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Why Romans Sometimes Wrote 8 as VIII, And Sometimes as IIX: A Possible Explanation

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Abstract

Most of us are familiar with Roman numerals and with the standard way of describing numbers in the form of these numerals. What many people do not realize is that the actual ancient Romans often deviated from these rules. For example, instead of always writing the number 8 as VIII, i.e., $5 + 3$, they sometimes wrote it as IIX, i.e., as $10 - 2$. Some of such differences can be explained: e.g., the unusual way of writing 98 as IIC, i.e., as $100 - 2$, can be explained by the fact that the Latin word for 98 literally means “two from hundred”. However, other differences are not easy to explain – e.g., why Romans sometimes wrote 8 as VIII and sometimes as IIX. In this paper, we provide a possible explanation for this variation.

Mathematics Subject Classification: 01A35

Keywords: Roman numerals, history of mathematics

1 Formulation of the Problem

Roman numerals as we know them. Most people are familiar with Roman numerals. There, 1 is I, 5 is V, 10 is X, 50 is L, 100 is C, 500 is D, 1000 is M, and numbers are described by listing first thousands, then hundreds, then

tens, and then ones, with the additional complication that while usually all the values add, a smaller-valued symbol before the larger-valued ones means subtraction.

We usually learn that numbers from 1 to 3 are described by addition, as I, II, and III, 4 is obtained by subtraction – as IV, then come V, VI, VII, VIII, IX, and X. Same system is used for tens, for hundreds, etc. So, e.g., the year 1961 is represented as MCMLXI, where:

- the first M stands for 1000,
- the two following symbols CM, in which the smaller-valued symbol C = 100 precedes a larger-valued one M = 1000, stand for the difference $1000 - 100 = 900$,
- then LX stands for $50 + 10 = 60$, and
- finally, I stands for 1;

see, e.g., [6, 7, 8, 13] for details.

Actual ancient Romans often wrote the numbers differently. Interestingly, the numerals in the actual ancient Roman inscriptions are often different. To be more precise, they all follow the same rules about addition and subtraction, but they do not necessarily follow our usual way of describing numbers in this form; see, e.g., [1, 2, 3, 5, 10, 11, 12]. In most Roman books, including Julius Cesar’s *The Gallic War*, some dates do not follow the usual standard. Deviations are also observed on inscription of many Roman buildings, including the Colosseum.

Let us give two examples:

- The number 98 – which would normally be written as XCVIII – was sometimes written as IIC.
- The number 8 was sometimes described not in the usual way, as VIII (i.e., as $5 + 3$), but as IIX (i.e., as $10 - 2$). For example, in the official documents of the 18th Legion, in the official calendars, and on the graves, the number 18 is usually written as XIIX.

Possible explanations. Some of the differences from the usual way of writing numerals can be explained linguistically. For example, in Latin, 98 is *duodecentum*, literally meaning “two (duo) from (de) hundred (centum)”. This explains why this number was sometimes written as IIC. However, many other differences do not have a linguistic explanation.

The writing of 8 as IIX instead of VIII can be partly explained by the fact that IIX requires 4 strokes, while VIII requires five. However, this does not explain why more frequently, the usual form VIII was used.

What we do in this paper. In this paper, we provide a possible explanation for some of the not-yet-explained differences.

2 Our Explanation

What if we carve in stone. If we carve in stone – e.g., on a grave or on a building – each linear segment requires a separate effort. In this case, carving V means making two lines, carving VIII means making $2 + 3 = 5$ lines, while carving IIX means making only 4 lines. In this case, clearly, IIX is easier to make – which explains why this way of writing 8 appears so often when the number is carved.

What if we write a nice looking official document. If we want to write a nice looking official document – e.g., a certificate that some officer of the 18th Legion is commended for bravery in battle, or an official calendar – a natural idea is to use a ruler to make all the lines neat and perfectly straight. In this case too, to make a V, we need to use the ruler twice. Overall, to make VIII, we need to apply the ruler 5 times, while to make IIX, we need to apply the ruler only 4 times. Thus here too, it is better to use the notation IIX.

But what if we are simply writing a letter – or even a book? When we write, we are accustomed to letters being not completely straight. What matters is whether we can write a letter in one – possible curved – stroke, like a letter O, or we need to have at least two strokes, as with proverbial letters t and i – “dotting the i’s and crossing the t’s” is the usual expression for finalizing the text.

From this viewpoint, writing the letter V requires just one stroke: we start with \ and continue with / without taking the pen off the paper. So, in this case, writing VIII requires 4 strokes.

At first glance, writing IIX also requires 4 strokes: 2 strokes to write two I’s and 2 more strokes to write an X. However, remember that the Romans used ink. If you write in ink, you want to always go in one direction to avoid smearing what you have written so far. In this sense, VIII is easy to write, but writing an X means going back: after one of the two lines forming this letter, you have to go back to draw another line, and there is a possibility to smear. So clearly, VIII is easier to write – which is why it was used.

And since most of the time, we write usual letters, and official documents are rarer – this explains why VIII is the most frequent form of the number 8.

How about 7? In principle, number 7 can also be described in two different forms: in the usual form VII and in the subtraction-based form IIIX (which is somewhat also occurring – but very very rarely). In this case, VII is always better, whether we count straight line segments or possible curved strokes – which explains why 7 was practically always written as VII.

Comment. The usual Roman numbering system ends with $M = 1000$. Romans clearly had a need for larger numbers – they had thousands of troops, millions of people in the Empire, millions of money and goods to be counted.

From the viewpoint of easiness to write, the simplest way to transform a number such as 19 into a description for 19 thousand is to use one additional line. Interestingly, this was indeed one of the most popular ways to describe thousands (see, e.g., [4, 8, 9]): by placing a line above a number. This way, XIX (meaning 19) becomes \overline{XIX} (meaning 19 thousand), and, correspondingly, $\overline{XIXDCII}$ means 19,602.

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