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# SageMath and SageMathCloud

Introduction

# SageMath is a free open source mathematics software

- ▶ Created in 2005 by William Stein.
- ▶ <http://www.sagemath.org/>
- ▶ Mission: *Creating a viable free open source alternative to Magma, Maple, Mathematica and Matlab.*

- ▶ the main language of Sage is **python** (but there are many other source languages: cython, C, C++, fortran)
- ▶ the source is distributed under the GPL licence.

One of the original purpose of Sage was to put together the many existent open source mathematics software programs: Atlas, GAP, GMP, Linbox, Maxima, MPFR, PARI/GP, NetworkX, NTL, Numpy/Scipy, Singular, Symmetrica,...

Sage is **all-inclusive**: it installs all those libraries and gives you a common python-based interface to work on them.

**On top of it** is the python / cython Sage library it-self.

- ▶ You can use a library explicitly:

```
sage: n = gap(20062006)
sage: type(n)
<class 'sage.interfaces.gap.GapElement'>
sage: n.Factors()
[ 2, 17, 59, 73, 137 ]
```

- ▶ But also, many of Sage computation are done through those libraries without necessarily telling you:

```
sage: G = PermutationGroup([[(1,2,3),(4,5)],[(3,4)]]
sage: G._gap_()
Group( [ (3,4), (1,2,3)(4,5) ] )
```

# Development model

- ▶ **Sage is developed by researchers for researchers:** the original philosophy is to develop what you *need* for your research and *share* it with the community.
- ▶ The first full-time Sage developer has been recruited last January at Paris-Sud university by the OpenDreamKit project.
- ▶ The code is maintained through a git repo with a system of tickets and peer-review for new contributions:  
<http://trac.sagemath.org/>



# What can I do with Sage?

Number theory, combinatorics, graph theory,...

Most things: *Calcul Mathématique avec Sage*



# How can I use it?

- ▶ native install on Linux and Mac
- ▶ install through a virtual machine on Windows
- ▶ online on **SageMathCloud**

# SageMathCloud

SageMathCloud is an online open-source **platform** where you can use Sage and more.