"SIMPLON" SLIDE RULE
"Primary," "Bilateral," "Major"
AND OTHER SIMILAR PATTERN RULES

PRIMARY.

BILATERAL—FACE.

BILATERAL—BACK.

The Slide rule is a calculating instrument for rapidly solving arithmetical problems by mechanical means.

INSTRUCTIONS FOR USE.

Introduction. The processes of multiplication and division are so quickly performed by its aid that the slide rule has now become an instrument of universal use all over the civilized world. The degree of accuracy obtainable is sufficient for most practical purposes, and the speed of operation naturally increases with its use.

These brief instructions are intended for beginners only, but the more advanced student, desirous of attaining a better knowledge of the slide rule such as will enable him to use it for higher mathematical operations, is recommended to purchase a copy of "Slide rules and how to use them" which may be had for 1/9 from the suppliers of this "Simplon" slide rule, or direct from the makers, Baguio Brothers Ltd., Halifax, England.

First Principles.

The calculating part of the rule comprises the 4 scales—A, B, C, D. These scales are logarithmic in principle and are simply tables of logarithms graphically represented (plotted out to scale). Note that scales A and B are alike and are numbered 1, 2, 3, 4, etc., up to 100 and that these scales, which are decimally divided, repent themselves from 1 to 10 and from 10 to 100. The ciphers are sometimes omitted to lessen appearance of overcrowding.

The three several parts of the instrument will be referred to in the following instructions as:

The Rule which is the main member.
The Slide which is the movable part sliding along the channel or groove.
The Cursor which is the movable portion with hair line across it.

The scales A and B are called the upper scales, and the scales C and D the lower scales, but for convenience and brevity the left hand index number 1 on each of the four scales will be described simply as 1(A), 1(B), 1(C), 1(D) respectively. In cases where the right hand index 1 is intended, the references will be R1(A), R1(B), R1(C) and R1(D).

Multiplication and division may be carried out on either the upper or lower scales, and though greater accuracy in results apply more to the lower scales, the upper scales should be used where great precision is not required.

MULTIPLICATION.

Two numbers are multiplied together by adding the distances corresponding to the numbers on the rule and slide.

Example 1: 25 x 2 = 75—Set 1(B) under 25 (A), move cursor line over 2(B) and read 75 under cursor line on A (See Fig. 1 over page).
FIG. 1. EXAMPLE 1.

We now try out this on the lower scales, C and D, we find that the second factor 34 is off the second line 45. Proceed through (C) to 65 (D), move cursor over 34 (C) and read 187 (precisely) under cursor line on D.

Rule for Decimal Point in Division.—If the right hand 1 be used as an index line, the number of figures before the decimal point in the product is equal to the sum of those before the decimal point in the two numbers being multiplied together; if the right hand 1 be used we must subtract one from the sum.

Exercises for practice.—Set 1(B) under 3 (see special division, 31410) on A and read off (from Scale A) the circumferences of circles of the following diameters without further settings: 750", 1-5", 3-785", 4", 12-5", and 18".

DIVISION.

It will have been noticed by the Student that in the process of multiplying two numbers together, the result is obtained by a simple operation of adding the distances (on the rule and slide) representing the factors, and reading the result over the second factor, conversely, two numbers are subjected to a dividing process by subtracting the distance representing the divisor on one of the scales from the distance defining the dividend on the other adjacent scale.

Example 6. $765 \div 45 = 17$. Set the cursor line over 765, scale D, bring 45 (C) under the cursor line and read 17 on 1(C). (See Fig. 8).

Example 8. $35 \div 8 = 4.375$. Set cursor line over 35 (A), slide 8 (B) under cursor line and read 4375 on A, over 1(B). (See Fig. 10). Alternatively if we use the lower scales, proceed as follows.—Set cursor line over 35 (say three five) (D), slide 8 (C) under cursor line and read 4375 (say four three seven five) on D under R1(C). Determine position of decimal point by applying the rule defined below.

FIG. 10. EXAMPLE 8.

Rule for position of decimal point in Division.—If the result is read at right hand end of slide, the number of figures before the decimal point in the quotient is equal to the difference of those before the decimal point in the dividend and divisor; when the result is read at the left hand we must add one to the difference.

Greater accuracy will always result when C and D scales are used in multiplication and division.

SQUARES AND SQUARE ROOTS.

If the student now takes up the rule again he will notice on further examination that the readings on Scale "A" are the squares of exactly opposite readings on Scale "D." Thus, if he slides the cursor line precisely over 9 (A) he will find that the cursor line also registers over 3 (D), the square root of 9. Further, if he again slides the cursor line over 5 (D) the line will be seen to be locating the square of $5 = 25$ on A. This arises by reason of the graduations on the upper scale 1 to 10 being equal to 1 to 100 on the lower scale. It is evident from this arrangement that twice the logarithm of any number equals the logarithm of the square of that number.

Example 11. $4^2 = 16$.—Place the cursor line over 4 (D) and read 16 under the cursor line Scale A. (See Fig. 14)

FIG. 14. EXAMPLE 11.
Example 12. \( \sqrt{64} = 8 \). Set the cursor line over 64 (A) and read 8 on scale L. (See Fig. 15).

CUBES AND CUBE ROOTS.

The operation of raising a number to its third power, on a slide rule not having a special direct reading cube scale is easily performed by continued multiplication, thus to raise 2 to the power of 3 \((2^3)\) proceed as follows:—Set 1(C) to 2 (D), slide cursor line over 2 (B) and read 8, the cube of 2, under the line on A.

Example 13. \(1.5^3 = 3.375\). Set 1(C) to 1.5 (D), move cursor line over 1.5 (B) and read 3.375 under line on A.

Explanation.—1.5 on D is opposite or in line with its square \((2.25)\) on A, and \(2.25 \times 1.5 = 3.375\) as shown on A. (See Fig. 16).

Note.—We have observed that the finding of the square root of a number presents no more difficulty than the squaring of a number, and while the cubing of a number likewise presents no real difficulty, the extracting of the cube root is not quite so easily performed. A little practice, however, will enable the student to find the cube roots of numbers with only a fraction of the difficulty first experienced.

Example 14. \(\sqrt[3]{27} = 3\). Move cursor line over 27 (A), draw out slide (to the right in this case) until the same number (3) comes under the cursor line on B which registers simultaneously on D under 1(C). (See Fig. 17).

Example 15. \(\sqrt[3]{41} = 1.6\). Set cursor line over 4.1 (A), draw out slide (to right) until the position is reached where the same number which comes under the cursor line on B also comes under index 1(C) on D. This answer, 1.6, though not absolute, is very near. (See Fig. 18).

THE LOG LOG SCALES.

These scales begin at the top left hand of rule (LH) with 1.1 and extend to 3.2 and are then continued on the bottom left hand of rule (LL) from 2.5 to \(10^6\) (100,000). The two portions are arranged in relation to one another so that the bottom scale (LL) is the tenth power of the top scale (LH), and the cursor line is used for setting.

Example. \(1.15^{10} = 4.046\). \(2.206^{10} = 2090\). \(1.82^7 = 4068\). \(1.697^{10} = 1886\).

Conversely over every number on the lower scale (LL) is to be found on scale LH the 10th root of the number.

Example. \(\sqrt[10]{35} = 1.15\). \(\sqrt[10]{15} = 1.311\). \(\sqrt[10]{1000} = 1.995\).

Under every number \(n\) on scale D will be found \(e^n\) on the lower scale (LL). If \(e^n\) has to be worked out, read off \(e^n\) and then take the reciprocal value. (Reciprocal scale is on centre of Slide).

Example. \(e^3 = 20.1\). \(e^2 = 7.389\). \(e^1 = 148\).

Over every number \(n\) on the D scale is to be found \(e^{10n}\) on the upper scale (LU).

Example. \(e^{10} = 2.7183\). \(e^{20} = 1.284\).
THE LOG LOG SCALES——Continued.

If roots of "e" have to be found express them first as a "power" of "e," e.g., \( \sqrt[3]{e} = e^{1/3} \) and proceed as

If the equation \( ax^2 + bx + c = 0 \) has to be solved set \( y \) = upper (LU) or lower (LL) log log scale according to its size and read \( x \) on the D scale.

Example. \( e^x \), \( x = 30 \)

\[ ax = y \times x = 2500 \]

As the values on D are the hyperbolic logarithms of the numbers on the log log scale the rule gives a table of hyperbolic logarithms.

Example. Log 25 = 1.42

\[ \log 105 = 2.046 \]

Solve 1.124 \( \times \) \( 22 \) = 1.586

TANGENTS, SINES AND LOGS.

Scales for direct reading of Sines and Tangents are on the back of the slide of the "Simplicon." Major rule and the log scale is on the back of the rule.

The scales for direct reading of Sines, Tangents and Logarithms are on the back of the Bilateral Rules and are read with the transposable cursor.

MONEY VALUES.

Mosey calculations can be done on a slide rule and a conversion table is given below to use in connection with this.

Example—Find the cost of 50 articles at \( £ 2 14 \) 8d. each. Bring R1 (C) over 50 on D then opposite \( £ 2533 ( £ 2 14 8d. = £ 2533 \) from table) will be found \( £ 1066 \) = \( £ 105 12s. 6d. \) (extracted from table).

Example. 7\% of \( £ 54 14s. 6d. \) (\( £ 544 65s. 5d. \) from table).—Set R1 (C) to \( 54 65s. 5d. \) on D scale and opposite 7\% on C read on D \( 3.55 \) = \( £ 3 96 \) and from table we get \( £ 195 2s. 6d. \) (5.888). Actual amount is \( £ 195 2s. 6d. \).

### TABLE FOR CONVERTING SHILLINGS AND PENCE INTO DECIMALS OF £1 AND VICE VERSA.

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### DECIMAL EQUIVALENTS OF 1s.

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<th>0.06</th>
<th>0.07</th>
<th>0.08</th>
<th>0.09</th>
<th>0.10</th>
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<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
<td>0.12</td>
<td>0.14</td>
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<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>3d. is</td>
<td>0.03</td>
<td>0.06</td>
<td>0.09</td>
<td>0.12</td>
<td>0.15</td>
<td>0.18</td>
<td>0.21</td>
<td>0.24</td>
<td>0.27</td>
<td>0.30</td>
</tr>
<tr>
<td>4d. is</td>
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<td>0.08</td>
<td>0.12</td>
<td>0.16</td>
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<td>0.24</td>
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### THE "SIMPION" BILATERAL AND OTHER SIMILAR PATTERN SLIDE RULES.

The following instructions for the "Simplicon" Primary Slide Rule also refer to the face of the "Simpilon" Bilateral and other Rules.

The Simpilon Bilateral Slide Rule, however, has a Sine, Log and Tangent scale on the back of the rule which has a great advantage over the common form of rule in that the Sines, Logs and Tangents can be read direct without the necessity of having either to reverse the rule or slide in order to get the result as is the case with the ordinary slide rule.

To find either Sines, Logs or Tangents proceed as follows:—Transpose the cursor so as to obtain readings on the back of the slide rule. Here will be found 5 scales, S, L and T, and above S another A scale and below T another D scale.

### SINES

are found by putting the cursor line over scale S and reading on scale above (A) the answer. The sine scale starts at an angle of about 35 minutes.

**Examples.**

- Sine 30° = 0.5
- Sine 2°35' = 0.0451
- Sine 6°52°30' = 0.1198
- Sine 8°25' = 0.0845

### LOGS

are found by reading on the log (L) scale the logarithm of the number under the cursor line on scale D under T scale.

**Examples.**

- Log 2 = 0.3010
- Log 7.5 = 0.88
- Log 3 = 0.4771
- Log 1.2 = 0.070

### TANGENTS

are found by reading direct from T scale on to bottom scale (D). The Tangent scale starts about 5° 45'.

**Examples.**

- Tangent 45° = 1
- Tangent 6° 45' = 1.184
- Tangent 10° = 0.344
- Tangent 31° 55' = 0.6218

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