Slide Rules, Their History, Their Operation, and How They Won a War: Alex E. S. Green

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Short History of Slide Rules

- **1610** , Napier's invents logarithms: to determine product of two numbers add their logarithms and take the sum's anti-logarithm. For division subtract the logarithms and take anti-logarithm.

  $z = xy$, $\log z = \log x + \log y$ $z=x/y$ $\log z=\log x - \log y$
- **1620**, Gunter makes scale with distances proportional to logarithms. Uses divider to add their logarithms
- **1630**, William Oughtred uses two Gunter scales in a sliding arrangement to mechanically add logarithms to obtain product. Also develops a circular slide rule version.
- **1675** Isaac Newton, other early scientists generalized slide rules to multiply or divide functions of numbers using scales with distances proportional to the logarithm of these functions. They facilitate calculations such as $F(x)G(y)=H(x,y)$.
- **!700** Most early slide rules were for specific applications with liquor taxes as the objective of many.

Short History of Slide rules (continued)

- James Watt pioneered the development of slide rules for general engineering calculations
- Keuffel and Esser, Astro-werke, Dietzgen, Post, Hemmi … produced slide rule computers for engineers that were heavily used until the 1970s.
- 20th AF slide rules used above and could handle 2D problems i.e. F(x,y)G(z,w)=H(x,y,z,w) and were programmable and had data storage. Liquor-a lubricant not a tax item. See link

http://ptonline.aip.org/journals/doc/PHTOAD-ft/vol_54/iss_8/40_1.shtml

- In the 1970s computers derived from Shockley's 1947 trans-stor displaced slide rule use by engineers.and scientists.

Slide Rule Scale Markings on Standard Slide Rules
D is basic scale,

Symbol	Relationship	Description
D	x	principal scale (one $\log_{10}$ cycle)
C	x	principal scale (on slide)
A	x^2	square of D (two cycles)
B	x^2	square of D (on slide)
K	x^3	cube of D (three cycles)
S		D is the sine of angle on S scale
T	$\tan^{-1}x$	D is the tangent of angle on T scale
ST	$180x/\pi$,	D radians in degrees
AI	$1/x^2$	reciprocal of square of D
BI	$1/x^2$	reciprocal of square of D (on slide)
CF	π x	folded principle (on slide)
CI	1/x	reciprocal of principal (on slide)
CIF	$1/\pi$ x	reciprocal of folded principal (os)
DF	π x	folded principal
DIF	$1/\pi$ x	reciprocal of folded principal

Scales on advanced slide rules

Symbol	Relationship
• L	$\log_{10}$ x com log
• LL0	exp.001x
• LL	exp.01x
• LL2	exp.1x
• LL3	exp x
• LL00	exp- 001x
• LL01	exp-:01x
• LL02	exp-.1x
• LL03	exp-x

see also http://www.oughtred.org/flyers/OS-ISRM_SlideRuleSeminar.pdf

Demonstrate use of slide rule (with Instructor's SR)