

The **xfp** package Floating Point Unit*

The L^AT_EX3 Project[†]

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This package provides a L^AT_EX 2_ε document-level interface to the L^AT_EX3 floating point unit (part of `expl3`).

\fpeval ★

The expandable command `\fpeval` takes as its argument a floating point expression and will produce a result using the normal rules of mathematics. As this command is expandable it can be used where T_EX requires a number and for example within a low-level `\edef` operation to give a purely numerical result.

Briefly, the floating point expressions may comprise:

- Basic arithmetic: addition $x + y$, subtraction $x - y$, multiplication $x * y$, division x / y , square root \sqrt{x} , and parentheses.
- Comparison operators: $x < y$, $x <= y$, $x >? y$, $x != y$ *etc.*
- Boolean logic: `sign` $\text{sign } x$, negation `!` x , conjunction $x \&\& y$, disjunction $x || y$, ternary operator $x ? y : z$.
- Exponentials: `exp` x , `ln` x , x^y .
- Trigonometry: `sin` x , `cos` x , `tan` x , `cot` x , `sec` x , `csc` x expecting their arguments in radians, and `sind` x , `cosd` x , `tand` x , `cotd` x , `secd` x , `cscd` x expecting their arguments in degrees.
- Inverse trigonometric functions: `asin` x , `acos` x , `atan` x , `acot` x , `asec` x , `acsc` x giving a result in radians, and `asind` x , `acosd` x , `atand` x , `acotd` x , `asecd` x , `acscd` x giving a result in degrees.
- Extrema: `max`(x, y, \dots), `min`(x, y, \dots), `abs`(x).
- Rounding functions ($n = 0$ by default, $t = \text{NaN}$ by default): `trunc`(x, n) rounds towards zero, `floor`(x, n) rounds towards $-\infty$, `ceil`(x, n) rounds towards $+\infty$, `round`(x, n, t) rounds to the closest value, with ties rounded to an even value by default, towards zero if $t = 0$, towards $+\infty$ if $t > 0$ and towards $-\infty$ if $t < 0$.
- Random numbers: `rand`(\cdot), `randint`(m, n) (requires pdfT_EX or LuaT_EX).
- Constants: `pi`, `deg` (one degree in radians).

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- Dimensions, automatically expressed in points, *e.g.*, `pc` is 12.
- Automatic conversion (no need for `\number` of integer, dimension, and skip variables to floating points, expressing dimensions in points and ignoring the stretch and shrink components of skips).

An example of use could be the following.

`\LaTeX{}` can now compute: $\frac{\sin(3.5)}{2} + 2 \cdot 10^{-3}$
`= \fpeval{sin 3.5 /2 + 2e-3} $.`

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The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

E		N	
<code>\edef</code> <u>1</u>	<code>\number</code> <u>2</u>
F			
<code>\fpeval</code> <u>1</u> , <u>1</u>		