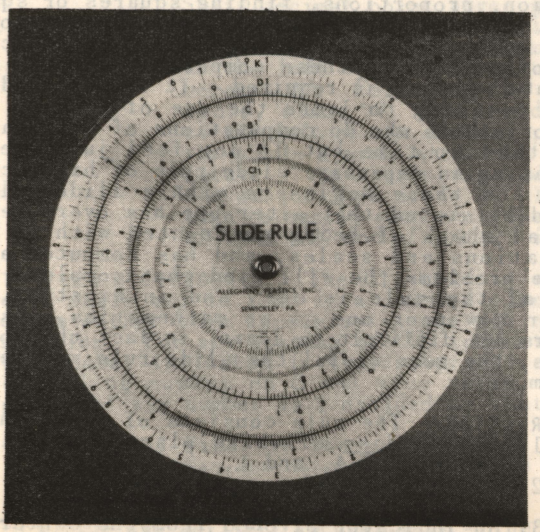
INSTRUCTION MANUAL FOR

ALLEGHENY PLASTICS SLIDE RULE ★



- ***Printing Protected by Lamination.***
- *All Plastic — Durable.*
- *Easy to Use — Easy to Carry.*

Circular Decimal Equivalent Table on Reverse Side

ALLEGHENY PLASTICS, INC.
THORN RUN ROAD
CORAOPOLIS, PA.

INSTRUCTION MANUAL FOR

ALLEGHENY PLASTICS SLIDE RULE

USES - This rule can be used for multiplication, division, proportions, finding squares or square roots, cubes or cube roots, reciprocals and logarithms. It affords one of the easiest and quickest ways of performing these computations where only moderate accuracy is required. It is intended for those desiring to learn the use of a slide rule and for others who do computations of this nature from time to time but do not feel justified in purchasing an expensive slide rule of high accuracy. For those beginners with a slide rule it should be stated that after one has overcome the initial shock of being confronted with so many graduations and scales, and has computed a few simple problems, he will find that complete mastery of the rule is easy and interesting. No matter how poor one is at mathematics, a slide rule is not difficult to learn, in fact the poorer one is, the more useful the slide rule may become to him.

CONSTRUCTION - The rule consists of three parts:

1. A base disc of white plastic containing scales K,D,A, and L,
2. A top disc of transparent plastic containing scales C,B, and CI,
3. An indicator pivoted from the center and carrying a hairline.

HOW TO MULTIPLY - Above the word "Slide Rule" will be seen on the base disc the letter D which identifies the D scale. Adjacent to and inside this scale is a scale on the top transparent disc identified by the letter C. These two scales together are generally used for multiplication (and division). These two scales will be seen to be identical in divisions and numerical markings. To the right of the D and C on these scales is a graduation marked by a large 1, which henceforth will be called the index. Ten divisions more to the right is a small 1; ten more divisions to the right is a small 2; then a 3,4,5, etc. up to 9. Ten more divisions after 9 is a large 2. To the right of 2 is a large 3,4,5, etc. up to 9. Beyond 9 to the right the circle is completed and the large 1 appears again. In a computation this large 1 (index) will indicate 1 and 10, or 0. 1 and 1, or 10 and 100, or 100 and 1,000 etc., depending upon the particular problem. If the index is taken to indicate 1 and 10 the numbered graduations clockwise in between will then be 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2,3,4,5,6,7,8,9.

EXAMPLE 1. Multiply 3 by 4.
Set 3 on scale C opposite index on D. Read answer 12 on C opposite 4 on D.

EXAMPLE 2. Multiply 15 by 4.
Set 15 on C (graduation marked by small 5 between index and 2) opposite index on D. Read answer 60 on C opposite 4 on D.

EXAMPLE 3. Multiply 14 by 36.
Set 14 on scale C opposite index on D. Read answer 504 on C opposite 36 on D.

The graduation indicating 36 will be found between 3 and 4. This section is divided by graduations into 10 large sub-divisions which indicate one-tenths between 3 and 4 and each one-tenth division is subdivided into five smaller divisions indicating two-one hundredths. Thus, 36 is indicated by the graduation between the sixth and seventh large subdivisions between 3 and 4. The graduation indicating 504 is found between 5 and 6. This section is divided into ten large subdivisions indicating one-tenths and each of these is divided into two subdivisions indicating five-one hundredths. Thus 504 is four-fifths of the way between 5 and the next adjacent division clockwise which indicates 505. There is no actual graduation at 504 and this point must be picked off visually.

RULE FOR MULTIPLICATION: To multiply two numbers together, set one number opposite index on D. Read answer on C opposite other number on D.

HOW TO DIVIDE -

EXAMPLE 4. Divide 6 by 3.
Set 3 on scale C opposite 6 on scale D. Read answer 2 on D opposite index of scale C.

EXAMPLE 5. Divide 37.5 by 62.3.
Set 62.3 on scale C opposite 37.5 on scale D. Read answer .602 on D opposite index of scale C.

RULE FOR DIVISION: Set number being divided by on scale C opposite number being divided on D. Read answer on D opposite index of C.

HOW TO DO PROPORTIONS -

EXAMPLE 6. If 3 yards of cloth cost $4.25, how much would 21 yards cost?
The answer is x in the proportion:

$$\frac{4.25}{3} = \frac{x}{21}$$

Opposite 4.25 on D set 3 on C. Read answer $29.75 on D opposite 21 on C.

HOW TO FIND SQUARES OR SQUARE ROOTS - Scales A and B are identical and each is a double scale constructed along the same logarithmic principles as the C and D scales. Because of this, any number N on scale A is the square of the corresponding number N' on scale D. (The same relationship applies between scales B and C).

EXAMPLE 7. Find the square of 2. Set the indicator to 2 on D and the answer 4 appears on A under the indicator. (This may also be interpreted that the square of 20 is 400; the square of .2 is .04, etc.)

EXAMPLE 8. Find the length of the side of a square whose area is 64 sq. ft. Since 64 has an even number of digits to the left of its decimal point (64.), we use the half section of the A scale farthest clockwise from the index of the D scale. Set the indicator to 64 on this section of the A scale and read answer 8 at indicator on D scale.

This example illustrates how to find the square root of any number with an even number of digits to the left of its decimal point; this also applies for numbers like .64, .0064, .000064 etc. which can be obtained by shifting the decimal an even number of places to the left.

To find the square root of a number with an odd number of digits to the left of its decimal point, the half section of the A scale commencing at the point directly below the index on the D scale is used. Locate the number in question on this section of the A scale and its square root on D. A similar procedure applies for numbers like .08, .0008 etc. which contain an odd number of ciphers between the decimal point and the first numeral to the right.

HOW TO FIND CUBES OR CUBE ROOTS - The outside scale on the base disc is the K scale which is used in obtaining cubes or cube roots. It is made up of three identical small scales, each occupying one-third the area of the D scale. Because of this, any number N on the K scale is the cube of the corresponding number N' on the D scale.

EXAMPLE 9. Find the cube of 3. Set indicator to 3 on D. Read answer 27 at indicator on K. (Likewise, the cube of 30 is 27,000; the cube of .3 is .027, and of .03 is .000027).

EXAMPLE 10. Find the cube root of 43. Since 43 has two figures to the left of its decimal point (43.) we use the middle K scale. Set indicator at 43 on this scale. Read answer 3.50 on D at indicator.

To find the cube root of any number N which has 2,5,8, ...,2 + 3n (where n is any positive integer) digits to the left of its decimal point, use the middle K scale. If the number N has 1,4,7, ..., 1 + 3n digits to the left of its decimal point, use the first K scale clockwise from the point above index of D; if N has 3,6,9, ..., 3 + 3n digits to the left of its decimal point, use the third K scale clockwise.

To find the cube root of a decimal fraction (such as .000027), shift the decimal point to the right three places at a time until one or more significant figures are to the left of the transposed decimal point, and, using this number and the same rules as above, determine which section of the K scale to use.

The location of the decimal point in the answer is determined by inspection and trial and error.

EXAMPLE 11. Find the cube root of .000027. Shift decimal point three places at a time to the right until one or more significant figures is to the left of it and the number becomes 27. Following the rules above, since 27. has two digits to the left of the decimal point, the middle K scale should be used. Locate 27 on this scale and read the answer 3 on scale D. It can then be easily seen that the cube of .3 is .027 and of .000027 is .03.

HOW TO FIND RECIPROCALS - The CI scale is an inverted C scale and is read in a counter-clockwise direction rather than clockwise as are all of the other scales. For any setting of the indicator on CI, the number indicated is the reciprocal of the corresponding number on C and vice versa. (The reciprocal of any number is 1 divided by that number.)

EXAMPLE 12. Find the reciprocal of 5. Set indicator at 5 on scale C and read answer .20 on CI.

HOW TO DIVIDE AND MULTIPLY SUCCESSIVELY - The slide rule user will probably find that successive division and multiplication is one of the most useful and time-saving computations which his slide rule will assist in performing.

EXAMPLE 13. Solve the following:

$$\frac{25 \times 3 \times .333}{8 \times 420 \times .015} = ?$$

1. Set 8 on C under 25 on D
2. Move indicator to 3 on C
3. Bring 420 on C under indicator (which is held fixed with relation to base disc)
4. Move indicator to .333 on C
5. Bring .015 on C under indicator (which is held fixed with relation to base disc)
6. Read answer .496 at index of C on D.

HOW TO FIND LOGARITHMS - The L Scale at the center of the base disc is used in determining logarithms.

First, however, the general rule of characteristics of logarithms should be stated. It is: The characteristic of the logarithm of a number which has an integral part is 1 less than the number of digits in the integral part. (The characteristics of 3, 30 and 300 are for example, 0, 1 and 2 respectively).

The characteristic of the logarithm of a proper decimal is negative and 1 greater except for sign than the number of zeros between the decimal point and the first non-zero digit. (For example, the characteristics of the logarithms of .3, .03, and .003 are -1, - 2, and -3 respectively).

EXAMPLE 14. Find the logarithm of 400. Using rule stated above, the characteristic is known to be 2. Set indicator at 400 on D and read 602 at indicator on L. Thus, the logarithm of 400 is 2.602.

Using the value of log N, by reversing the procedure described above, it is possible to determine N.

EXAMPLE 15. Given log N = 1.397; find N. The characteristic of log N is 1; therefore there are two digits to the left of the decimal point in N. Set indicator to 397 on scale L. The indicator falls at 25 on scale D; therefore, N is 25.0.