ABSTRACT. In the children’s book “The Phantom Tollbooth” by Norton Juster one can find the following passage:

“Yes, please,” said Milo. “Can you show me the biggest number there is?”
“I’d be delighted,” [the Mathemagician] replied, opening one of the closet doors. “We keep it right here. It took four miners just to dig it out.”

Inside was the biggest $3$ Milo had ever seen. It was fully twice as high as the Mathemagician.

This is what children might consider to be a large number. The scope of this paper is to shed some light on numbers which adults – in former times and now – regard as large. Of course, the selection is arbitrary.

1. LARGE NUMBERS – A HISTORICAL GLIMPSE

Numbers have always fascinated people. We start with a short look at the number system of the Romans and the Greeks which will lead us to Archimedes and to the largest number which appears in the literature of early occidental history.

1.1. The Roman system

The German word “Zahl” (number) goes back to the Old High-German word “zala”, which in turn belongs (as also the English “tale” and the Dutch “taal” do) to the Indo-German root “del-” (to notch, to carve). So, considering the origin of the word “Zahl”, it basically means “the notched” or “the carved”.

Indeed, bones notched by pre-historic man 20,000 years ago are probably the oldest items which human beings used to help them counting. Our ancestors cut notches into bones and later into pieces of wood in order to express the number of different things. But it is clear that the human ability to accurately and quickly determine the number of notches on a bone, say, rarely exceeded the number four. Thus, if one tries to count with aid of notches, the question arises how to express numbers larger than four in such a way that the encoded number can be recognized at the
first glance. The answer is easy and was found independently by several of our ancestors. After four equal notches, just change the form or position of the fifth one slightly to maintain readability of this sequence of lines. Moreover, some thousands of years ago several cultures developed the habit of doubling the symbol which they used for a fifth notch at every second occurrence. A typical example is given in Figure 1 which shows a piece of wood with notches made by Dalmatian herdsmen.

You easily can recognize three different kind of marks which are very similar to the numerals I, V and X used by the Romans. In fact, the origin of the Etruscan and, hence, also of the Roman numerals is the use of different wooden notches.

At the time of Caesar, then, the Romans used mainly the following symbols as numerals:

\[
\begin{array}{cccccccc}
I & V & X & L & C & D & M & = I \: C \: = I \: C \\
1 & 5 & 10 & 50 & 100 & 500 & 1000 \\
\end{array}
\]

Using these symbols, the Romans created all numbers they wanted to express just by adding them. For example,

\[
3888 = MMMDCCCLXXXVIII.
\]

The only possibility for them to express large numbers without writing very long sequences of these symbols was to create new numerals. For example, they also used the numerals

\[
\begin{array}{cccc}
C & C & C & C \\
5000 & 10,000 & 50,000 & 100,000 \\
\end{array}
\]

But they stuck (essentially) to their principle of expressing numbers by adding numerals from a limited toolbox (additive principle). Through continuing the scheme shown above the Romans could also have created symbols for 500,000, 1,000,000 and so on. But they did not do so, probably because these symbols got confusing. So 23 (of the original 33) copies of CCCC CCC can still be seen on the Columna Rostrata dedicated to the Roman commander Duli in the 3rd century B.C. describing the capture of 3,300,000 prisoners. The Romans even did not have a word for numbers larger than 100,000. For one million they used, as Plinius writes in the first century, “decies centena milia” which is ten hundreds of thousand.