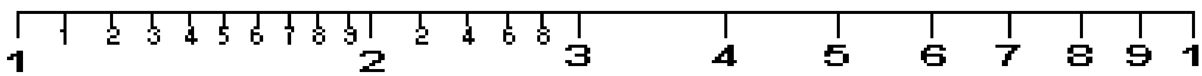
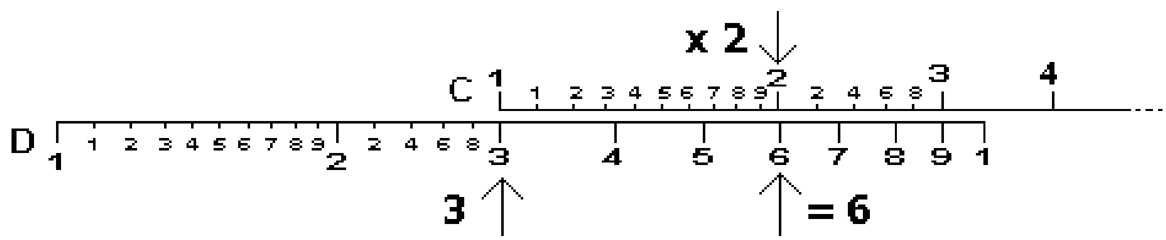
How a slide rule works

The **C** and **D** scales on a slide rule uses base 10 logarithms, so if the length of the scale from the 1 on the left hand edge to the 1 on the right hand edge is 1 linear unit and x is a number between 1 and 10, then the mark corresponding to x is $\log_{10} x$ units from the left hand edge.



(***Source:*** http://web.mit.edu/2.972/www/reports/slide_rule/slide_rule.html)

To multiply 3 by 2, one slides the **C** scale so that the left hand edge meets the **D** scale at 3, and find the point on the **C** scale marked 2. Now look at the point on the **D** scale which lies underneath it and notice that this point is marked 6, which is 3 times 2.



(***Same source as before***)

Why does this work? The left edge of the **C** scale is located $\log_{10} 3$ units away from the left edge of the **D** scale, and the point marked 2 on the **C** scale is another $\log_{10} 2$ units away from the left edge of the **C** scale. The point underneath the latter on the **D** scale is then $\log_{10} 3 + \log_{10} 2 = \log_{10} 6$ units away from the left edge of the **D** scale. By construction, the marking on the **D** scale for this point is equal to 6.

A second possibility The preceding method works well for multiplying two digit numbers if their product is less than 10. Suppose now that the product is greater than 10; for example, consider the product 4 times 3. If we try to carry out the procedure outlined above, we find that the point marked by 4 on the **C** scale will go beyond the markings on the **D** scale. In such cases, we first slide the **C** scale so that its **right end** sits over 4 on the **D** scale. Next, we locate the point marked by 3 on the **C** scale and look at the point on the **D** scale which lies underneath it. Consider the position of the left end of the **C** scale with respect to the left end of the **D** scale. Since the right end of the **C** scale lies at the point which is $\log_{10} 4$ units to the right of the **D** scale's left end, the left end of the **C** scale lies at the point which is $\log_{10} 4 - 1$ units to the left of the **D** scale's left end. Therefore the point on the **C** scale which is $\log_{10} 3$ units to the right of that scale's left end will be

$$\log_{10} 4 + \log_{10} 3 - 1 = \log_{10} 12 - 1 = \log_{10} 1.2$$

units to the right of the **D** scale's left end. All of this is illustrated in the drawing below.