

# Return to the classics

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## Abstract

When did the width of margins in a page become less important than having a small number of pages in a book? We have been inundated by badly printed material since most publishers are now mostly interested in getting as much profit as possible, leaving the art of publishing aside. The premise of book designers should be not only to create attractive printed material but also to provide a pleasant reading experience.

There are quite a few examples of designs that are now considered classics because they have proven themselves to be aesthetically incomparable. These designs include:

**Ternary canon:** 2:3 page proportions where the height of the typographic box is equal to the width of the page, the left margin is half the right margin and the top margin is half the bottom margin.

**Gutenberg's Göttingen Bible:** same as above but in two columns with a wide column separation.

**Universal scaling:** the page is created when the user defines a unit box and the design takes multiples of three times the unit box; the left margin is the unit's box width, the top margin is the unit's box height, and the right and bottom margins are twice the unit's box width and height respectively.

**Diagonal and double diagonal methods:** the page dimensions and the left margin are provided by the user and all the other elements are defined in terms of either a diagonal or using both diagonals.

**ISO 216:** the typographic box is sized either A5 or A6 depending on the choice of A4 or A5 paper size, and the left and top margins are half the right and bottom margins respectively.

**2–3–4–6 system:** page dimensions and the margin unit are defined by the user, and the typographic box is adapted to have two, three, four, and six times the margin unit as left, top, right and bottom margins respectively.

This paper presents *classics*, the author's new class which allows the user to typeset camera-ready books using any of the above designs. This class uses the `calc` and `geometry` packages to create the design, and `crop` to generate the crop marks. If *classics* is used with Hàn Thê Thành's micro-typographic extensions, the user will get state-of-the-art printed material. Let's recover centuries of publishing tradition!

## Introduction

Typography and book design are artistic expressions whose principal goal is to bring the reader the most pleasant reading experience.

Gutenberg, in the XVth century, used over 280 types, including many ligatures and expanded (or contracted) characters, to get almost even interword spaces, and protruding of some left and rightmost characters (marginal kerning). With these, he ob-

tained perfectly visual “gray” boxes when printing his Bible.

Most of these aspects are already achieved by using (L<sup>A</sup>)T<sub>E</sub>X, and the micro-typographic extensions made by Hàn Th<sup>ế</sup> Thành for pdf(L<sup>A</sup>)T<sub>E</sub>X, explained in [7], complete the picture.

This paper is divided in two sections: the first contains a brief geometric description of some page layouts that have proven to be aesthetic and functional. Some variations obtained from them are included. The second explains the usage of `classics`, a class that allows the user to typeset books using those page layouts. Some instances of the usage of `classics` with protruding characters generated with pdf(L<sup>A</sup>)T<sub>E</sub>X are included.

### Classic page layouts

Traditional published works present carefully studied margin proportions obeying (some of) the following four rules:

1. the diagonal of the typographic box coincides with the diagonal of the page;
2. the height of the typographic box equals the page width;
3. the outer margin is twice the inner margin;
4. the bottom margin is twice the top margin.

**First approach to the classics** Let  $ABCD$  be a page with arbitrary proportions. Consider the following construction for the type area (figure 1) which guarantees rules 1, 3 and 4.

Construct diagonals  $AC$  and  $BM$ , where  $M$  is the midpoint of  $AD$ , and  $O$  the point of intersection. Take any point  $P$  between  $A$  and  $O$ . From  $P$  draw the parallel to  $AB$  which intersects  $BM$  in  $Q$ . From  $Q$  trace the parallel to  $BC$  which intersects  $AC$  in  $R$ . To obtain  $S$ , draw parallels from  $R$  and  $P$  to  $CD$  and  $AD$  respectively. Then the rectangle  $PQRS$  will have the same proportions as  $ABCD$ . Moreover,  $O$  divides in the same ratio both  $PR$  and  $AC$ , i.e.,  $PR/PO = AC/AO = 1/3$ .

Of course we want to leave wide enough margins on our page, so that the area of the typographic box covers no more than, say, 50%. But if we also want to follow rule 2 we must restrict the proportions of our page to no less than  $1 : \sqrt{2}$ . Table 1 shows some page ratios with the percentage of area their typographic box occupies if its height equals the paper’s width (i.e., following rule 2).

**2–3–4–6 approach** Take a unit  $u$  as half the inner margin of any page. If we take  $2u$ ,  $3u$ ,  $4u$ , and  $6u$  dimensions for the inner, top, outer, and bottom margins respectively we will get a fairly good typographic box — this depends, of course, on the width

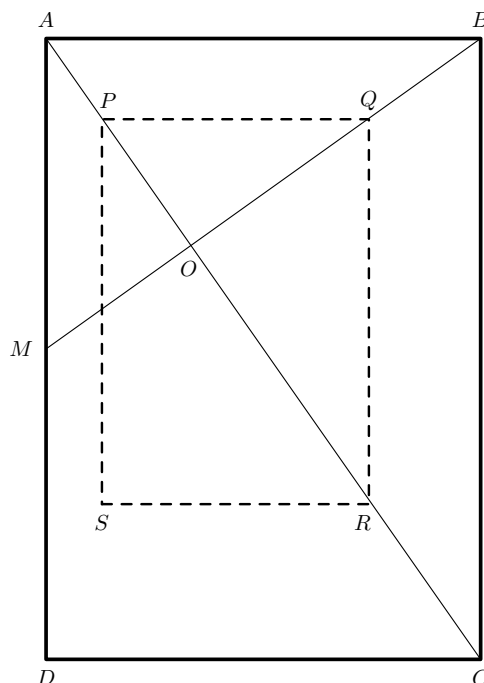


Figure 1: First approach.

Page ratios	Documents	% of area
1 : 2	—	25%
2 : 3	Gutenberg’s Bible	39.5%
2 : 3	Ternary Canon	44.4%
$1 : \sqrt{2}$	ISO 216	50%
3 : 4	Ghostscript’s archA	56%
1 : 1	—	100%

Table 1: Page ratios and typographic box area.

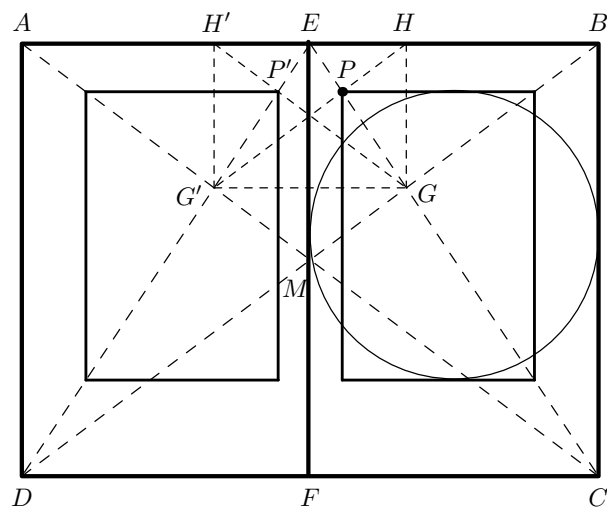
to height ratio of the page and on the value of  $u$  respect to the width of the page. In most cases (except for a  $2 : 3$  page), the typographic box will not present the same width to height ratio as the page, because if  $w$  and  $h$  represent the width and height of the page, then the typographic box will be  $w - 6u$  in width and  $h - 9u$  in height. Suppose the page and type area have the same proportions; then

$$\frac{w}{h} = \frac{w - 6u}{h - 9u} = \frac{2}{3}.$$

This is, nevertheless, a good method for obtaining interesting asymmetrical results.

**Ternary Canon** Many medieval and Renaissance manuscripts and printed books present a  $2 : 3$  width to height page ratio whose typographic box not only follows the four rules mentioned above but also presents the 2–3–4–6 progression in the margins.

Following Van der Graaf’s method, Jan Tschichold [8] published an elegant geometrical way to obtain such a layout. Take a two-page diagram (see figure 2), draw diagonals  $AC$  and  $BD$  which intersect at  $M$ , the midpoint of  $EF$ ; draw diagonals  $EC$  and  $ED$  which intersect  $BD$  and  $AC$  at  $G$  and  $G'$  respectively. Draw  $GG'$  and perpendiculars through  $G$  and  $G'$  to  $AB$  which intersect it at  $H$  and  $H'$ . The point of intersection  $P$  ( $P'$ ) of  $EG$  ( $EG'$ ) and  $HG'$  ( $H'G$ ) is the upper left (right) corner of the typographic box. Complete the construction as in figure 1.

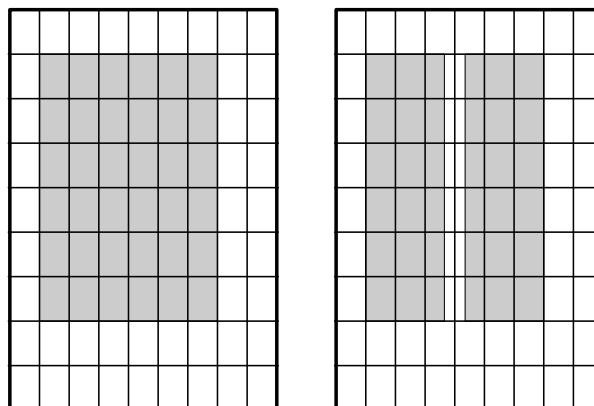


**Figure 2:** Tschichold’s geometrical construction for the Ternary Canon.

The circle in figure 2 simply shows that the height of the typographic box equals the width of the page. That the margins are in 2–3–4–6 progression follows from the fact that the top left corner of the box divides in  $1/9$  both the height and the width of the page. If we fix a unit  $u$  which is half the inner margin then the page will have width  $18u$  and height  $27u$ , so the inner margin is  $2u$  wide, the top margin is  $3u$  high. Because the height of the type area is equal to the width of the page,  $18u$ , the bottom margin is  $27u - (3u + 18u) = 6u$ . Moreover, as the typographic box is in the same ratio as the page its width is  $12u$ , thus the outer margin is  $18u - (2u + 12u) = 4u$ .

On the other hand, a much different approach is given by Raúl Rosarivo [6], who discovered that creating a  $9 \times 9$  grid on a  $2 : 3$  ratio page (figure 3, left), and positioning the typographic box leaving one column and one row of the grid as inner and top margins, and two columns and rows as outer and bottom margins, gives exactly the same position

and proportions for the typographic box to fulfill the rules and the 2–3–4–6 progression.



**Figure 3:** Rosarivo’s  $9 \times 9$  grid. At the left, the ternary canon typographic box in gray. At the right, Gutenberg’s Bible two column boxes.

In the ternary canon model, the typographic box will cover only  $4/9$  (44%) of the area of the paper.

Gutenberg designed his Göttingen Bible of 42 lines using the ternary canon model, but the text is written in two columns whose separation space is exactly  $2/3$  the width of the grid’s cells as shown in figure 3 (right); each column has  $2\frac{2}{3}$  cell width covering just (39.5%) of the area of the paper.

**Universal scaling** Rosarivo extended this concept to  $n \times n$  grids, where  $n$  is a multiple of 3. Once divided, the column and the row correspond to inner and top margins, and two columns and rows to outer and bottom margins. The margin dimensions are inversely proportional to the number of divisions made.

Note, however, that if  $n$  is not a multiple of 3 we are still following rules 1, 3 and 4. A quite critical example is taking a square page and dividing it in a  $10 \times 10$  grid. The resulting type area is a  $7 \times 7$  box, filling 49% of the page (see figure 10). Nice, isn’t it?

**ISO 216** The ISO A range begins with the A0 sheet, whose ratio is  $1 : \sqrt{2}$  and has area  $1 \text{ m}^2$ . If we cut the A0 sheet along the middle of the long side we obtain a sheet whose ratio is  $\sqrt{2}/2 : 1 = 1/\sqrt{2}$ .

This new sheet, A1, is proportional to the original one and has half A0’s area,  $1/2 \text{ m}^2$ . This process can be continued to obtain proportional sheets with half the area of the predecessor.

Another range that belongs to the ISO 216 family starts with the B0 sheet, whose ratio is again  $1 : \sqrt{2}$  and has area  $\sqrt{2} \text{ m}^2$ , i.e., whose width is  $1 \text{ m}$ .

Name	dimensions (mm)	area (m <sup>2</sup> )
A0	841 × 1189	1
A1	594 × 841	1/2
A2	420 × 594	1/4
A3	297 × 420	1/8
A4	210 × 297	1/16
<i>B5</i>	176 × 250	$\sqrt{2}/32$
A5	148 × 210	1/32
A6	105 × 148	1/64

Table 2: ISO 216 A range and B5 page dimensions.

It happens that the B range consists of the geometric means of the A range. For example, the height of B5 is equal to the square root of the product of the heights of A4 and A5.

Table 2 shows the dimensions of the A range up to 6 divisions, and B5, between A4 and A5 in italics. Figure 4 shows a sketch of the A range.

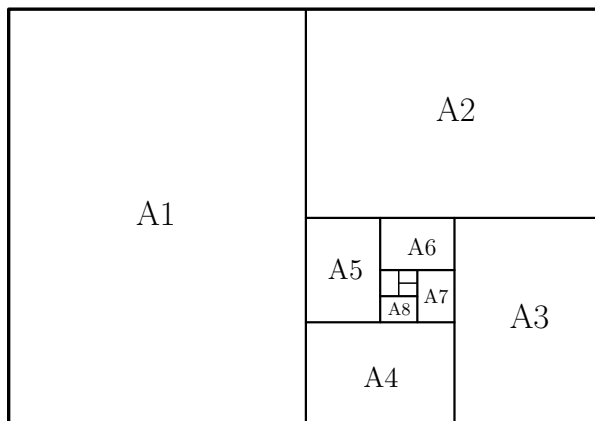


Figure 4: Subdivisions of an A0 sheet.

What is really important about this system is that it allows us two things. First, we can make a complete sheet from, say, 8 physical pages without having to make unnecessary cuts. Second, we can reduce the size of the page to its immediate successor, *retaining proportions*, using `pstops`, `psnup`, or some other tool; or by means of photographic media.

Let  $A_n$  be the page; then if  $A_{(n+1)}$  is the typographic box which, as mentioned above, has 50% the area of the page (not far from the 44.4% of the ternary canon). If we follow the four rules (as shown in figure 5) the margin progression will be  $2-2\sqrt{2}-4-4\sqrt{2}$  which is approximately  $2-2.828-4-5.657$  which is not very far from the ternary canon's progression.

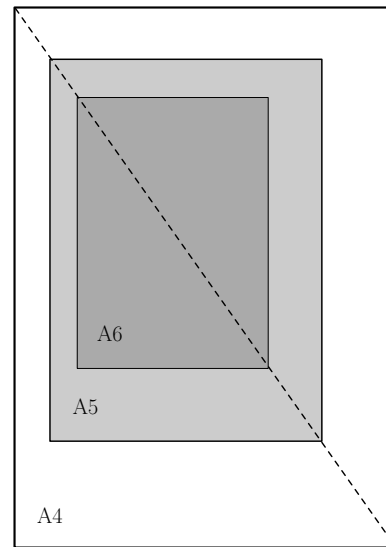


Figure 5: A5 as the typographic box of an A4 page (light gray in white), and A6 in A5 (dark in light gray).

### The classics class

The `classics` class is primarily intended to typeset books using any of the designs explained in the previous section, along with some variations of them.

The user invokes `classics` like any other class:

```
\documentclass[options]{classics}
```

The description of *options* will be divided into the generic ones which are inherited from the `book` class, and the specific ones created for `classics` together with the commands (parameters) related to each page layout.

**Generic options** The following list shows the options inherited from `book`, which do not relate to the page design whatsoever.

`10pt|11pt|12pt` For choosing the normal type size.

The default is `10pt`.

`final|draft` Shows (`draft`) black boxes for overflow lines or not (`final`). The `final` option is the default.

`oneside|twoside` For printing on one or both sides of a page. The default is `twoside`, which produces mirrored layouts of even and odd pages. The `oneside` option makes even pages the same as odd numbered ones.

`openright|openany` For the chapters to begin only on recto pages (`openright`) or on any pages (`openany`). The default is `openright`.

`onecolumn|twocolumn` Specifies if the text box will be one or two columns per page. The default

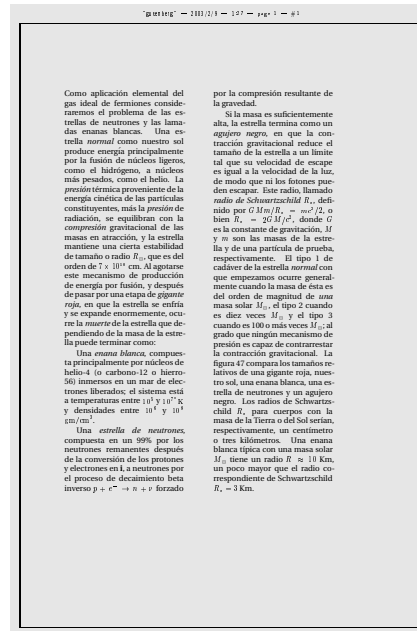
is onecolumn unless the `gutenberg` option is chosen. (See Specific options.)

`titlepage|notitlepage` If `\maketitle` is invoked, by default `classics` (`book`) will make a separate title page, and a separate abstract page, if any. `openbib` To format the bibliography in open style. `leqno` Formula numbers will be put to the left for any numbered display math environments. `fleqn` Aligns to the left displayed formulae.

As `classics` is intended specifically to produce page layouts whose dimensions are not, in general, standard, book paper size options (`letterpaper`, `legalpaper`, ...) are not recognized.

**Specific options** The `classics` class offers the following options for page layouts in contrast to page size options of `book`; `ternary` being the default.

`ternary` This layout builds a 2 : 3 width-to-height page with type area as described in figures 2 and 3. The only parameter users can modify is `\classicswidth` (see Parameters) because all other parameters are absolutely determined.



`\documentclass[gutenberg,utopia,frame]{classics}`

Figure 7: Page layout for `gutenberg` option.

`gutenberg` Same as above but the type area is typeset in two columns having the column separation space equal to  $\frac{2}{3}$  the inner margin.

Figure 7 shows the `Gutenberg Bible's` layout. It is similar to `ternary` but in two columns separated by  $\frac{2}{3}$  the inner margin width.

`rosarivo` Following Rosarivo's ideas, the user can define an  $n \times n$  grid of whatever page proportion are desired. By default  $n = 9$ , and the page proportion is 2 : 3.

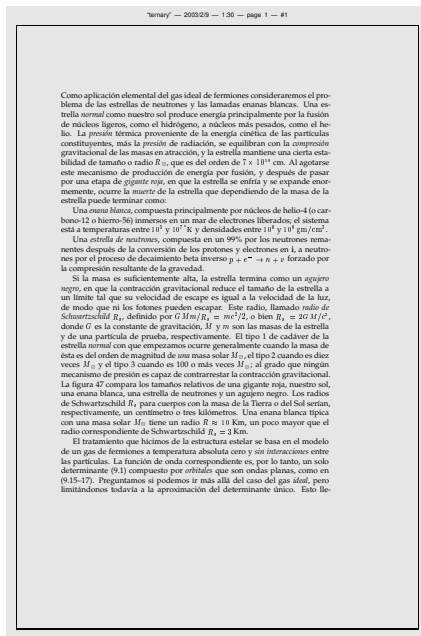
The command `\cellnum` is used to change the value of  $n$ , while the width and height of the paper can be changed using `\classicswidth` and `\classicsheight` respectively.

`universal` Almost the same as `rosarivo`, but this time the user defines the cell dimensions (as `\cellwidth` and `\cellheight`) and  $n$  as above.

Note the difference: `rosarivo` divides the page once fixed to get the  $n \times n$  grid, while `universal` constructs the page in terms of the cell and the grid's dimension. Compare figures 8 and 9.

Figure 10 shows a  $40 \times 40$  picas square page whose type area is  $28 \times 28$  picas.

`a4|a5|b5` ISO 216 formats. These page layouts are totally predetermined, except when typesetting in two columns. If the `twocolumn` option is selected the default separation space will be equal

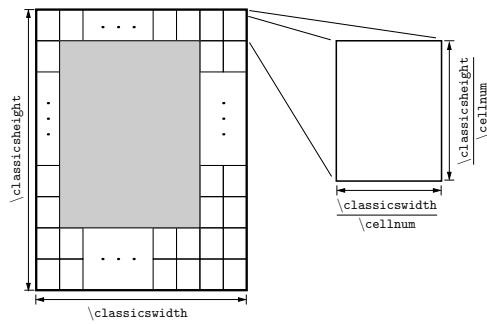


`\documentclass[palatino,frame]{classics}`

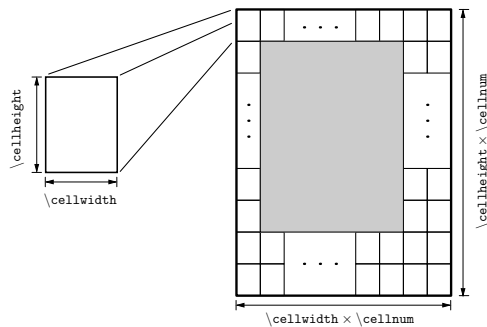
Figure 6: The default `classics` layout.

If the `twocolumn` option is specified, `ternary` becomes the same as `gutenberg`, but with the flexibility of changing the column separation space using `\classicscolsep`.

Figure 6 shows the `ternary` design with  $42 \times 63$  picas width-to-height page.



**Figure 8:** Page layout and relevant parameters for `rosarivo` option.



**Figure 9:** Page layout and relevant parameters for `universal` option.

to the inner margin, but it can be changed with the `\classicscolsep` length parameter.

Figure 11 is the A6 type area of the A5 sheet following the rules described in Classic page layouts.

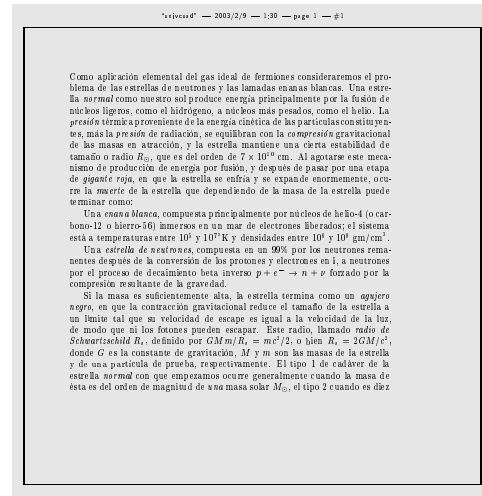
2346 The user can define the page proportions and inner margin with the `\classicsinmargin` parameter. The other margins are determined by multiplying the inner margin by 1.5, 2 and 3.

Figure 12 shows quite an extreme case; it defines a square page with 2–3–4–6 progression margins creating a wider than higher type box.

`ddiagonal` This is almost equivalent to Rosarivo's method. The user simply sets the page proportions and inner margin. It is precisely our first approach, shown in figure 1.

The main difference from `rosarivo` is that the top inner corner should not divide horizontally (vertically) the width (height) of the page.

`diagonal` Most free of all. The user can set the page proportions as well as inner and outer margin lengths. The only thing that this option preserves is similarity between the type area and the page.



```
\documentclass[universal,frame]{classics}
\cellwidth4pc
\cellheight4pc
\cellnum10
...
```

**Figure 10:** A square page with type area determined using `universal` option.

**Cropmarks** The following options define the kind of cropmarks to be printed. If any, information about the document will be printed on top of the page. It includes the file name, date, `TeX` page number, i.e., in case of `\frontmatter` material, and page index number, which starts with `#1` and is consecutively incremented.

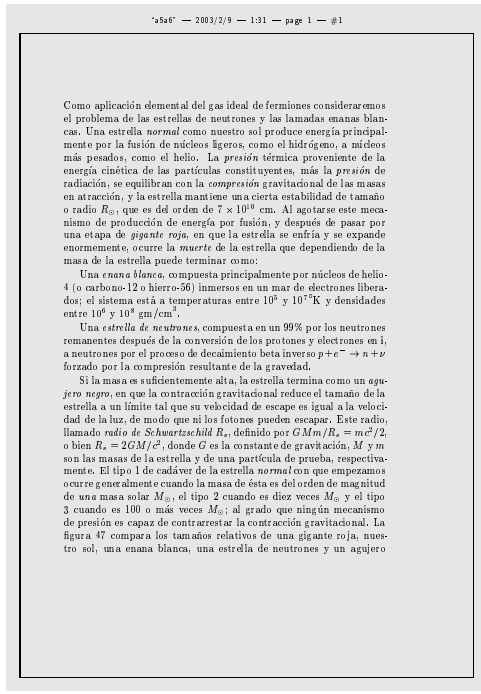
`camera|frame|nocrop` The default is `camera`. If the user is playing with the parameters, `frame` can give a better idea of the layout. It is useful to have no crop-marks (`nocrop`) if printing in a physical page whose dimensions are equal to the page defined.

**Predefined fonts** Finally, some shortcuts for loading *Palatino*, *Times*, and *Utopia* PostScript fonts:

`cm|palatino|times|utopia` The default option is `cm`, but believe me, with `palatino`, the ternary canon looks great; and for Gutenberg's Bible style, the compactness of `utopia` is ideal for the narrowness of the columns.

**Parameters** The following parameters are used by all page layout options except for `universal`, whose paper dimensions are determined by `\cellwidth`, `\cellheight`, and the grid constructed in terms of `\cellnum`.

`\classicswidth{dimen}` Sets the width of the paper. By default it is set to 42 pc, giving 42 lines



```
\documentclass[a5,frame]{classics}
```

**Figure 11:** A5 (148 × 210 mm) page with A6 type area obtained using a5 option.

of text in both `ternary` and `gutenberg`, if the font size is set to 10pt.

`\classicsheight<dimen>` Sets the height of the paper. If height is in terms of `\classicswidth`, i.e., if page layout `ternary` or `gutenberg` is selected, `\classicsheight` is ignored.

The following parameters are useful only for the `diagonal` and `ddiagonal` options:

`\classicsinmargin<dimen>` Sets the length of the inner margin. For the `ddiagonal` design, the outer margin is determined by the inner margin.

`\classicsoutmargin<dimen>` Sets the length of the outer margin. This parameter is only used by the `diagonal` page layout.

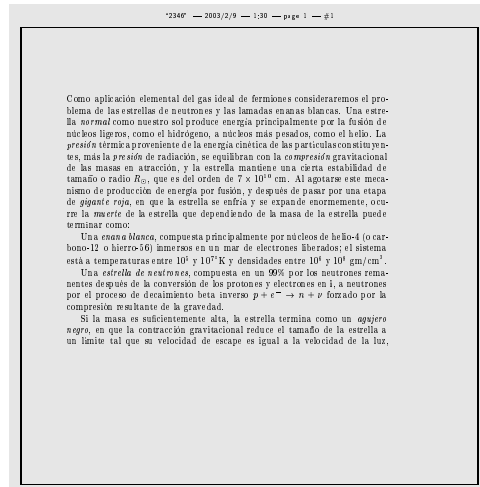
For the `universal` page layout option:

`\cellwidth<dimen>` Sets the width of the cell (see figure 9).

`\cellheight<dimen>` Sets the height of the cell.

The next parameter is needed by `rosarivo` (figure 8) and `universal`:

`\cellnum<count>` If `rosarivo` is chosen, then both `\classicswidth` and `\classicsheight` will be divided by `\cellnum` to get the grid.



```
\documentclass[2346,frame]{classics}
\classicswidth40pc
\classicsheight40pc
\classicsinmargin4pc
```

...

**Figure 12:** A 40 × 40 picas page with 2–3–4–6 margins progression and 4 picas inner margin.

If `universal` is chosen, then the page dimensions are obtained by multiplying `\cellnum` to `\cellwidth` and `\cellheight`.

Finally, for `twocolumn` or `gutenberg` options the separation space between columns is set by:

`\classicscolsep<dimen>` This command is analogous to `\columnsep` of the base classes in L<sup>A</sup>T<sub>E</sub>X.

**The defaults** If `classics` is invoked without options, i.e.,

```
\documentclass{classics}
```

then the option `ternary` will be the page layout, 10pt the font size, `cm` the font family, `camera` cropmarks, and all book inherited options as described in the ‘Generic options’ section.

Parameters are initialized in such a way that whatever page layout is selected, it will look like the `ternary` canon:

```
\classicswidth=42pc
\classicsheight=63pc
\classicswidth = 2/3\classicsheight
\classicsinmargin=56pt
\classicsoutmargin=112pt
\classicsinmargin = 1/9\classicswidth
                    = 42pc / 9 = 42 × 12pt / 9 = 56pt
\classicsoutmargin = 2\classicsinmargin
```

```

\cellwidth=56pt
\cellheight=84pt
\cellnum=9

\cellwidth = \classicsinmargin
\cellheight = 3/2\cellwidth
\cellnum × \cellwidth = \classicswidth
\cellnum × \cellheight = \classicsheight

\classicscolsep=37.33pt

\classicscolsep = 1/9(type area)
                = 2/3\classicswidth
                  9

```

No matter what page layout option is chosen, except for the ISO 216 system, if parameters are not modified, the layout will be the ternary canon, or Gutenberg's Bible if `twocolumn`.

### Moral of the story

*A wider outer margin is quite useful not only to be able to hold the book comfortably, but also to be able to make notes or annotations, and not just for controversial texts.*<sup>1</sup>

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<sup>1</sup> Hermann Zapf, *TUGboat*, Volume 22 (2001), No. 1/2. (However, in the XVIIth century, there was not enough margin space for Fermat to write the beautiful proof of his last theorem.)

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