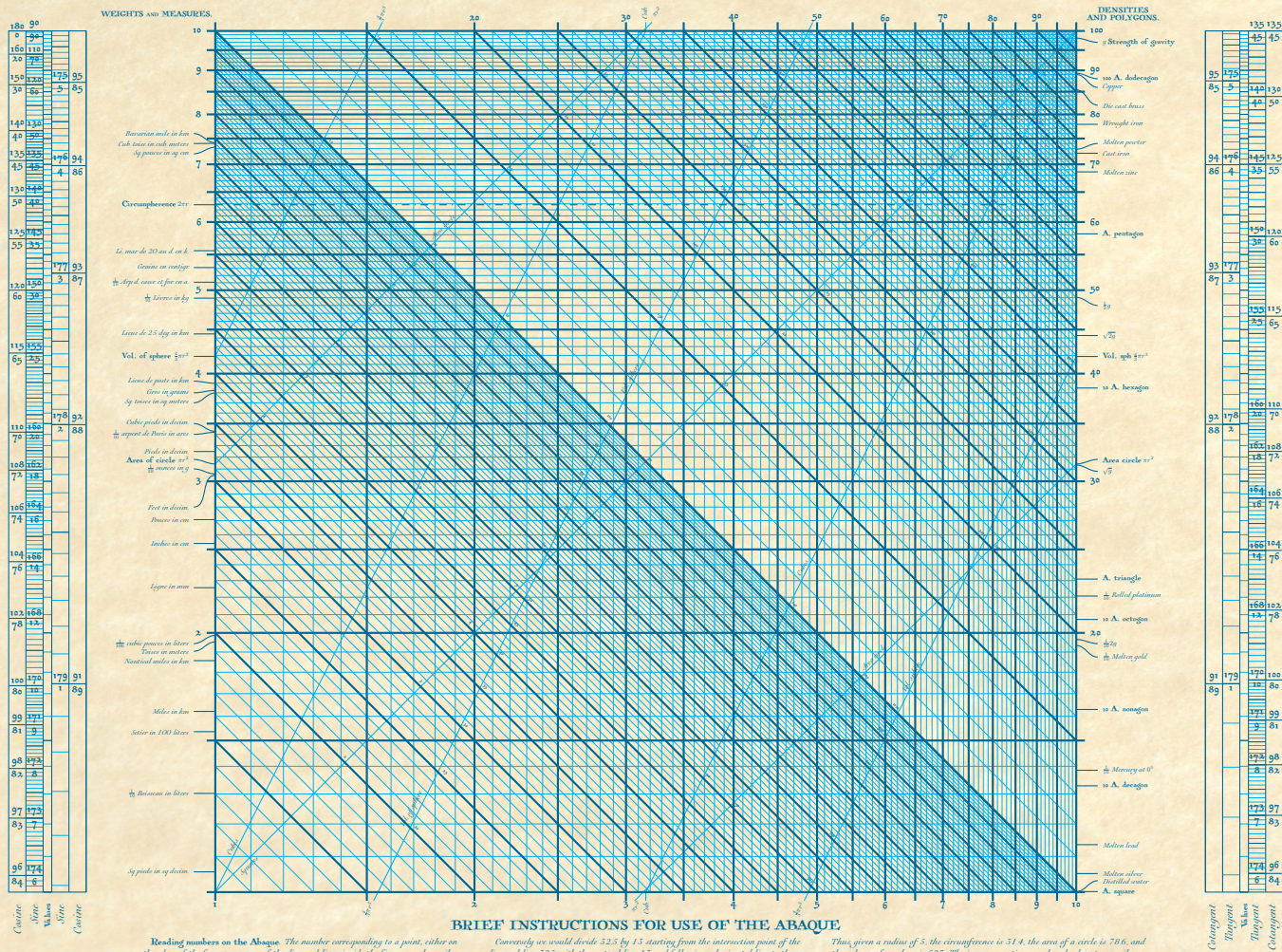


ABAQUE OR UNIVERSAL CALCULATOR,

giving on sight, accurate within $\frac{1}{200}$, the results of all calculations of Arithmetic, Geometry, and practical Mechanics, etc.

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This Abaque was approved by the Academy of Sciences on September 11, 1843



BRIEF INSTRUCTIONS FOR USE OF THE ABAQUE

Conversion. We would divide 32.5 by 13 starting from the intersection point of the diagonal line 32.5 with the vertical line 13 and following a horizontal line to the quotient 2.5 on the vertical edge of the frame.

Nothing could be easier than obtaining the result of the multiplication and division of any number of quantities, in particular the fourth term of a proportion.

Powers and roots. The squares and cubes are found on the diagonal lines labeled as such, starting from the numbers counted at the bottom of the frame. Conversely, square roots and cube roots are obtained by starting from the lines of squares and cubes and descending to the bottom line of the frame. For powers of 3/2 that arise in various questions of hydraulics, one should start from the vertical edge of the frame and read on the nearest cube line.

Examples: $\sqrt{2} = 1.41$; $\sqrt[3]{318} = 11.0$; $13^3 = \sqrt{(13)^2} = 954$

To obtain a power of the 4th, 5th, or 6th degree, which is useful in compound interest calculations, simply draw diagonal lines on the Abaque starting at 1 with slopes of 3/4, 4/5, or 1/2, each following the others like the lines of cubes.

Circumference, circle, sphere. The diagonal lines labeled as such are used to obtain the length of a circumference, the area of a circle and the volume of a sphere, with the radius being measured on the bottom edge of the frame.

Thus, given a radius of 5, the circumference is 31.4, the area of a circle is 78.6, and the volume of a sphere is 527. The inverse questions can be solved just as easily.

Conversion of weights and measures. The heights marked on the left edge of the frame between the starting point 1 and the small marks corresponding to the conversion of weights and measures serve as multipliers to convert old measurements into metric, and they serve as divisions for the inverse problem.

Weight of volumes of various substances. Similarly next to the names of various substances placed along the right edge, there are corresponding multipliers or divisions depending on the nature of the question to be solved.

Gravity. Questions related to the falling of bodies in a vacuum, the pendulum, and the flow of liquids can be easily solved using the numbers corresponding to g , $3g$, $\sqrt{5g}$, $\sqrt{2g}$, and $2g$, which have been marked on the right edge of the frame.

Regular polygons. The area of a regular polygon can be obtained by dividing the square of its side by the corresponding number marked on the right edge of the frame with the letter A.

N.B. For more detailed information, please refer to the printed instruction manual available from the same distributor, as well as other models of the Abaque.

Reading numbers on the Abaque. The number corresponding to a point, either on the edge of the frame or on one of the diagonal lines inside the figure, can be easily obtained by considering the digits 1, 2, 5, 4, 10, 20, 30, 100 placed on those edges, representing whole or decimal units, of any order as desired.

Thus the 2th division mark between 2 and 5 can represent the numbers 2.5, 25, 250, etc., and 0.25, 0.025, etc.

However on the diagonal lines labeled squares and circle area, only the numbers written on them and their multiples or quotients by 100, 10000, 1000000, etc., should be read. On the lines related to the volume of the sphere and cubes, only the written numbers and their quotients by 1000, 1000000, etc., should be read.

General principle of the Abaque. The product of two numbers is determined exactly as in the table commonly attributed to Pythagoras, by reading the number on the diagonal line in this direction where the vertical and horizontal lines meet, corresponding to the two factors.

Thus, the product of 2 by 5 is found on the diagonal line with the digit 6. The product of 13 by 2.5, falling between the lines 2.5 and 3.5, the digit of the product will be 32.5, which represents the answer 32.5 when placing the decimal point appropriately.

