

Solutions to the riddle from *TUGboat* 11#4

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Puzzle:

Given a simple \TeX document containing only straight text, is it possible for the editor, after deleting one sentence, to end up with a document producing an extra page?

We assume that the deleted text contains no \TeX macros and that the document was prepared with a standard macro package like the one used for *TUGboat* production.

When I wrote down the riddle, I had a real life experience with the *TUGboat* layout in mind. In `ltugboat.sty` we have

```
\widowpenalty=10000
\clubpenalty =10000
```

Suppose that, a four line paragraph is broken across two pages. If we now reduce this paragraph to three lines, then \TeX will no longer find any breakpoint in this paragraph.¹ So it will move the whole paragraph to the next page, thereby enlarging the document by at least one line. Similar problems might arise before displayed formulas if the default value for `\predisplaypenalty` is used.

Three other solutions were communicated to me by Bogosław Jackowski and Marek Ryćko. They all might occur in situations where only one word is removed from the input.

- `\lineskip` might get inserted when a paragraph is reformatted after deletions. If this parameter is positive² it will enlarge the paragraph height.
- If, after deletions, a footnote marker would have to be placed on the last line of a page, \TeX will move the whole line to the next page.
- If the value of `\beforedisplayskip` is smaller than `\beforedisplayshortskip` removal of words preceding a formula might enlarge the document.

While the last solution might be classified under “obscure layouts”, all solutions show that parameter setting in \TeX is a difficult art and might result in surprising results. There are many parameter settings buried inside plain \TeX that have never been

¹ Before, there was a permissible breakpoint between the second and the third line.

² The default in \LaTeX is 1pt.

questioned. It would be nice if this short example arouses enough curiosity in you to play with them.³

One learns by experience — most of \TeX 's world is still unexplored.⁴

³ You probably won't believe this, but when I entered a few corrections to this note (as suggested by Chris Rowley), the current paragraph became a bit shorter, so that the word “them” moved up one line. Now, `ltugboat.sty` sets `\widowpenalty` to 10000, so that the column break could not be taken at the same place as before. Therefore one line from the preceding column was moved to this one.

⁴ An interesting and wide open field is the paragraph breaking mechanism, especially with the new `\emergencystretch` feature. Don Knuth has given us some hints about its potential but this has been never been systematically researched (or at least such research has never been published), which is a pity.