

System Korte – Worked Example

(based on an explanation by Peter Holland)

Before electronic calculators there was just one-way to multiply two or more large numbers¹: longhand with “pen and paper”. Mechanical Calculators could, for the most part, only work with numbers 13 to 20 decimal digits long. The alternative, using Logarithmic Tables, could only handle much shorter numbers and gave imprecise results.

So traditionally multiplying, for example, two 20-digit long numbers needed a 20-step long multiplication while taking care with the “ten’s carry” and writing down each step correctly nested before finally summing up all 20 interim result lines. For each interim result line we effortlessly use the “10 Times Table” we learnt by heart in junior school. However, most of us only memorised the multiplication tables up to 12. With a few exceptions, we struggle to calculate in our heads when multiplying by a factor of 13 or more.

In 1919 German Friedrich Korte came up with his *Sytem Korte* slide rule design for all four primary arithmetic operators and an especially novel approach when the calculations involved multiplying or dividing long numbers.

How it worked

To avoid tedious repetitively similar steps the long number example chosen is:

$$2345 * 6789 = 15,920,205$$

The Korte approach was to split each long number into 2-digit “super numbers”. In the example this would mean calculating with:

$$23 | 45 * 67 | 89$$

Then working from left to right in a series of steps, multiply the two 2-digit “super numbers” (follow the workings by the **red and bold** numbers) to build the parts needed for the answer:

¹ These are numbers with a magnitude significantly bigger than those ordinarily used in everyday life.

Step 1

$$23 \mid 45 * 67 \mid 89$$

$$15 \mid 41$$

Step 2

$$23 \mid 45 * 67 \mid 89$$

$$15 \mid 41 \\ \quad 30 \mid 15$$

Step 3

$$23 \mid 45 * 67 \mid 89$$

$$15 \mid 41 \\ \quad 30 \mid 15 \\ \quad 20 \mid 47$$

Step 4

$$23 \mid 45 * 67 \mid 89$$

$$15 \mid 41 \\ \quad 30 \mid 15 \\ \quad 20 \mid 47 \\ \quad 40 \mid 05$$

Step 5

Add the interim results from right to left taking care with the tens carry

$$23 \mid 45 * 67 \mid 89$$

$$15 \mid 41 \\ \quad 30 \mid 15 \\ \quad 20 \mid 47 \\ \quad 40 \mid 05$$

$$15 \quad 92 \quad 02 \quad 05$$