

# README

xint 1.3b

2018/05/18

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Source: `xint.dtx` 1.3b 2018/05/18 (doc 2018/05/18)

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Info: Expandable operations on big integers, decimals, fractions

License: LPPL 1.3c

This README is also available as `README.pdf` and `README.html`.

Change log is to be found in `CHANGES.pdf` or `CHANGES.html`.

The user manual is `xint.pdf`, and the commented source code is available as `sourcexint.pdf`.

## Aim

The basic aim is provide *expandable* computations on integers, fractions, and floating point numbers. For example

```
\xinttheexpr reduce(37189719/183618963+11390170/17310720)^17\relax
```

will evaluate exactly the fraction; the result has 462 characters (including the fraction slash.) One can also work with dummy variables:

```
\xinttheexpr mul(add(x(x+1)(x+2), x=y..y+15), y=171286,98762,9296)\relax
```

evaluates to 15979066346135829902328007959448563667099190784.

Float computations are possible at an adjustable precision (default 16).

```
\xintDigits:=48;\xintthefloatexpr 123_456_789^1_000.5\relax  
->3.63692761822782679930738270515740797370813691938e8095
```

But currently, only integer and half-integer exponents are allowed for the power operation in expressions and only the square-root operation is implemented besides the four arithmetic operations. Square-root and the four operations achieve correct rounding in the given arbitrary precision.

Sub-units `xintcore`, `xint` and `xintfrac` provide the underlying macros, and `xintexpr` loads all of them and provides expandable parsers allowing computations such as the above (and more).

## Usage

It is possible to use the package with Plain (via `\input` anywhere) or with LaTeX (via `\usepackage` in the preamble).

### With LaTeX

```
\usepackage{xint}      % expandable arithmetic with big integers
\usepackage{xintfrac}  % decimal numbers, fractions, floats
\usepackage{xintexpr}  % expressions with infix operators
```

Further packages: `xintbinhex`, `xintgcd`, `xintseries` and `xintcfrac`.

Main dependencies are handled automatically. For example `xintexpr` automatically loads `xintfrac` which itself loads `xint`; but use of the `gcd` and `lcm` functions in expressions require explicit loading of `xintgcd`, and hexadecimal notation requires explicit loading of `xintbinhex`.

Package `xintcore` is the subset of `xint` providing only the five operations on big integers: `\xintiAdd`, `\xintiMul`, ... It is (by default) loaded by the (LaTeX only) package `bnumexpr` which provides a more light-weight expression parser handling only big integers, the four operations, the power operation and the factorial.

There is also `xinttools` which is a separate package providing, among others, expandable and non-expandable loops such as `\xintFor`.

### With TeX

One does for example:

```
\input xintexpr.sty
```

The packages may be loaded in any catcode context such that letters, digits, `\` and `%` have their standard catcodes.

`xintcore.sty` and `xinttools.sty` both import `xintkernel.sty` which has the catcode handler and package identifier and defines a few utilities such as `\oodef`, `\fdef`, or `\xint_dothis/\xint_orthat`.

## Installation

### Method A: using the package manager of your TeX distribution

`xint` is included in [TeXLive](#) (hence also [MacTeX](#)) and [MikTeX](#).

There can be a few days of delay between apparition of a new version on [CTAN](#) and availability via the distribution package manager.

## Method B: manual installation using `xint.tds.zip` and `unzip`

Assumes a GNU/Linux-like system (or Mac OS X).

1. obtain `xint.tds.zip` from CTAN: <http://mirror.ctan.org/install/macros/generic/xint.tds.zip>

2. cd to the download repertory and issue:

```
unzip xint.tds.zip -d <TEXMF>
```

where <TEXMF> is a suitable TDS-compliant destination repertory. For example, with TeXLive:

- Linux, standard access rights, hence `sudo` is needed, installation into the “local” tree:  

```
sudo unzip xint.tds.zip -d /usr/local/texlive/texmf-local
```

```
sudo texhash /usr/local/texlive/texmf-local
```
- Mac OS X, installation into user home folder (no `sudo` needed, and it is recommended to not have a `ls-R` file there, hence no `texhash`):  

```
unzip xint.tds.zip -d ~/Library/texmf
```

## Method C: manual installation using `Makefile` and `xint.dtx`

The `Makefile` automatizes rebuilding from `xint.dtx` all documentation files as well as `xint.tds.zip`. It is for GNU/Linux-like (inc. Mac OS X) systems, with a `teTeX` like installation such as TeXLive. Furthermore the [Pandoc](#) software is required.

1. obtain `xint.dtx` and `Makefile` from <http://mirror.ctan.org/macros/generic/xint>.
2. put them in an otherwise empty working repertory, run `make` or equivalently `make help` for further instructions.

## Method D: installation starting with only `xint.dtx`

Run `"tex xint.dtx"` or `"etex xint.dtx"` to extract from `xint.dtx` all packages as well as these files:

**README.md** the current README with Markdown formatting.

**CHANGES.md** the changes across successive releases.

**xint.tex** used to generate `xint.pdf` via `"latex xint.tex"` (thrice) then `"dvipdfmx xint.dvi"`. It is also possible to compile `xint.tex` with `xelatex`, or with `pdflatex` (this latter option produces a bigger pdf).

For successful compilation, packages `newtxtt`, `newtxmath`, `etoc`, `mathastext` are needed. Inclusion of the source code is off by default, but the toggle can be set in `xint.tex`.

A third option is to generate `xint.pdf` via `xelatex xint.dtx` or `pdflatex xint.dtx`. Source code is then included by default (but some code comments in French use 8bit characters, hence for `xelatex` an a priori conversion of `xint.dtx` into utf-8 will give a better result).

**Makefile.mk** this is for UNIX-like systems. Note: this file is only produced with `"etex xint.dtx"`, not with `"tex xint.dtx"`. Rename it to `Makefile` and run `make` on the command line for further help.

**doHTMLs.sh** and **doPDFs.sh** these are scripts (for UNIX-like systems) which can be used to convert the `README.md` and `CHANGES.md` to HTML and PDF formats. They require [Pandoc](#).

**pandoctpl.latex** a Pandoc template used by `doPDFs.sh`.

Finishing the installation in a TDS hierarchy:

- move the style files to `TDS:tex/generic/xint/`
- `xint.dtx` goes to `TDS:source/generic/xint/`
- the documentation (`xint.pdf`, `README.md`, ...) goes to `TDS:doc/generic/xint/`

Depending on the destination, it may then be necessary to refresh a filename database.

## License

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<http://www.latex-project.org/lppl/lppl-1-3c.txt>

and version 1.3 or later is part of all distributions of LaTeX version 2005/12/01 or later.

This Work has the LPPL maintenance status `author-maintained`.

The Author of this Work is Jean-Francois Burnol.

This Work consists of the source file `xint.dtx` and of its derived files: `xintkernel.sty`, `xintcore.sty`, `xint.sty`, `xintfrac.sty`, `xintexpr.sty`, `xintbinhex.sty`, `xintgcd.sty`, `xintseries.sty`, `xintcfraction.sty`, `xinttools.sty`, `xint.ins`, `xint.tex`, `README`, `README.md`, `README.html`, `README.pdf`, `CHANGES.md`, `CHANGES.html`, `CHANGES.pdf`, `pandoctpl.latex`, `doHTMLs.sh`, `doPDFs.sh`, `xint.dvi`, `xint.pdf`, `Makefile.mk`.