

# backward compatibility of LM Math

Is

backward compatibility of LM Math  
and CM math sensible?

Piotr Strzelczyk

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We wanted to achieve compatibility of the new Latin Modern OTF math font with the CM original fonts, at least we wanted to keep the widths of METAFONT prototype.

Easy?

# Easy?

Like you might expect,  
it's rather hard because of...

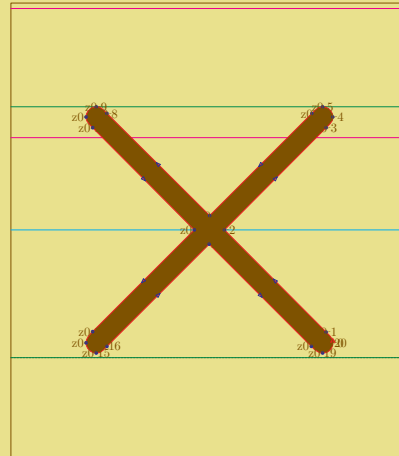
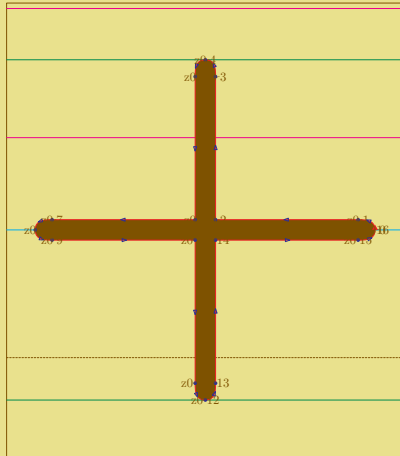
# Easy?

Like you might expect,  
it's rather hard because of...  
some strange decisions by Knuth  
(not bugs of course :)





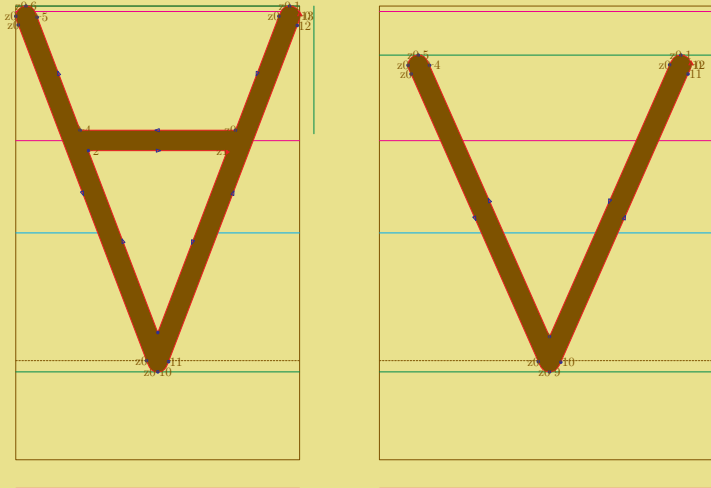
# Strange decisions



The character `\times` has the width of plus `+` which makes the sidebearings of `×` bigger.

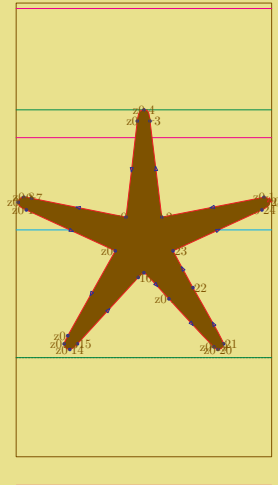


# Strange decisions



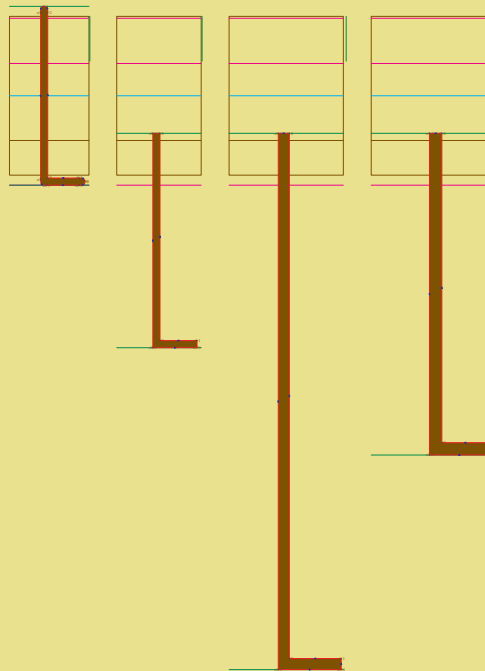
$\forall$  (`\forall`) has no sidebearings  
but  $\forall$  and  $\exists$  have normal margins.

# Strange decisions



`\star` also has no sidebearings  
(and who needs such a big star?)

## Strange decisions



Widths of the ceiling and floor characters is non monotonic: `\Bigg\lfloor` is wider than `\left\lfloor` [high formula].

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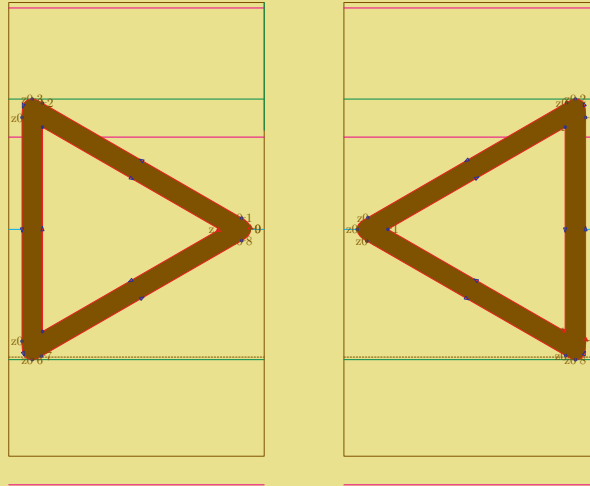
# Easy?

Like you might expect,  
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my favorite Unicode.

“[...] for every character, [...]” – really?

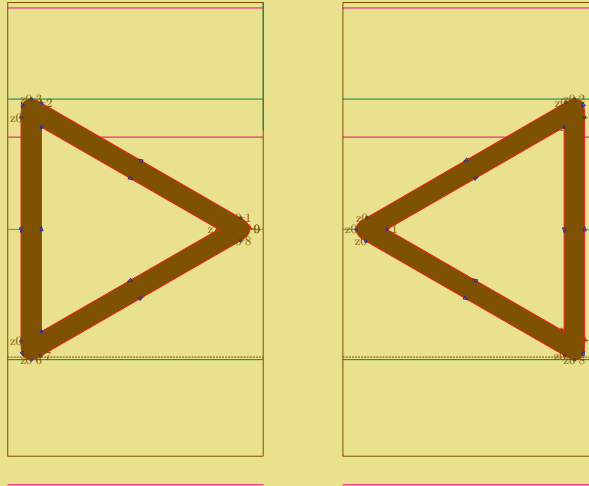


# Unicode problems



In CMMI we have `\triangleright`,

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in unicode we have:

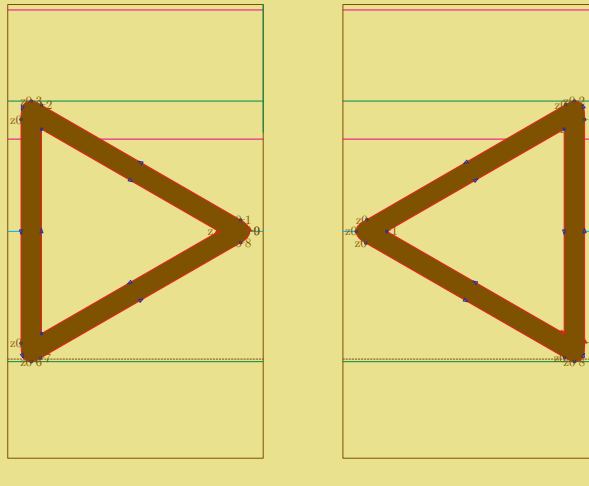
U+25B7 WHITE RIGHT-POINTING TRIANGLE

U+25B9 WHITE RIGHT-POINTING SMALL TRIANGLE

U+25BB WHITE RIGHT-POINTING POINTER

and analogous set of LEFT TRIANGLES

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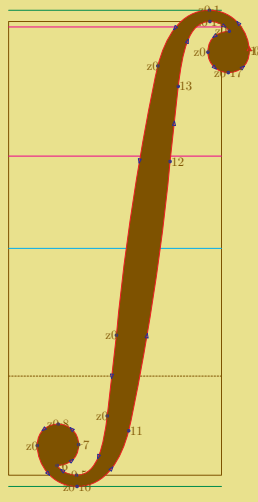
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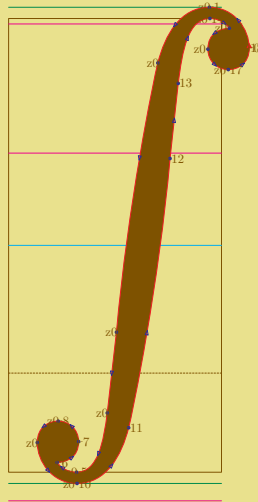
none of them is like the Knuth's triangle!

# Unicode problems



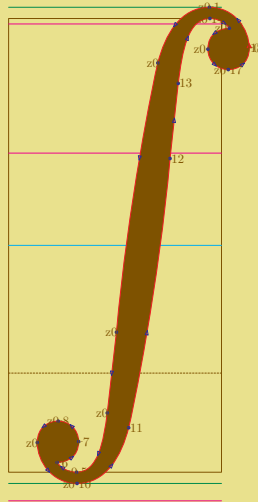
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# Unicode problems



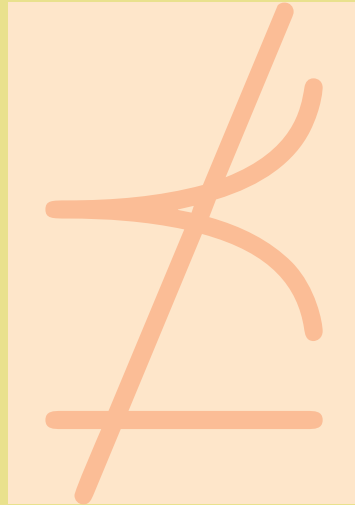
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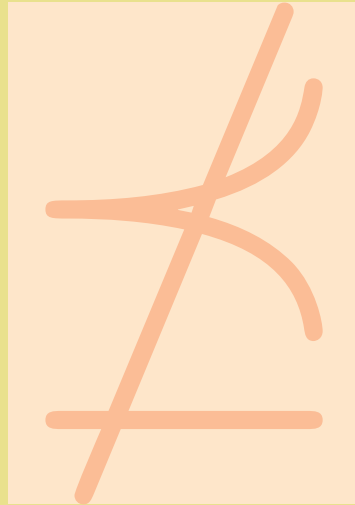
In CMSY we have `\smallintegral`  
but in Unicode there is no place for it  
(may be 0283: LATIN SMALL LETTER ESH  
– we know that is really bad, but...)

# Unicode problems



In AMS fonts: `\notpreceq`

# Unicode problems



In AMS fonts: `\notpreceq`, but  
in unicode we have:

U+227A PRECEDES

U+2280 DOES NOT PRECEDE

U+227C PRECEDES OR EQUAL TO

U+22E0 DOES NOT PRECEDE OR EQUAL

U+2AAF PRECEDES ABOVE SINGLE-LINE EQUALS SIGN

U+2AB1 PRECEDES ABOVE SINGLE-LINE NOT EQUAL TO



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In TFM we have 32-bit numbers with  
12-bits on the left side of the decimal point;  
precision is about  $10^{-5}$  pt.

In OTF fonts, width is an integer number  
scaled by font matrix; with the resulting  
precision only  $10^{-2}$  pt.

# Possible?

So achieving exact compatibility  
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## Possible?

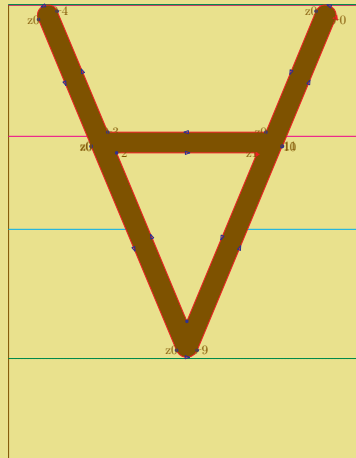
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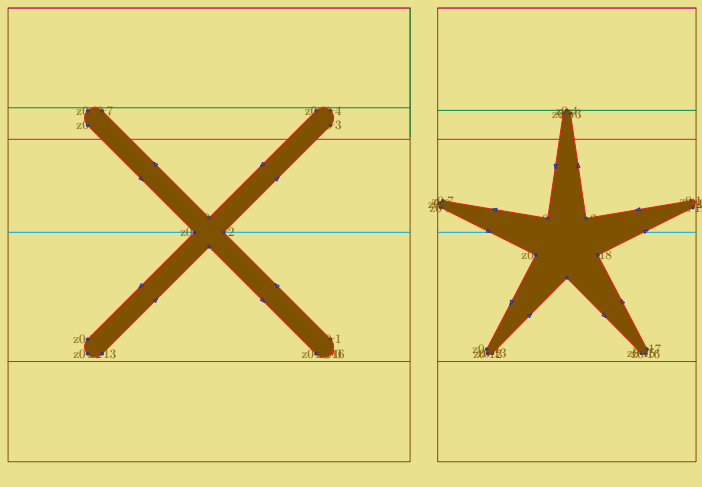
We decided to alter (to improve?)  
some Knuth's "decisions".

# Changes



We added sidebearings  
in the `\forall` char.

# Changes



But (for now) we haven't changed the sidebearings of `\times` and `\star`.

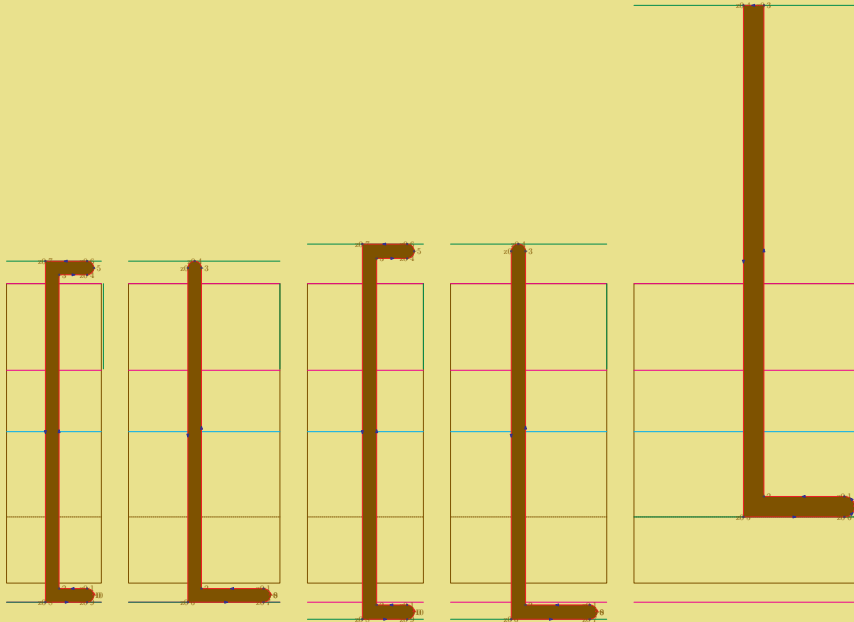


## Other changes

We also decided to correct  
some other “features”

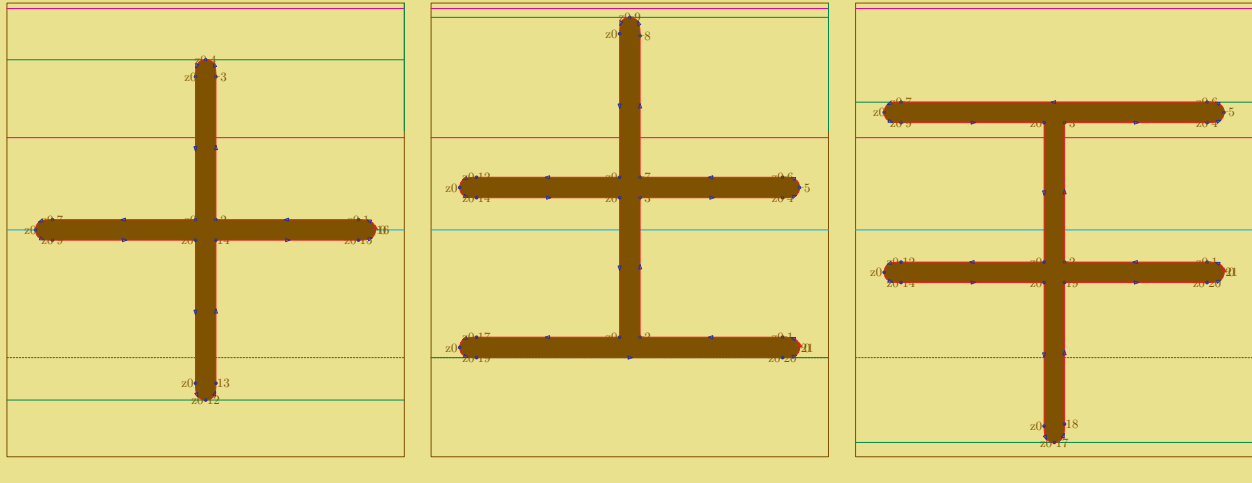
(which don't change the metric of the font)

## Other changes



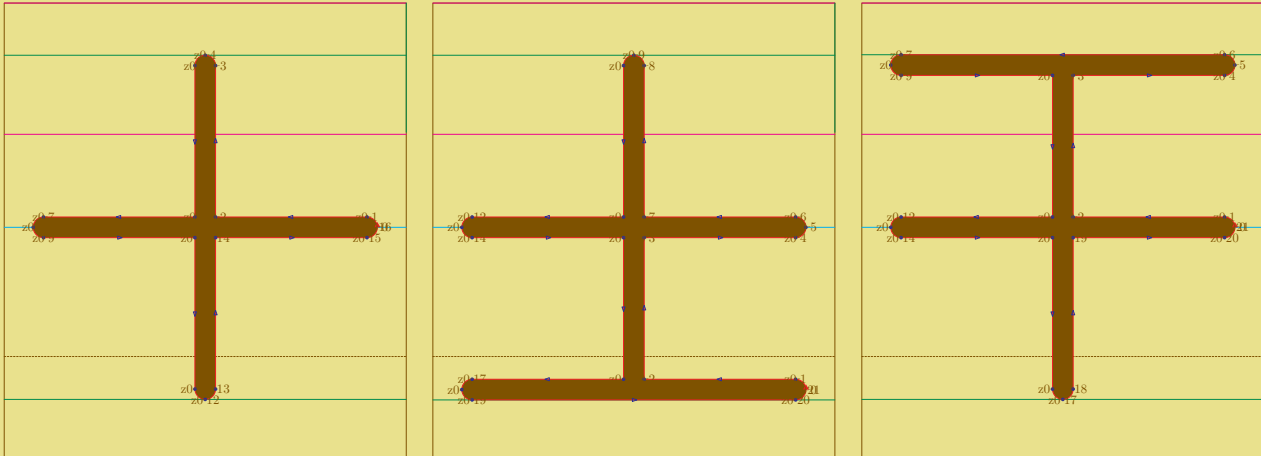
We rounded the ends  
of the  $\lceil$  and  $\lfloor$  characters.

# Other changes



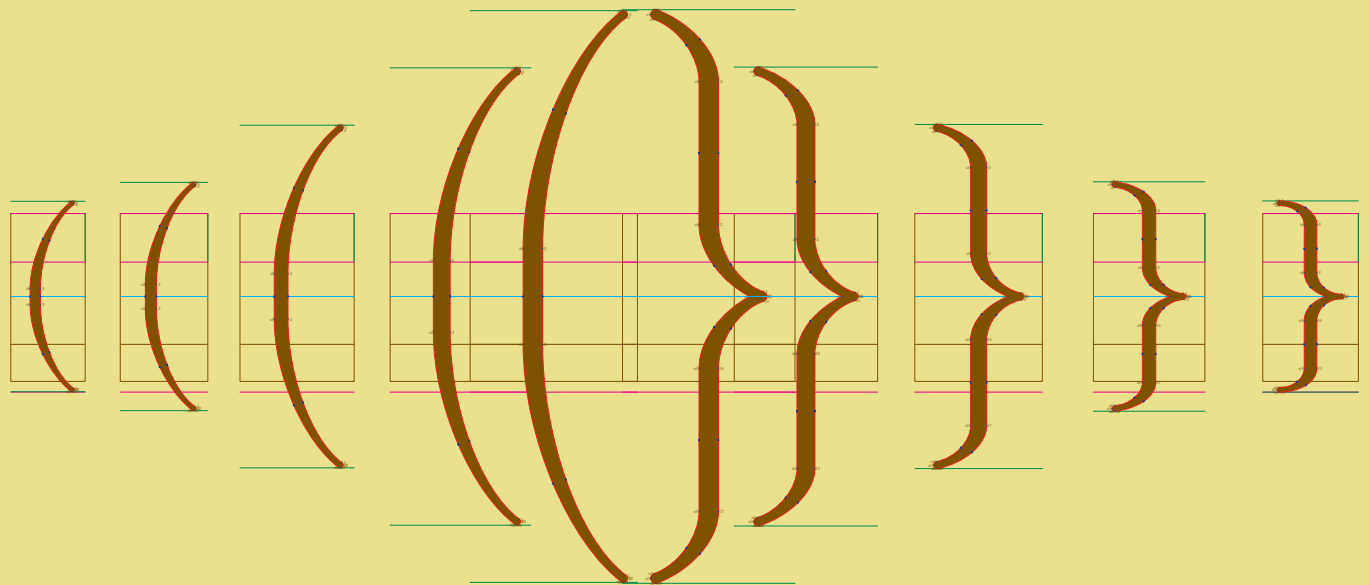
In CM fonts some operators were positioned oddly.

# Other changes

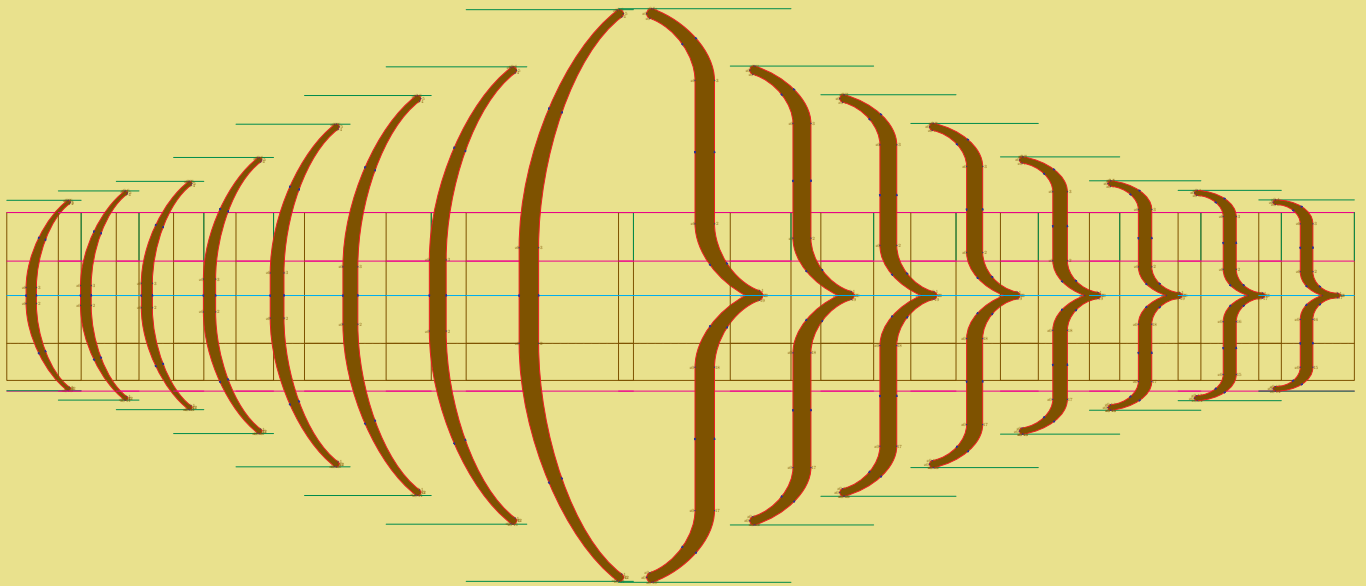


We moderated them a little.

# Yet some more changes



## Yet some more changes



We added more sizes  
for braces and parentheses.

## Yet some more changes

We also decided to remove some `ssty` chains,  
only the variants alphabets have this feature.

# Results

Despite all, we made an effort to keep the widths of Knuthian glyphs.



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Most of math should typeset being very similar to the originals.

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- sidebearings of `\times`
- sizes of parenthesis
- scope of the repertoire
- etc., etc.

# Repertoire

The set of characters is hard to define:

- old Knuth's CM set
- enhanced AMS/L<sup>A</sup>T<sub>E</sub>X set
- our TG Math set
- combination of both above
- extended by some Unicode complement.

The end?

# The end...

is still far away  
but the way is marked out.