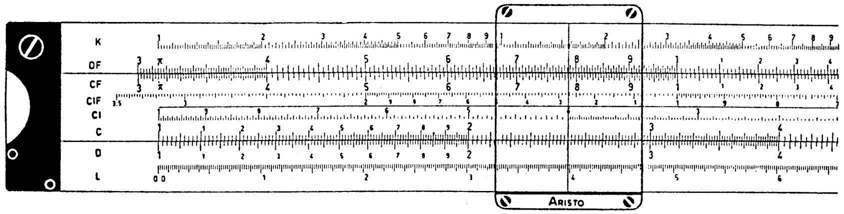
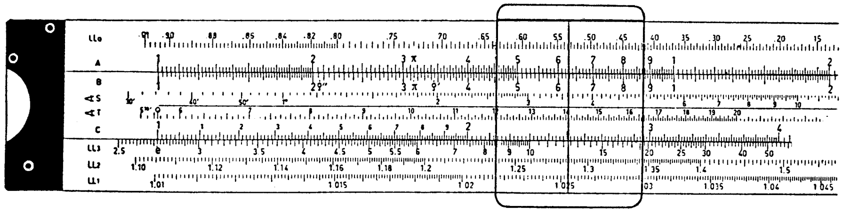
Instructions for Use of

ARISTO "LOG-LOG"

Slide Rule No. 966





I. Pattern of Scales.

Face:	K	Scale of Cubes	on body
	DF	Fundamental Scale with graduations staggered by π	on body
	CF	Fundamental Scale with graduations staggered by π	on slide
	CIF	Reciprocal Scale with graduations staggered by π	on slide
	CI	Reciprocal Scale	on slide
	C	Fundamental Scale	on slide
	D	Fundamental Scale	on body
	L	Mantissa Scale	on body
Back:	LL0	Exponential (log-log) Scale 0,05 to 0,97	
	A	Scale of Squares	
	B	Scale of Squares	
	∢S	Angle Sine Scale 0° 30′ — 90° (relative to B)	
	∢T	Angle Tan Scale 5° 30′ — 45° (relative to C)	
	C	Fundamental Scale	
	LL3		
	LL2	Trisected Exponential (log-log) Scale 1,01 to 50 000	
	LL1		

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II. Working Diagrams.

The present manual explains the manipulation of the slide rule by the aid of so-called working diagrams. In a species of script resembling musical scores the sequence of the individual steps in the solution of mathematical problems is visually explained. The need of explanatory text is thus reduced to a minimum. The scales used in computations are represented in the diagrams through parallel lines designated with their corresponding letters (cf. I). On these lines the necessary steps of a calculation are clearly shown by a few symbols whose significance is explained hereunder:
An empty circle signals the beginning of a calculation (Fig. 1). The setting is given beside the circle. Setting on the scale of squares is effected in the left (right) section when the left (right) figure is in larger type than the others (Figs. 2 and 3). Similarly this system applies to the scale of cubes in respect of the left, ri[illegible] and centre figures.

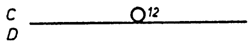
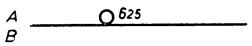


Abb. 1



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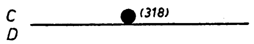

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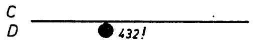

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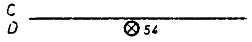

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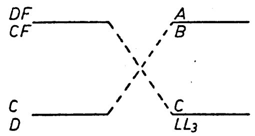

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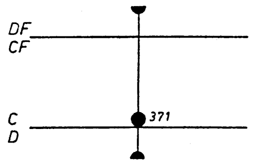


Abb. 9

Each successive step is indicated by a black circle. Numbers between brackets signify intermediate results (Fig. 4). They need not be read, being only intended as checks for practising purposes. The final result shows an exclamation mark [!] (Fig. 5). Connecting lines and arrows show the course of the operation (Fig. 6). A new setting in the progress of a problem is marked by a cross inside a circle (Fig. 7).
Crossed broken lines call for reversal of the rule (Fig. 8). As a general principle the position of the cursor is omitted, except when considered necessary. It is then done as shown in Fig. 9.
When the "1" on the extreme right of the fundamental scales C and D must be set the diagrams show "10" for clear distinction from the left hand end. In a similar manner this applies to the scales of squares A and B ("1", "10" and "100" for left, centre and right "1" respectively.)

III. Purpose and Function of the Scales.

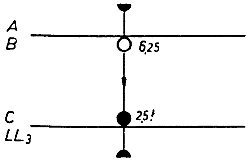
1. Scales A, B, C, D CI, K and L

are used with the aid of the double-faced cursor as employed in the well-known "Rietz" System. (Cf. Instructions for ARISTO Slide Rule "Rietz" Pattern.)

Example 1: $\sqrt{6{,}25} = 2{,}5$ (Fig. 10)

Example 2: $2{,}2 \cdot 1{,}5^2 = 4{,}95$ (Fig. 11)

Example 3: $\sqrt{225^3} = 3375$ (Fig. 12)



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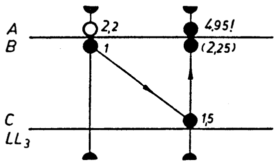

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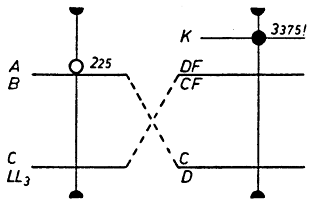


Abb 12

2. Scales CF, DF and CIF

are fundamental and inverted scales respectively with staggered graduations. They simplify multiplications and divisions by π with only one adjustment of the cursor. They also eliminate the trouble of pushing the slide through to left when calculating with the fundamental scales. This is particularly valuable and time-saving in tabulating work.

Example 4: d = 32 m U = dπ = 100,5 m (Fig. 13)

Example 5: $\frac{5}{\pi} = 1{,}592 \qquad \frac{\pi}{7{,}5} = 0{,}419$ (Fig. 14)

Example 6: Table $3{,}12 \cdot x = y$ (Fig. 15)

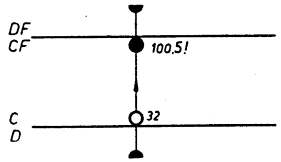
x	8,5	17	25,5	34
y	26,5	53,0	79,6	106,1

Example 7: Table $\frac{25{,}2}{x} = y$ (Fig. 16)

x	7,4	14,8	22,2	29,6
y	3,40	1,703	1,135	0,851

Example 8: Table $5{,}12\,\pi \cdot x = y$ (Fig. 17)

x	1,8	3,6	5,4	7,2
y	28,95	57,9	86,9	115,8



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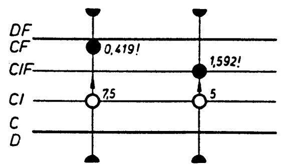

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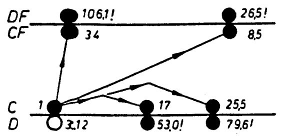

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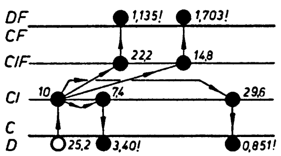

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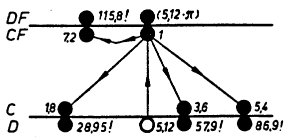


Abb. 17

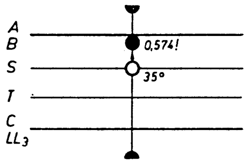
3. Scales S and T.

Scale S is correlative to the scales of squares (A and B).

Example 9: $\sin 35^0 = 0{,}574$ (Fig. 18)

Example 10: $3{,}5 \cdot \sin 42^0 = 2{,}34$ (Fig. 19)

Example 11: $\cos 38^0 = \sin (90^0 - 38^0) = \sin 52^0 = 0{,}788$ (Fig. 20)



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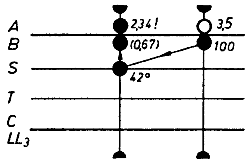

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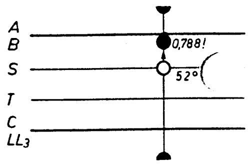
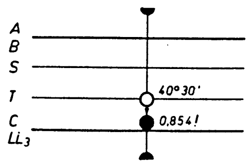


Abb. 20

Scale T is correlative to the fundamental scale (C and D).

Example 12: $\mathrm{tg}\, 40^0\, 30' = 0{,}854$ (Fig. 21)

Example 13: $\mathrm{ctg}\, 32^0 = \frac{1}{\mathrm{ctg}\, 32^0} = 1{,}600$ (Fig. 22)



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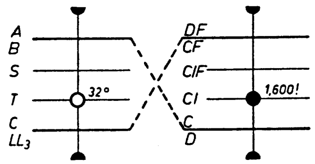
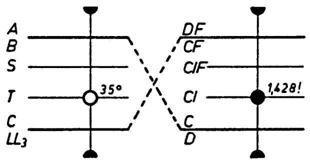


Abb.22

Example 14: $\mathrm{tg}\, 55^0 = \mathrm{ctg}\, (90^0 - 55^0) = \mathrm{ctg}\, 35^0 = \frac{1}{\mathrm{tg}\, 35^0} = 1{,}428$ (Fig. 23)

Example 15: $\mathrm{ctg}\, 65^0 = \mathrm{tg}\, (90^0 - 65^0) = \mathrm{tg}\, 25^0 = 0{,}466$ (Fig. 24)



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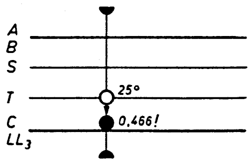


Abb. 24

4. The Exponential (log-log) Scales LL0, LL1, LL2, LL3

serve for raising to powers, extraction of roots and logarithmical computations. These scales only yield readings in decimals as appearing on the graduation. The location of the decimal point cannot be read variably as, for instance, on the ordinary scales C and D. Scale LL0 is correlative to scales A and B; scales LL1, LL2 and LL3 are correlative to scales C and D.

a) Powers of e

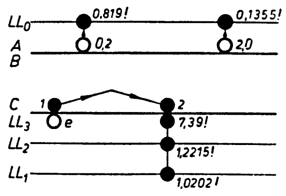


Abb. 25

Example 16: $e^2 = 7{,}39$ (Fig. 25)

$e^{0,2} = 1{,}2215$

$e^{0,02} = 1{,}0202$

$e^{-2} = 0{,}1355$

$e^{-0,2} = 0{,}819$

Attention! Scale LL0 extends from $e^{-3} \approx 0{,}05$ to $e^{-0,03} \approx 0{,}97$

it is interrupted (bi-sected) over 3 on scale A.

Roots of e are converted to fractional powers and solutions are as explained in Example 16.

Example 17: $\sqrt[3,5]{e} = e^{\frac{1}{3.5}} = e^{0,286} = 1{,}331$

A simpler process is explained in Example 21.

Should the LL scales prove insufficient in length the power is split up into convenient fractions e. g:

Example 18: $e^{15} = (e^{7,5})^2 = 1800^2 = 1{,}8^2 \cdot 10^6 = 3{,}24 \cdot 10^6 = 3\,240\,000$

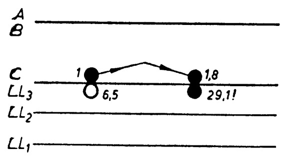
b) Powers of the General Shape a^n

Example 19: $6{,}5^{1,8} = 29{,}1$ (Fig. 26)

Example 20: $0{,}7^4 = 0{,}240$ (Fig. 27)

Example 21: $\sqrt[3,2]{56} = 3{,}52$ (Fig. 28)

Example 22: $4^{-0,3} = \frac{1}{4^{0,3}} = \frac{1}{1{,}516} = 0{,}66$. (Fig. 29)



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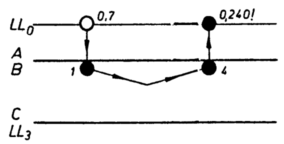
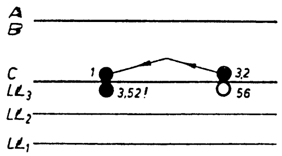


Abb. 27



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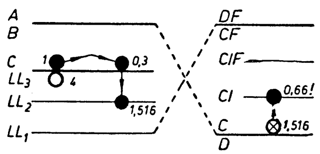

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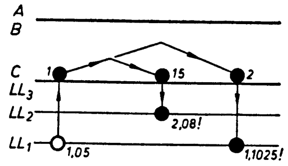

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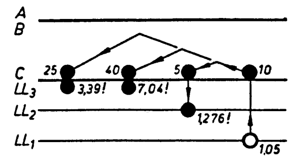


Abb. 31

Example 23: Table $1{,}05^x = y$

x	2	5	15	25	40
y	1,1025	1,276	2,08	3,39	7,04

(Fig. 30) Slide to left. (Fig. 31)

A pass from one section of the LL-scales to the next therefore, signifies either raising to the tenth power or extraction of the tenth root, depending on the direction.

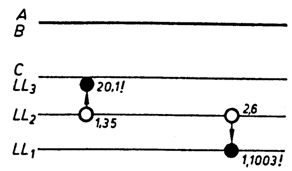


Abb. 32

Example 24: $1{,}35^{10} = 20{,}1$ (Fig. 32)

$\sqrt[10]{2{,}6} = 1{,}1003$

c) Logarithms:

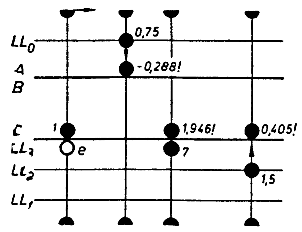


Abb. 33

Example 25: $\ln 7 = 1{,}946$ (Fig. 33)

$\ln 1{,}5 = 0{,}405$

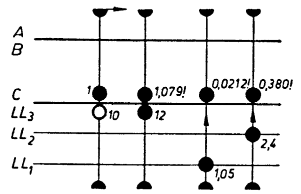
$\ln 0{,}75 = -0{,}288$

Example 26: $\lg 12 = 1{,}079$ (Fig. 34)

$\lg 2{,}4 = 0{,}380$

$\lg 1{,}05 = 0{,}0212$

Example 27: $_5\log 125 = 3{,}00$ (Fig. 35)



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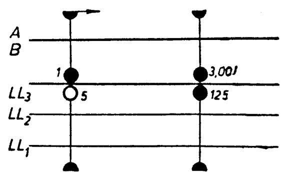

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