

# SLIDE RULE MANUAL

Instructions for using the

## ATLAS SLIDE RULE

# D I E T Z G E N

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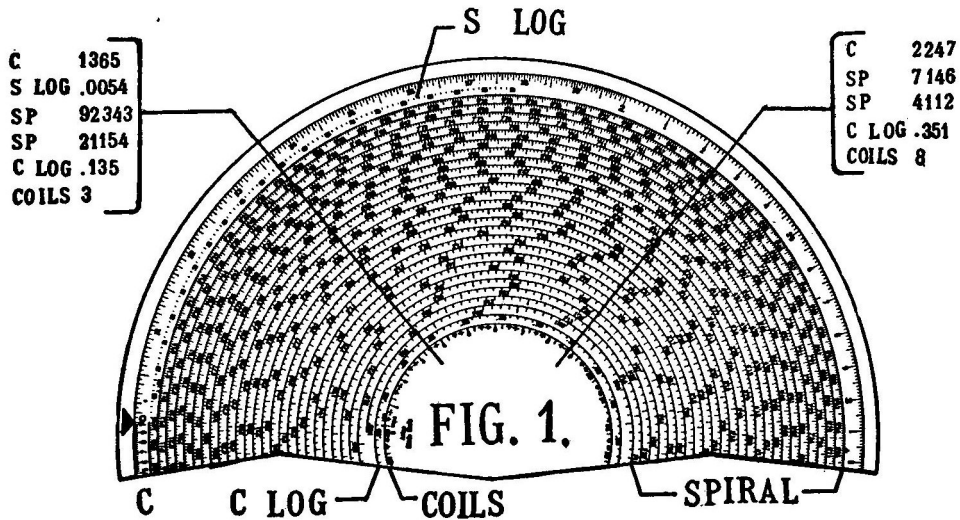
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## DESCRIPTION

This circular slide rule is constructed to give many years of good service. The Scales are protected by three coats of transparent lacquer, so that any ordinary wear will not erase the scales. However, if the user presses down on the Indicators when they are moved, the finish of the rule will become dull. To move the Short Indicator, catch the fingernail under the edge and raise the Indicator about  $1/16$ th of an inch. The Long Indicator should be raised when it is moved.

Throughout these instructions the long indicator will be referred to as L and the short indicator will be termed S. It will be noted that whenever S is moved that L remains stationary, but that when L is moved S moves with it. Whenever L is moved in solving a problem, be sure that nothing interferes with the free movement of S. L always gives the answer to the problem.

The outer scale on the front side of the rule is called the C Scale. It is used for solving problems in multiplication, division and proportion. The beginner should master the C Scale before attempting to use any of the others. Therefore the problems given in the next paragraph should be solved on the C Scale and all others disregarded. Figure 1 shows the scales.

**TO MULTIPLY  $5 \times 7$ .** Set L at 5 and S at 10. Turn L until S is at 7 and L will indicate the answer, 35.

**TO DIVIDE  $18 \div 3$ .** Set L at 18 and S at 3. Turn L until S is at 10 and L will indicate the answer, 6. Try other simple examples using the C scale.

TO SOLVE PROPORTION  $7:35::5:x$ . Set L at 35 and S at 7. Turn L until S is at 5 and L will give the answer, 25.

TO SOLVE  $35 \div 15 \times 3$ . Set L at 35 and S at 15. Turn L until S is at 3 and read the answer 7, under L.

Try these examples several times until you are familiar with the operation of the slide rule.

## READING THE SCALES

These examples were made very simple, because when using larger numbers, the operator must be able to read the Scales. This can be learned by studying their construction. Taking the C Scale, it will be noted that beginning at the Index and reading clockwise, the long lines are numbered 11, 12, 13, etc., to 2. Then each of these spaces is further divided into 10 subdivisions. Tenths of these subdivisions must be estimated if required by the problem. To locate any number beginning with 1, as 1365, move an Indicator to 13, then move it six or more subdivisions to 136 and the center of the next subdivision gives 1365.

To locate a number beginning with 2, as 2247 (22.47, .022,470, 2,247,000, etc.) move the Indicator two large divisions from 2, which gives 22. then move it 4 divisions and estimate .7 of the next subdivision. Figure 1 shows the location of these settings. Study this figure until you are familiar with it. Locate various numbers on the different scales and learn the name of the scales and their location on the face of the rule.

## THE SPIRAL SCALE

The Spiral Scale, called Sp. is a "C" Scale of 25 coils and occupies most of the face of the slide rule. To aid in finding the various numbers on its scales, the coils covering the even numbers have been printed on a yellow background.

The operation of the Spiral Scale and the "C" Scale are exactly the same but when using the Spiral Scale the indicator covers 25 numbers. To determine which of these numbers is the answer, first solve the problem on the "C" Scale. This will give the answer to 3 figures. Note this answer on the computation sheet. Also note on the innermost scale, labeled "Coils," which coil the answer will appear on. Then solve the problem, using the Spiral Scale and read the result from the coil which indicates the first three figures obtained from that first try.

Example: Find the product of 256 X 351. Using the "C" Scale set L at 256 and S at 10. Then move L until S is at 351 and L will indicate 898. Note this result and that 898 will appear on coil 23 of Sp. Now set L to 256 on Sp. This will be in the first group of yellow Scales. Set S again at 10. Move L until S is at 351 on Sp. Read the answer 89856. The last figure may be obtained either by estimation or by mentally multiplying the last digit in the two numbers, 6 and 1, together. The answer is known to have 5 figures since L did not pass 10 when moved clockwise in the multiplication on the "C" scale. This is explained in the paragraph "The Decimal Point."

Example: 164 X 532

Answer 87,248

613 X 121

Answer 74,173

Try other examples until you become familiar with the operation of the Spiral Scale.

## THE DECIMAL POINT

If the C scale of the Rule is used for multiplication and division and L turned clockwise to set S then the following rules will give the number of figures in the result. To simplify the rules the following terms are used. "Sum" is the number of figures in the multiplier plus the number of figures in the multiplicand. "Difference" is the number of figures in the dividend minus the number of figures in the divisor.

Rule 1. In multiplication, if L is moved to, or past, 10 to set S, the number of figures in the product equals the sum. Example:  $75 \times 62$  equals 4650. There are four figures in the two factors and, as L crosses 10, there are four figures in the result.

Rule 2. If L does not reach 10, one figure should be deducted from the Sum. Example:  $75 \times 124$  equals 9300. The Sum adds to 5 figures but, since L does not pass 10, one figure is deducted making 4 figures in the result.

For division the following rules apply:

Rule 1. When the Divisor lies clockwise between the dividend and 10, the number of figures in the quotient equals the figures in the dividend less those in the divisor. Example: 5950 divided by 70 equals 85. Since 70 lies between 5950 and 10, there are 4 minus 2 equals 2 figures in the result.

Rule 2. If the dividend lies closer to 10 than the divisor, add 1 to the Difference for the number of figures in the quotient. Example: 852 divided by 12 equals 71. Since the dividend lies closer to 10 than the divisor, there are 3 minus 2 plus 1 equals 2 figures in the result.

In adding the number of figures in the factors the following rules apply:

Rule 1. Units in front of the decimal points are plus numbers.

Rule 2. Each zero directly after the decimal point is a minus number.

## LOGARITHMS

Using the various scales of the Atlas slide rule, logarithms of numbers may be found to 5 places. Since the Spiral scale is 25 turns, each turn increases the logarithm of the number by 0.04 and 25 coils increase it from 0 to 1. To conserve space on the rule the entire spiral log scale was not placed on the rule. Instead of a portion from 0 to 10 covering a quarter turn is placed at the 1,000 end of the Spiral scale and marks are placed under the C scale at a half turn, near 3.16, and at three-quarters turn, near 5.62. This scale is called the S Log scale. It is used with the Spiral scale to obtain the last three numbers of the logarithm.

The second scale from the center of the slide rule called, C Log scale, is used with the C scale in obtaining the first two or three figures of the logarithms. The student will also notice that the first scale, Coils, is not only divided into the number of coils but each division is divided into four parts with marks corresponding to those on the S Log scale. This is to indicate which of these marks to set the S indicator on when setting the L indicator on the Sp. scale, to obtain the last 3 figures of the logs.

Example: Find the logarithm of 2247.5. Set L at 224.7 on the C scale and read .351 on the C Log scale. Also note that 224.7 is in the fourth quarter of the S log scale as shown on the Coils scale, see Fig. 1. Now set L at 2247.5 on Sp. and S at X on the S Log scale, near 5.62 on the C scale. Turn L until S is at 10 and read .00170 under L on the S Log scale. The logarithm of 2247.5 is 3,35170.

Example: Find the log of 39.184

Answer: 1.59311

Find the log of 1645.6

Answer: 3.21632

## COMMERCIAL PROBLEMS

The C Scale is used for solving most commercial problems so if no scale is mentioned the C Scale should be used.

**OVERHEAD:** A merchant has \$15,200 sales for a year with a \$3,800 overhead. What is his percent of overhead? Set L at \$3,800 and S at \$15,200 (or 152). Turn L until S is at 10 and read 25 or 25% at L.

If an article costs the above merchant \$2.50 and he wishes to make a 10% net profit, with a 25% overhead. What should be the selling price of the article? Add 10% and 25% and subtract them from 100% which gives 65%. Set L at 10 and S at 65. Turn L until S is at \$2.50 (or 25) and L will give \$3.85 as the correct selling price. If the selling price of other articles is desired (25% overhead and 10% profit) turn L until S is at the invoiced cost and L will give the selling price.

If a case of 48 articles cost the above merchant \$145, what should be the selling price of one article so that he will make a 10% net profit with an overhead of 25%? Set L at 48 on CI Scale and S at 65 on C Scale. Turn L until S is at 145 on C Scale and L will indicate 465 on C Scale. Therefore the correct selling price for each article would be \$4.65. The above method may be used for finding selling price of articles bought by quantities, including dozen and gross lots. When finding the selling price of an article when the unit cost is known, set L at 10. If the cost of the lot is known, set L at the at the quantity, on the CI Scale and proceed in the same manner.



## TRIGONOMETRIC FUNCTIONS

The back side of the Rule has one Indicator, which will be referred to as T. It has three separate Sets of scales. The outer scale of each Set is Degrees, the middle scale is Sines and the inner scale is Tangents. Each degree graduation has one or two figures on each side of the line, as 53 37. The figures at the left of each line give the degrees for Sines and Tangents and increase from 0 to 90 degrees in a clockwise direction, while the figures at the right of the line give the degrees for Cosines and Cotangents and increase from 0 to 90 degrees in a counter-clockwise direction. Each of the larger degree divisions is divided into .1 degree or six minute divisions.

To read the function of any angle, set the hair-line, T, to degrees and read the function on its scale. The co-functions are read on their corresponding scale but the degrees must be read in a clockwise direction. Thus:— Sine  $65^{\circ} 42'$  is .9114. Tangent  $18^{\circ} 30'$  is .3346. Cos.  $51^{\circ} 54'$  is .6170.

### To read to one Minute

It will be noticed that the division on the three Degree scales are not on radial lines but differ by 2 minutes. To increase 2 minutes, move the hair-line to the next outer degree scale, moving to the center if necessary. By going halfway between the degree divisions of any two adjacent (or the outer and inner) graduations, the hair-line can be set to one minute.



**BE WISE.**