= 10) . For example , Briggs ' first table contained the common logarithms of all integers in the range 1 ? 1000 , with a precision of 14 digits . As the function f (x) =
bx is the inverse function of logb (x) , it has been called the antilogarithm . The product and quotient of two positive numbers c and d were routinely calculated as the sum and difference of their logarithms . The product cd or quotient c / d came from looking up the antilogarithm of the sum or difference , also via the same table :
<formula>
and
<formula>
For manual calculations that demand any appreciable precision , performing the lookups of the two logarithms , calculating their sum or difference , and looking up the antilogarithm is much faster than performing the multiplication by earlier methods such as prosthaphaeresis , which relies on trigonometric identities . Calculations of powers and roots are reduced to multiplications or divisions and look @-@ ups by
<formula>
and
<formula>
Many logarithm tables give logarithms by separately providing the characteristic and mantissa of x , that is to say , the integer part and the fractional part of log10 (x) . The characteristic of 10 · x is one plus the characteristic of x , and their significands are the same . This extends the scope of logarithm tables : given a table listing log10 (x) for all integers x ranging from 1 to 1000 , the logarithm of 3542 is approximated by
<formula> Greater accuracy can be obtained by interpolation .
Another critical application was the slide rule , a pair of logarithmically divided scales used for calculation , as illustrated here :
The non @-@ sliding logarithmic scale , Gunter 's rule , was invented shortly after Napier 's invention . William Oughtred enhanced it to create the slide rule ? a pair of logarithmic scales movable with respect to each other . Numbers are placed on sliding scales at distances proportional to the differences between their logarithms . Sliding the upper scale appropriately amounts to mechanically adding logarithms . For example , adding the distance from 1 to 2 on the lower scale to the distance from 1 to 3 on the upper scale yields a product of 6 , which is read off at the lower part . The slide rule was an essential calculating tool for engineers and scientists until the 1970s , because it allows , at the expense of precision , much faster computation than techniques based on tables .

= = Analytic properties = =

A deeper study of logarithms requires the concept of a function . A function is a rule that , given one number , produces another number . An example is the function producing the x @-@ th power of b from any real number x , where the base b is a fixed number . This function is written
<formula>

= = = Logarithmic function = = =

To justify the definition of logarithms , it is necessary to show that the equation
<formula>
has a solution x and that this solution is unique , provided that y is positive and that b is positive and unequal to 1 . A proof of that fact requires the intermediate value theorem from elementary calculus . This theorem states that a continuous function that produces two values m and n also produces any value that lies between m and n . A function is continuous if it does not " jump " , that is , if its graph can be drawn without lifting the pen .