mathcode **1**

`mathcode`. A *mathcode* is a number that TEX uses to identify and describe a math character, i.e., a character that has a particular role in a math formula. A mathcode conveys three pieces of information about a character: its font position, its family, and its class. Each of the 256 possible input characters has a mathcode, which is defined by the TEX program but can be changed.

TEX has sixteen families of fonts, numbered 0–15. Each family contains three fonts: one for text size, one for script size, and one for scriptscript size. TEX chooses the size of a particular character, and therefore its font, according to the context. The class of a character specifies its role in a formula (see page 154 of *The TEXbook*). For example, the equals sign '`=`' is in class 3 (Relation). TEX uses its knowledge of character classes when it is deciding how much space to put between different components of a math formula.

The best way to understand what mathcodes are all about is to see how TEX uses them. So we'll show you what TEX does with a character token t of category code 11 or 12 in a math formula:

1) It looks up the character's mathcode.
2) It determines a family f from the mathcode.
3) It determines the size s from the context.
4) It selects a font F by picking the font for size s in family f.
5) It determines a character number n from the mathcode.
6) It selects as the character c to be typeset the character at position n of font F.
7) It adjusts the spacing around c according to the class of t and the surrounding context.
8) It typesets the character c.

The context dependence in items (3) and (7) implies that TEX cannot typeset a math character until it has seen the entire formula containing the math character. For example, in the formula '`$a\over b$`', TEX doesn't know what size the '`a`' should be until it has seen the `\over`.

The mathcode of a character is encoded according to the formula $4096c+256f+n$, where c is the class of the character, f is its family, and n is its ASCII character code within the family. You can change TEX's interpretation of an input character in math mode by assigning a value to the `\mathcode` table entry (p. '`\mathcode`') for that character. The character must have a category code of 11 (letter) or 12 (other) for TEX to look at its `\mathcode`.

You can define a mathematical character to have a "variable" family by giving it a class of 7. Whenever TEX encounters that character in a math formula, it takes the family of the character to be the current value of the `\fam` parameter (p. '`\fam`'). A variable family enables you to specify the font of ordinary text in a math formula. For instance, if the roman characters are in family 0, the assignment `\fam = 0` will cause ordinary

text in a math formula to be set in roman type rather than in something else like math italic type. If the value of `\fam` is not in the range from 0 to 15, TEX takes the value to be 0, thus making classes 0 and 7 equivalent. TEX sets `\fam` to −1 whenever it enters math mode.