SINGLE-DIGIT SYMBOLS FOR TEN AND ELEVEN

by Dominique Waller

To make it easier to write and read, a duodecimal music notation that goes from 0 to 11 needs two new single-digit symbols for 10 and 11. But how to choose them? I've been searching for ten years now and have often changed my mind, but I now have come to a conclusion. That's what I'm going to explain here.

In ten years, these are the signs I've been considering and even used in sheet music for the number ten: X, the hieroglyph ∩, θ and Φ, ɛ, and finally ɣ;

And for number eleven: H (the German letter for the musical note B), the two Chinese Γand ⅂, ∪ (reverse of ∩), the Egyptian cross ☥, &, h, Ч, ψ, ɣ, and finally ɛ.

An important thing to know is that there's never been any culture in human history that used a written numeration in base 12, only oral numerations. So nowhere are there any ancient, forgotten symbols that could be reemployed for the task. Many symbols for ten can be found in old number systems from before the invention of the zero. For example, the Egyptian hieroglyph ∩ is very old. But there are no symbols for eleven, with the exception of two ancient Chinese symbols (see table below).

First, I decided that those two ciphers should be very simple symbols. I browsed through many of the world's forms of written language (the Cyrillic, Armenian and Coptic alphabets are interesting in this respect) and found that very often, the same elementary forms reappeared, in alphabets and number systems as well. For example, 3 is both an Arabic numeral and a Cyrillic consonant.

From experience, I realized it was not a good idea to use an existing letter of the alphabet, because you can hear it sound in your brain every time you read it, and that interferes and prevents you from considering it as a number of its own. So for me it's out of the question to use X, H, A or B as numbers anymore. We should be more imaginative than that. There must be somewhere a forgotten sign that doesn't mean anything (at least in the Western world) and could be used for that one function, right?

Compared to letters, and especially capital letters, Arabic numerals are more rounded. As symbols, they are notably elegant and sober, which give them a modern image of simplicity and functionality. So, I came to the conclusion that the two newcomers should resemble Arabic numerals in every aspect: round, sober and elegant, modern and functional, easy to draw and read, unique and unambiguous.

Later I found that all the Arabic numerals can be written by hand going from top to bottom, which is not the case for all the letters of the Latin alphabet. So I decided that the new symbols should be able to be drawn that way too.

In India, where our Arabic numerals originate, there are a dozen number systems corresponding to various alphabets and languages of the different Indian states. If you compare them, you may find that:

In *Telugu* writing, ౨ means two, ౬ means six and ౯ means nine.

In *Gurumukhi* writing, ੧ means one, ੫ means five, ੬ means six.

In *Gujarati* and *Malayalam* writings, ૭ means seven.

In *Kannada* writing ೩ means three.

In *Bengali* writing, ৪ means four and ৭ means seven.

In *Oriya* writing, ୧ means one and ୨ means two (two ciphers that are mirror images of each other).

We can see that the same forms, the same glyphs, appear in Indian number systems with different meanings. The conclusion is that the number of symbols available in the style of Indian numeration is limited. But…

We also see that, within one writing system, the same form can be inverted (turned upside down) as a mirror image or reversed. The conclusion is that if we need a sign in the Indian style then we can invert or reverse an existing sign for that purpose.

Now, there's a reversed 3 already used in certain Indian writings and generally meaning six, and it's ૬. That's a usable symbol in the style of Indian number systems.

But the most salient symbol available in an Indian number system, which cannot be confused with any existing sign of our alphabet, is ૪, an old character that gave birth to our modern 4. This sign is available in the Gujarati number system from the "Shruti" font set. All the signs of the Gujarati writing are round, sober and elegant…

And so we have two available symbols, which meet all criteria: ૪ and ૬. Now next question is: which one for meaning what? Which one is best fitted for meaning ten and the other eleven? Is there any visual symbolism that imposes itself naturally?

That's where I have changed my mind twice. I asked my friends and colleagues to assign each of these two symbols the number ten or eleven. We found various possible symbolisms, but no clear tendency emerged.

Then I added two criteria. The first one I already knew, but had forgotten: natural numbers are basically even or odd, all of them, alternatively. It's like male or female in living species. It's like genders, for languages that have them. If we admit that symmetry across a vertical axis is (even unconsciously) a valid visual criterion for even numbers, then the sign ૪ is a better fit for 10. And as ૬ is asymmetrical across a vertical axis, then it is a better fit for an odd number, and thus for 11.

But then finally, there was another very important idea. Was there any kind of emerging consensus in favor of certain duodecimal symbols, either among mathematicians or among inventors of music notations? Have a look at these two tables, and you'll see that only three symbols seem to be a bit insistent: X (for ten, not surprisingly), ↊(for both ten or eleven) and E, or ɛ, for eleven, because of the first letter of that word in English:

Symbols of duodecimal numerations

Numbers in Arabic numerals	10	11
Chinese symbols of the Shang era	|	˥ or ⌈
Chinese symbols of the Han era	+	±
Roman numerals	X	XI
Mathematicians	X	Y
Mathematicians	α	β
F. E. Andrews (1935)	X	E
J. Essig (1955)	7 reversed & inverted	ᘔ
G. Zirkel (1982)	∗	#
Dozenal Association America	𝒳	ℰ
Dozenal Association GB	ᘔ	ɛ

Symbols used or proposed for duodecimal music notations going from 1 to 12 or from 0 to 11.

Latin syllables	La	Si b	Si
English notes	A	Bb	B
German notes	A	B	H
Werneburg (1800)		ϵ	∂ or ϑ
A. Hahn (1874)	descending 0	reversed 1	ᘔ
L. Kuncze (1877)	*idem*	*idem*	ᘔ
H. Hohmann (1877)	+	O	B
H. Schmitt (1892)	ɣ	u	s
A. Loquin (1884)	a	b	c
J. Carrillo (1895)		10	11
E. Souriau (1952)		δ	ω
A. Barbaud (1971)		x	z
A. Forte (1973)		t	e
D. Lewin (1977)		a	b
R. Stuckey* (1983)		X	N
C. Pörksen* (2008)	A	B	C or 0
T. Taylor* (2009)		λ	ε
D. Waller* (2010)		ɣ	ɛ
I. Naydenov* (2011)		Φ	Π
C. J. Wang* (2011)		%	!

*inventors that appear on the MNP forum.

I had noticed that I had a symbol in common with Tony Taylor (also known as Leopold Plumtree on the MNP forum). When someone recently pointed to the music forum of the Dozenal Society, I saw the symbols on their sundial, and I thought: “That’s it! Here we are…”

My conclusion is that the symbols I had finally chosen with my own criteria match pretty well those shown by the Dozenal Society.

So maybe it’s the beginning of a consensus...