingly enough, the *SR71 Blackbird* was also designed and built in the 1960s before the widespread availability of calculators and computer aided design.

Description Of The Parts:

A slide rule is made up of 3 parts: **the body** (fixed parts above and below the slide), **the slide** (center part which moves left and right), and **the cursor** (moveable hairline for reading the scales).



Scales appear on both the body and the slide, and on both sides of the rule. One side alone, or both sides together can be used in making a calculation.

Some Basic Examples:

Multiplication and Division:

I. The ordinary method using the C and D scales:

18 * 32 = 576

a. Set the cursor to 1.8 D.
b. Line up 1 C with the cursor.
c. Move the cursor to 3.2 C.
d. Read the answer 576 D.

62 / 2.4 = 25.8

a. Set the cursor to 6.2 D.
b. Line up 2.4 C with the cursor.
c. Move the cursor to 1 C.
d. Read the answer 25.8 D.

2.1 * 5.5 * 7.8 / 32 = 2.815

a. Set the cursor at 2.1 D.
b. Line up 3.2 C with the cursor.
c. Move the cursor to 5.5 C.
d. Line up 10 C with the cursor.
e. Move the cursor to 7.8 C.
f. Read the answer 2.815 D.

II. Using the CF and DF scales:

Less movement of the slide is required when using CF and DF. By making a shorter projection of the slide, to the right or to the left, you will have the result without scaling out!

2.1 * 7.8 = 16.38

a. Set the cursor to 2.1 D.
b. Line up 1 C with the cursor.
c. Move the cursor to 7.8 CF.
d. Read the answer 16.38 DF.

III. Using the CIF scale:

2.1 * 7.8 * 3.8 = 62.2

a. Set the cursor to 2.1 DF.
b. Line up 3.8 CIF with the cursor.
c. Move the cursor to 7.8 CF.
d. Read the answer 62.2 DF.

This example could have been solved using C, D and CI, but it would have required the use of both faces of the slide rule!

IV. Using the CI scale:

23 * 75 = 1725

a. Set the cursor to 2.3 D.
b. Line up 7.5 CI with the cursor.
c. Move the cursor to 10 CI.
d. Read the answer 1725 D.

Further Applications of the Scales:

V. Square and Square Root:

250 ^ 1/2 = 15.81

a. Set the cursor to 2.5 D.
b. Read the answer 15.81 R1.

4120 ^ 1/2 = 64.2

a. Set the cursor to 4.12 D.
b. Read the answer 64.2 R2.

250 ^ 2 = 62500

a. Set the cursor to 2.5 R1.
(The result will have an odd number of digits,
one less than twice the number being squared!)
b. Read 62500 D.

4.5 ^ 2 = 20.25

a. Set the cursor to 4.5 R2.
(The result will have an even number of digits using R2!)
b. Read the answer 20.25 D.

VI. Cube and Cube Root:

0.0325 ^ 3 = 0.0000343

a. Move the decimal point two places to the right.
b. Set the cursor to 3.25 D.
c. Read 34.3 K.
d. Find the answer by moving the decimal place back
six places to the left!

26400 ^ 1/3 = 29.8

a. Move the decimal point three places to the left.
b. Set the cursor at 26.4 K.
c. Read 2.98 D.
d. Find the answer by moving the decimal place back
one place to the right!

VII. An Example of Trigonometry:

(12.8 tan 19 sin 47) / (cos 25 tan 32) = 5.69

a. Set cursor to 1.28 D.
b. Line up 1 C with the cursor.
c. Move the cursor to 19 on T.
d. Line up 10 C with the cursor.
e. Move the cursor to 47 on Sin.
f. Move 25 on Cos to the cursor.
g. Move the cursor to 10 C.
h. Move 32 on T to the cursor.
i. Move the cursor to 10 C.
j. Read the answer 5.69 D.
Wow, I can see why I use a calculator!

VIII. An Example of an Application to Business:

A woman is spending $2000 on a new computer by taking out a loan with an annual interest rate of 6%. What is the monthly payment if the life of the loan is two years? *She missed out on the 6 months same as cash deal!*

r = 0.06 / 12 = 0.005

a. Set the cursor to 6 D.
b. Line up 1.2 C with the cursor.
c. Move the cursor to 1 C.
d. Read the answer 0.005 D.

n = 2 * 12 = 24

a. Set the cursor to 2 D.
b. Line up 1 C with the cursor.
c. Move the cursor to 1.2 C.
d. Read the answer 24 D.

2000 = A (1 - (1.005) ^ -24) / 0.005

The value (1.005) ^ -24 is obtained by setting the cursor to 1.005 on LL0, moving 2.4 CI to the cursor, moving the cursor to 10 CI, and reading 0.8872 at the cursor on LL/2.

2000 = A (1 - 0.8872) / 0.005 = A (22.6)
(Do another division!)

A = 2000 / 22.6 = $88.70 per month
(Do a final division!)

The monthly payment will be $88.70 for 2 years, resulting in a total interest of 24 * 88.7 - 2000 = $128.80. *But now that she has a computer, she can run the Slide Rule Program!*

Scales Of The Slide Rule:

This slide rule has 23 scales. These scales can be used to solve any kind mathematical problem except ***addition and subtraction.*** A letter or group of letters identifies each scale, and appears at the left end of each scale on the rule. All of the scales (except the L scale) are logarithmic, which means that the distances along the scales are proportional to the base-10 logarithms of the numbers or functions represented.

C and D: These two scales are identical except that the D scale appears on the body and the C scale appears on the slide. These scales are numbered from 1 to 10 from left to right, and are used for multiplication and division, as well as in conjunction with all of the other scales on the rule.

CI: The CI scale is located on the slide, and is exactly the same as the C scale except it is numbered from right to left. This scale is used for rapid multiplication and division. Numbers appearing on the CI (inverted) scale are the reciprocals of numbers directly opposite on the C scale.

CF, DF, and CIF: The DF (folded) scale is located on the body, is the same length as the D scale, only it begins and ends at **π.** This places the 1 mark very near the midpoint of the scale. The CF scale is identical to the DF scale, only it is located on the slide. The CIF scale is identical to the CF scale, except it is numbered from right to left. Numbers on the CIF scale are reciprocals of those directly opposite on the CF scale.

L: The L scale is a linear scale numbered from 0 to 1. It is used to obtain common base-10 logarithms. When the cursor is set to any number on the D scale, the mantissa of its common log is read at the cursor on the L scale.

R1 and R2: These scales are used for finding squares and square roots. When the cursor is set to any number on an R scale, its square appears at the cursor on the D scale. R1 is numbered from 1 to 3.162 (the square root of 10), and the R2 scale is numbered from 3.162 to 10.

K: The K scale is used for finding cubes and cube roots. When the cursor is set to a number on the D scale, its cube appears at the cursor on the K scale.

LL and LL/ Scales: The log log scales (LL0, LL1, LL2, LL3) are used to obtain powers and roots of numbers from 1.001 to 22,000. Fractional and decimal powers can be easily handled with these scales. Powers of **e** (the base of natural logarithms) are also found directly on the LL scales by setting the cursor to the power desired on the D scale.

The LL/0, LL/1, LL/2, and LL/3 scales are reciprocal log log scales, and are used in the same manner as the LL scales, but for numbers less than 1. The scales are numbered from right to left in a range from 0.00005 to 0.999. When the cursor is set to a number on the D scale, **1/e** raised to the power of the number is read directly on a reciprocal log log scale.

Cos and Sin: These two scales are used to obtain sine and cosine functions of angles in degrees. For sines the scale is graduated from left to right from 5.74 to 90 degrees. When the cursor is set at an angle on the Sin scale, the sine of the angle is read on the C scale. For cosines the scale is graduated from right to left from 0 to 84.3 degrees. To find the cosine of an angle, the cursor is set at an angle on the Cos scale, and its cosine is read on the C scale.

T and T: The T scale is used to find the tangent of angles from 5.71 degrees to 84.3 degrees. For angles in the range of 5.71 to 45 degrees, the scale is graduated from left to right in black. When the cursor is set to an angle in this range, its tangent is read on the C scale. For angles from 45 degrees to 84.3 degrees, the scale is graduated from right to left in red. When the cursor is set to an angle in this range, its tangent is read on the CI scale.

SecT and ST: The last scale is provided to determine the tangent function of small angles from 0.57 to 5.73 degrees. This scale is graduated from left to right in this range, is numbered in black, and is used with the C scale. It may also be used to find the sine of small angles, since tangent and sine functions are nearly equal for small angles. For large angles the scale is graduated from right to left and numbered in red for use with the CI scale. In the range of 84.27 to 89.43 degrees, with the cursor set to an angle on the SecT scale, either tangents or secants are read at the cursor on the CI scale. In this range, the tangent and the secant are nearly equal.

The Moving Parts Of The Slide Rule:

There are two moving parts of the slide rule, the **slide** and the **cursor**. The cursor is moved by clicking on the scrollbar located above the slide rule. The slide is moved by clicking on the scrollbar located below the slide rule. To move it in 5% increments, click on the scrollbar itself. To move it in the smallest increment possible, click on one of the arrows located at the end of the scrollbar.

As the slide and cursor are moved, the scale value boxes are updated with their respective scale value. The scale value is found by reading the point on the scale where the cursor line crosses.

The Slide Rule Programmer:

Hi! Im David Brown, creator of this unique program! This is freeware, so feel free to pass this out to your friends (and/or enemies), but remember that nothing is ever truly free! If you find this program useful, donations would be very welcome. Mail your contributions to:

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5631 N. Rosslyn Ave.
Indianapolis, IN 46220
U.S.A.
email: mcdoc@juno.com

At the very least, please send me a postcard with some feedback. I always enjoy getting postcards from the far away places where my programs are being enjoyed. Thanks. Gracias. Merci. Danke.

Limited Warranty and Legal Issues:

This Slide Rule program is contributed **as is** to the public domain. The program, including its companion data and documentation files, is distributed entirely and exclusively as freeware. As such, it is not intended for sale, resale, purchase, or for-profit distribution in shareware, retail, or direct-mail markets.

Users are free to install and run the program on any system or systems they wish (subject only to the program's hardware requirements). Users are also free to copy and distribute the original files in any manner and via any means available to them.

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The programmer makes no warranties, expressed or implied, with respect to this software. In no event will the programmer be liable for any direct or indirect damages arising from the use of this software.

This program requires *Microsoft Windows* 3.1 or higher. No other special hardware or software is needed.

Results boxes that continually display the numeric value for each scale.

To flip the slide rule on its back side, use the menu option: **Back**. Once on its back, use the menu option: **Front** to flip it back to its front side. Simple enough.

John F. Kennedy was President of the United States of America from November 8, 1960 until his assassination on November 22, 1963.

The Lunar Excursion Module (LEM) was the transport vehicle used in the Apollo Program to shuttle two astronauts between the Command Module in lunar orbit and the surface of the Moon.

π is approximately 3.1416

e is approximately 2.7183

1/e is approximately 0.3679

Comparing this simulated slide rule to an actual 10-inch rule, its length is 360 pixels or 5400 twips. 5400 divided by 10 gives 540 twips per inch. The smallest movement that can be made with the scrollbars is set to 5 twips, giving exactly **108 increments per inch!** At least as accurate as its real 10-inch counterpart.

It is not exactly true that you cannot add or subtract with a slide rule, it is just a pain! If you remember that **10^(X+Y) = (10^X)*(10^Y)** you can find **X+Y** by using the formula **Log[(10^X)*(10^Y)]**. In a like manner, you can find **X-Y** with the formula **Log[(10^X)/(10^Y)]**. So, to do a simple addition or subtraction, you would have to perform **two** power operations, **one** multiplication or division, and **one** logarithm! See what I mean by pain?