Answers to TeXtests

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Following are the questions and answers to the TeXtests shown in the last issue of *TUGboat* (pp. 157–159). We hope to build a list of questions and answers, and we solicit help from all our readers.

The TeXtest — Level One

1. One of the visible ASCII characters is used as TeX's escape character. It is the ⎯⎯⎯ symbol and its name is
   ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ .

   - \ *and "backslash".*

2. In the following TeX code fragment:

   ```
   1. ...
   2. last line of a paragraph.
   3. \parskip=6pt
   4. First line of a new paragraph
   ```

   what horizontal and vertical spaces will be between "... a paragraph." and "First line..."?

   - *End of sentence space only. The setting of a new paragraph parameter does not also signal the end of a paragraph.*

3. What TeX control sequence is the equivalent of a blank line?

   - *The* \par *command for ending a paragraph.*

4. How do you cause the TeX program to execute and process the file "testfile.tex" on your system?

   - *Depending upon the system it will probably be*

   `tex testfile`

   or

   `tex testfile.tex`

   or a command to invoke an environment and select the appropriate option from a menu or click on the appropriate icon.

5. When TeX has finished processing `testfile.tex`, how can you get another look at the error messages (with more detail) without running TeX again?

   - *Look at* `testfile.log`.

6. The code fragment `the \TeX program` produces output "the TeXprogram" which is obviously missing a space after the TeX logo. Give two or more ways to correct this.

   - *Follow* \TeX *with a tilde, control space, left-right brace followed by a space, left brace-space-right brace, or ...*

7. What is the name of TeX's monospaced font and what control sequence is used to access it?

   - *Typewriter and* \tt.

8. What is the typographer's name for straight lines?

   - *rules.*

9. How do you end the indentation from the \narrower instruction?

   - *Group the* \narrower *command and text in braces. Be sure to end the paragraph before ending the group.*

10. How should you end the current paragraph before ending the \narrower mode?

    - *It is ended by a blank line,* \par, *or a* \vskip *command that terminates a paragraph.*

11. What is the indentation of the following paragraph and why?

    ```
    1. {\narrower\narrower
    2. first line of a paragraph.
    3. ...
    4. last line of a paragraph.
    5. }\par
    ```

    - *The paragraph will use the text width outside the* \narrower *mode, because the* \par *follows the end of the group.*

12. Consider the following code fragment:

    ```
    1. \parindent=0.5in
    2.
    3. A first paragraph ...
    4. \parindent1.0in
    5.
    6. A second paragraph ...
    7. \bye
    ```

    How much will each of the paragraphs be indented? first ⎯⎯⎯⎯ second ⎯⎯⎯⎯

    - *The first will be indented 0.5 inch and the second 1.0 inch.*

13. How do you specify an italic correction?

    - *It is denoted by* \/.

14. What does an italic correction do?

    - *It is used to make sure that tall italic characters do not lean into tall upright*

characters. With: tall boys, and without: tall boys.

15. Is the space in:

    `\centerline {Centered}`

    necessary _____ , optional _____ , or in error _____ ?

    - *Optional; spaces after alphabetic control sequence names are gobbled, and a brace may delimit such a control sequence.*

16. What will TeX output from the following code fragment?

    `\centerline Center This!`

    - *It will center the 'C' and start a new paragraph with "enter This!"*

17. Describe the output of this code fragment?

    `\bf{this is bold text}...`

    - *This will cause everything to be bold from now on until another font is specified. The obvious intent could have been achieved by placing the opening brace before the \bf. The braces, as they are, are wasted.*

18. What is a widow?

    - *It is the last line of a paragraph which appears at the top of a page. An orphan (also called a club line) is the first line of a paragraph that appears alone at the bottom of a page.*

19. How do you place the page number flush right in a running head?

    - *Define the \headline to have \hfill\folio in it.*

20. How do you keep the left margin fixed and move the right margin to the left by 0.5in?

    - *By increasing the \rightskip by .5in or decreasing the \hsize by .5in.*

A new TeX user has decided to create some macros. The following definitions are OK or BAD! Mark each of these OK or BAD, and indicate what is wrong with the BAD ones. Assume the plainest of TeXs.

21. `\def\A1{...}`

    - *BAD; names are all alphabetic or 1 character.*

22. `\def\A-OK{...}`

    - *BAD; ditto.*

23. `\def\Test{...}`

    - *OK to mix cases.*

24. `\def\\{...}`

    - *OK to use the escape character, too.*

25. `\def\10{...}`

    - *BAD; because if not alpha, 1 character.*

There are ten visible ASCII characters that TeX has reserved for special uses. For example, the dollar sign is used to toggle mathematics mode. List the other nine and their use as illustrated.

26.	$	*toggle math mode*
27.	___	_____
28.	___	_____
29.	___	_____
30.	___	_____
31.	___	_____
32.	___	_____
33.	___	_____
34.	___	_____
35.	___	_____

- $ *toggle math mode*
- #   *for arguments and parameters*
- &   *tab character*
- ~   *tie or hard space*
- {   *begin group*
- }   *end group*
- \   *the escape character*
- %   *begin comment*
- ^   *superscript*
- _   *subscript*

The TeXtest — Level Two

1. What *mode* is TeX in when building a paragraph?
   - *Horizontal.*

2. How do you end a \topinsert?
   - *The \endinsert ends \topinsert, \midinsert, and \pageinserts.*

3. If TeX hyphenates a word badly, how do you fix it?
   - *If the word is used frequently, you should use \hyphenation. If it is rarely used you can use a discretionary hyphenation, \-, when using the word. If the word should not be hyphenated, put it in an \hbox.*

4. What happens to a paragraph that has both normal indentation and a \hangindent specification?

- *The first line will be indented an amount of* \parindent *and the other lines numbered* $\geq$ *the value of* \hangafter *will be indented by the amount of* \hangindent.

5. What will \line{A Short Line} look like in a normal page?

- *It will be spread out to the entire width of the page and will give you an* underfull \hbox *message unless you have a small value of* \hsize.

6. Why won't a field like {\hfil x \hfil} be centered in a \settabs environment?

- *An* \hfil *is furnished by* \settabs *and glue is additive. Thus, there will be twice as much space following as there is preceding.*

7. How can you get a black square, like ■, in the middle of a line of text?

- *Use a vrule; this one is 10pt by 10pt with zero depth.*

8. Consider the code fragment:

   1. ...
   2. \eject\vskip2in
   3. How now brown cow...

   Where is the "How now brown cow" placed relative to the top margin of the page?

- *It immediately follows the top margin, since vertical glue is gobbled up as the first item on a page.*

9. How do you move a \vbox to the right one inch?

- \moveright1in; *the* \raise *and* \lower *commands are used to move boxes in the vertical direction.*

10. How do you reduce or prevent widows?

- *Raising the* \widowpenalty *will reduce the possibility. If raised high enough (10000) it will prevent them. The* \clubpenalty *is similar for orphans. Using the* \filbreak *macro between paragraphs will make breaks there more attractive.*

11. What is a penalty?

- *A penalty is the "cost" assigned by TEX to breaking a line or a page at a particular place. Each possible break has a penalty assigned to it depending upon some complicated rules.*

12. What happens when you forget to end a \footnote?

- *The text following keeps being taken into memory. TEX is trying to build a single box of all of it. Thus, you will often get the message that it has exceeded its memory capacity.*

13. What happens when you try to end a document without a proper end to an insert?

- *You get an error message that you cannot end a document while in internal vertical mode.*

14. What happens if you have a blank line in display math mode?

- *You get a message that* \par *is not allowed in math mode.*

15. How is the \tabskip parameter used?

- *It is used to put white space between columns of an alignment.*

16. How are the \lineskip and \lineskiplimit parameters used?

- *If the depth of one "line" (i.e. box) plus the height of the following "line" is* $>$ \baselineskip $-$ \lineskiplimit, *then glue with value* \lineskip *is inserted between the lines rather than the glue needed to achieve* \baselineskip. *This often happens when boxes which themselves contain more than one line of text adjoin one another.*

17. What actions should you consider to correct the conditions that caused the warning Overfull hbox?

- *Change the wording, add discretionary hyphens, use* \slash *for slashed acronyms, or adjust* \hfuzz *and/or* \tolerance.

18. What actions should you consider to correct the conditions that caused the warning:

   Underfull \vbox has occurred
       while \output is active

- *The* \raggedbottom *command or* \vfil *will often do enough. If you want to fill the page without the* \raggedbottom *appearance, you can put extra stretch in* \parskip, \baselineskip, \abovedisplayskip, *and* \belowdisplayskip, (*and of course,* \abovedisplayshortskip *and* \belowdisplayshortskip.)

19. Show how to assign the control sequence \8 to a new font "cmss8" that has not already been defined in plain TEX.

- \font\8=cmss8.

20. What is the meaning of #1 in a macro definition?

- *It represents the first argument.*

21. Arguments to macros may be *delimited* or *undelimited*. Describe how TeX determines arguments in the two cases. How do users notice the difference?

- *In the case of an undelimited argument, TeX reads the next token or the next group of tokens with balanced braces. For delimited arguments, TeX reads tokens until it encounters the next occurrence of the delimiting string on the same grouping level at which it started the search. Thus, undelimited arguments that are not a single character or control sequence must be enclosed in braces. Delimited arguments will have a specific character string that denotes their end. Semicolons, commas, new lines, etc. are often used as delimiters.*

The TeXtest — Level Three

1. How is TeX's escape character determined?

- *It is the \ by default. It can be any character whose* \catcode *is set to zero.*

2. What is the name of the control sequence that can be used to accomplish the function of the left brace, {, inside a macro that will not have its matching right brace, }?

- \bgroup *can act as* { *and* \egroup *can act as* }. \begingroup *and* \endgroup *are similar and can be used for localization, but they cannot be used to delimit box contents.*

3. What are the names of the parameters that specify the amount of glue above and below display math?

- *The* \abovedisplayskip *and* \belowdisplayskip *parameters have descriptive names as do* \abovedisplayshortskip *and* \belowdisplayshortskip.

4. TeX treats several consecutive spaces as one. Thus the usual practice of keyboarding 2 spaces after periods does not insert extra space at the end of a sentence. How does TeX know to put more than an ordinary interword space at the ends of sentences?

- *TeX looks at the current value of* \spacefactor *whenever a space is read. If this value is 1000, ordinary interword space is inserted, but if the* \spacefactor *is* ≠ 1000, *TeX adjusts space accordingly. As each character is set, its* \sfcode *resets the* \spacefactor *if the* \sfcode *is non-zero. The* \sfcode *of a period, for example, is 3000. When a space follows a period, this generally causes TeX to insert extra space. However, TeX disallows consecutive settings of the* \spacefactor *to jump from below 1000 to above 1000 (or vice-versa). It sets the* \spacefactor *to 1000 when the second character of such a pair is encountered. This can show different effects depending upon the stream of* \sfcodes *and* \spacefactors *devoured by TeX. For example, this is the means by which TeX "knows" what to do with space after initials.*

5. Are the leading spaces in \halign entries significant?

- *No.*

6. Are the trailing spaces in \halign entries significant?

- *Yes, they are significant up to the ampersand or* \cr.

7. Are the leading and trailing spaces in \settabs entries significant?

- *Neither are significant.*

8. How serious will underfull vbox badness 3412 be?

- *Not very serious.*

9. Build a macro called \xx that has one parameter delimited by a semicolon. The macro is to center its one parameter and set it in bold.

- \def\xx#1;{\centerline{\bf#1}}

10. What happens when
    \def\p#1{\it\centerline#1}
    is called with \p01234?

- *It changes the default font to italics. It then centers the 0. The rest of the digits are indented to start a new paragraph. In some cases TeX expects a numeric field and it will eat digits until it finds a non-digit.*

11. The following code fragment is an exercise in being careful:

1. `\newcount\cntr`
2. `\advance\cntr1\the\cntr1`

What is the resulting value of the counter?

- *The answer is 101. Before the addition (to zero) is done, \the\cntr is evaluated as 0. Then, the three digits in a row make up the addend. Put in a couple of spaces and see some different results!*

12. How can you zero all the dimensions of `\box0`?

- *You can set the height, depth, and width to zero or you can \setbox0=\hbox{}.*

13. What information is in a `tfm` file?

- *The tfm file contains the TEX Font Metrics. This is the height, depth, and width of each character. Also included is information about which character pairs are kerned, ligature substitution, italic corrections, etc. TEX uses only this information about fonts.*

14. What information is stored in a `pk` or `gf` file?

- *This file contains actual picture or pixel information about the font. This file is necessary for most of the programs that put the ink on the paper. They are not needed on systems where the font that TEX is using is already in the printer.*

15. How are `\vtop` and `\vbox` similar? How do they differ?

- *They both create a vertical box. \vtop takes the height of its first line and grows in depth while \vbox grows in height and has the depth of its last line.*

16. A two column macro package works by gathering enough information for both columns before invoking the `\output` routine. What is the name of the TEX primitive that is probably used to determine each column?

- *The \vsplit primitive allows the creator of an output routine to control the breaking of pages (and columns).*

17. What does `\futurelet` allow you to do?

- *\futurelet allows a user to replicate a token just ahead of the next token to be read in the input stream. The next token can then test the replication to determine what will be coming next and hence to take the appropriate action.*

18. What TEX commands would you have to use to automatically build an index and/or table of contents to a separate file, and print it in the output?

- *The commands would certainly include \openout, \write, and \closeout. After it is written and closed, then you would open the file to read, or use \input.*

19. What happens when you underestimate the number of lines in a `\parshape` command?

- *All subsequent lines take the shape of the last line of the definition.*

20. Under what conditions can you use the built-in fonts of an arbitrary printer?

- *The fonts must be baseline fonts and the tfm file must be available to TEX. You can build a tfm file by measuring, say, 10 or 20 of each character, editing a pl (property list) file, and running pltotf to make a tfm file. You should expect to need to enter some kerning information after a few tests.*

21. What characteristics should you look for on a page of output to try to determine if the page was prepared using *PageMaker, troff,* ..., or TEX.

- *TEX is most easily identified by the quality of mathematics. Usually the other systems will have limited fonts, poor hyphenation, no ligatures, and inconsistent or no kerning.*

22. What element(s) of TEX is (are) case insensitive?

- *The dimensions are case insensitive, $IN \equiv in$ ... In some systems file names will also be case insensitive.*

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