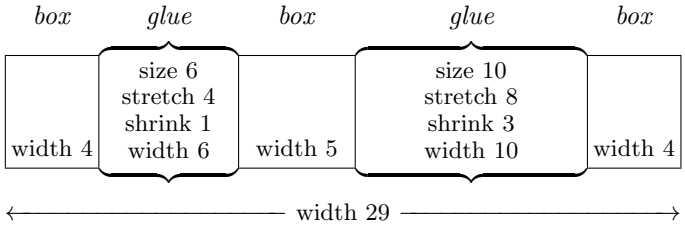
glue **1**

`glue.` *Glue* is blank space that can stretch or shrink. Glue gives TEX the flexibility that it needs in order to produce handsome documents. Glue comes in two flavors: horizontal glue and vertical glue. Horizontal glue occurs within horizontal lists, while vertical glue occurs within vertical lists. You can produce a glue item either implicitly, e.g., with an interword space, or explicitly, e.g., with the `\hskip` command. TEX itself produces many glue items as it typesets your document. We'll just describe horizontal glue—vertical glue is analogous.

When TEX assembles a list of boxes and glue into a larger unit, it adjusts the size of the glue to meet the space requirements of the larger unit. For instance, TEX ensures that the right margin of a page is uniform by adjusting the horizontal glue within lines. Similarly, it ensures that different pages have the same bottom margin by adjusting the glue between blocks of text such as paragraphs and math displays (where the change is least likely to be conspicuous).

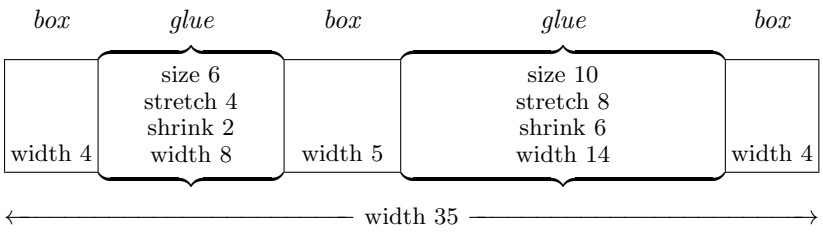
A glue item has a natural space—the size it "wants to be". Glue also has two other attributes: its stretch and its shrink. You can produce a specific amount of horizontal glue with the `\hskip` command (p. '`\hskip`'). The command `\hskip 6pt plus 2pt minus 3pt` produces a horizontal glue item whose natural size is 6 points, whose stretch is 2 points, and whose shrink is 3 points. Similarly, you can produce a specific amount of vertical glue with the `\vskip` command (p. '`\vskip`').

The best way to understand what stretch and shrink are about is to see an example of glue at work. Suppose you're constructing an hbox from three boxes and two glue items, as in this picture:



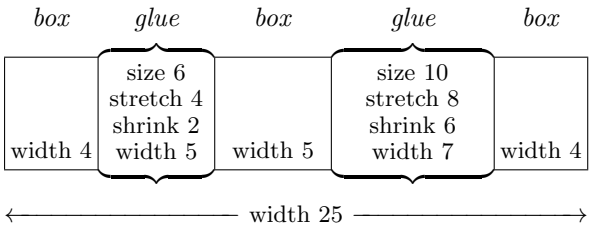
The units of measurement here could be points, millimeters, or anything else. If the hbox is allowed to assume its natural width, then each glue item in the box also assumes its natural width. The total width of the hbox is then the sum of the widths of its parts, namely, 29 units.

Next, suppose that the hbox is required to be wider than 29 units, say 35 units. This could happen, for example, if the hbox is required to occupy an entire line and the line width is 35 units. Since the boxes can't change their width, TEX produces the necessary extra space by making the glue items wider. The picture now looks like this:



The glue items don't become wider equally; they became wider in proportion to their stretch. Since the second glue item has twice as much stretch as the first one, it gets wider by four units while the first glue item gets wider by only two units. Glue can be stretched as far as necessary, although TEX is somewhat reluctant to stretch it beyond the amount of stretch given in its definition.

Finally, suppose that the hbox is required to be narrower than 29 units, say 25 units. In this case TEX makes the glue items narrower. The picture looks like this:



The glue items become narrower in proportion to their shrink. The first glue item becomes narrower by one unit, while the second glue item becomes narrower by three units. Glue cannot shrink by a distance less than the amount of shrink given in its definition even though the distance it can stretch is unlimited. In this important sense the shrink and the stretch behave differently.

A good rule of thumb for glue is to set the natural size to the amount of space that looks best, the stretch to the largest amount of space that TEX can add before the document starts to look bad, and the shrink to the largest amount of space that TEX can take away before the document starts to look bad. You may need to set the values by experiment.

You can produce glue that is infinitely stretchable by specifying its stretch in units of '`fil`', '`fill`', or '`filll`'. Glue measured in '`fill`' is infinitely more stretchable than glue measured in '`fil`', and glue measured in '`filll`' is infinitely more stretchable than glue measured in '`fill`'. You should rarely have any need for '`filll`' glue. Glue whose stretch is `2fil` has twice as much stretch as glue whose stretch is `1fil`, and similarly for the other kinds of infinitely stretchable glue.

When TEX is apportioning extra space among glue items, the infinitely stretchable ones, if there are any, get all of it. Infinitely stretchable glue is particularly useful for setting text flush left, flush right, or centered:

- To set text flush left, put infinitely stretchable horizontal glue to the right of it. That glue will consume all the extra space that's available on the line. You can use the `\leftline` command (p. '`\leftline`') or the `\raggedright` command (p. '`\raggedright`') to do this.
- To set text flush right, put infinitely stretchable horizontal glue to the left of it. As before, that glue will consume all the extra space on the line. You can use the `\rightline` command (p. '`\rightline`') to do this.
- To set centered text, put identical infinitely stretchable horizontal glue items on both sides of it. These two glue items will divide all the extra space on the line equally between them. You can use the `\centerline` command (p. '`\centerline`') to do this.

You can also specify infinitely shrinkable glue in a similar way. Infinitely shrinkable glue can act as negative space. Note that `fil`, etc., can be used only to specify the stretch and shrink of glue—they can't be used to specify its natural size.