backward compatibility of LM Math

Breskens, The Netherlands, 11 October 2012

Is backward compatibility of LM Math and CM math sensible?

Piotr Strzelczyk

Breskens, The Netherlands, 11 October 2012

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of the well known (and widely used) fonts:
Computer Modern (*by Donald E. Knuth*).

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?

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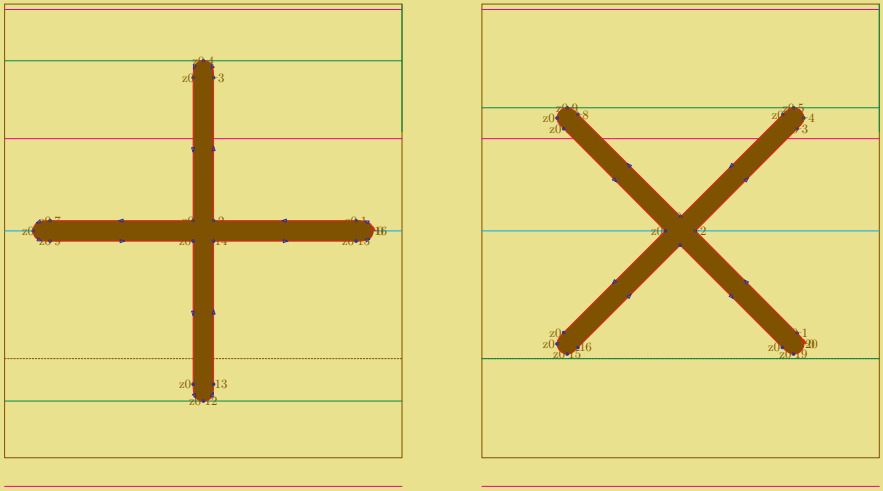
it's rather hard because of...

Easy?

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

Strange decisions



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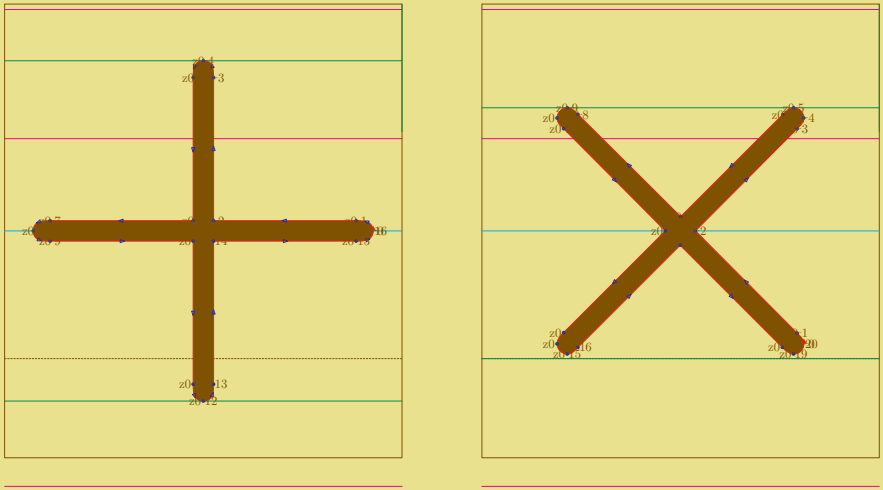
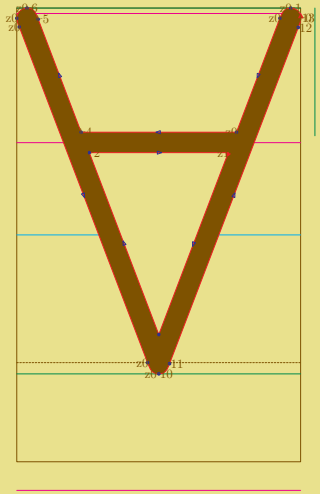


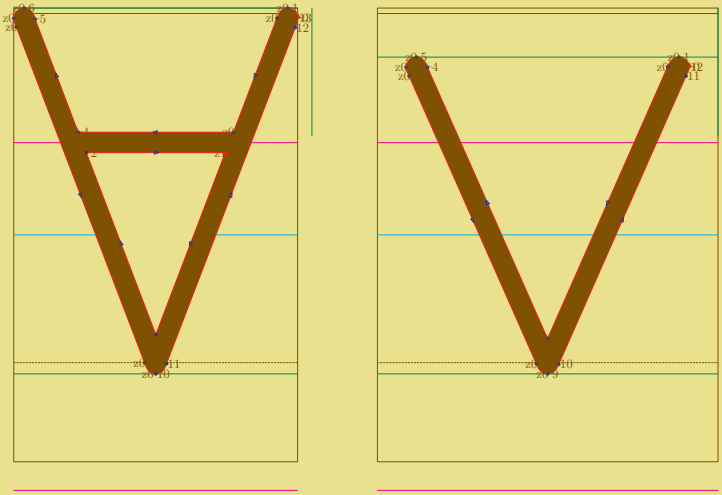
The character `\times` has the width of plus + which makes the sidebearings of $\times$ bigger.

Strange decisions



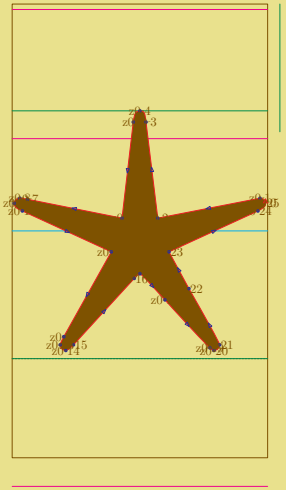
$\forall$ (`\forall`) has no sidebearings

Strange decisions



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

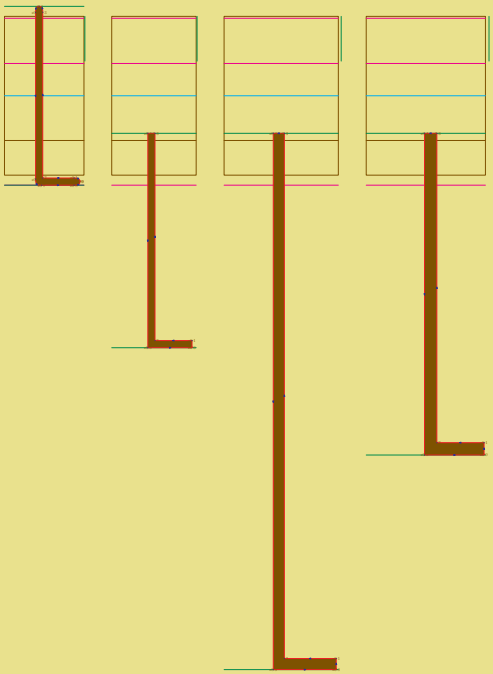
Strange decisions



`\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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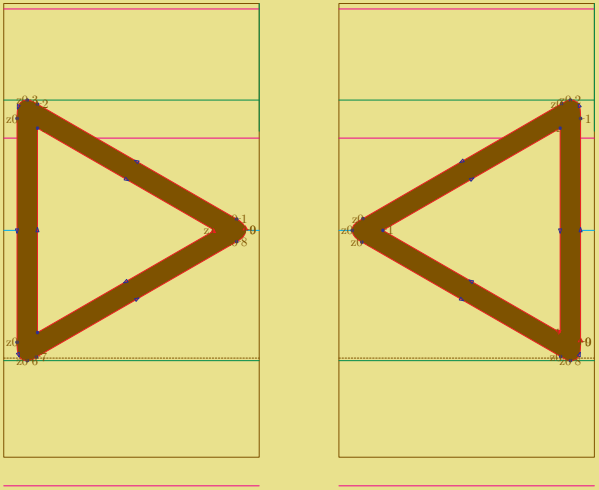
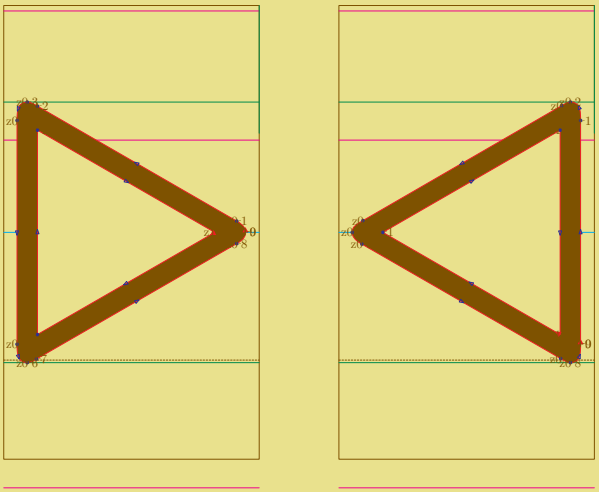
Like you might expect,
it's rather hard because of...
my favorite Unicode.
"[...] for every character, [...]" – really?

Unicode problems



In CMMI we have `\triangleright`,

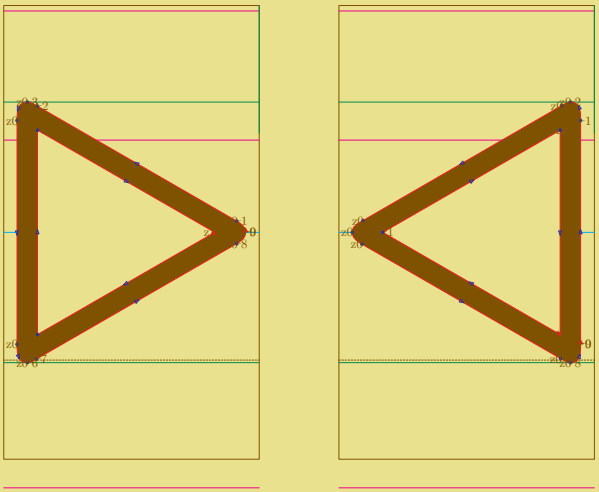
Unicode problems



In CMMI we have `\triangleright`,
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**

Unicode problems



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none of them is like the Knuth's triangle!

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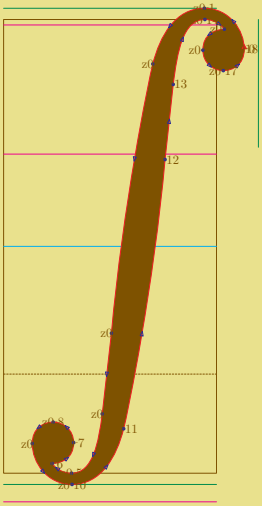
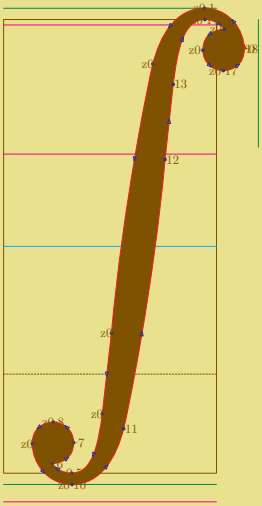


In CMSY we have `\smallintegral`

Unicode problems



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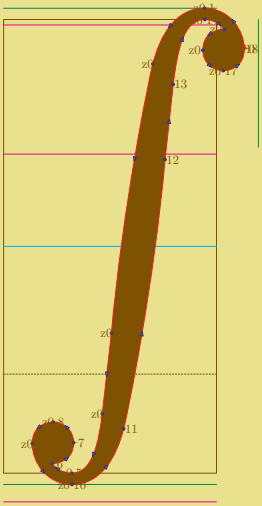

In CMSY we have `\smallintegral`
but in Unicode there is no place for it
(may be 0283: LATIN SMALL LETTER ESH
– we know that is really bad, but...)

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?

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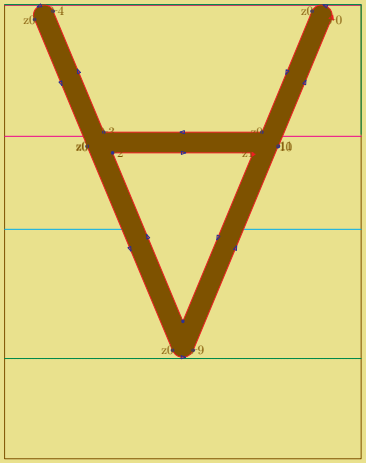
So achieving exact compatibility
looks imposible
so we just abandoned it.

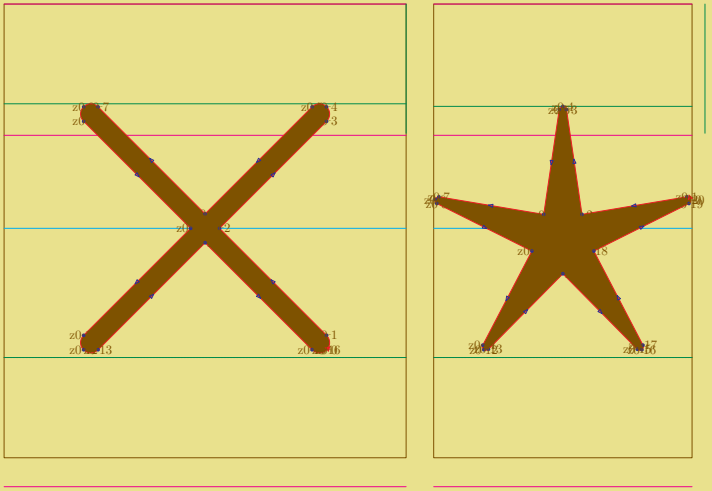
We decided to alter (to improve?)
some Knuth's "decisions".

Changes



We added sidebearings
in the `\forall` char.

Changes

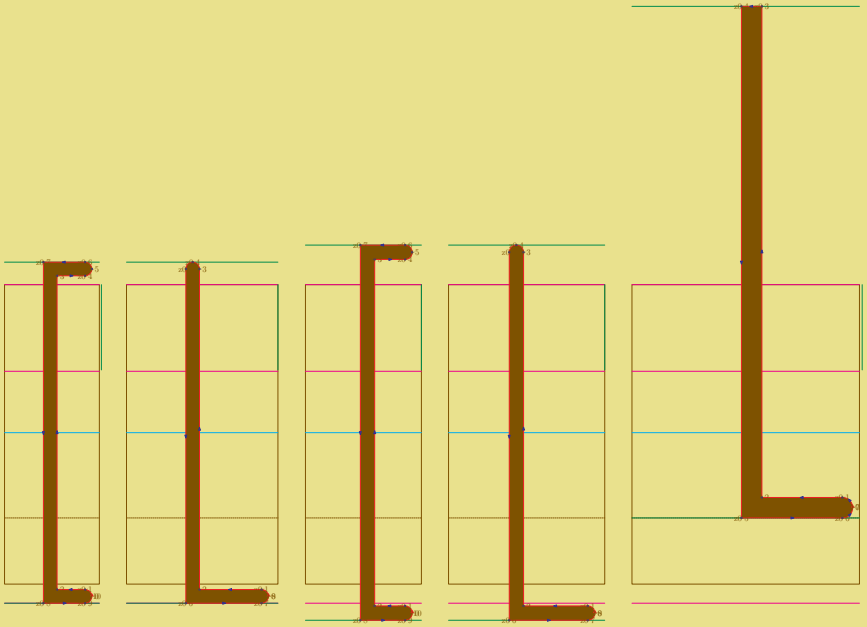


But (for now) we haven't changed the sidebearings of `\times` and `\star`.

Other changes

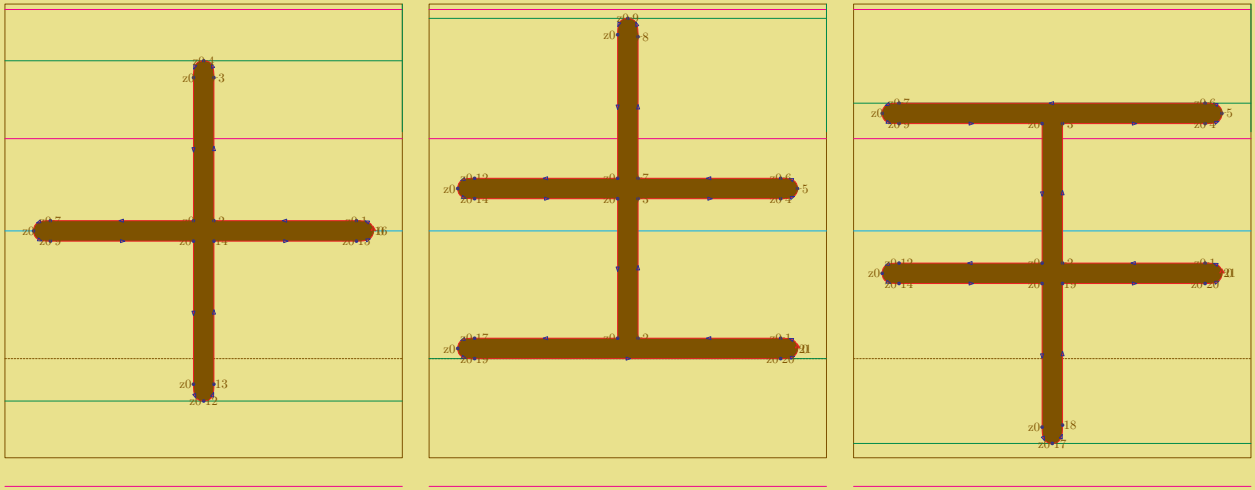
We also decided to correct
some other “features”
(which don’t change the metric of the font)

Other changes



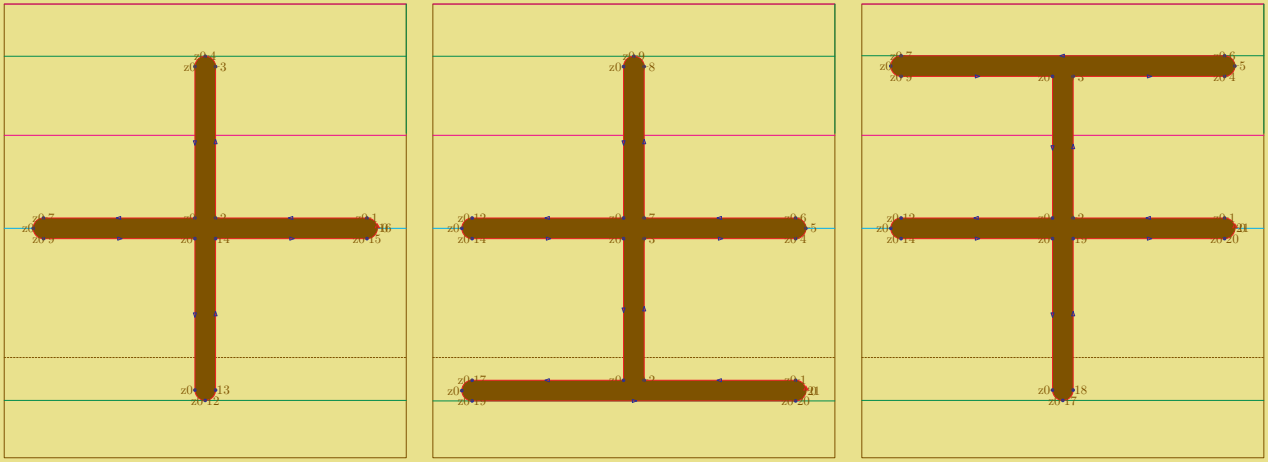
We rounded the ends
of the `\*ceil` and `\*floor` characters.

Other changes



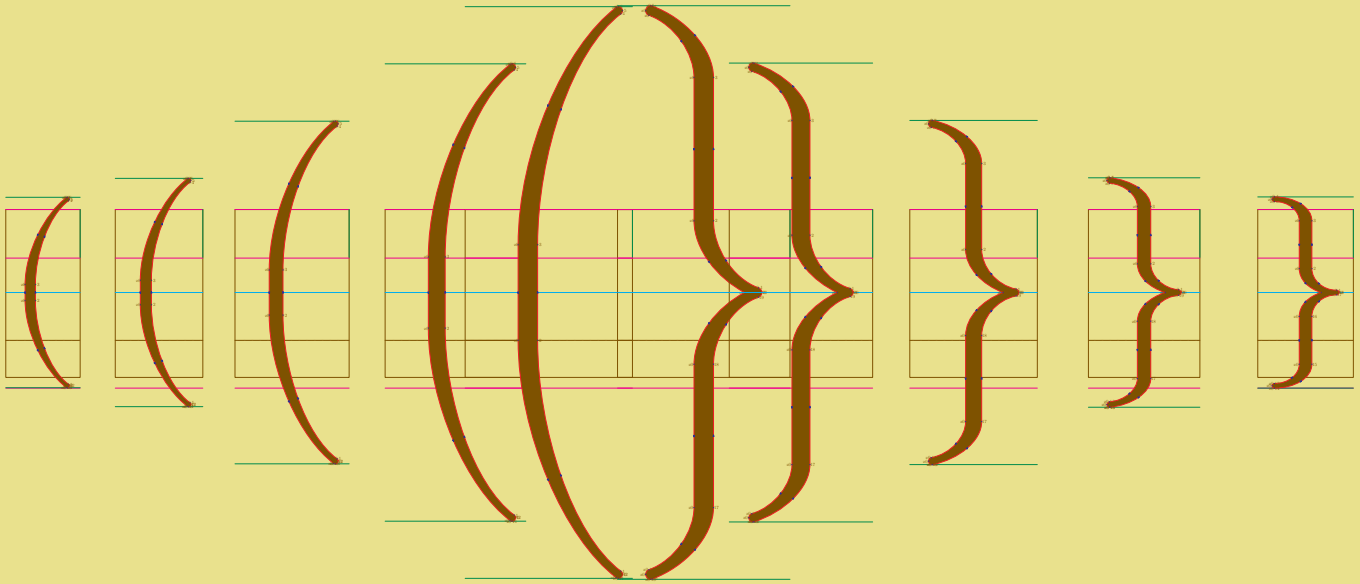
In CM fonts some operators were positioned oddly.

Other changes

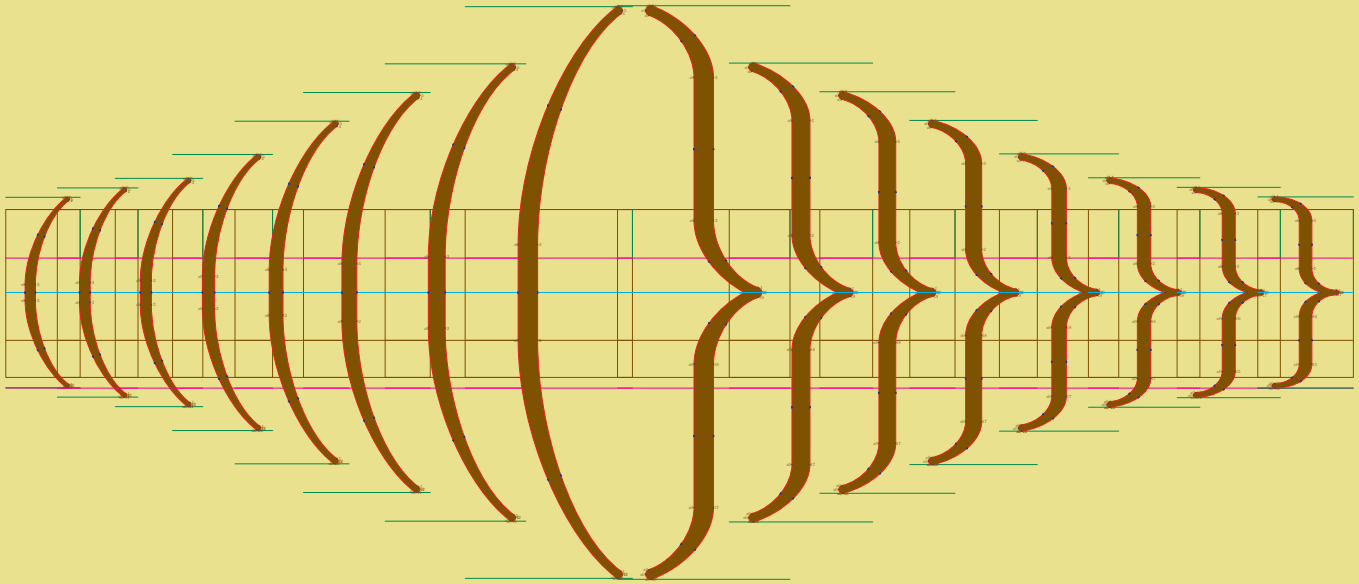


We moderated them a little.

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 alfabets 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.

Dilemmas

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- sidebearings of `\times`
- sizes of parenthesis

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

Reportoire

The set of characters is hard to define:

- old Knuth's CM set
- enhanced AMS/LaTeX 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.

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