prime
tensor notation
sqrt
underline
overline
surds, see sqrt
vinculum, see overline
root

The control sequence `\prime` stands for the symbol '$\prime$', which is used mostly in superscripts. In fact, '$\prime$' is so big as it stands that you would never want to use it except in a subscript or superscript, where it occurs in a smaller size. Here are some typical examples:

Input	*Output*
`$y_1^\prime$`	$y_1^\prime$
`$y_2^{\prime\prime}$`	$y_2^{\prime\prime}$
`$y_3^{\prime\prime\prime}$`	$y_3^{\prime\prime\prime}$

Since single and double primes occur rather frequently, plain TeX provides a convenient abbreviation: You can simply type `'` instead of `^\prime`, and `''` instead of `^{\prime\prime}`, and so on.

`$f'[g(x)]g'(x)$`	$f'[g(x)]g'(x)$
`$y_1'+y_2''$`	$y_1'+y_2''$
`$y'_1+y''_2$`	$y'_1+y''_2$
`$y'''_3+g'^2$`	$y'''_3+g'^2$

▸ **EXERCISE 16.5**
Why do you think TeX treats `\prime` as a large symbol that appears only in superscripts, instead of making it a smaller symbol that has already been shifted up into the superscript position?

▸ **EXERCISE 16.6**
Mathematicians sometimes use "tensor notation" in which subscripts and superscripts are staggered, as in '${R_i}^{jk}{}_l$'. Explain how to achieve such an effect.

Another way to get complex formulas from simple ones is to use the control sequences `\sqrt`, `\underline`, or `\overline`. Like `^` and `_`, these operations apply to the character or subformula that follows them:

`$\sqrt2$`	$\sqrt2$
`$\sqrt{x+2}$`	$\sqrt{x+2}$
`$\underline4$`	$\underline4$
`$\overline{x+y}$`	$\overline{x+y}$
`$\overline x+\overline y$`	$\overline x+\overline y$
`$x^{\underline n}$`	$x^{\underline n}$
`$x^{\overline{m+n}}$`	$x^{\overline{m+n}}$
`$\sqrt{x^3+\sqrt\alpha}$`	$\sqrt{x^3+\sqrt\alpha}$

You can also get cube roots '$\sqrt[3]{\ }$' and similar things by using `\root`:

`$\root 3 \of 2$`	$\sqrt[3]{2}$
`$\root n \of {x^n+y^n}$`	$\sqrt[n]{x^n+y^n}$
`$\root n+1 \of a$`	$\sqrt[n+1]{a}$

Appendix F lists many more binary operations, for which you type control sequences instead of single characters. Here are some examples:

`$x\times y\cdot z$`	$x \times y \cdot z$
`$x\circ y\bullet z$`	$x \circ y \bullet z$
`$x\cup y\cap z$`	$x \cup y \cap z$
`$x\sqcup y\sqcap z$`	$x \sqcup y \sqcap z$
`$x\vee y\wedge z$`	$x \vee y \wedge z$
`$x\pm y\mp z$`	$x \pm y \mp z$

It is important to distinguish $\times$ (`\times`) from X (`X`) and from x (`x`); to distinguish $\cup$ (`\cup`) from U (`U`) and from u (`u`); to distinguish $\vee$ (`\vee`) from V (`V`) and from v (`v`); to distinguish $\circ$ (`\circ`) from O (`O`) and from o (`o`). The symbols '$\vee$' and '$\wedge$' can also be called `\lor` and `\land`, since they frequently stand for binary operations that are called "logical or" and "logical and."

Incidentally, binary operations are treated as ordinary symbols if they don't occur between two quantities that they can operate on. For example, no extra space is inserted next to the $+$, $-$, and $*$ in cases like the following:

`$x=+1$`	$x=+1$
`$3.142-$`	$3.142-$
`$(D*)$`	$(D*)$

Consider also the following examples, which show that binary operations can be used as ordinary symbols in superscripts and subscripts:

`$K_n^+,K_n^-$`	K_n^+,K_n^-
`$z^*_{ij}$`	z^*_{ij}
`$g^\circ \mapsto g^\bullet$`	$g^\circ \mapsto g^\bullet$
`$f^*(x) \cap f_*(y)$`	$f^*(x) \cap f_*(y)$

▸ **EXERCISE 16.11**
How would you obtain the formulas 'z^{*2}' and '$h'_*(z)$'?

Plain TeX treats the four characters `=`, `<`, `>`, and `:` as "relations" because they express a relationship between two quantities. For example, '$x<y$' means that x is less than y. Such relationships have a rather different meaning from binary operations like $+$, and the symbols are typeset somewhat differently:

`$x=y>z$`	$x=y>z$
`$x:=y$`	$x:=y$
`$x\le y\ne z$`	$x\le y\ne z$
`$x\sim y\simeq z$`	$x\sim y\simeq z$
`$x\equiv y\not\equiv z$`	$x\equiv y\not\equiv z$
`$x\subset y\subseteq z$`	$x\subset y\subseteq z$

(The last several examples show some of the many other relational symbols that plain TeX makes available via control sequences; see Appendix F.)

TEX doesn't know that you forgot a '`$`' after the first '`n`', because it doesn't understand English; so it finds a "formula" between the first two `$` signs:

The smallest $nsuchthat$

after which it thinks that '`2`' is part of the text. But then the `^` reveals an inconsistency; TEX will automatically insert a `$` before the `^`, and you will get an error message. In this way the computer has gotten back into synch, and the rest of the document can be typeset as if nothing had happened.

Conversely, a blank line or `\par` is not permitted in math mode. This gives TEX another way to recover from a missing `$`; such errors will be confined to the paragraph in which they occur.

If for some reason you cannot use `^` and `_` for superscripts and subscripts, because you have an unusual keyboard or because you need `^` for French accents or something, plain TEX lets you type `\sp` and `\sb` instead. For example, '`$x\sp2$`' is another way to get 'x^2'. On the other hand, some people are lucky enough to have keyboards that contain additional symbols besides those of standard ASCII. When such symbols are available, TEX can be set up to make math typing a bit more pleasant. For example, at the author's installation there are keys labeled ↑ and ↓ that produce visible symbols (these make superscripts and subscripts look much nicer on the screen); there are keys for the relations ≤, ≥, and ≠ (these save time); and there are about two dozen more keys that occasionally come in handy. (See Appendix C.)

Mathematicians are fond of using accents over letters, because this is often an effective way to indicate relationships between mathematical objects, and because it greatly extends the number of available symbols without increasing the number of necessary fonts. Chapter 9 discusses the use of accents in ordinary text, but mathematical accents are somewhat different, because spacing is not the same; TEX uses special conventions for accents in formulas, so that the two sorts of accents will not be confused with each other. The following math accents are provided by plain TEX:

`$\hat a$`	$\hat a$
`$\check a$`	$\check a$
`$\tilde a$`	$\tilde a$
`$\acute a$`	$\acute a$
`$\grave a$`	$\grave a$
`$\dot a$`	$\dot a$
`$\ddot a$`	$\ddot a$
`$\breve a$`	$\breve a$
`$\bar a$`	$\bar a$
`$\vec a$`	$\vec a$

The first nine of these are called `\^`, `\v`, `\~`, `\'`, `` \` ``, `\.`, `\"`, `\u`, and `\=`, respectively, when they appear in text; `\vec` is an accent that appears only in formulas. TEX will complain if you try to use `\^` or `\v`, etc., in formulas, or if you try to use `\hat` or `\check`, etc., in ordinary text.

par
sp
sb
character set
uparrow
downarrow
leq
geq
neq
accents
hat
check
tilde
acute
grave
dot
ddot
breve
bar
vec

Now that the font layouts have all been displayed, it's time to consider the names of the various mathematical symbols. Plain TeX defines more than 200 control sequences by which you can refer to math symbols without having to find their numerical positions in the layouts. It's generally best to call a symbol by its name, for then you can easily adapt your manuscripts to other fonts, and your manuscript will be much more readable.

The symbols divide naturally into groups based on their mathematical class (Ord, Op, Bin, Rel, Open, Close, or Punct), so we shall follow that order as we discuss them. N.B.: Unless otherwise stated, math symbols are available only in math modes. For example, if you say '`\alpha`' in horizontal mode, TeX will report an error and try to insert a `$` sign.

1. Lowercase Greek letters.

α	`\alpha`	ι	`\iota`	ϱ	`\varrho`
β	`\beta`	κ	`\kappa`	σ	`\sigma`
γ	`\gamma`	λ	`\lambda`	ς	`\varsigma`
δ	`\delta`	μ	`\mu`	τ	`\tau`
ϵ	`\epsilon`	ν	`\nu`	υ	`\upsilon`
ε	`\varepsilon`	ξ	`\xi`	ϕ	`\phi`
ζ	`\zeta`	o	`o`	φ	`\varphi`
η	`\eta`	π	`\pi`	χ	`\chi`
θ	`\theta`	ϖ	`\varpi`	ψ	`\psi`
ϑ	`\vartheta`	ρ	`\rho`	ω	`\omega`

There's no `\omicron`, because it would look the same as `o`. Notice that the letter `\upsilon` (υ) is a bit wider than `v` (v); both of them should be distinguished from `\nu` (ν). Similarly, `\varsigma` (ς) should not be confused with `\zeta` (ζ). It turns out that `\varsigma` and `\upsilon` are almost never used in math formulas; they are included in plain TeX primarily because they are sometimes needed in short Greek citations (cf. Appendix J).

2. Uppercase Greek letters.

Γ	`\Gamma`	Ξ	`\Xi`	Φ	`\Phi`
Δ	`\Delta`	Π	`\Pi`	Ψ	`\Psi`
Θ	`\Theta`	Σ	`\Sigma`	Ω	`\Omega`
Λ	`\Lambda`	Υ	`\Upsilon`		

The other Greek capitals appear in the roman alphabet (`\Alpha` $\equiv$ `{\rm A}`, `\Beta` $\equiv$ `{\rm B}`, etc.). It's conventional to use unslanted letters for uppercase Greek, and slanted letters for lowercase Greek; but you can obtain $(\mit\Gamma, \mit\Delta, \ldots, \mit\Omega)$ by typing `$({\mit\Gamma}, {\mit\Delta}, \ldots, {\mit\Omega})$`.

3. Calligraphic capitals. To get the letters $\mathcal{A} \ldots \mathcal{Z}$ that appear in Figure 5, type `${\cal A}\ldots{\cal Z}$`. Several other alphabets are also used with mathematics (notably Fraktur, script, and "blackboard bold"); they don't come with plain TeX, but more elaborate formats like $\mathcal{AMS}$-TeX do provide them.

symbols in math, table
alpha
iota
varrho
beta
kappa
sigma
gamma
lambda
varsigma
delta
mu
tau
epsilon
nu
upsilon
varepsilon
xi
phi
zeta
varphi
eta
pi
chi
theta
varpi
psi
vartheta
rho
omega
omicron
Gamma
Xi
Phi
Delta
Pi
Psi
Theta
Sigma
Omega
Lambda
Upsilon
Alpha
Beta
mit
calligraphic letters
Fraktur
script
blackboard bold

4. Miscellaneous symbols of type Ord.

$\aleph$	`\aleph`	$\prime$	`\prime`	$\forall$	`\forall`
$\hbar$	`\hbar`	$\emptyset$	`\emptyset`	$\exists$	`\exists`
$\imath$	`\imath`	∇	`\nabla`	$\neg$	`\neg`
$\jmath$	`\jmath`	$\surd$	`\surd`	$\flat$	`\flat`
ℓ	`\ell`	$\top$	`\top`	$\natural$	`\natural`
$\wp$	`\wp`	$\bot$	`\bot`	$\sharp$	`\sharp`
$\Re$	`\Re`	$\Vert$	`|`	$\clubsuit$	`\clubsuit`
$\Im$	`\Im`	$\angle$	`\angle`	$\diamondsuit$	`\diamondsuit`
∂	`\partial`	$\triangle$	`\triangle`	$\heartsuit$	`\heartsuit`
∞	`\infty`	$\backslash$	`\backslash`	$\spadesuit$	`\spadesuit`

The dotless letters `\imath` and `\jmath` should be used when i and j are accented; for example, `$\hat\imath$` yields $\hat\imath$. The `\prime` symbol is intended for use in subscripts and superscripts, as explained in Chapter 16, so you usually see it in a smaller size. On the other hand, the `\angle` symbol has been built up from other pieces; it does not get smaller when it appears in a subscript or superscript.

5. Digits. To get italic digits *0123456789*, say `{\it0123456789}`; to get boldface digits **0123456789**, say `{\bf0123456789}`; to get oldstyle digits 0123456789, say `{\oldstyle0123456789}`. These conventions work also outside of math mode.

6. "Large" operators. The following symbols come in two sizes, for text and display styles:

$\sum$ $\displaystyle\sum$	`\sum`	$\bigcap$ $\displaystyle\bigcap$	`\bigcap`	$\bigodot$ $\displaystyle\bigodot$	`\bigodot`
$\prod$ $\displaystyle\prod$	`\prod`	$\bigcup$ $\displaystyle\bigcup$	`\bigcup`	$\bigotimes$ $\displaystyle\bigotimes$	`\bigotimes`
$\coprod$ $\displaystyle\coprod$	`\coprod`	$\bigsqcup$ $\displaystyle\bigsqcup$	`\bigsqcup`	$\bigoplus$ $\displaystyle\bigoplus$	`\bigoplus`
$\int$ $\displaystyle\int$	`\int`	$\bigvee$ $\displaystyle\bigvee$	`\bigvee`	$\biguplus$ $\displaystyle\biguplus$	`\biguplus`
$\oint$ $\displaystyle\oint$	`\oint`	$\bigwedge$ $\displaystyle\bigwedge$	`\bigwedge`		

It is important to distinguish these large Op symbols from the similar but smaller Bin symbols whose names are the same except for a '`big`' prefix. Large operators usually occur at the beginning of a formula or subformula, and they usually are subscripted; binary operations usually occur between two symbols or subformulas, and they rarely are subscripted. For example,

`$\bigcup_{n=1}^m(x_n\cup y_n)$` yields $\bigcup_{n=1}^m(x_n\cup y_n)$

The large operators `\sum`, `\prod`, `\coprod`, and `\int` should also be distinguished from smaller symbols called `\Sigma` (Σ), `\Pi` (Π), `\amalg` ($\amalg$), and `\smallint` ($\smallint$), respectively; the `\smallint` operator is rarely used.

aleph
prime
forall
hbar
emptyset
exists
imath
nabla
neg
jmath
surd
flat
ell
top
natural
wp
bot
sharp
Re
escvert
clubsuit
Im
angle
diamondsuit
partial
triangle
heartsuit
infty
backslash
spadesuit
Weierstrass, see wp
dotless letters
accent
digits
sum
bigcap
bigodot
prod
bigcup
bigotimes
coprod
bigsqcup
bigoplus
int
bigvee
biguplus
oint
bigwedge
binary operations
smallint

7. Binary operations. Besides + and −, you can type

$\pm$	`\pm`	$\cap$	`\cap`	$\vee$	`\vee`
$\mp$	`\mp`	$\cup$	`\cup`	$\wedge$	`\wedge`
$\setminus$	`\setminus`	$\uplus$	`\uplus`	$\oplus$	`\oplus`
$\cdot$	`\cdot`	$\sqcap$	`\sqcap`	$\ominus$	`\ominus`
$\times$	`\times`	$\sqcup$	`\sqcup`	$\otimes$	`\otimes`
$\ast$	`\ast`	$\triangleleft$	`\triangleleft`	$\oslash$	`\oslash`
$\star$	`\star`	$\triangleright$	`\triangleright`	$\odot$	`\odot`
$\diamond$	`\diamond`	$\wr$	`\wr`	$\dagger$	`\dagger`
$\circ$	`\circ`	$\bigcirc$	`\bigcirc`	$\ddagger$	`\ddagger`
$\bullet$	`\bullet`	$\bigtriangleup$	`\bigtriangleup`	$\amalg$	`\amalg`
$\div$	`\div`	$\bigtriangledown$	`\bigtriangledown`		

It's customary to say `$G\backslash H$` to denote double cosets of G by H ($G\backslash H$), and `$p\backslash n$` to mean that p divides n ($p\backslash n$); but `$X\setminus Y$` denotes the elements of set X minus those of set Y ($X\setminus Y$). Both operations use the same symbol, but `\backslash` is type Ord, while `\setminus` is type Bin (so TeX puts more space around it).

8. Relations. Besides <, >, and =, you can type

$\leq$	`\leq`	$\geq$	`\geq`	$\equiv$	`\equiv`
$\prec$	`\prec`	$\succ$	`\succ`	$\sim$	`\sim`
$\preceq$	`\preceq`	$\succeq$	`\succeq`	$\simeq$	`\simeq`
$\ll$	`\ll`	$\gg$	`\gg`	$\asymp$	`\asymp`
$\subset$	`\subset`	$\supset$	`\supset`	$\approx$	`\approx`
$\subseteq$	`\subseteq`	$\supseteq$	`\supseteq`	$\cong$	`\cong`
$\sqsubseteq$	`\sqsubseteq`	$\sqsupseteq$	`\sqsupseteq`	$\bowtie$	`\bowtie`
$\in$	`\in`	$\ni$	`\ni`	$\propto$	`\propto`
$\vdash$	`\vdash`	$\dashv$	`\dashv`	$\models$	`\models`
$\smile$	`\smile`	$\mid$	`\mid`	$\doteq$	`\doteq`
$\frown$	`\frown`	$\parallel$	`\parallel`	$\perp$	`\perp`

The symbols `\mid` and `\parallel` define relations that use the same characters as you get from `|` and `\|`; TeX puts space around them when they are relations.

9. Negated relations. Many of the relations just listed can be negated or "crossed out" by prefixing them with `\not`, as follows:

$\not<$	`\not<`	$\not>$	`\not>`	$\neq$	`\not=`
$\not\leq$	`\not\leq`	$\not\geq$	`\not\geq`	$\not\equiv$	`\not\equiv`
$\not\prec$	`\not\prec`	$\not\succ$	`\not\succ`	$\not\sim$	`\not\sim`
$\not\preceq$	`\not\preceq`	$\not\succeq$	`\not\succeq`	$\not\simeq$	`\not\simeq`
$\not\subset$	`\not\subset`	$\not\supset$	`\not\supset`	$\not\approx$	`\not\approx`
$\not\subseteq$	`\not\subseteq`	$\not\supseteq$	`\not\supseteq`	$\not\cong$	`\not\cong`
$\not\sqsubseteq$	`\not\sqsubseteq`	$\not\sqsupseteq$	`\not\sqsupseteq`	$\not\asymp$	`\not\asymp`

pm
cap
vee
mp
cup
wedge
setminus
uplus
oplus
cdot
sqcap
ominus
times
sqcup
otimes
ast
triangleleft
oslash
star
triangleright
odot
diamond
wr
dagger
circ
bigcirc
ddagger
bullet
bigtriangleup
amalg
div
bigtriangledown
leq
geq
equiv
prec
succ
approx
preceq
succeq
propto
ll
gg
asymp
subset
supset
sim
subseteq
supseteq
simeq
sqsubseteq
sqsupseteq
cong
in
ni
bowtie
vdash
dashv
models
smile
mid
doteq
frown
parallel
perp
not

The symbol `\not` is a relation character of width zero, so it will overlap a relation that comes immediately after it. The positioning isn't always ideal, because some relation symbols are wider than others; for example, `\not\in` gives '$\not\in$', but it is preferable to have a steeper cancellation, '$\notin$'. The latter symbol is available as a special control sequence called `\notin`. The definition of `\notin` in Appendix B indicates how similar symbols can be constructed.

10. Arrows. There's also another big class of relations, namely those that point:

$\leftarrow$	`\leftarrow`	$\longleftarrow$	`\longleftarrow`	$\uparrow$	`\uparrow`
$\Leftarrow$	`\Leftarrow`	$\Longleftarrow$	`\Longleftarrow`	$\Uparrow$	`\Uparrow`
$\rightarrow$	`\rightarrow`	$\longrightarrow$	`\longrightarrow`	$\downarrow$	`\downarrow`
$\Rightarrow$	`\Rightarrow`	$\Longrightarrow$	`\Longrightarrow`	$\Downarrow$	`\Downarrow`
$\leftrightarrow$	`\leftrightarrow`	$\longleftrightarrow$	`\longleftrightarrow`	$\updownarrow$	`\updownarrow`
$\Leftrightarrow$	`\Leftrightarrow`	$\Longleftrightarrow$	`\Longleftrightarrow`	$\Updownarrow$	`\Updownarrow`
$\mapsto$	`\mapsto`	$\longmapsto$	`\longmapsto`	$\nearrow$	`\nearrow`
$\hookleftarrow$	`\hookleftarrow`	$\hookrightarrow$	`\hookrightarrow`	$\searrow$	`\searrow`
$\leftharpoonup$	`\leftharpoonup`	$\rightharpoonup$	`\rightharpoonup`	$\swarrow$	`\swarrow`
$\leftharpoondown$	`\leftharpoondown`	$\rightharpoondown$	`\rightharpoondown`	$\nwarrow$	`\nwarrow`
$\rightleftharpoons$	`\rightleftharpoons`				

Up and down arrows will grow larger, like delimiters (see Chapter 17). To put symbols over left and right arrows, plain TeX provides a `\buildrel` macro: You type `\buildrel`⟨superscript⟩`\over`⟨relation⟩, and the superscript is placed on top of the relation just as limits are placed over large operators. For example,

$\buildrel \alpha\beta \over \longrightarrow$	`\buildrel \alpha\beta \over \longrightarrow`
$\buildrel \rm def \over =$	`\buildrel \rm def \over =`

(In this context, '`\over`' does not define a fraction.)

11. Openings. The following left delimiters are available, besides '(':

$[$	`\lbrack`	$\lfloor$	`\lfloor`	$\lceil$	`\lceil`
$\{$	`\lbrace`	$\langle$	`\langle`		

You can also type simply '`[`' to get `\lbrack`. All of these will grow if you prefix them by `\bigl`, `\Bigl`, `\biggl`, `\Biggl`, or `\left`. Chapter 17 also mentions `\lgroup` and `\lmoustache`, which are available in sizes greater than `\big`. If you need more delimiters, the following combinations work reasonably well in the normal text size:

$[\![$	`\lbrack\!\lbrack`	$\langle\!\langle$	`\langle\!\langle`	$(\!($	`(\!(`

12. Closings. The corresponding right delimiters are present too:

$]$	`\rbrack`	$\rfloor$	`\rfloor`	$\rceil$	`\rceil`
$\}$	`\rbrace`	$\rangle$	`\rangle`		

Everything that works for openings works also for closings, but reversed.

13. Punctuation. TeX puts a thin space after commas and semicolons that appear in mathematical formulas, and it does the same for a colon that is called `\colon`. (Otherwise a colon is considered to be a relation, as in '$x := y$' and '$a : b :: c : d$', which you type by saying '`$x:=y$`' and '`$a:b::c:d$`'.) Examples of `\colon` are

$f\colon A\rightarrow B$	`$f\colon A\rightarrow B$`
$L(a,b;c\colon x,y;z)$	`$L(a,b;c\colon x,y;z)$`

Plain TeX also defines `\ldotp` and `\cdotp` to be '.' and '·' with the spacing of commas and semicolons. These symbols don't occur directly in formulas, but they are useful in the definition of `\ldots` and `\cdots`.

14. Alternate names. If you don't like plain TeX's name for some math symbol—for example, if there's another name that looks better or that you can remember more easily—the remedy is simple: You just say, e.g., '`\let\cupcap=\asymp`'. Then you can type '`f(n)\cupcap n`' instead of '`f(n)\asymp n`'.

Some symbols have alternate names that are so commonly used that plain TeX provides two or more equivalent control sequences:

$\ne$	`\ne` or `\neq`	(same as `\not=`)
$\le$	`\le`	(same as `\leq`)
$\ge$	`\ge`	(same as `\geq`)
$\{$	`\{`	(same as `\lbrace`)
$\}$	`\}`	(same as `\rbrace`)
$\to$	`\to`	(same as `\rightarrow`)
$\gets$	`\gets`	(same as `\leftarrow`)
$\owns$	`\owns`	(same as `\ni`)
$\land$	`\land`	(same as `\wedge`)
$\lor$	`\lor`	(same as `\vee`)
$\lnot$	`\lnot`	(same as `\neg`)
$\vert$	`\vert`	(same as `|`)
$\Vert$	`\Vert`	(same as `|`)

There's also `\iff` ($\iff$), which is just like `\Longleftrightarrow` except that it puts an extra thick space at each side.

15. Non-math symbols. Plain TeX makes four special symbols available outside of math mode, although the characters themselves are actually typeset from the math symbols font:

§	`\S`
¶	`\P`
†	`\dag`
‡	`\ddag`

These control sequences do not act like ordinary math symbols; they don't change their size when they appear in subscripts or superscripts, and you must say, e.g.,

colon
colon
ldotp
cdotp
ldots
cdots
ne
neq
le
ge
to
gets
owns
land
lor
lnot
vert
iff