mathmaker Documentation

Release 0.7.4

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May 25, 2018

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CHAPTER 1

User's guide

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1.1 Overview

Mathmaker creates elementary maths worksheets with detailed solutions.

The output documents can be compiled into pdf files by lualatex. Examples of available themes are: first degree equations, pythagorean theorem, fractions calculation...

It can run from command line, but can be controlled via http requests too.

License

Documentation (master release)

Documentation (latest development release).

1.2 Quickstart

1.2.1 Install

Required (non python) dependencies are python >=3.6, euktoeps >=1.5.4, xmllint, msgfmt, lualatex, luaotfload-tool and a bunch of LaTeX packages(1)

To install them:

- on Ubuntu, install python3.6 if it is not already installed, then:

```
$ sudo apt-get install eukleides libxml2-utils gettext texlive-latex-base
```

And for the yet missing LaTeX packages: you can either install the complete texlive distribution (takes some room on the hard disk): run `$ sudo apt-get install texlive-full`, or install only the necessary packages:

```
$ sudo apt-get install texlive-luatex texlive-latex-recommended texlive-xetex␣
↪texlive-pstricks texlive-font-utils texlive-latex-extra texlive-base texlive-
↪science texlive-pictures texlive-generic-recommended texlive-fonts-recommended␣
↪texlive-fonts-extra
```

- on FreeBSD(2):

```
$ sudo pkg install python36 py36-sqlite3 gettext eukleides libxml2 texlive-full
$ rehash
```

Note: As of 2018 (mathmaker version 0.7.3) it is necessary to install texlive directly using texlive instructions. Do not forget to setup the fonts for lualatex if you intend to use them (as described in the same link).

Note: Check how to fix eukleides install in the complete documentation

Once you're done, you can proceed installing mathmaker:

```
$ pip3 install mathmaker
```

(this will automatically install some extra python3 libraries too: mathmakerlib, polib, ruamel.yaml, intspan and python-daemon).

Note: Check how to fix install if it stops with an error in python-daemon install, in the complete documentation

1.2.2 Basic use

```
$ mathmaker pythagorean-theorem-short-test > out.tex
$ lualatex out.tex
```

or directly:

```
$ mathmaker pythagorean-theorem-short-test --pdf > out.pdf
```

Get the list of all provided sheets:

```
$ mathmaker list
```

1.2.3 Some settings

Check `mathmaker --help` to see which settings can be changed as command line arguments.

Some more settings can be overriden by user defined values in `~/.config/mathmaker/user_config.yaml`. Read the complete documentation for more information.

1.2.4 Advanced use

It's possible to create your own sheets in yaml. Read the complete documentation for more information.

1.3 Contribute

You can contribute to mathmaker:

1.3.1 As a wordings contributor

Mathmaker needs contexts for problems wordings. There are already some, but the more there is, the better. Existing wordings can be found here. You can submit any new idea as an enhancement proposal there (should be written in english, french or german).

Any question can be sent to nh dot techn (hosted at gmail dot com).

1.3.2 As a translator

You can help translating mathmaker to your language (or any language you like, if you have enough elementary maths vocabulary for that).

If the translation to your language isn't started yet, there are several pot files to get here (see explanations about their respective roles there). You can use an editor like poedit or any other you like better, to create po files from them and start to translate.

If you want to add missing translations, or to correct some, you can find the po files in the subdirectories here.

Once you're done, you can make a pull request here.

Any question can be sent to nh dot techn (hosted at gmail dot com).

1.3.3 As a developer

Before submitting a PR, please ensure you've had a look at the writing rules.

More details can be found in the documentation for developers.

Any question can be sent to nh dot techn (hosted at gmail dot com).

1.4 Contributors

1.4.1 Development

- Lead developer: Nicolas Hainaux
- Developers: Vaibhav Gupta
- Clever advices: Olivier Cecillon

1.4.2 Translation

- French: Nicolas Hainaux

1.4.3 Problems wordings

Nicolas Hainaux

1.4.4 Patience and chocolate cakes

Sophie Reboud

1.5 Changelog

1.5.1 New in version 0.7.4 (2018-03-..)

- Add mental calculation sheets for fifth level ("yellow belt, 2d stripe")
- Automatically adapt LaTeX preamble, depending on packages really required to compile the document

1.5.2 New in version 0.7.3 (2018-01-15)

- Add mental calculation sheets for fourth level ("yellow belt, 1st stripe")

1.5.3 New in version 0.7.2 (2017-10-18)

- Add mental calculation sheets for third level ("yellow belt")
- The mental calculation pdf may now be "interactive" (answers can be written in text fields, they can be validated pushing a button; this validation is done by some javascript)
- The daemon now accepts an optional argument in the request (written right after sheet's name, separated with a 'l'. Only interactive is allowed, so far)

1.5.4 New in version 0.7.1-3 (2017-08-30)

- Patch the daemon to let it accept the new YAML sheet names.
- The output dir will always be in user's home.
- Fix several bugs.

1.5.5 New in version 0.7.1 (2017-08-29)

- Support for python3.6 only, drop support for older python versions.
- Mental calculation sheets can now be created as slideshows. Add a default slideshows series for white belt, 1st and 2d stripes.
- Reorganization of mental calculation in belts: White belt, 1st stripe and 2d stripe have been added (including new sheets: addition/subtraction, fraction of a rectangle, complements)
- New sheet: order of precedence in operations.
- YAML files will be used to store sheets. The previous ways (XML and Python) will be dropped.
- Huge reorganization of the lib/ source code.

- Fair bunch of bug fixes.
- Issue warnings instead of exceptions when the version of a dependency could not be determined. [0.7.1dev5 (2017-05-04)]
- New sheets about trigonometry: [0.7.1dev4 (2017-05-03)]
  - vocabulary in the right triangle
  - write the correct formulae
  - calculate a length
  - calculate an angle
- New sheets: [0.7.1dev3 (2016-10-21)]
  - intercept theorem: "butterfly" configuration
  - intercept theorem: converse
- New sheets: [0.7.1dev2 (2016-10-13)]
  - expansion of simple brackets (declined in two versions)
  - clever multiplications (mental calculation)
  - intercept theorem: write the correct quotients' equalities
  - intercept theorem: solve simple exercises
- A new sheet (declined in two versions): expansion of double brackets. Defined in an xml sheet as for mental calculation sheets. [0.7.1dev1 (2016-09-14)]

1.5.6 New in version 0.7.0-6 (2016-08-19)

- Added a setting to let the user change mathmaker's path (to be used by the daemon)
- Bugfix [0.7.0-5 (2016-08-19)]
- If an IP address is passed as parameter to mathmaker's daemon, it will return a 429 http status code (too many requests) if the last request from the same address is not older than 10 seconds. [0.7.0-4 (2016-08-19)]
- Fixed the install of locale files and font listing file [0.7.0-3 (2016-07-18)]

1.5.7 New in version 0.7 (2016-07-15)

- Standardized structure (`mathmaker` becomes pip3-installable, available on PyPI and github; its documentation is hosted on readthedocs; tests are made with py.test)
- A daemon is added (`mathmakerd`) to provide communication with `mathmaker` through http connections.
- A bunch of mental calculation sheets
- The use of XML frameworks for the sheets (yet only for mental calculation, so far)

Footnotes:

1. Complete list of recommended LaTeX packages (list up-to-date for 0.7 release):

CTAN Package Name	Package name (Ubuntu 14.04)
fontspec	texlive-latex-recommended
polyglossia	texlive-xetex
geometry	texlive-latex-base
graphicx	texlive-pstricks
epstopdf	texlive-font-utils
tikz	texlive-latex-extra
amssymb	texlive-base
amsmath	texlive-latex-base
siunitx	texlive-science
cancel	texlive-pictures
array	texlive-latex-base
ulem	texlive-generic-recommended
textcomp	texlive-latex-base
eurosym	texlive-fonts-recommended
lxfonts	texlive-fonts-extra
multicol	texlive-latex-base

2. Using `pkg`, you'll have to install `texlive-full`; if you wish to install only the relevant LaTeX packages, you'll have to browse the ports, I haven't done this yet so cannot tell you exactly which ones are necessary.

1.6 Advanced features

1.6.1 User settings

The default settings are following:

```
PATHS:
    EUKTOEPS: euktoeps
    XMLLINT: xmllint
    LUALATEX: lualatex
    LUAOTFLOAD_TOOL: luaotfload-tool
    MSGFMT: msgfmt
    # OUTPUT_DIR *must* be relative (to user's home)
    OUTPUT_DIR: .mathmaker/outfiles/

LOCALES:
    # Available values can be checked in the locale directory.
    LANGUAGE: en_US
    ENCODING: UTF-8
    # Values can be 'euro', 'sterling', 'dollar'
    CURRENCY: dollar

LATEX:
    FONT:
    ROUND_LETTERS_IN_MATH_EXPR: False

DOCUMENT:
    # Double quotes around the template strings are mandatory.
    # {n} will be replaced by the successive numbering items (1, 2, 3... or
    # a, b, c... etc.)
    QUESTION_NUMBERING_TEMPLATE: "{n}."
    # nothing; bold; italics; underlined
```

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```
    QUESTION_NUMBERING_TEMPLATE_WEIGHT: bold
    QUESTION_NUMBERING_TEMPLATE_SLIDESHOWS: "{n}."
    QUESTION_NUMBERING_TEMPLATE_SLIDESHOWS_WEIGHT: regular

DAEMON:
    MATHMAKER_EXECUTABLE: mathmaker
```

Some explanations:

- The `PATHS:` section is here to provide a mean to change the paths to `euktoeps`, `lualatex` and `xmllint` mainly. In case one of them is not reachable the way it is set in this section, you can change that easily.
- The `PATHS:` section contains also an `OUTPUT_DIR:` entry. This is the directory where `mathmaker` will store the possible picture files (.euk and .eps). Change it at your liking, but as it must be a subdirectory of user's own directory, it must be a relative path.
- The entries under `LOCALES:` allow to change the language, encoding, and default currency used.
- The `LATEX:` section contains an entry to set the font to use (be sure it is available on your system). The `ROUND_LETTERS_IN_MATH_EXPR:` entry is disabled by default (set to False). If you set it to True, a special font will be used in math expressions, that will turn all letters (especially the 'x') into a rounded version. This is actually the `lxfonts` LaTeX package. It doesn't fit well with any font. Using "Ubuntu" as font and setting `ROUND_LETTERS_IN_MATH_EXPR:` to True gives a nice result though.
- The entries under `DOCUMENT:` allow to change some values to format the output documents.

Your settings file must be `~/.config/mathmaker/user_config.yaml`.

1.6.2 Command-line options

Several command-line options correspond to settings that are defined in `~/.config/mathmaker/user_config.yaml`. Any option redefined in command-line options will override the setting from the configuration file.

Type `mathmaker --help` to get information on these command-line options.

1.6.3 http server (mathmakerd)

Once everything is installed, it's possible to run a server to communicate with mathmaker through a web browser.

Run the server:

```
$ mathmakerd start
```

Then go to your web browser and as url, you can enter:

```
http://127.0.0.1:9999/?sheetname=<sheetname>
```

and replace `<sheetname>` by an available sheet's name (from `mathmaker list`), for instance:

```
http://127.0.0.1:9999/?sheetname=pythagorean-theorem-short-test
```

`mathmaker` will create the new sheet, compile it and return the pdf result to be displayed in the web browser.

At the moment, `mathmakerd stop` doesn't work correctly, you'll have to `kill` it directly (`ps aux | grep mathmakerd` then `kill` with the appropriate pid).

It's possible to pass an IP address in an extra parameter named `ip`, like:

http://127.0.0.1:9999/?sheetname=pythagorean-theorem-short-test&ip=127.0.0.1

In this case, `mathmakerd` will check if the last request is older than 10 seconds (this is hardcoded, so far) and if not, then a http status 429 will be returned. In order to do that, `mathmakerd` uses a small database that it erases when the last request is older than one hour (also hardcoded, so far).

1.6.4 YAML sheets

As a directive to mathmaker it is possible to give a path to yaml file.

Creating a new yaml file that can be used as a model by `mathmaker` is more for advanced users, though it's not that difficult.

Example

Let's have a look at `mathmaker/data/frameworks/algebra/expand.yaml`, where four sheets are defined:

```
simple: !!omap
  - title: "Algebra: expand simple brackets"
  - exercise: !!omap
    - details_level: medium
    - text_exc: "Expand and reduce the following expressions:"
    - questions: expand simple -> inttriplets_2to9 (5)

simple_detailed_solutions: !!omap
  - title: "Algebra: expand simple brackets"
  - exercise: !!omap
    - text_exc: "Expand and reduce the following expressions:"
    - questions: expand simple -> inttriplets_2to9 (5)

double: !!omap
  - title: "Algebra: expand and reduce double brackets"
  - exercise: !!omap
    - details_level: medium
    - text_exc: "Expand and reduce the following expressions:"
    - questions: expand double -> intpairs_2to9;;intpairs_2to9 (5)

double_detailed_solutions: !!omap
  - title: "Algebra: expand and reduce double brackets"
  - exercise: !!omap
    - text_exc: "Expand and reduce the following expressions:"
    - question: expand double -> intpairs_2to9;;intpairs_2to9 (5)
```

The four top-level keys are the sheets' names. These names must not contain spaces (not supported).

A list of keys is defined below each sheet's name. No one is mandatory. If you do not define the `title`, then the default value will be used (for titles, this is an empty string).

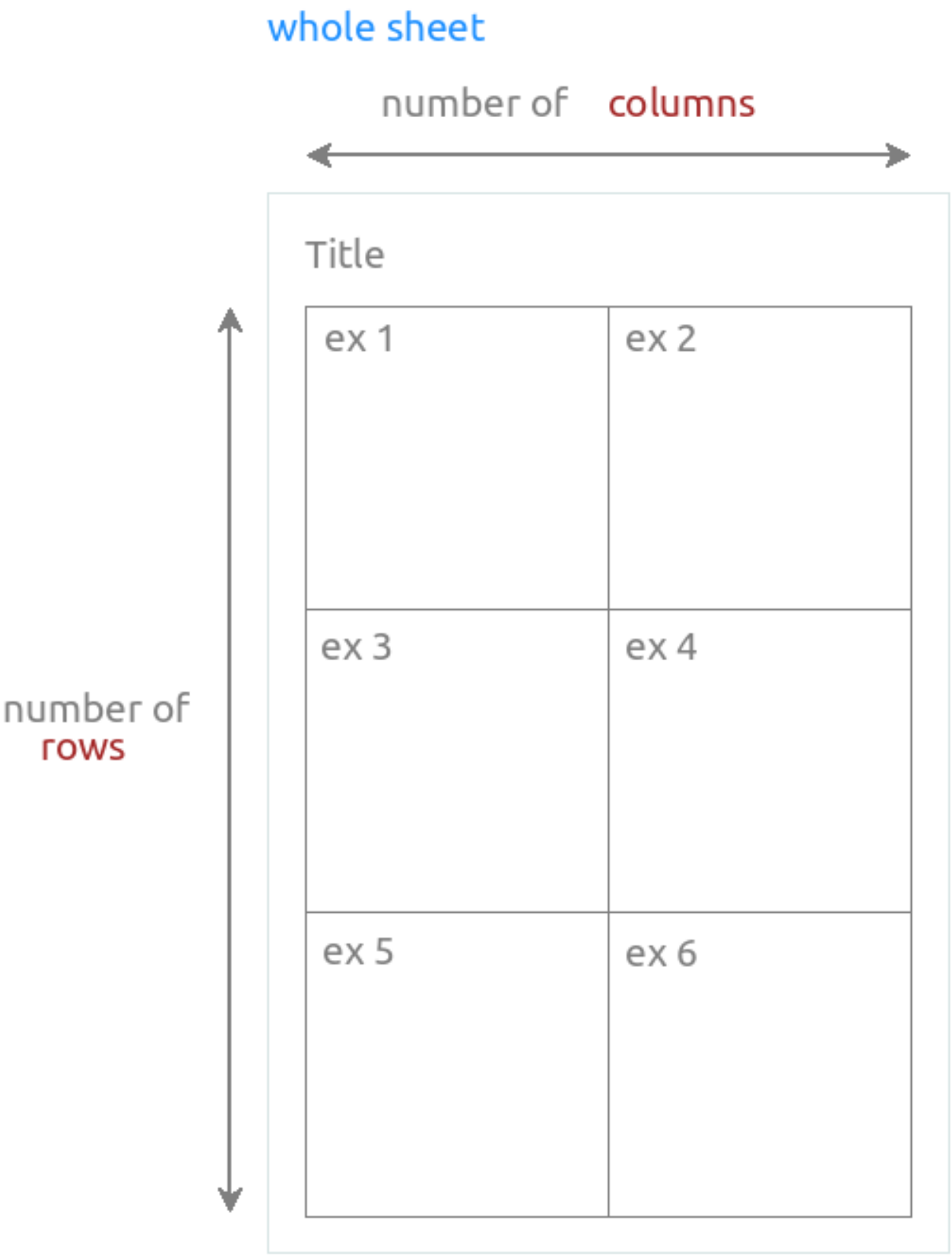
Sheet's keys

Possible keys for sheets, at the moment, are:

- `preset` allows to preset a number of other keys. Possible values: `default`, `mental_calculation`. Default is `default`. The `mental_calculation` value will remove the exercise's titles and the exercises layout.

- `header`, `title`, `subtitle`, `text` allow to customize the header, title, subtitle and text of the sheet. Default value is an empty string for each of them.
- `answers_title` allows to customize the title for the answers' sheet. It defaults to `Answers`.
- `layout` contains the layout description of the sheet, if necessary (see below).
- Any key starting with `exercise` will contain the list of questions of one exercise. It is not possible to use the same key several times (YAML forbids it), so if you want to define several exercises, say two, for instance, you'll have to use `exercise` and `exercise2`, for instance (if you use numbers, it will have no effect on the order of exercises in the output).

Sheet's layout



If a sheet contains no `layout` key (or if its value is left empty), then the default layout will be used (all exercises printed one after the other, unlike the 3×2 grid in the figure above).

The `layout` key can list a `unit` key, whose value will be used for columns widths (see below). `unit` defaults to `cm`.

The `layout` key can list a `font_size_offset` key, whose value is a relatively small integer allowing to change the font size (for instance, set it at `+1` or `+2` to enlarge all fonts, or `-1` or `-2` to reduce all fonts' size)

So far, no `spacing` key is available for sheets' `layout`, but the spacing between exercises can be set in the properties.

Finally, the `layout` key can list one `wordings` key and/or one `answers` key. They allow to define different settings for wordings and answers, but both work the same way.

The properties are defined as key=value pairs separated by commas (actually a comma and a space). For instance: `rowxcol=?×2, print=3 3`

- `rowxcol` can contain `none` (default: no layout) or the number of rows and columns as a multiplication of two integers: `r×c`, for instance: `3×2`. This would mean 3 rows and 2 columns, what would define 6 "cells", like in the figure above. As a convenience, you can use a x instead of a ×, like this: `3x2`.
- `colwidths` is ignored if `rowxcol` contains `none`. If `rowxcol` contains a `r×c` definition, then `colwidths` defaults to `auto`: the width of all columns will be calculated automatically (all equal). Otherwise, you can set the values you like, separated by spaces, like: `4.5 4.5 9` what would make the two first columns 4.5 units wide and the last, 9 units wide (See `unit` key description above). Note that there must be as many values as the number of columns defined in the `"r×c"` definition.
- `print` is the number of exercises to print, either one after the other, or per "cell". It defaults to `auto`. If `rowxcol` contains `none`, then `print` can either be a natural number (how many exercises/questions to print), or `auto`, and then all exercises (left) will be printed, without distributing them among columns. If `rowxcol` contains a `r×c` definition, then an `auto` value would mean that each "cell" will contain one question. Otherwise, you can tell how many questions you want in each cell, row after row, as integers separated by spaces, like: `2 1 1 3 1 1` what would put (with `rowxcol=2×3`) 2 questions (or exercises) in the first cell, then 1 question in each other cell of the first row, then 3 questions in the first cell of the second row, and 1 question in each cell left. There must be as many numbers as cells. As a convenience, you can add a `.` or a `/` to separate the rows, like: `2 1 1 / 3 1 1` (These two signs will simply be ignored). Each row must contain as many numbers as defined in the `r×c` definition. If the number of rows is left undefined (`?`) then only the first row has to be defined (extra rows will be ignored) as a pattern for all rows (the default still being `auto`, i.e. 1 question per cell).
- `newpage` can be turned to true in order to insert a jump to next page.

Examples of sheet's layouts:

Say you have 4 exercises and you want to put the answers of the two first ones in 2 two columns, and then print the left ones one after another:

```
layout:
  answers: rowxcol=1×2, print=1 1,
           print=2
```

ex 1 ex 2

ex 3

ex 4

Note: YAML allows to write the same string ("scalar") on several lines. This is practical for readability. In the example above, we could have written `rowxcol=1×2, print=1 1, print=2` all on the same line.

If you have 3 exercises and you want to print 2 answers on a first page, then jump to next page and print the answer of the third one, then your sheet's layout may be:

```
layout:
  answers: print=2,
           newpage=true,
           print=1
```

The !!omap label

The sheets' names keys as well as the `exercise` keys are labeled `!!omap`. This is required in order to ensure the order of the created sheets will be the same as the one defined in the sheet. Forgetting these labels won't prevent `mathmaker` from running, but the final order may be changed (what does not mean it will be randomly reorganized at each run). In this example, this wouldn't have any consequence as there's only one `exercise` key in each sheet and only one `question` key in each exercise.

Exercise's keys

Possible keys for sheets, at the moment, are:

- `preset` (same as for sheets)
- `layout_variant` can be `default`, `tabular` or `slideshow`.
- `layout_unit` defaults to `cm`.
- `shuffle` can be `true` or `false`. It defaults to `false`, except for `mental_calculation` preset. If set to true, then the questions will be shuffled.
- `details_level` can be `maximum` (default), `medium` or `none` (default for `mental_calculation` preset). Some types of questions can be configured to output the answer with different levels of details.
- `q_numbering` defines the numbering of the questions of the exercise. It can be `default`, `alphabet`, `alphabetical`, `numeric` or `disabled`. The three first values are synonyms.
- `start_number` defines the first number, when numbering the questions. Must be an integer greater or equal to `1`.
- `spacing` defines the spacing between two consecutive exercises. It defaults to `''` (i.e. nothing). Otherwise, you can set it at `newline`, `newline_twice`, or a value that will be inserted in a LaTeX `addvspace{}` command, for instance `spacing=40.0pt` will result in a `addvspace{40.0pt}` inserted at the end of each exercise. `spacing` can be overriden in the `layout` key (in either or both `wordings` and `answers` keys) of the exercise, in order to set different spacings for the wordings and the answers.
- `newpage` can be turned to true in order to insert a jump to next page.
- `q_spacing` can be used to set a default value for the spacing between two consecutive questions.
- `text_exc` and `text_ans` allow to customize the wording of the exercise and of its answer. `text_exc` defaults to nothing (empty string). `text_ans` defaults to `"Example of detailed solutions:"` with `default` preset, but also to an empty string with `mental_calculation` preset.
- The `question` and `mix` keys allow to define the exercise's questions. As YAML does not allow to use the same key, if you want to define several `question` keys, nor several `mix` keys, you'll have to use the same

trick for them as for the `exercise` key: `question1`, `question2` etc. or `mix1`, `mix2`, etc. See below the paragraphs about `question` and `mix`.

Exercise's layout

It works the same way as a Sheet's layout, with some differences:

- In `rowxcol`, the first number can be replaced by a `?`. In that case, the number of rows will be automatically calculated, depending on the number of questions and the number of columns.

Examples of exercise's layouts:

```
layout:
  wordings: rowxcol=4×3
  answers: rowxcol=4×3
```

will basically distribute the questions in 4 rows of 3 columns. Same for wordings and for answers.

```
layout:
  wordings: rowxcol=?×3, colwidths=5 5 8, print=1 1 2
```

will distribute, only for wordings, the questions in 3 columns of widths 5 cm, 5 cm and 8 cm. There will be 1 question in the left cell of each row, 1 question in the middle cell of each row and 2 questions in the right cell of each row.

If you have 6 expressions, say A, B, C, D, E and F to distribute:

```
layout:
  wordings: rowxcol=?×2
```

will distribute the questions in 2 columns of 3 rows, 1 question per row, i.e.:

A = ... B = ...

C = ... D = ...

E = ... F = ...

whereas:

```
layout:
  wordings: rowxcol=?×2,  print=3 / 3
```

will distribute the questions in 2 columns of 1 row, 3 questions per row, i.e.:

A = ... D = ...

B = ... E = ...

C = ... F = ...

The `question` key

Example of a simple question:

```
question: expand simple -> inttriplets_2to9 (5)
```

This question says: "I want 5 questions about expand a simple braces expression, the numbers being integers between 2 and 9".

It is actually divided in two parts, separated by this arrow `->`. The first part concerns the kind of question and possibly its specific attributes, the second part concerns the numbers' source to be used to create the question.

The question's `id` and attributes

The left part of the scalar (string) matching a `question` key **must start** with two parts (words or several_words) separated by a space. This is the `id` of the question. Possible extra attributes can follow it, separated by commas (actually a comma and a space). Each extra attribute will be written as a pair `key=value`.

For instance:

```
question: calculation order_of_operations, subvariant=only_positive, spacing=15.0pt ->
↪ singleint_5to20;;intpairs_2to9, variant=5 (1)
```

In this example, a question of kind "calculation order_of_operations" will be created, with only positive numbers, spaced of 15.0pt.

The question's `nb` and its attributes

The right part (after `->`) starts with the name of the numbers' source (`intpairs_*to*`, `singleint_*to*` etc. see the already existing questions to know what to use, so far there's no doc about them. Some questions require multiple sources, like the one in the example above, they're written in row, joined by `;;`). It may be followed by attributes, just like the left part, and **must end** with an integer between braces, what is the number of questions to create with this numbers' source.

The example above will create 1 question, variant number `5`, and use the sources `singleint_5to20` and `intpairs_2to9`.

Note that you can put several different numbers' sources inside one `question`. For instance:

```
questions: calculation order_of_operations, subvariant=only_positive, spacing=15.0pt -
↪> singleint_5to20;;intpairs_2to9, variant=5 (1)
                                                                                    -
↪> singleint_5to20;;intpairs_2to9, variant=7 (1)
```

or:

```
questions: expand simple -> inttriplets_2to9 (3)
                         -> inttriplets_5to15 (3)
```

This means there will be six questions, all being of "expand simple" kind, but the three first ones will use integers between 2 and 9; and the three last ones will use integers between 5 and 15.

The `mix` key

"Mixes" are primarily meant to allow to distribute numbers' sources randomly on several questions types. This will only work if all numbers' sources match all the questions of the same `mix`.

They can also be used to control the randomness of questions in an exercise. For instance, you want that the 3 first questions of an exercise are in random order, and then the 3 next ones too, but not all the 6 questions in random order. Then you can set two `mix` keys, say `mix1` and `mix2` and put 3 questions inside each mix.

The questions and numbers' sources inside `mix` are not displayed as in simple `question`, but under different keys, the ones starting by `question`, the others by `nb`.

```
- mix0:
  - question: calculation order_of_operations, subvariant=only_positive, pick=4, nb_
↪variant=decimal1, spacing=15.0pt
  - nb: singleint_5to20;;intpairs_2to9, variant=0, required=true (1)
        singleint_5to20;;intpairs_2to9, variant=1,3,5,7, required=true (1)
        singleint_5to20;;intpairs_2to9, variant=2,3,6,7, required=true (1)
        singleint_5to20;;intpairs_2to9, variant=0-7, required=true (1)
- mix1:
  - question: calculation order_of_operations, subvariant=only_positive, pick=6, nb_
↪variant=decimal1, spacing=15.0pt
  - nb: singleint_3to12;;intpairs_2to9, variant=8-23, required=true (2)
        singleint_3to12;;intpairs_2to9, variant=116-155, required=true (1)
        singleint_3to12;;intpairs_2to9, variant=156-187, required=true (1)
        singleint_3to12;;intpairs_2to9, variant=8-23,100-187 (2)
```

Note: Inside a `mix`, the `<question>`'s `pick` attribute tells how many times to create such a question. If unspecified, default value is `1`. This attribute has no effect outside `mix` keys.

The rules to follow in a `mix` list are:

- Any numbers' source must be assignable to any of the questions of the section.
- Put at least as many numbers' sources as there are questions.

If you put more number's sources as there are questions, the extraneous ones will be ignored. This is useful when there are a lot of possibilities to pick from and you want to define special features to each of them, if chosen (like different number sources depending on variant or subvariant).

If among the sources you want to ensure there will be at least one of a certain type, you can set the `required` attribute of `nb` to `true`.

Also, note that the question's variant can be redefined as `nb`'s attribute (it overrides the one defined in `question`, if any).

Conclusion

Now the question is: how to know about the questions kinds and subkinds, and the possible contexts, variants or whatever other attributes? Well it is planned to add an easy way to know that (like a special directive) but there's nothing yet. The better, so far, may be to look at the provided sheets in `mathmaker/data/frameworks/` and see what's in there.

1.7 Install notes

1.7.1 eukleides install fix for FreeBSD

`eukleides` currently does not work out of the box. The pkg-installed version has a functional euktoeps script, it is required, so keep it somewhere. Then do `pkg remove eukleides` and re-install it from source:

- get the 1.5.4 source from http://www.eukleides.org/, for instance `wget http://www.eukleides.org/files/eukleides-1.5.4.tar.bz2`
- then `tar xvzf eukleides-1.5.4.tar.bz2`

- then possibly modify the prefix for install in the `Config` file, at your liking
- remove the making of documentation and manpages from the `install` target in the `Makefile` (they cause errors)
- install the required dependencies to compile eukleides: `pkg install bison flex gmake gcc`
- do `gmake` and then `gmake install`. This will provide functional binaries.
- replace the euktoeps script by the one you did get from the pkg installed version.
- if necessary (if `lualatex` complains about not finding `eukleides.sty`), reinstall `eukleides.sty` and `eukleides.tex` correctly:

```
# mkdir /usr/local/share/texmf-dist/tex/latex/eukleides
# cp /usr/local/share/texmf/tex/latex/eukleides/eukleides.* /usr/local/
↪share/texmf-dist/tex/latex/eukleides/
# mktexlsr
```

1.7.2 python-daemon error at install

You might get an error before the end of `mathmaker`'s installation:

```
error: The 'python-daemon>=2.1.1' distribution was not found and is required by␣
↪mathmaker
```

or:

```
File "/home/nico/dev/mathmaker/venv/test071_bis/lib/python3.6/site-packages/
↪setuptools/command/easy_install.py", line 250, in finalize_options
  'dist_version': self.distribution.get_version(),
File "/tmp/easy_install-myl7eaei/python-daemon-2.1.2/version.py", line 656, in get_
↪version
File "/tmp/easy_install-myl7eaei/python-daemon-2.1.2/version.py", line 651, in get_
↪version_info
File "/tmp/easy_install-myl7eaei/python-daemon-2.1.2/version.py", line 552, in get_
↪changelog_path
File "/usr/lib/python3.6/posixpath.py", line 154, in dirname
  p = os.fspath(p)
TypeError: expected str, bytes or os.PathLike object, not NoneType
```

Fix it this way:

```
# pip3 install python-daemon --upgrade
```

And finish the install:

```
# pip3 install mathmaker
```

CHAPTER 2

Developer's documentation

2.1 Guided tour

2.1.1 Foreword

This code has been developed chunk by chunk over more than 10 years now, starting with python2.3 or 4. Now it is a python3.6 software and my python skills have fortunately improved over the years. Problem is that several old parts, even after big efforts to correct the worst pieces, are not very idiomatic, especially the core.

Luckily there are unit tests, and whatever one might think about them, it's not difficult to admit that they're extremely useful to check nothing got broken when the core parts are written anew or debugged.

The documentation has been originately written using doxygen. Despite the fact it is an excellent documentation software, I have decided to move to Sphinx because it corresponds closer to python best practices. So, all doxygen-style comments will be turned into docstrings so mathmaker can use Sphinx to build the documentation. At the moment this work is just started, so the auto-generated Sphinx documentation is quite uncomplete now.

So, a part of the work to do is surely to bring new features, but another part, more annoying, is to turn ugly old parts into the right pythonic idioms. That's why at places you'll see that this or this other module is deprecated and should be "reduced", or rewritten. A list of such things to do is available on sourceforge.

2.1.2 The issue

It is utmost important to understand that mathmaker is not a software intended to *compute* mathematical stuff, but to *display* it. For instance, resolving a first-degree equation is not in itself a goal of mathmaker, because other softwares do that already (and we don't even need any software to do it). Instead, mathmaker will determine and display the steps of this resolution. Whenever possible, mathmaker solutions will try to mimic the pupils' way of doing things.

For instance, it won't automatically simplify a fraction to make it irreducible in one step, but will try to reproduce the steps that pupils usually need to simplify the fraction. So the GCD is only used to check when the fraction is irreducible and for the cases where there's no other choice, but not as the mean to simplify a fraction directly (not before pupils learn how to use it, at least).

Another example is the need of mathmaker to control the displaying of decimal and integer numbers perfectly. Of course, most of the time, it doesn't matter if a computer tells that 5.2×5.2 = 27.040000000000003 or 3.9×3.9 = 15.209999999999999 because everyone knows that the correct results are 27.04 and 15.21 and because the difference is not so important, so in many situations, this precision will be sufficient. But, mathmaker can't display to pupils that the result of 5.2×5.2 is 27.040000000000003.

Also, the human rules we use to write maths are full of exceptions and odd details we don't notice usually because we're familiar to them. We would never write

$+2x^2 + 1x - 1(+5 - 1x)$

but instead

$2x^2 + x - (5 - x)$

There are many conventions in the human way to write maths and many exceptions.

These are the reasons why the core is quite complex: re-create these writing rules and habits on a computer and let the result be readable by pupils is not an easy thing.

2.1.3 Workflow

Mathmaker creates Sheets of maths Exercises.

Each Exercise contains Questions.

Each Question uses objects from the core, that embbed enough information to compute and write the text of the Question and also the answer.

The main executable (`entry_point()` in `mathmaker/cli.py`) performs following steps:

- Load the default settings from configuration files.
- Setup the main logger.
- Check that the correct dependencies are installed.
- Parse the command-line arguments, updates the settings accordingly.
- Install the language and setup shared objects, like the database connection.
- If the main directive is `list`, it just write the directives list to stdout
- Otherwise, it checks that the directive matches a known sheet (either a yaml or xml file or a sheet's name that mathmaker provides) and writes the result to the output (`stdout` or a file) (xml will be dropped in 0.7.2)

2.1.4 The directories

Directories that are relevant to git, at the root:

```
.
├── docs
├── mathmaker
├── tests
└── toolbox
```

- The usual `docs/` and `tests/` directories
- `mathmaker/` contains the actual python source code
- `toolbox/` contains several standalone scripts that are useful for developers only (not users)

- Several usual files (`.flake8` etc.)
- `outfiles/` (not listed here, because it is not relevant to git) is where the garbage is put (figures created when testing, etc.). Sometimes it is useful to remove all garbage files it contains.

`mathmaker/`'s content:

```
$ tree -d -L 1 mathmaker -I __pycache__
mathmaker
├── data
├── lib
├── locale
└── settings
```

- `data/` is where the database is stored, but also yaml files containing additional wordings, translations etc.
- `lib/` contains all useful classes and submodules (see below).
- `locale/` contains all translation files.
- `settings/` contains the functions dedicated to setup the settings and also the default settings files themselves.

`lib/`'s content:

```
$ tree -d -L 3 mathmaker/lib -I __pycache__
mathmaker/lib
├── constants
├── core
├── document
│   ├── content
│   │   ├── algebra
│   │   ├── calculation
│   │   ├── geometry
│   │   └── ... (maybe some others in the future)
│   └── frames
├── machine
├── old_style_sheet
│   └── exercise
│       └── question
└── tools
```

- `constants/` contains several constants (but `pythagorean.py` must be replaced by requests to the database)
- `core/` contains all mathematical objects, numeric or geometric
- `document/` contains the frames for sheets, exercises in questions, under `document/frames/`, and the questions' content, under `document/content/`.
- `machine/` contains the "typewriter"
- `old_style_sheet/` contains all old style sheets, exercices and questions. All of this is obsolete (will be replaced by generic objects that take their data from yaml files and created by the objects defined in `document/frames/`)
- `tools/` contains collections of useful functions
  - `__init__.py` contains various functions
  - `database.py` contains all functions required to interact with mathmaker's database
  - `frameworks.py` contains a collection of useful functions to handle the collection of yaml sheet files
  - `ignition.py` contains several functions called at startup

  - `maths.py` contains some extra mathematical functions
  - `wording.py` contains a collection of useful functions to handle wordings
  - `xml.py` contains a collection of useful functions to handle the xml files (obsolete, will disappear in 0.7.2)
- `shared.py` contains objects and variables that need to be shared (except settings), like the database connection

2.1.5 Overview of the main classes

A Machine is like a typewriter: it turns all printable objects (Sheets, and everything they contain) into LaTeX. It knows how to turn a mathematical expression in LaTeX format. It knows how to draw figures from the geometrical objects (using eukleides).

The Sheet objects given to a Machine contain guidelines for the Machine: the layout of the Sheet and what Exercises it contains.

The Exercise objects contain Questions and also layout informations that might be specific to the exercise (for instance, display the equations' resolutions in two columns).

The Question objects contain the mathematical objects from the core and uses them to compute texts and answers. The real content is in `lib/document/content/*/*.py`. The appropriate module is used by the Question object (defined in `lib/document/frames/question.py`) to create the question's mathematical objects, wording and answer.

The objects from the core are all different kinds of mathematical objects, like Sums, Products, Equations or Triangles, Tables... For instance, a Question about Pythagora's theorem would embed a RightTriangle (which itself embeds information on its sides, vertices, angles; and enough methods to create a picture of it) but also fields telling if the figure should be drawn in the Question's text or if only a description of the figure should be given; if the hypotenuse should be calculated or another side; if the result should be a rounded decimal and how precise it should be etc.

When a new Sheet is created, all objects it contains are created randomly, following some rules, though, to avoid completely random uninteresting results.

More details about the core objects a little bit below, in the paragraph about *The core*.

2.2 Start working on mathmaker

2.2.1 Short version

> **Warning:** The work is currently (0.7.1) done with python 3.6.

Install dependencies:

- Ubuntu:

```
$ sudo apt-get install eukleides libxml2-utils gettext texlive-full
```

- FreeBSD:

```
$ sudo pkg install python36 py36-sqlite3 gettext eukleides libxml2 texlive-full
$ rehash
```

And FreeBSD users should check the *eukleides install fix for FreeBSD*

To install mathmaker in dev mode in a venv, get to the directory where you want to work, and (assuming git and python3.6 are installed):

- Ubuntu:

```
$ python3 -m venv dev0
$ source dev0/bin/activate
(dev0) $ pip3 install pytest tox flake8 pydocstyle sphinx sphinx-autodoc-
↪annotation sphinx-rtd-theme
(dev0) $ mkdir mathmaker
(dev0) $ cd mathmaker/
(dev0) $ git clone https://github.com/nicolashainaux/mathmaker.git
(dev0) $ python3 setup.py develop
```

- FreeBSD:

```
$ python3 -m venv dev0
$ source dev0/bin/activate.csh
[dev0] $ sudo pip3 install pytest tox flake8 pydocstyle sphinx sphinx-autodoc-
↪annotation sphinx-rtd-theme
[dev0] $ mkdir mathmaker
[dev0] $ cd mathmaker/
[dev0] $ git clone https://github.com/nicolashainaux/mathmaker.git
[dev0] $ python3 setup.py develop
```

Usage: get to an empty directory and:

```
(dev0) $ mathmaker test_11_2 > out.tex
(dev0) $ lualatex out.tex
```

You can check `out.pdf` with the pdf viewer you like.

Run the tools:

```
(dev0) $ cd path/to/mathmaker/tools/
(dev0) $ ./build_db.py
(dev0) $ ./update_pot_files
```

Most of the tests are stored under `tests/`. Some others are doctests. Any new test or doctest will be added automatically to the tests run by `py.test` or `tox`.

Run the tests:

```
(dev0) $ py.test
(dev0) $ tox
```

Tox will ignore missing python interpreters.

Edit the settings:

```
(dev0) $ cd path/to/mathmaker/settings/
(dev0) $ mkdir dev/
(dev0) $ cp default/*.yaml dev/
```

In `dev/logging.yaml` you can set the `__main__` logger to `INFO` (take care to define log rotation for `/var/log/mathmaker`). Set the dbg logger to `DEBUG`.

Each debugging logger can be enabled/disabled individually in `debug_conf.yaml` (by setting it to `DEBUG` or `INFO`).

See *Loggers: main, daemon, debugging, output watcher* for more details on how to setup new loggers (and debugging loggers).

You can override settings in `dev/user_config.yaml` to your liking.

Before starting, you should read at least the *Auxiliary tools* and *Writing rules* sections. It is certainly worth also to have a look at *Advanced features*.

Hope you'll enjoy working on mathmaker!

2.2.2 Detailed version

Dev environment

Note: python3.6 is mandatory for mathmaker development

Install external dependencies

You'll need to install the same dependencies as users do (see *Install*). In addition, `xgettext` is required to extract the gettext messages from py files. In Ubuntu 14.04 it's in the `gettext` package.

Get mathmaker's source code from github repo

In the folder of your choice:

```
$ git clone https://github.com/nicolashainaux/mathmaker.git
```

Setup a python virtual environment

It is strongly advised to install mathmaker in develop mode inside of a python virtual environment. This allows to install the required libraries without conflicting with other projects or python software on the same computer. Just get to the directory of your choice, and to create a virtual environment named `dev0`, you type:

```
$ python3 -m venv dev0
```

From there, you can activate it:

on Ubuntu:

```
$ source dev0/bin/activate
```

on FreeBSD:

```
$ source dev0/bin/activate.csh
```

Install mathmaker

Once your virtual environment is activated, go to mathmaker's root:

```
(dev0) $ cd path/to/mathmaker/
```

You should see something like:

```
(dev0) $ ls
CHANGELOG.rst  docs  LICENSE  MANIFEST.in  mathmaker README.md  README.rst
↪requirements.txt  setup.py  tests  tools  tox.ini
```

There you can install mathmaker in developer mode:

```
(dev0) $ python3 setup.py develop
```

It's possible to clean the project's main directory:

```
(dev0) $ python3 setup.py clean
```

Run mathmaker and tools

From now on, it is possible to run `mathmaker` from your virtual environment. As `mathmaker` is installed in developer mode, any change in the source files will be effective when running `mathmaker`. Go to a directory where you can leave temporary files (each sheet requiring pictures will produce picture files, by default), and test it:

```
(dev0) $ cd path/to/garbage/directory/
(dev0) $ mathmaker test_11_2 > out.tex
(dev0) $ lualatex out.tex
```

You can check `out.pdf` with the pdf viewer you like.

You can also run the tools:

```
(dev0) $ cd path/to/mathmaker/
(dev0) $ cd toolbox/
(dev0) $ ./build_db.py
(dev0) $ ./update_pot_files
```

Somewhat below, more informations about the *Auxiliary tools*.

Once you're done working with mathmaker, you can deactivate the virtual environment:

```
(dev0) $ deactivate
$
```

Note that it is possible to run `mathmaker` outside the virtual environment this way:

```
$ cd path/to/mathmaker/
$ python3 -m mathmaker.cli
```

But it requires to have installed the python dependencies yourself on the host system (e.g. the computer) and maybe also to have set `$PYTHONPATH` correctly (and exported it).

Other dependencies

Linters

It is recommended to install linters for PEP 8 and PEP 257 (see *Writing rules*):

```
(dev0) $ pip3 install flake8
(dev0) $ pip3 install pydocstyle
```

Test dependencies

In addition you should install at least `py.test`, and also `tox` if you intend to run tox tests:

```
(dev0) $ pip3 install pytest
(dev0) $ pip3 install tox
```

Below is more information about *testing*.

Documentation dependencies

You'll need to install these dependencies in the virtual environment:

```
(dev0) $ pip3 install sphinx sphinx-rtd-theme
```

`sphinx-rtd-theme` is the theme used for mathmaker's documentation. It's the readthedocs theme.

Note: `sphinx-autodoc-annotation` makes writing docstrings lighter when using python3 annotations. Problem is, this package currently has a bug that prevents to build the doc on readthedocs.

Below is more information about *documentation*.

Dev settings

You can make a copy of the default configuration files:

```
(dev0) $ cd path/to/mathmaker/
(dev0) $ cd settings/
(dev0) $ mkdir dev/
(dev0) $ cp default/*.yaml dev/
```

Then you can edit the files in `mathmaker/settings/dev/` to your liking. Any value redefined there will override all other settings (except the options from the command line).

In `logging.yaml` the loggers part is interesting. I usually set the `__main__` logger to `INFO` (this way, informations about starting and stopping mathmaker are recorded to `/var/log/mathmaker`, take care to define the log rotation if you do so) and the dbg logger to `DEBUG`. This second setting is important because it will allow to enable debugging loggers in `debug_conf.yaml`.

`debug_conf.yaml` allows to trigger each debugging logger individually by setting it to `DEBUG` instead of `INFO`.

And in `user_config.yaml` it is especially nice to define an output directory where all garbage files will be stored, but also to set the language, the font etc.

For instance, my `settings/dev/user_config.yaml` contains this:

```
# SOFTWARE'S CONFIGURATION FILE

PATHS:
```

(continues on next page)

(continued from previous page)

```
    OUTPUT_DIR: /home/nico/dev/mathmaker/poubelle/

LOCALES:
    LANGUAGE: fr_FR
    CURRENCY: euro

LATEX:
    FONT: Ubuntu
    ROUND_LETTERS_IN_MATH_EXPR: True

DOCUMENT:
    QUESTION_NUMBERING_TEMPLATE_SLIDESHOWS: "n°{n}"
```

See *Settings* to learn more about the way settings are handled by `mathmaker`.

Testing

Run the tests

The testing suite is run by py.test this way:

```
(dev0) $ py.test
```

or this way:

```
(dev0) $ python3 setup.py test
```

Where do they live?

Most of the tests belong to `tests/`. Any function whose name starts with `test_` written in any python file whose name also starts with `test_` (and stored somewhere under `tests/`) and will be automatically added to the tests run by `py.test`.

Some more tests are written as doctests (see also pytest documentation about doctests) in the docstrings of the functions. It's possible to add doctests, especially for simple functions (sometimes it is redundant with the tests from `tests/`, but this is not a serious problem). The configuration for tests is so that any new doctest will be automatically added to the tests run by `py.test`.

Tox

To test `mathmaker` against different versions of python, you can run tox this way:

```
(dev0) $ tox
```

or this way:

```
(dev0) $ python3 setup.py tox
```

Be sure you have different versions of python installed correctly on your computer before starting this. The missing versions will be skipped anyway. Note that it is not a purpose of `mathmaker` to run under a lot of python versions (several python3 versions are OK, but no support for python2 is planned, unless someone really wants to do that).

Loggers: main, daemon, debugging, output watcher

See *Dev settings* to know how to use the settings files and enable or disable logging and debugging.

Main logger

__main__ is intended to be used for messages relating to mathmaker general working. In particular, it should be used to log any error that forces mathmaker to stop, before it stops.

In order to use this __main__ logger, you can write this at the start of any function (assuming you have imported settings at the top of the file):

```
log = settings.mainlogger
```

And then inside this function:

```
log.error("message")
```

(or log.warning("message") or log.critical("message") depending on the severity level).

If an Exception led to stop mathmaker, then the message should include its Traceback (if you notice this is not the case somewhere, you can modify this and make a pull request). For instance in cli.py:

```
try:
    shared.machine.write_out(str(sh))
except Exception:
    log.error("An exception occured during the creation of the sheet.",
              exc_info=True)
    shared.db.close()
    sys.exit(1)
```

Daemon logger

This logger is intended to be used by the daemon script. Works the same way as the main logger.

Debugging logger

dbg is the logger dedicated to debugging and ready to use. No need to write sys.stderr.write(msg) anywhere.

If there's no logger object in the function you want to print debugging messages, you can create one this way:

- Add the matching entry in debug_conf.yaml (both the settings/default/ and settings/dev/ versions, but set to INFO in the settings/default/ version). For short modules, you can add only one level, and for modules containing lots of functions of classes, two levels should be added, like the example of the extract below:

```
dbg:
    db: INFO
    wording:
        merge_nb_unit_pairs: INFO
        setup_wording_format_of: INFO
        insert_nonbreaking_spaces: INFO
    class_or_module_name:
        fct: DEBUG
```

- Import the settings at the top of the file, if it's not done yet:

```
from mathmaker import settings
```

- Create the logger at the start of the function (i.e. locally):

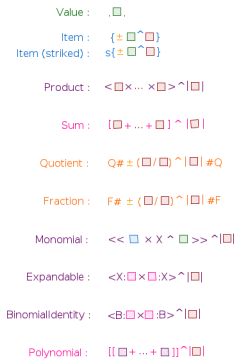
```
def fct():
    log = settings.dbg_logger.getChild('class_or_module_name.fct')
```

- Then where you need it, inside `fct`, write messages this way:

```
log.debug("the message you like")
```

Later when you need to disable this logger, you just set it to `INFO` instead of `DEBUG` in `settings/dev/debug_conf.yaml`. See *Dev settings* for information on these files.

A summary of the conventions used to represent the different core objects (i.e. what their `__repr__()` returns):



Output Watcher logger

This is another debugging logger. It can be used to check wether output is as expected, in order to detect bugs that do not crash mathmaker. Works the same way as the main logger. The log messages are sent to another facility (local4), in order to be recorded independently.

System log configuration

Systems using `rsyslog`

The communication with `rsyslog` goes through a local Unix socket (no need to load `rsyslog` TCP or UDP modules).

Note: The default socket is `/dev/log` for Linux systems, and `/var/run/log` for FreeBSD. These values are defined in the logging*.yaml settings files.

`rsyslog` may be already enabled and running by default (Ubuntu) or you can install, enable and start it (in Manjaro, `# systemctl enable rsyslog` and `# systemctl start rsyslog`).

Ensure `/etc/rsyslog.conf` contains these lines:

```
$ModLoad imuxsock

$IncludeConfig /etc/rsyslog.d/*.conf
```

Then create (if not created yet) a 'local' configuration file, like: `/etc/rsyslog.d/40-local.conf` and put (or add) in it:

```
#  Local user rules for rsyslog.
#
#
local4.*                        /var/log/mathmaker_output.log
local5.*                        /var/log/mathmaker.log
local6.*                        /var/log/mathmakerd.log
```

Then save it and restart:

- in Ubuntu: `# service rsyslog restart`
- in Manjaro: `# systemctl restart rsyslog`

Warning: Do not create `/var/log/mathmaker.log` yourself with the wrong rights, otherwise nothing will be logged.

To format the messages in a nicer way, it's possible to add this in /etc/rsyslog.conf:

```
$template MathmakerTpl,"%$now% %timegenerated:12:23:date-rfc3339% %syslogtag%%msg%\n"
```

and then, modify /etc/rsyslog.d/40-local.conf like:

```
local4.*                        /var/log/mathmaker_output.log;MathmakerTpl
local5.*                        /var/log/mathmaker.log;MathmakerTpl
local6.*                        /var/log/mathmakerd.log;MathmakerTpl
```

Tools to check everything's fine: after having restarted rsyslog, enable some more informations output:

```
# export RSYSLOG_DEBUGLOG="/var/log/myrsyslogd.log"
# export RSYSLOG_DEBUG="Debug"
```

and running the configuration validation:

```
# rsyslogd -N2 | grep "mathmaker"
```

should show something like (errorless):

```
rsyslogd: version 7.4.4, config validation run (level 2), master config /etc/rsyslog.
↪conf
2564.153590773:7f559632b780:   ACTION 0x2123160 [builtin:omfile:/var/log/mathmaker.
↪log;MathmakerTpl]
2564.154126386:7f559632b780:   ACTION 0x2123990 [builtin:omfile:/var/log/mathmakerd.
↪log;MathmakerTpl]
2564.158461309:7f559632b780:   ACTION 0x2123160 [builtin:omfile:/var/log/mathmaker.
↪log;MathmakerTpl]
2564.158729012:7f559632b780:   ACTION 0x2123990 [builtin:omfile:/var/log/mathmakerd.
↪log;MathmakerTpl]
rsyslogd: End of config validation run. Bye.
```

Once you've checked this works as expected, do not forget to configure your log rotation.

Note: mathmaker does not support systemd journalisation (the default one in Manjaro). You may have to setup systemd too (enable `ForwardToSyslog` in its conf file) in order to get `rsyslog` recording messages. Also you may need to add `$ModLoad imjournal` in `/etc/rsyslog.conf` and to create the file `/var/spool/rsyslog`. For a better setup, see https://www.freedesktop.org/wiki/Software/systemd/syslog/. A workaround to prevent duplicate messages could be to discard the unwanted ones, like described here: http://www.rsyslog.com/discarding-unwanted-messages/.

Documentation

Current state

As stated in the *Foreword*, the documentation is being turned from doxygen to Sphinx, so there are missing parts .

Any new function or module has to be documented as described in PEP 257.

The doxygen documentation for version 0.6 is here. The core parts are still correct, so far.

Format

This documentation is written in ReStructured Text format.

There are no newlines inside paragraphs. Set your editor to wrap lines automatically to your liking.

Make html

To produce the html documentation:

```
(dev0) mathmaker [dev] $ $ cd docs/
(dev0) mathmaker/docs [dev] $ $ make html
```

If modules have changed (new ones, deleted ones), it is necessary to rebuild the autogenerated index:

```
(dev0) mathmaker/docs [dev] $ sphinx-apidoc -f -o . ../mathmaker
```

Auxiliary tools

Several standalone scripts live in the `toolbox/` directory under root. They can be useful for several tasks that automate the handling of data.

The two most useful ones are both meant to be run from the `toolbox/` directory. They are:

- `build_db.py`, used to update the database when there are new entries to add in it. If new words of 4 letters are added to any po file, `build_db.py` should be run, it will add them to the database. If new wordings are entered in `mathmaker/data/wordings/*.xml` (obsolete: xml files will be replaced by yaml files up from 0.7.2), then it should be run too. See details in the docstring. And if a new table is required, it should be added in this script. For instance, the pythagorean triples should live in the database and will be added to this list soon or later.

- `update_pot_files`, a shell script making use of `xgettext` and of the scripts `merge_py_updates_to_main_pot_file`, `merge_yaml_updates_to_pot_file` and `merge_xml_updates_to_pot_file` (this last one will be removed in 0.7.2). Run `update_pot_files` to update `locale/mathmaker.pot` when new strings to translate have been added to python code (i.e. inside a call to `_()`) or new entries have been added to any yaml or xml (xml files will be turned to yaml files in 0.7.2) file from `mathmaker/data` (only entries matching a number of identifiers are taken into account, see DEFAULT_KEYWORDS in the source code to know which ones exactly).
- `build_index.py` will build the index of available sheets. Run it when you need to test a new sheet.

`import_msgstr` and `retrieve_po_entries` are useful on some rare occasions. See their docstrings for more explanations. They both have a `--help` option.

`pythagorean_triples_generator` shouldn't be of any use any more (later on maybe a part of its code will be incorporated to `build_db.py`, that's why it's still around here)

Writing rules

It is necessary to write the cleanest code possible. It has not been the case in the past, but the old code is updated chunk by chunk and **any new code portion must follow python's best practices**, to avoid adding to the mess, and so, must:

- Use idioms (to learn some, it is recommended to read Jeff Knupp's Writing Idiomatic Python)
- Conform to the PEP 8 – Style Guide for Python
- Conform to the PEP 257 – Docstring Conventions

And of course, all the code is written in english.

As to PEP 8, mathmaker 's code being free from errors, the best is to use a linter, like `flake8`. They also exist as plugins to various text editors or IDE (see *Atom packages* for instance). Three error codes are ignored (see `.flake8`):

- E129 because it is triggered anytime a comment is used to separate a multiline conditional of an `if` statement from its nested suite. A choice has been made to wrap multiline conditions in `()` and realize the separation with next indented block using a `# ___` comment (or any other comment if it's necessary) and this complies with PEP 8 (second option here):

  Acceptable options in this situation include, but are not limited to:

  ```
  # No extra indentation.
  if (this_is_one_thing and
      that_is_another_thing):
      do_something()

  # Add a comment, which will provide some distinction in editors
  # supporting syntax highlighting.
  if (this_is_one_thing and
      that_is_another_thing):
      # Since both conditions are true, we can frobnicate.
      do_something()
  ```

- W503 because PEP 8 does not compel to break before binary operators (the choice of breaking *after* binary operators has been done).
- E704 because on some occasions it is OK to put several *short* statements on one line in the case of `def`. It is the case in several test files using lines like `def v0():  return Value(4)`

Other choices are:

- A maximum line length of 79
- Declare _ as builtin, otherwise all calls to `_()` (i.e. the translation function installed by gettext) would trigger flake8's error F821 (undefined name).
- No complexity check. This might change in the future, but the algorithms in the core are complex. It's not easy to make them more simple (if anyone wants to try, (s)he's welcome).
- Name modules, functions, instances, and other variables in lower case, whenever possible using a single `word` but if necessary, using `several_words_separated_with_underscores`.
- Name classes in CapitalizedWords, like: `SuchAWonderfullClass` (don't use mixedCase, like `wrongCapitalizedClass`).
- All `import` statements must be at the top of any module. It must be avoided to add `from ... import ...` at the top of some functions, but sometimes it's necessary. A solution to avoid this is always preferred.
- All text files (including program code) are encoded in UTF-8.

As to PEP 257, this is also a good idea to use a linter, but lots of documentation being written as doxygen comments, the linter will detect a lot of missing docstrings. Just be sure the part you intend to push does not introduce new PEP 257 errors (their number must decrease with time, never increase).

The text of any docstring is marked up with reStructuredText.

The module *mathmaker.lib.tools.wording* can be considered as a reference on how to write correct docstrings. As an example, the code of two functions is reproduced here.

Note: The use of python3's annotations and `sphinx-autodoc-annotation` would automatically add the types (including return type) to the generated documentation. If `sphinx-autodoc-annotation`'s bug is corrected, the `:type ...:  ...` and `:rtype:  ...` lines will be removed.

```
def cut_off_hint_from(sentence: str) -> tuple:
    """
    Return the sentence and the possible hint separated.

    Only one hint will be taken into account.

    :param sentence: the sentence to inspect
    :type sentence: str
    :rtype: tuple

    :Examples:

    >>> cut_off_hint_from("This sentence has no hint.")
    ('This sentence has no hint.', '')
    >>> cut_off_hint_from("This sentence has a hint: |hint:length_unit|")
    ('This sentence has a hint:', 'length_unit')
    >>> cut_off_hint_from("Malformed hint:|hint:length_unit|")
    ('Malformed hint:|hint:length_unit|', '')
    >>> cut_off_hint_from("Malformed hint: |hint0:length_unit|")
    ('Malformed hint: |hint0:length_unit|', '')
    >>> cut_off_hint_from("Two hints: |hint:unit| |hint:something_else|")
    ('Two hints: |hint:unit|', 'something_else')
    """
    last_word = sentence.split()[-1:][0]
    hint_block = ""
    if (is_wrapped(last_word, braces='||')
        and last_word[1:-1].startswith('hint:')):
```

(continues on next page)

(continued from previous page)

```
        # __
        hint_block = last_word
    if len(hint_block):
        new_s = " ".join(w for w in sentence.split() if w != hint_block)
        hint = hint_block[1:-1].split(sep=':')[1]
        return (new_s, hint)
    else:
        return (sentence, "")


def merge_nb_unit_pairs(arg: object):
    r"""
    Merge all occurences of {nbN} {\*_unit} in arg.wording into {nbN\_\*_unit}.

    In the same time, the matching attribute arg.nbN\_\*_unit is set with
    Value(nbN, unit=Unit(arg.\*_unit)).into_str(display_SI_unit=True)
    (the possible exponent is taken into account too).

    :param arg: the object whose attribute wording will be processed. It must
      have a wording attribute as well as nbN and \*_unit attributes.
    :type arg: object
    :rtype: None

    :Example:

    >>> class Object(object): pass
    ...
    >>> arg = Object()
    >>> arg.wording = 'I have {nb1} {capacity_unit} of water.'
    >>> arg.nb1 = 2
    >>> arg.capacity_unit = 'L'
    >>> merge_nb_unit_pairs(arg)
    >>> arg.wording
    'I have {nb1_capacity_unit} of water.'
    >>> arg.nb1_capacity_unit
    '\\SI{2}{L}'
    """
```

Atom packages

This paragraph lists useful packages for atom users (visit the links to have full install and setup informations):

- `flake8` linter provider: linter-flake8 (Note: you should let the settings as is, except for the "Project config file" entry where you can write ".flake8" to use `mathmaker` project's settings.)
- `pydocstyle` linter provider: linter-pydocstyle
- python3's highlighter: MagicPython (MagicPython is able to highlight correctly python3's annotations. You'll have to disable the language-python core package.)
- To edit rst documentation: language-restructuredtext and rst-preview-pandoc

2.3 A deeper look in the source code

2.3.1 Settings

Everything happens in `mathmaker/settings/__init__.py` (it would be better to have everything happening rather in something like `mathmaker/settings/settings.py`, so this will most certainly change).

This module is imported by the main script at start, that run its `init()` function. After that, any subsequent `from mathmaker import settings` statement will make `settings.*` available.

The values shared as `settings.*` are: the paths to different subdirectories of the project, the loggers and the values read from *configuration* files. (Plus at the moment, two default values that should move to some other place).

None of these values is meant to be changed after it has been set by the main script, what calls `settings.init()` and then corrects some of them depending on the command-line options. Once this is done, these values can be considered actually as constants (they are not really constants as they are setup and corrected, so no UPPERCASE naming).

`tests/conftest.py `` uses the ``settings` module the same way `mathmaker/cli.py` does.

2.3.2 Configuration

`load_config()` handles this and is defined in `mathmaker/lib/tools/__init__.py`. It works the same way for any of the `*.yaml` files. It first loads the default values from `mathmaker/settings/default/filename.yaml`. Then it updates any value found redefined in any of these files: `/etc/mathmaker/filename.yaml`, `~/.config/mathmaker/filename.yaml` and `mathmaker/settings/dev/filename.yaml`. Any missing file is skipped (except the first one: the default settings are part of the code, are shipped with it and must be present).

An extended dict class is used to deal easier with dicts created from yaml files. See in `mathmaker/lib/tools/__init__.py`.

2.3.3 The daemon

It's a daemonized web server that allows to communicate with mathmaker through http requests. See *http server (mathmakerd)*.

2.3.4 Shared

Three resources are shared: *the database*, the LaTeX machine and the sources.

`mathmaker/lib/shared.py` works a similar way as the `settings` module. It is initialized once in the main script and then its resources are used.

2.3.5 The database

The aim of the database is to avoid having to create a lot of randomly values and store them in lists or dicts everytime we need something.

It is considered as a source among others.

2.3.6 The sources

They concern as well numbers as words or letters or anything one can think of.

Note: Old style sheets don't use sources.

When random numbers are required, most of the time, we don't need complete random. For instance if we want a pair of integers for the multiplication tables between 2 and 9, we don't want to ask the same question twice in a row.

The sources manage this randomness. Anytime we need to use a source, we can use its `next()` method to get the next random data, without worrying in the same time whether it's the same as the previous one or not.

So we have sources for names, for words having a limited number of letters, for different kinds of numbers but also for mini-problems wordings.

So far, there are two kinds of sources: the ones that are provided by the database, and the ones that are provided by the function `generate_values()`. They both reside in `mathmaker/lib/tools/database.py`.

All sources are initialized in `mathmaker/lib/shared.py`. There you can see which one has its values provided by the database, which are the other ones.

The database provides an easy way to ensure the next value will be different from the last one: we simply "stamp" each drawn value and the next time we draw a value among the yet unstamped ones. When they're all stamped, we reset all stamps and redraw. There's a tiny possibility to draw two times in a row the same value, so far, but it's so tiny we can safely ignore it. (This could be improved later). The values drawn from `generate_values()` are so different the ones from the others that it's very unlikely to draw the same ones two times in a row.

2.3.7 The real and the fake translation files

`mathmaker/locale/mathmaker.pot` is a real translation file.

The other `mathmaker/locale/*.pot` files are "fake" ones. They are used to get random words in a specific language, but the words do not need to be the exact translation from a source language.

For instance, `w4l.pot` contains words of four different letters. It wouldn't make sense to translate the english word "BEAN" into a word of the same meaning AND having exactly four different letters, in another language. This wouldn't work for french, for instance. In general this would only work for rare exceptions (like "HALF" can be translated to "DEMI" in french).

The same applies to `feminine_names.pot` and `masculine_names.pot`. These files are used to get random names, but we don't need to *translate* them.

So, the entries in these "fake" translation files are only labeled entries, with nothing to translate.

A translator only needs to provide a number of entries (at least 10) in each of these files. No matter how many, no matter which `msgid` do they match. So: in `masculine_names.po` are several masculine names required, in `feminine_names.po` are several feminine names required and in `w4l.po` are several words of four unique letters required. Each time, at least 10, and then, the more the better.

2.3.8 The sheets, exercises and questions

There is still a bunch of "old-style" written sheets, that were not generated from yaml documents. I won't describe them thoroughly. They will disappear in the future, when they're replaced by their yaml counterparts. They are kept in `lib/old_style_sheet/`, so far. They use the classes `S_Structure` and `S_Generic`. `S_Structure` handles the layout of the sheet depending on the `SHEET_LAYOUT` dict you can find at the top of any sheet module.

Another bunch have been written in XML. They will disappear. So far, `mathmaker` can read the sheets data from a xml or a yaml document, but the xml format will be dropped in 0.7.2, so don't bother with it now.

So, all new sheets are stored in yaml files (under `data/frameworks/theme/subtheme.yaml`, for instance `data/frameworks/algebra/expand.yaml`).

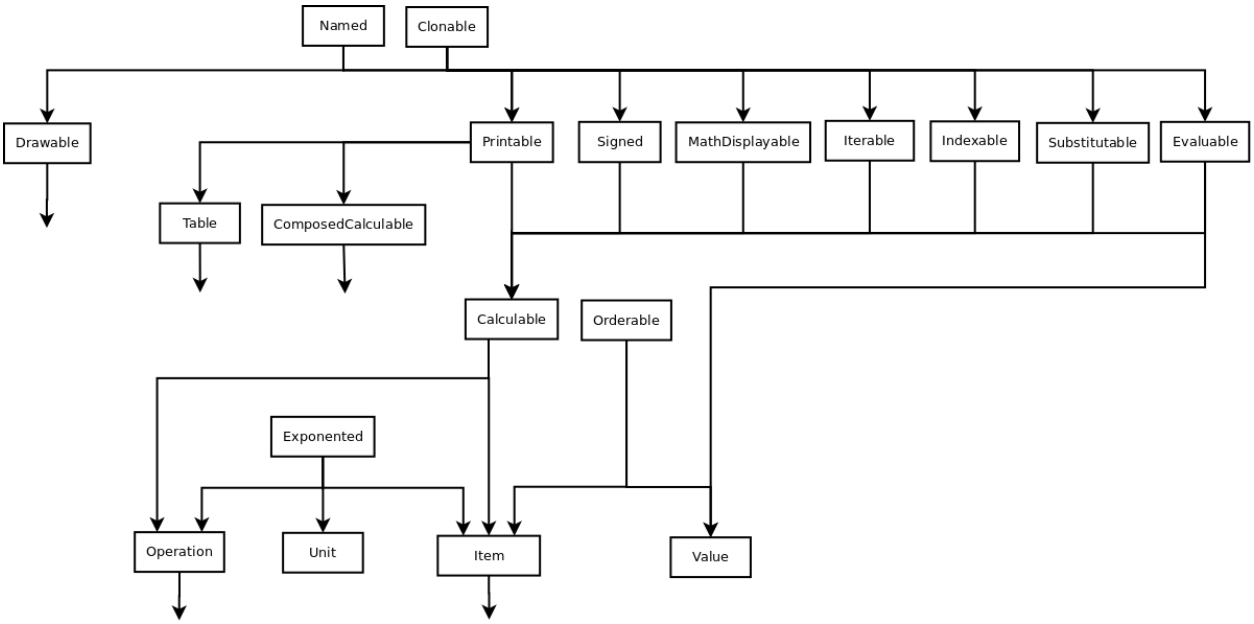
They are handled by `sheet.py`, `exercise.py` and `question.py` in `lib/document/frames/`.

2.3.9 The core

Diagram

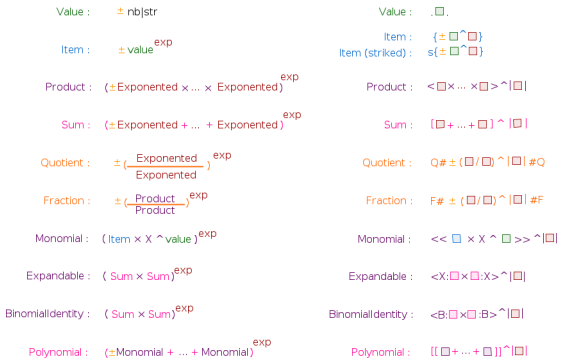
You can check the 0.6 version (i.e. from doxygen) of the top of the core diagram, though it will be somewhat changed later, it still can be used as reference for some time.

Unfinished draft of future plans:



Core objects' summary

Objects at left; associated `__repr()` at right:



Core objects' details

The "old" doc for 0.6 version is available here and mainly still correct for 0.7 version. When things will have settled down to something more stable, an updated documentation will be published chunk by chunk.

2.4 What can be done?

See the tickets on sourceforge and especially the ones for the 1.0 version.

2.5 mathmaker package

2.5.1 Subpackages

mathmaker.lib package

Subpackages

mathmaker.lib.constants package

Submodules

mathmaker.lib.constants.content module

mathmaker.lib.constants.latex module

mathmaker.lib.constants.numeration module

mathmaker.lib.constants.pythagorean module

mathmaker.lib.constants.pythagorean.**get_legs_matching_given_hypotenuse**(*side_length*)

mathmaker.lib.constants.pythagorean.**get_legs_matching_given_leg**(*side_length*)

mathmaker.lib.constants.units module

Module contents

mathmaker.lib.core package

Submodules

mathmaker.lib.core.base module

class mathmaker.lib.core.base.**Clonable**

Bases: object

clone()

class mathmaker.lib.core.base.**Drawable**
Bases: *mathmaker.lib.core.base.NamedObject*

eps_filename

euk_filename

into_euk()

into_pic(*create_pic_file=True*)

name

class mathmaker.lib.core.base.**NamedObject**
Bases: *mathmaker.lib.core.base.Clonable*

name

class mathmaker.lib.core.base.**Printable**
Bases: *mathmaker.lib.core.base.NamedObject*

into_str(***options*)

jsprinted
Shortcut for self.into_str(force_expression_begins=True, js_repr=True)

This returns the string of the Printable object, assuming it starts the expression.

printed
Shortcut for self.into_str(force_expression_begins=True)

This returns the string of the Printable object, assuming it starts the expression.

mathmaker.lib.core.base_calculus module

class mathmaker.lib.core.base_calculus.**AngleItem**(*raw_value=None*, *copy_this=None*, *from_this_angle=None*)
Bases: *mathmaker.lib.core.base_calculus.Item*

Represent Angles' names, like widehat{ABC} (handled as Items).

into_str(***options*)
Return the printed version of the AngleItem.

If the AngleItem is literal, it will be displayed like a literal Item yet wrapped in a 'wide hat'. If it is not numeric, the unit will be automatically discarded.

class mathmaker.lib.core.base_calculus.**BinomialIdentity**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base_calculus.Expandable*

a
Gets the 'a' term of the BinomialIdentity

b
Gets the 'b' term of the BinomialIdentity

expand()

expand_and_reduce_next_step(***options*)

get_a()

get_b()

get_kind()

into_str(***options*)

kind
kind of BinomialIdentity it, e.g. 'sum_square'|'difference_square'|'squares_difference'

class mathmaker.lib.core.base_calculus.**CommutativeOperation**
Bases: *mathmaker.lib.core.base_calculus.Operation*

append(*elt*)

compact_display
compact_display field of a CommutativeOperation

contains_a_rounded_number()

contains_exactly(*objct*)

evaluate(***options*)

get_compact_display()

get_first_letter()

get_info()

get_sign()

info
info field of a CommutativeOperation

is_displ_as_a_single_int()

is_displ_as_a_single_neutral(*neutral_elt*)

is_displ_as_a_single_numeric_Item()

remove(*elt*)

set_compact_display(*arg*)

set_info(*arg*)

set_sign(*arg*)

throw_away_the_neutrals()

class mathmaker.lib.core.base_calculus.**Division**(*arg*, *ignore_1_denominator=False*, ***options*)
Bases: *mathmaker.lib.core.base_calculus.Quotient*

Same as Quotient, but using ÷ sign as default.

class mathmaker.lib.core.base_calculus.**Expandable**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base_calculus.Product*

calculate_next_step(***options*)

expand(***options*)

expand_and_reduce_()

expand_and_reduce_next_step(***options*)

is_expandable()

class mathmaker.lib.core.base_calculus.**Fraction**(*arg*, *ignore_1_denominator=False*, ***options*)

Bases: *mathmaker.lib.core.base_calculus.Quotient*

calculate_next_step(***options*)

completely_reduced()

evaluate(***options*)

expand_and_reduce_next_step(***options*)
If possible, expands Quotient's numerator and/or denominator.

get_first_letter()

get_same_deno_reduction_in_progress()

get_simplification_in_progress()

get_status()

is_a_decimal_number()

is_reducible()

minimally_reduced(*ignore_1_denominator=False*)
Return the simplest reduction step possible

reduced_by(*n*, *ignore_1_denominator=False*)
Divide numerator and denominator by n.

replace_striked_out()

same_deno_reduction_in_progress
Fraction's same_deno_reduction_in_progress field

set_down_numerator_s_minus_sign()

set_same_deno_reduction_in_progress(*arg*)

set_status(*arg*)

simplification_in_progress
Fraction's simplification_in_progress status

simplification_line()

simplified()

status
Fraction's status

class mathmaker.lib.core.base_calculus.**Function**(*copy_this=None*, *name='f'*, *var={+x (unit='') ^1.}*, *fct=<function Function.<lambda>>*, *num_val=1.*, *display_mode='literal'*, *inv_fct=None*, *unlocked=False*)

Bases: *mathmaker.lib.core.base_calculus.Item*

Represent the image of a number under a function like f(x) or cos(ABC).

argument

calculate_next_step(***options*)
Will only swap to numeric argument, no automatic evaluation.

contains_a_rounded_number()
f(...) neither its argument never have any reason to be rounded.

contains_exactly(*objct*)
True if the looked for object is self.

evaluate(**options*)
Return the value of f(number).

expand_and_reduce_next_step(**options*)
Same as calculate_ntext_step(), for Functions.

fct
The lambda function to use for evaluation.

get_first_letter()
Return the first letter of Function's name.

get_iteration_list()
Return [variable, exponent].

get_minus_signs_nb()
1 if Function object has a negative sign and no even exponent, else 0.

image_notation

into_str(**options*)
Creates the str version of the Function.

inv_fct
The lambda function to use for evaluation.

is_displ_as_a_single_0()
f(x) is never a single 0.

is_displ_as_a_single_1()
f(x) is never a single 1.

is_displ_as_a_single_int()
f(x) is never a single int.

is_displ_as_a_single_minus_1()
f(x) is never a single -1.

is_displ_as_a_single_neutral(*elt*)
f(x) is never a single neutral element.

is_displ_as_a_single_numeric_Item()
f(x) is never a single numeric Item (like any single number).

is_expandable()
f(x) is not expandable.

is_literal(*displ_as=False*) → bool
Return True if Function is to be considered literal.

Parameters **displ_as** – if displ_as is True, it's about knowing whether the object should be considered literal for display, otherwise, it's about knowing wether it can be numerically evaluated (directly, without replacing its variable by a Value).

is_null()
True if self evaluates to 0.

is_numeric(*displ_as=False*)
Return True if current display mode is numeric.

Parameters **displ_as** – if displ_as is True, it's about knowing whether the object should be considered numeric for display, otherwise, it's about knowing wether it can be numerically evaluated (directly, without replacing its variable by a Value).

multiply_symbol_is_required(*objct*, *position*)
True if × is required between self and next objct in a Product.

num_val

requires_brackets(*position*)
True if Function requires brackets inside a Product.

requires_inner_brackets()
Return True for cases like (-f(x))^2

set_literal_mode()
Set the display mode to 'literal'.

set_numeric_mode()
Set the display mode to 'numeric'.

substitute(*subst_dict*)
Substitute the argument by its value, if available in subst_dict.

unlocked

var

class mathmaker.lib.core.base_calculus.**Item**(*arg*, ***options*)
Bases: *mathmaker.lib.core.root_calculus.Exponented*

calculate_next_step(***options*)

contains_a_rounded_number()

contains_exactly(*objct*)

digits_number()

evaluate(***options*)

expand_and_reduce_next_step(***options*)

force_display_sign_once
Item's force_display_sign_once field

get_first_letter()

get_force_display_sign_once()

get_is_out_striked()

get_iteration_list()

get_minus_signs_nb()

get_raw_value()

get_unit()

get_value_inside()

into_str(***options*)

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_int()

is_displ_as_a_single_minus_1()

is_displ_as_a_single_neutral(*elt*)

is_displ_as_a_single_numeric_Item()

is_expandable()

is_literal(*displ_as=False*) → bool
Return True if Item is to be considered literal.

Parameters **displ_as** – not applicable to Items

is_null()

is_numeric(*displ_as=False*)

is_out_striked
Item's is_out_striked field

multiply_symbol_is_required(*objct*, *position*)

needs_to_get_rounded(*precision*)

raw_value
Item's raw value

requires_brackets(*position*)

requires_inner_brackets()

rounded(*precision*)

set_force_display_sign_once(*arg*)

set_is_out_striked(*arg*)

set_unit(*arg*)

set_value_inside(*arg*)

turn_into_fraction()

unit
Unit of the Item

value_inside
Item's Value

class mathmaker.lib.core.base_calculus.**Monomial**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base_calculus.Product*

coeff
Monomial's coefficient

degree
Monomial's degree

get_coeff()

get_degree()

get_first_letter()

get_raw_value()

get_sign()

get_value_inside()

is_negative()

is_null()

is_numeric(*displ_as=False*)

is_positive()

letter
Monomial's letter

raw_value
0-degree-Monomial's value

set_coeff(*arg*)

set_degree(*arg*)

set_letter(*letter*)

sign
Monomial's sign

value_inside
0-degree Monomial's Value inside

class mathmaker.lib.core.base_calculus.**Operation**
Bases: *mathmaker.lib.core.root_calculus.Exponented*

element
element field of Operation

get_element()

get_iteration_list()

get_neutral()

get_symbol()

is_expandable()

is_literal(*displ_as=False*) → bool
Return True if Operation is to be considered literal.

Parameters **displ_as** – not applicable to Operations

is_numeric(*displ_as=False*)

neutral
neutral field of Operation

operator(*arg1*, *arg2*)

reset_element()

set_element(*n*, *arg*)

set_symbol(*arg*)

symbol
symbol field of Operation

class mathmaker.lib.core.base_calculus.**Polynomial**(*arg*)
Bases: *mathmaker.lib.core.base_calculus.Sum*

degree
Real degree of the Polynomial

get_degree()

get_max_degree()

class mathmaker.lib.core.base_calculus.**Product**(*arg*, *compact_display=True*)
Bases: *mathmaker.lib.core.base_calculus.CommutativeOperation*

calculate_next_step(***options*)

expand_and_reduce_next_step(***options*)

factor
To access the factors of the Product.

get_factors_list(*given_kind*)

get_factors_list_except(*objct*)

get_first_factor()

get_minus_signs_nb()

into_str(***options*)

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_minus_1()

is_null()

is_reducible()

multiply_symbol_is_required(*objct*, *position*)

operator(*arg1*, *arg2*)

order()

reduce_()

requires_brackets(*position*)

requires_inner_brackets()

set_factor(*n*, *arg*)

class mathmaker.lib.core.base_calculus.**Quotient**(*arg*, *ignore_1_denominator=False*, ***options*)
Bases: *mathmaker.lib.core.base_calculus.Operation*

calculate_next_step(***options*)

contains_a_rounded_number()

contains_exactly(*objct*)

denominator
denominator field of Quotient

evaluate(***options*)

expand_and_reduce_next_step(**options)
If possible, expands Quotient's numerator and/or denominator.

get_denominator()

get_iteration_list()

get_minus_signs_nb()

get_numerator()

get_sign()

into_str(**options)

invert()

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_int()

is_displ_as_a_single_minus_1()

is_displ_as_a_single_neutral(*elt*)

is_displ_as_a_single_numeric_Item()

is_null()

multiply_symbol_is_required(*objct*, *position*)

numerator
numerator field of Quotient

operator(*arg1*, *arg2*)

requires_brackets(*position*)

requires_inner_brackets()

set_denominator(*arg*)

set_numerator(*arg*)

class mathmaker.lib.core.base_calculus.**SquareRoot**(*arg*, **options*)
Bases: *mathmaker.lib.core.base_calculus.Function*

calculate_next_step(**options)
Will only swap to numeric argument, no automatic evaluation.

contains_a_rounded_number()
f(. . .) neither its argument never have any reason to be rounded.

contains_exactly(*objct*)
True if the looked for object is self.

expand_and_reduce_next_step(**options)
Same as calculate_ntext_step(), for Functions.

force_display_sign_once
Item's force_display_sign_once field

get_force_display_sign_once()

get_iteration_list()
Return [variable, exponent].

get_minus_signs_nb()
1 if Function object has a negative sign and no even exponent, else 0.

into_str(**options*)
Creates the str version of the Function.

is_displ_as_a_single_0()
f(x) is never a single 0.

is_displ_as_a_single_1()
f(x) is never a single 1.

is_displ_as_a_single_int()
f(x) is never a single int.

is_displ_as_a_single_minus_1()
f(x) is never a single -1.

is_displ_as_a_single_neutral(*elt*)
f(x) is never a single neutral element.

is_displ_as_a_single_numeric_Item()
f(x) is never a single numeric Item (like any single number).

is_expandable()
f(x) is not expandable.

is_literal(*displ_as=False*)
Return True if SquareRoot is to be considered literal.

Parameters **displ_as** – not applicable to SquareRoots

is_null()
True if self evaluates to 0.

is_numeric(*displ_as=False*)
Return True if current display mode is numeric.

Parameters **displ_as** – if displ_as is True, it's about knowing whether the object should be considered numeric for display, otherwise, it's about knowing wether it can be numerically evaluated (directly, without replacing its variable by a Value).

multiply_symbol_is_required(*objct*, *position*)
True if × is required between self and next objct in a Product.

requires_brackets(*position*)
True if Function requires brackets inside a Product.

requires_inner_brackets()
Return True for cases like (-f(x))^2

set_force_display_sign_once(*arg*)

turn_into_fraction()

class mathmaker.lib.core.base_calculus.**Sum**(*arg*)
Bases: *mathmaker.lib.core.base_calculus.CommutativeOperation*

calculate_next_step(**options*)

expand_and_reduce_next_step(**options*)

force_inner_brackets_display
force_inner_brackets_display field of a Sum

get_force_inner_brackets_display()

get_literal_terms()

get_minus_signs_nb()

get_numeric_terms()

get_terms_lexicon()

intermediate_reduction_line()

into_str(***options*)

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_minus_1()

is_null()

is_reducible()

multiply_symbol_is_required(*objct*, *position*)

next_displayable_term_nb(*position*)

numeric_terms_require_to_be_reduced()

operator(*arg1*, *arg2*)

reduce_()

requires_brackets(*position*)

requires_inner_brackets()

set_force_inner_brackets_display(*arg*)

set_term(*n*, *arg*)

term
To access the terms of the Sum.

mathmaker.lib.core.base_geometry module

class mathmaker.lib.core.base_geometry.**Angle**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base.Drawable*, *mathmaker.lib.core.base.Printable*

into_euk()

into_str(***options*)

label

label_display_angle

mark

measure

points

vertex

class mathmaker.lib.core.base_geometry.**Point**(*name=None*, *x=None*, *y=None*)
Bases: *mathmaker.lib.core.base.Drawable*

into_euk()

name

rotate(*center*, *angle*, ***options*)

x

x_exact

xy

y

y_exact

class mathmaker.lib.core.base_geometry.**Ray**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base.Drawable*

into_euk()

class mathmaker.lib.core.base_geometry.**Segment**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base.Drawable*

dividing_points(*n=1*, *prefix='a'*)
Create the list of Points that divide the Segment in n parts.

Parameters **n** (*int*) – the number of parts (so it will create n - 1 points) n must be greater or equal to 1

into_euk()

invert_length_name()
Swap points' names in the length name. E.g. AB becomes BA.

label
Label of the Segment (the displayed information).

label_into_euk()
Return the label correctly positionned along the Segment.

length
Fake length of the Segment (the one used in a problem).

length_has_been_set
Whether the (fake) length has been set or not.

length_name
Length's name of the Segment, like AB.

mark

points

real_length
Real length (build length) of the Segment.

revert()

setup_label(*flag*)

class mathmaker.lib.core.base_geometry.**Vector**(*arg*, ***options*)
Bases: *mathmaker.lib.core.base_geometry.Point*

bisector_vector(*arg*)
Return a vector colinear to the bisector of self and another vector.

Parameters **arg** (Vector) – the other vector

into_euk()

norm
Return the norm of self.

orthogonal_unit_vector(*clockwise=True*)
Return a unit vector that's (default clockwise) orthogonal to self.

If clockwise is set to False, then the anti-clockwise orthogonal vector is returned.

slope
Return the slope of self.

unit_vector()
Return the unit vector built from self

mathmaker.lib.core.calculus module

class mathmaker.lib.core.calculus.**ComposedCalculable**
Bases: *mathmaker.lib.core.base.Printable*

class mathmaker.lib.core.calculus.**CrossProductEquation**(*arg*)
Bases: *mathmaker.lib.core.calculus.Equation*

get_variable_obj()

get_variable_position()

solve_next_step(***options*)

variable_obj
Variable object of the Equation

variable_position
Variable position in the Equation

class mathmaker.lib.core.calculus.**Equality**(*objcts*, *subst_dict=None*, ***options*)
Bases: *mathmaker.lib.core.calculus.ComposedCalculable*, *mathmaker.lib.core.root_calculus.Substitutable*

content
The content to be substituted (list containing literal objects).

elements
Elements of the object

equal_signs
Equal signs of the object

get_elements()

get_equal_signs()

into_str(***options*)

class mathmaker.lib.core.calculus.**Equation**(*arg*, ***options*)
Bases: *mathmaker.lib.core.calculus.ComposedCalculable*

auto_resolution(***options*)

get_left_hand_side()

get_number()

get_right_hand_side()

get_variable_letter()

into_str(***options*)

left_hand_side
Left hand side of the Equation

name

number
Number of the Equation

right_hand_side
Right hand side of the Equation

set_hand_side(*left_or_right*, *arg*)

set_number(*arg*)

solve_next_step(***options*)

variable_letter
Variable letter of the Equation

class mathmaker.lib.core.calculus.**Expression**(*integer_or_letter*, *objct*)
Bases: *mathmaker.lib.core.calculus.ComposedCalculable*

auto_expansion_and_reduction(***options*)

get_right_hand_side()

into_str(***options*)

right_hand_side
Right hand side of the object

set_right_hand_side(*arg*)

class mathmaker.lib.core.calculus.**QuotientsEquality**(*arg*, *displ_as_qe=True*, *ignore_1_denos=True*, *subst_dict=None*)
Bases: *mathmaker.lib.core.calculus.Table*

A shortcut to create Tables as quotients equalities.

class mathmaker.lib.core.calculus.**Table**(*arg*, *displ_as_qe=False*, *ignore_1_denos=None*, *subst_dict=None*)
Bases: *mathmaker.lib.core.base.Printable*, *mathmaker.lib.core.root_calculus.Substitutable*

class SubstitutableList(**args*, *subst_dict=None*)
Bases: list, *mathmaker.lib.core.root_calculus.Substitutable*

A list that can call substitute() on its elements.

content
The content to be substituted (list containing literal objects).

auto_resolution(*col0=0*, *col1=1*, *subst_dict=None*, ***options*)

cell
t.cell is the complete Table t.cell[i][j] is a cell

content
The content to be substituted (list containing literal objects).

cross_product(*col*, *x_position*, *remove_1_deno=True*, ***options*)

displ_as_qe

get_cell()

ignore_1_denos

into_crossproduct_equation(*col0=0*, *col1=1*) → mathmaker.lib.core.calculus.CrossProductEquation
Create a CrossProductEquation from two columns.

Ensure there is only one literal among the four cells before using it.

Parameters

- **col0** – the number of the first column to use
- **col1** – the number of the second column to use

into_str(*as_a_quotients_equality=None*, *ignore_1_denos=None*, ***options*)

is_numeric(*displ_as=False*)

class mathmaker.lib.core.calculus.**Table_UP**(*coeff*, *first_line*, *info*, *displ_as_qe=False*)
Bases: *mathmaker.lib.core.calculus.Table*

coeff
the coefficient of the Table_UP

crossproducts_info
infos about the cross products

get_coeff()

get_crossproducts_info()

into_crossproduct_equation(*arg*)
Create a CrossProductEquation from two columns.

Ensure there is only one literal among the four cells before using it.

Parameters

- **col0** – the number of the first column to use
- **col1** – the number of the second column to use

mathmaker.lib.core.geometry module

class mathmaker.lib.core.geometry.**InterceptTheoremConfiguration**(*points_names=None*, *butterfly=False*, *sketch=True*, *build_ratio=None*, *build_dimensions=None*, *rotate_around_isobarycenter='no'*)
Bases: *mathmaker.lib.core.geometry.Triangle*

butterfly

chunk

enlargement_ratio

into_euk(***options*)
Create the euk file content, as a str

point

ratios_equalities() → mathmaker.lib.core.calculus.Table
Return a Table matching the ratios equalities.

ratios_equalities_substituted() → mathmaker.lib.core.calculus.Table_UP
Return the ratios equalities containing known numbers.

It is returned as a Table_UP object.

ratios_for_converse() → mathmaker.lib.core.calculus.Table
Return a Table matching the ratios equality for converse.

set_lengths(*lengths_list*, *enlargement_ratio*)
Set all ("fake") lengths of the figure.

The given lengths' list matches the three small sides. The ratio will be used to compute all other segments' sides. As these lengths are the "fake" ones (not the ones used to draw the figure, but the ones that will show up on the figure), this ratio is the "fake" one (not the same as self.ratio).

Parameters

- **lengths_list** (*a list (of Values)*) – the list of the lengths for small0, small1, small2
- **enlargement_ratio** (*any Evaluable*) – the enlargement ratio of the exercise.

small

u

v

class mathmaker.lib.core.geometry.**Polygon**(*arg*, *shapecolor="*, ***options*)
Bases: *mathmaker.lib.core.base.Drawable*

angle

filename

into_euk()
Build the euk file content.

Return type str

lengths_have_been_set

name

nature

perimeter

rename(*n*)

rotation_angle

set_lengths(*lengths_list*)

setup_labels(*flags_list*, *segments_list=None*)
Tells what to display along each segment of the list.

If no segments' list is provided, it defaults to the Polygon's sides' list. It is expected that both the flags' and segments' lists have the same length. Meaning of the flags' list: - a '?' will be displayed for each Segment flagged as None or '?' - its length will be displayed if it's flagged as anything else

evaluating to True

- nothing will be displayed it it's flagged as anything else evaluating to False

Parameters

- **flags_list** (*list*) – the list of the flags
- **segments_list** (*list (of Segments)*) – the list of the Segments to flag

side

vertex

class mathmaker.lib.core.geometry.**Rectangle**(*arg*, ***options*)

Bases: *mathmaker.lib.core.geometry.Polygon*

area

length

set_lengths(*lengths_list*)

width

class mathmaker.lib.core.geometry.**RectangleGrid**(*arg*, *layout='2×2'*, *fill='0×0'*, *autofit=False*, *fillcolor='lightgray'*, *startvertex=None*)

Bases: *mathmaker.lib.core.geometry.Rectangle*

fill(*fill='0×0'*, *fillcolor=None*, *startvertex=None*)

class mathmaker.lib.core.geometry.**RightTriangle**(*arg*, ***options*)

Bases: *mathmaker.lib.core.geometry.Triangle*

hypotenuse

leg

pythagorean_equality(***options*)

pythagorean_substequality(***options*)

right_angle

setup_for_trigonometry(*angle_nb=None*, *trigo_fct=None*, *angle_val=None*, *up_length_val=None*, *down_length_val=None*, *length_unit=None*, *only_mark_unknown_angle=False*, *mark_angle='simple'*)

Setup labels, determine subst_dict and stores configuration details.

Exactly one parameter among the three *_val ones must be left to None. According to the chosen trigo_fct and this parameter, this method will create the correct subst_dict.

Parameters

- **angle_nb** (*int*) – must be either 0 or 2 (index of an acute angle)
- **trigo_fct** (*str*) – must belong to ['cos', 'sin', 'tan']
- **angle_val** (*Value (or leave it to None to use it as the unknown value to calculate)*) – the angle's Value

- **up_length_val** (Value *(or leave it to None to use it as the unknown value to calculate)*) – the length's Value of the side that's at the numerator of the trigonometric formula
- **down_length_val** (Value *(or leave it to None to use it as the unknown value to calculate)*) – the length's Value of the side that's at the denominator of the trigonometric formula
- **length_unit** (*anything that can be used as argument for Units*) – the length's unit to use for lengths

side_adjacent_to(*angle=None*)
Return the side adjacent to given angle.

Parameters **angle** (*must be self.angle[0] or self.angle[2]*) – one of the acute angles

side_opposite_to(*angle=None*)
Return the side opposite to given angle.

Parameters **angle** (*must be self.angle[0] or self.angle[2]*) – one of the acute angles

trigonometric_equality(*angle=None*, *trigo_fct=None*, *subst_dict=None*, *autosetup=False*)
Return the required trigonometric equality.

Parameters

- **angle** (Angle) – the acute Angle to use
- **trigo_fct** (*str*) – either 'cos', 'sin' or 'tan'
- **subst_dict** (*dict*) – a correct substitution dictionary
- **autosetup** (*bool*) – if enabled, will take the angle, trigo_fct and subst_dict from pre-configured values (requires to have called setup_for_trigonometry() previously).

trigonometric_ratios()
Definitions of the three standard trigonometric ratios.

class mathmaker.lib.core.geometry.**Square**(*arg*, ***options*)
Bases: *mathmaker.lib.core.geometry.Polygon*

area

set_lengths(*lengths_list*)

set_marks(*arg*)

set_side_length(*side_length*)

side_length

class mathmaker.lib.core.geometry.**Triangle**(*arg*, ***options*)
Bases: *mathmaker.lib.core.geometry.Polygon*

mathmaker.lib.core.root_calculus module

class mathmaker.lib.core.root_calculus.**Calculable**
Bases: *mathmaker.lib.core.root_calculus.Evaluable*

calculate_next_step(***options*)

expand_and_reduce_next_step(***options*)

get_iteration_list()

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_int()

is_displ_as_a_single_minus_1()

is_displ_as_a_single_neutral(*elt*)

is_displ_as_a_single_numeric_Item()

multiply_symbol_is_required(*objct*, *position*)

requires_brackets(*position*)

requires_inner_brackets()

substitute(*subst_dict*)

class mathmaker.lib.core.root_calculus.**Evaluable**
Bases: *mathmaker.lib.core.base.Printable*

alphabetical_order_cmp(*other_objct*)

contains_a_rounded_number()

contains_exactly(*objct*)

evaluate(***options*)

get_first_letter()

is_literal()

is_null()

is_numeric(*displ_as=False*)

class mathmaker.lib.core.root_calculus.**Exponented**
Bases: *mathmaker.lib.core.root_calculus.Signed*

exponent
Exponent of the Function

exponent_must_be_displayed()

get_exponent()

set_exponent(*arg*)

class mathmaker.lib.core.root_calculus.**Signed**
Bases: *mathmaker.lib.core.root_calculus.Calculable*

get_minus_signs_nb()

get_sign()

is_negative()

is_positive()

set_opposite_sign()

set_sign(*arg*)

sign
Sign of the object

class mathmaker.lib.core.root_calculus.**Substitutable**(*subst_dict=None*)
Bases: object

Any object whose (literal) value(s) can be substituted by numeric ones.

Any Substitutable must define a content property, should include an optional subst_dict argument in its __init__() method and must ensure that a _subst_dict is defined (an easy way to do this is calling Substitutable.__init__(self, subst_dict=subst_dict). The substitute() method is redefined by some Substitutable objects.

content
The content to be substituted (list containing literal objects).

subst_dict
Get the default dictionary to use for substitution.

substitute(*subst_dict=None*)
If a subst_dict has been defined, it is used for literals substitution.

class mathmaker.lib.core.root_calculus.**Unit**(*arg*, ***options*)
Bases: *mathmaker.lib.core.root_calculus.Exponented*

exponent
Exponent of the Function

into_str(*textwrap=True*, *js_repr=False*, ***options*)

name

class mathmaker.lib.core.root_calculus.**Value**(*arg*, *text_in_maths=True*, ***options*)
Bases: *mathmaker.lib.core.root_calculus.Signed*

abs_value

calculate_next_step(***options*)

contains_a_rounded_number()

contains_exactly(*objct*)

digits_number()

evaluate(***options*)

get_first_letter()

get_has_been_rounded()

get_iteration_list()

get_sign()

get_unit()

has_been_rounded
'has been rounded' state of the Value

into_str(*textwrap=True*, *js_repr=False*, ***options*)

is_a_perfect_square()

is_an_integer()

is_displ_as_a_single_0()

is_displ_as_a_single_1()

is_displ_as_a_single_int()

is_displ_as_a_single_minus_1()

is_displ_as_a_single_numeric_Item()

is_literal(*displ_as=False*) → bool
Return True if Value is to be considered literal.

Parameters **displ_as** – not applicable to Values

is_null()

is_numeric(*displ_as=False*)

needs_to_get_rounded(*precision*)

raw_value

rounded(*precision*)

set_has_been_rounded(*arg*)

set_opposite_sign()

set_sign(*arg*)

set_unit(*arg*)

sign
Sign of the Value

sqrt()

substitute(*subst_dict*)

unit
Unit of the Value

mathmaker.lib.core.utils module

mathmaker.lib.core.utils.**check_lexicon_for_substitution**(*objcts*, *subst_dict*, *how_many*)

mathmaker.lib.core.utils.**gather_literals**(*xpr*)
Return all literal Values|AngleItems of an expression.

Parameters **xpr** (Calculable) – the expression to iter over

mathmaker.lib.core.utils.**put_term_in_lexicon**(*provided_key*, *associated_coeff*, *lexi*)

mathmaker.lib.core.utils.**reduce_literal_items_product**(*provided_list*)

Module contents

mathmaker.lib.machine package

Submodules

mathmaker.lib.machine.LaTeX module

class mathmaker.lib.machine.LaTeX.**LaTeX**(*language*, *create_pic_files=True*, ***options*)
Bases: *mathmaker.lib.machine.Structure.Structure*

addvspace(*height='30.0pt'*, ***options*)
Add a vertical space.

create_table(*size*, *content*, ***options*)
Write a table filled with the given content.

insert_dashed_hline(***options*)
Draw a horizontal dashed line.

insert_nonbreaking_space(***options*)
Insert a non-breaking space.

insert_picture(*drawable_arg*, ***options*)
Draw and insert the picture of the drawable_arg.

insert_vspace(***options*)
Insert a vertical space (default height: 1 cm).

reset_exercises_counter()
Write command reinitializing the exercises counter.

set_font_size_offset(*arg*)
Set the font_size_offset field

set_redirect_output_to_str(*arg*)
Set the redirect_output_to_str field to True or False

translate_font_size(*arg*)
Turn the size keyword in markup language matching keyword.

type_string(*objct*, ***options*)
Get the str version of objct. (Should be __str__())

write(*given_string*, ***options*)
Write the given string.

write_document_begins(*variant='default'*)
Write "document begins" markup.

write_document_ends()
Write the "end of document" command.

write_exercise_number()
Write the command displaying "Exercise n°…".

write_frame(*content*, *uncovered=False*, *only=False*, *duration=None*, *numbering=''*)
Write a slideshow's frame to the output

Parameters

- **content** (*str*) – the frame's content
- **uncovered** (*bool*) – whether to split the content in several slides that will show one after the other. Mostly useful for title. The content's parts must be delimited by SLIDE_CONTENT_SEP (from lib.constants).
- **only** (*bool*) – whether to split the content in several slides that will show one after the other. Mostly useful for answers. The content's parts must be delimited by SLIDE_CONTENT_SEP (from lib.constants). Difference with uncovered is the text will be replaced, not only made invisible.
- **duration** (*number (int or float)*) – the duration of the frame. If it's None, then no duration will be set.

Return type str

write_jump_to_next_page()
Write the "jump to next page" command.

write_layout(*size*, *col_widths*, *content*, ***options*)
Writes content arranged like in a table.

Param size: (nb of columns, nb of lines)

Parameters

- **col_widths** – list of int
- **content** – list of str

write_math_style1(*given_string*)
Write the given string as a math. expression (2d option)

write_math_style2(*given_string*, ***kwargs*)
Write the given string as a mathematical expression.

write_new_line(*check=''*, *check2=''*, *check3=''*, *check4=''*)
Write the "new line" command.

write_new_line_twice(***options*)
Write the "new line" command twice.

write_out(*latex_document: str*, *pdf_output=False*)
Writes the given document to the output.

If pdf_output is set to True then the document will be compiled into a pdf and the pdf content will be written to output.

Parameters

- **latex_document** – contains the entire LaTeX document
- **pdf_output** – if True, output will be written in pdf format

write_preamble(*variant='default'*, *required_pkg=None*)
Write the LaTeX document's preamble.

write_set_font_size_to(*arg*)
Write the command to set font size.

mathmaker.lib.machine.Structure module

class mathmaker.lib.machine.Structure.**Structure**(*language*)
Bases: object

Abstract mother class of machine objects.

create_table(*size*, *content*, ***options*)
Write a table filled with the given content.

insert_dashed_hline(***options*)
Draw a horizontal dashed line.

insert_nonbreaking_space(***options*)
Insert a non-breaking space.

insert_picture(*drawable_arg*, ***options*)
Draw and insert the picture of the drawable_arg.

insert_vspace(***options*)
Insert a vertical space (default height: 1 cm).

reset_exercises_counter()
Write command reinitializing the exercises counter.

set_font_size_offset(*arg*)
Set the font_size_offset field

set_redirect_output_to_str(*arg*)
Set the redirect_output_to_str field to True or False

translate_font_size(*arg*)
Turn the size keyword in markup language matching keyword.

type_string(*objct*, ***options*)
Get the str version of objct. (Should be __str__())

write(*given_string*, ***options*)
Write the given string.

write_document_begins()
Write "document begins" markup.

write_document_ends()
Write the "end of document" command.

write_exercise_number()
Write the command displaying "Exercise n°…".

write_frame(*content*, *uncovered=False*, *only=False*, *duration=None*, *numbering=""*)
Write a frame to the output.

write_jump_to_next_page()
Write the "jump to next page" command.

write_layout(*size*, *col_widths*, *content*, ***options*)
Writes content arranged like in a table.

Param size: (nb of columns, nb of lines)

Parameters

- **col_widths** – list of int
- **content** – list of str

write_math_style1(*given_string*)
Write the given string as a math. expression (2d option)

write_math_style2(*given_string*)
Write the given string as a mathematical expression.

write_new_line(***options*)
Write the "new line" command.

write_new_line_twice(***options*)
Write the "new line" command twice.

write_out(*given_string*, ***options*)
Write to the current output.

write_preamble()
Write the LaTeX document's preamble.

write_set_font_size_to(*arg*)
Write the command to set font size.

Module contents

mathmaker.lib.old_style_sheet package

Subpackages

mathmaker.lib.old_style_sheet.exercise package

Subpackages

mathmaker.lib.old_style_sheet.exercise.question package

Submodules

mathmaker.lib.old_style_sheet.exercise.question.Q_AlgebraExpressionExpansion module

class mathmaker.lib.old_style_sheet.exercise.question.Q_AlgebraExpressionExpansion.**Q_Algebr**

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_AlgebraExpressionReduction module

class mathmaker.lib.old_style_sheet.exercise.question.Q_AlgebraExpressionReduction.**Q_Algebr**

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_Calculation module

class mathmaker.lib.old_style_sheet.exercise.question.Q_Calculation.**Q_Calculation**(*q_kind='def*
***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_Equation module

class mathmaker.lib.old_style_sheet.exercise.question.Q_Equation.**Q_Equation**(*q_kind='default_noth*
***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_Factorization module

class mathmaker.lib.old_style_sheet.exercise.question.Q_Factorization.**Q_Factorization**(*q_kind*
***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_Factorization.**level_01**(*q_subkind*, ***options*)

mathmaker.lib.old_style_sheet.exercise.question.Q_Factorization.**level_03**(*q_subkind*, ***options*)

mathmaker.lib.old_style_sheet.exercise.question.Q_Model module

mathmaker.lib.old_style_sheet.exercise.question.Q_RightTriangle module

class mathmaker.lib.old_style_sheet.exercise.question.Q_RightTriangle.**Q_RightTriangle**(*q_kind*
***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.Q_Structure*

answer_to_str()

text_to_str()

mathmaker.lib.old_style_sheet.exercise.question.Q_Structure module

class mathmaker.lib.old_style_sheet.exercise.question.Q_Structure.**Q_Structure**(*q_kind*, *AVAIL-ABLE_Q_KIND_V*
***options*)

Bases: `object`

answer_to_str(***options*)

hint_to_str(***options*)

text_to_str(***options*)

to_str(*ex_or_answers*)

Module contents

Submodules

mathmaker.lib.old_style_sheet.exercise.X_AlgebraExpressionExpansion module

class mathmaker.lib.old_style_sheet.exercise.X_AlgebraExpressionExpansion.**X_AlgebraExpressi**

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_AlgebraExpressionReduction module

class mathmaker.lib.old_style_sheet.exercise.X_AlgebraExpressionReduction.**X_AlgebraExpressi**

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_Calculation module

class mathmaker.lib.old_style_sheet.exercise.X_Calculation.**X_Calculation**(*x_kind='default_nothing'*, ***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_Equation module

class mathmaker.lib.old_style_sheet.exercise.X_Equation.**X_Equation**(*x_kind='default_nothing'*, ***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_Factorization module

class mathmaker.lib.old_style_sheet.exercise.X_Factorization.**X_Factorization**(*x_kind='default_no*, ***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_Model module

mathmaker.lib.old_style_sheet.exercise.X_RightTriangle module

class mathmaker.lib.old_style_sheet.exercise.X_RightTriangle.**X_RightTriangle**(*x_kind='default_no*
***options*)

Bases: *mathmaker.lib.old_style_sheet.exercise.X_Structure.X_Structure*

mathmaker.lib.old_style_sheet.exercise.X_Structure module

class mathmaker.lib.old_style_sheet.exercise.X_Structure.**X_Structure**(*x_kind*, *AVAILABLE_X_KIND_VALUES*, *X_LAYOUTS*, *X_LAYOUT_UNIT*, *number_of_questions=6*, ***options*)

Bases: object

to_str(*ex_or_answers*)

Module contents

Submodules

mathmaker.lib.old_style_sheet.AlgebraBalance_01 module

mathmaker.lib.old_style_sheet.AlgebraBinomialIdentityExpansion module

class mathmaker.lib.old_style_sheet.AlgebraBinomialIdentityExpansion.**AlgebraBinomialIdentit**

Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.AlgebraExpressionExpansion module

mathmaker.lib.old_style_sheet.AlgebraExpressionReduction module

class mathmaker.lib.old_style_sheet.AlgebraExpressionReduction.**AlgebraExpressionReduction**(*

Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.AlgebraFactorization_01 module

class mathmaker.lib.old_style_sheet.AlgebraFactorization_01.**AlgebraFactorization_01**(***options*

Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.AlgebraFactorization_02 module

mathmaker.lib.old_style_sheet.AlgebraFactorization_03 module

class mathmaker.lib.old_style_sheet.AlgebraFactorization_03.**AlgebraFactorization_03**(**options*
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.AlgebraMiniTest0 module

class mathmaker.lib.old_style_sheet.AlgebraMiniTest0.**AlgebraMiniTest0**(**options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.AlgebraMiniTest1 module

mathmaker.lib.old_style_sheet.AlgebraShortTest module

mathmaker.lib.old_style_sheet.AlgebraTest module

mathmaker.lib.old_style_sheet.AlgebraTest2 module

mathmaker.lib.old_style_sheet.ConverseAndContrapositiveOfPythagoreanTheoremShortTest module

class mathmaker.lib.old_style_sheet.ConverseAndContrapositiveOfPythagoreanTheoremShortTest
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.EquationsBasic module

class mathmaker.lib.old_style_sheet.EquationsBasic.**EquationsBasic**(**options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.EquationsClassic module

class mathmaker.lib.old_style_sheet.EquationsClassic.**EquationsClassic**(**options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.EquationsHarder module

class mathmaker.lib.old_style_sheet.EquationsHarder.**EquationsHarder**(**options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.EquationsShortTest module

mathmaker.lib.old_style_sheet.EquationsTest module

mathmaker.lib.old_style_sheet.FractionSimplification module

class mathmaker.lib.old_style_sheet.FractionSimplification.**FractionSimplification**(***options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.FractionsProductAndQuotient module

class mathmaker.lib.old_style_sheet.FractionsProductAndQuotient.**FractionsProductAndQuotient**
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.FractionsSum module

class mathmaker.lib.old_style_sheet.FractionsSum.**FractionsSum**(***options*)
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.PythagoreanTheoremShortTest module

class mathmaker.lib.old_style_sheet.PythagoreanTheoremShortTest.**PythagoreanTheoremShortTest**
Bases: *mathmaker.lib.old_style_sheet.S_Structure.S_Structure*

mathmaker.lib.old_style_sheet.S_Model module

mathmaker.lib.old_style_sheet.S_Structure module

class mathmaker.lib.old_style_sheet.S_Structure.**S_Structure**(*font_size_offset*, *sheet_layout_unit*, *sheet_layout*, *layout_type*, ***options*)
Bases: object

answers_title_to_str()

sheet_header_to_str()

sheet_text_to_str()

sheet_title_to_str()

texts_to_str(*ex_or_answers*, *n_of_first_ex*)

Module contents

mathmaker.lib.tools package

Submodules

mathmaker.lib.tools.database module

class mathmaker.lib.tools.database.**IntspansProduct**(*cartesianpower_spans*, *elt_nb=None*)

Bases: object

Handle intspan-like ranges, possibly concatenated by ×

random_draw(*return_all=False*, *do_shuffle=True*, ***kwargs*)

turn_to_query_conditions(*nb_list=None*, *nb_modifiers=None*)

Turn self to a SQLite query condition.

mathmaker.lib.tools.database.**classify_tag**(*tag*)

mathmaker.lib.tools.database.**db_table**(*tag*)

Table's name possibly associated to tag.

mathmaker.lib.tools.database.**generate_random_decimal_nb**(*position=None*, *width='random'*, *generation_type=None*, *pos_matches_invisible_zero=False*, *unique_figures=True*, *grow_left=False*, *numberof=False*, *digits_positions=None*, ***unused*)

mathmaker.lib.tools.database.**generate_values**(*source_id*)

class mathmaker.lib.tools.database.**mc_source**

Bases: object

next(*source_id*, *qkw=None*, ***kwargs*)

mathmaker.lib.tools.database.**parse_sql_creation_query**(*qr*)

Retrieve table's name and columns' names from sql query.

mathmaker.lib.tools.database.**postprocess_decimalfractionssums_query**(*qr*, *qkw=None*, ***kwargs*)

Create two decimal fractions from the drawn decimal number.

Parameters **qr** (*tuple*) – the result of the query (containing the decimal number)

Return type tuple

mathmaker.lib.tools.database.**postprocess_int_triplesforprop_query**(*qr*)

mathmaker.lib.tools.database.**postprocess_percentage_query**(*qr*, *source_id*, *qkw=None*, ***kwargs*)

Create the two numbers from the query result, depending on source_id.

Parameters

- **qr** (*tuple*) – the result of the query (containing the number(s))

- **source_id** (*str*) – the original source id
- **qkw** (*dict*) – the question's keywords (attributes)

Return type tuple

mathmaker.lib.tools.database.**preprocess_deci_int_triplesforprop_tag**(*tag*, *qkw=None*)

mathmaker.lib.tools.database.**preprocess_decimalfractions_pairs_tag**(*qkw=None*, ***kwargs*)

Create the SQL query according to possible qkw's overlap value.

Parameters **qkw** (*dict*) – keywords provided by the question

Return type dict

mathmaker.lib.tools.database.**preprocess_decimals_query**(*qkw=None*)
Create the SQL query according to possible qkw.

mathmaker.lib.tools.database.**preprocess_divisibles**(*intsp*, *reason='no reason'*)
Called to help to choose special numbers divisible by intsp (e.g. 3 or 9).

Parameters **intsp** – the possible divisor

mathmaker.lib.tools.database.**preprocess_extdecimals_query**(*qkw=None*)
Create the SQL query according to possible qkw.

mathmaker.lib.tools.database.**preprocess_int_pairs_tag**(*tag*, *qkw=None*)

mathmaker.lib.tools.database.**preprocess_int_quintuples_tag**(*tag*, *qkw=None*)

mathmaker.lib.tools.database.**preprocess_int_triplesforprop_tag**(*tag*, *not_in=None*)

mathmaker.lib.tools.database.**preprocess_percentage_tag**(*tag*, *qkw=None*)
Deal with quarters, halves... numbers' sources.

As the initial tag (source_id) may be modified, it is returned along the tag to use, in first position, so all return statements are of the form return tag, ...

mathmaker.lib.tools.database.**preprocess_polygons_sides_lengths_query**(*polygon_data=None*, *qkw=None*)
Query's keywords depending on polygon's type and expected kind of numbers.

mathmaker.lib.tools.database.**preprocess_qkw**(*table_name*, *qkw=None*)
Add relevant questions keywords to build the query.

mathmaker.lib.tools.database.**preprocess_single_nb_tag**(*tag*)
From single..._mintomax, get and return min and max in a dictionary.

mathmaker.lib.tools.database.**preprocess_units_pairs_tag**(*tag*, *last_draw=None*, *qkw=None*)
Create the SQL query according to last_draw content and possible qkw.

class mathmaker.lib.tools.database.**source**(*table_name*, *cols*, ***kwargs*)
Bases: object

next(***kwargs*)

class mathmaker.lib.tools.database.**sub_source**(*source_id*, ***kwargs*)
Bases: object

next(*qkw=None*, ***kwargs*)

mathmaker.lib.tools.frameworks module

mathmaker.lib.tools.frameworks.**build_exercises_list**(*data*)
Return the list of exercises from a sheet.

Parameters **data** (*dict*) – the sheet's data, as read from YAML file

Return type list

mathmaker.lib.tools.frameworks.**build_index**()
Create the index of all (YAML) sheets available.

mathmaker.lib.tools.frameworks.**build_questions_list**(*data*)
Return the list of questions from an exercise.

Parameters **data** (*dict*) – the exercise's data, as read from YAML file (extract from the complete sheet's data)

Return type list

mathmaker.lib.tools.frameworks.**get_attributes**(*filename*, *tag*)
Gathers the "attributes" of all *filename*'s keys matching *tag*.

Parameters

- **filename** (*str*) – The YAML file name.
- **tag** (*str*) – The tag we're looking for.

Return type list

mathmaker.lib.tools.frameworks.**get_q_modifier**(*q_type*, *nb_source*)

mathmaker.lib.tools.frameworks.**list_all_sheets**()
Creates the list of all available mathmaker's sheets.

The list is displayed as a tabular.

Returns The list as str

mathmaker.lib.tools.frameworks.**load_sheet**(*theme*, *subtheme*, *sheet_name*)
Retrieve sheet data from yaml file.

Parameters

- **theme** (*str*) – the theme where to find the sheet
- **subtheme** (*str*) – the subtheme where to find the sheet
- **sheet_name** (*str*) – the name of the sheet

Return type OrderedDict

mathmaker.lib.tools.frameworks.**parse_qid**(*qid*)
Return question's kind and subkind from question's attribute "id".

mathmaker.lib.tools.frameworks.**read_index**()
Read the index of all (YAML) sheets available.

mathmaker.lib.tools.frameworks.**read_layout**(*data*)
Create the layout dictionary from the raw data.

Parameters **data** (*dict or list*) – the dictionary loaded from YAML file (might be list of dict)

Return type dict

mathmaker.lib.tools.ignition module

This module gathers functions that should be run at startup.

These functions check dependencies, settings consistency and setup the language for gettext translations.

mathmaker.lib.tools.ignition.**check_dependencies**(*euktoeps='euktoeps'*, *xmllint='xmllint'*, *lualatex='lualatex'*, *luaotfload_tool='luaotfload-tool'*) → bool

Will check all mathmaker's dependencies.

mathmaker.lib.tools.ignition.**check_dependency**(*name: str*, *goal: str*, *path_to: str*, *required_version_nb: str*) → bool

Will check if a dependency is installed plus its version number.

The version number is supposed to be displayed at the end of the line containing 'version' when calling *executable –version* (or the equivalent).

Parameters

- **name** (*str*) – the dependency's name.
- **goal** (*str*) – tells shortly why mathmaker needs it for
- **path_to** (*str*) – the path to the executable to test
- **required_version_nb** (*str*) – well, the required version number

Return type bool

mathmaker.lib.tools.ignition.**check_font**() → bool

Will check if settings.font belongs to data/fonts_list.txt.

It will first check if the exact name is in the list, then if one line of the list starts with the exact name.

mathmaker.lib.tools.ignition.**check_settings_consistency**(*language=None*, *od=None*)

Will check the consistency of several settings values.

The checked values are: whether the language is supported as a LaTeX package that mathmaker uses, the output directory (is it an existing directory?) and whether the chosen font is usable by lualatex.

mathmaker.lib.tools.ignition.**install_gettext_translations**(***kwargs*)

Will install output's language (gettext functions).

mathmaker.lib.tools.ignition.**retrieve_fonts**(*fonts_list_file='mathmaker/data/fonts_list.txt'*, *datadir='mathmaker/data'*, *force=False*) → tuple

Store in a file the list of the fonts available for lualatex.

mathmaker.lib.tools.ignition.**warning_msg**(*name: str*, *path_to: str*, *c_out: str*, *c_err: str*, *gkw: str*, *g_out: str*, *g_err: str*)

Return the formatted warning message.

Parameters

- **name** – name of the software
- **path_to** – the path to the software
- **c_out** – output of the call to *software –version*
- **c_err** – error output of the call to *software –version*
- **gkw** – keyword used to grep the version from output

- **g_out** – output of the call to *grep...*
- **g_err** – error output of the call to *grep...*

mathmaker.lib.tools.maths module

mathmaker.lib.tools.maths.**barycenter**(*points_list*, *barycenter_name*, *weights=None*)

mathmaker.lib.tools.maths.**coprime_generator**(*n*)

mathmaker.lib.tools.maths.**coprimes_to**(*n*, *span*)
List numbers coprime to n inside provided span.

Parameters

- **n** (*int*) – integer number
- **span** (*list*) – a list of integer numbers

Return type list

mathmaker.lib.tools.maths.**gcd**(*a*, *b*)

mathmaker.lib.tools.maths.**generate_decimal**(*width*, *places_scale*, *start_place*)

mathmaker.lib.tools.maths.**is_even**(*objct*)

mathmaker.lib.tools.maths.**is_uneven**(*objct*)

mathmaker.lib.tools.maths.**lcm**(*a*, *b*)

mathmaker.lib.tools.maths.**lcm_of_the_list**(*l*)

mathmaker.lib.tools.maths.**mean**(*numberList*, *weights=None*)

mathmaker.lib.tools.maths.**not_coprimes_to**(*n*, *span*, *exclude=None*)
List numbers NOT coprime to n inside provided span.

Parameters

- **n** (*int*) – integer number
- **span** (*list*) – a list of integer numbers
- **exclude** (*list*) – a list of number to always exclude from the results

Return type list

mathmaker.lib.tools.maths.**prime_factors**(*n*)
Return all the prime factors of a positive integer

Taken from https://stackoverflow.com/a/412942/3926735.

mathmaker.lib.tools.maths.**pupil_gcd**(*a*, *b*)

mathmaker.lib.tools.maths.**sign_of_product**(*signed_objctlist*)

mathmaker.lib.tools.maths.**ten_power_gcd**(*a*, *b*)

mathmaker.lib.tools.wording module

Use these functions to process sentences or objects containing a wording.

mathmaker.lib.tools.wording.**cut_off_hint_from**(*sentence: str*) → tuple
Return the sentence and the possible hint separated.

Only one hint will be taken into account.

Parameters **sentence** (*str*) – the sentence to inspect

Return type tuple

Examples

```
>>> cut_off_hint_from("This sentence has no hint.")
('This sentence has no hint.', '')
>>> cut_off_hint_from("This sentence has a hint: |hint:length_unit|")
('This sentence has a hint:', 'length_unit')
>>> cut_off_hint_from("Malformed hint:|hint:length_unit|")
('Malformed hint:|hint:length_unit|', '')
>>> cut_off_hint_from("Malformed hint: |hint0:length_unit|")
('Malformed hint: |hint0:length_unit|', '')
>>> cut_off_hint_from("Two hints: |hint:unit| |hint:something_else|")
('Two hints: |hint:unit|', 'something_else')
```

mathmaker.lib.tools.wording.**extract_formatting_tags_from**(*s: str*)
Return all tags found wrapped in {}. Punctuation has no effect.

Parameters **s** – the sentence where to look for {tags}.

mathmaker.lib.tools.wording.**handle_valueless_names_tags**(*arg: object*, *sentence: str*)
Each {name} tag found triggers an arg.name attribute to be randomly set.

All concerned tags are: {name}, {nameN}, {masculine_name}, {masculine_nameN}, {feminine_name}, {feminine_nameN}.

If the tag embbeds a value, like in {name=John}, then it's ignored by this function. If arg already has an attribute matching the tag, then it's also ignored by this function.

Now, say arg has no attributes like name, name1, etc. then, if sentence contains:

- "{name}" then arg.name will receive a random name.
- "{name1}", then arg.name1 will receive a random name.
- "{name=Michael}", then this function ignores it.
- "{feminine_name}", then arg.feminine_name will get a random feminine name.

Parameters

- **arg** – the object that attributes must be checked and possibly set
- **sentence** – the sentence where to look for "name" tags.

mathmaker.lib.tools.wording.**handle_valueless_unit_tags**(*arg: object*, *sentence: str*)
Each {*_unit} tag triggers an arg.*_unit attribute to be randomly set.

For instance, if {length_unit} is found, then arg.length_unit will get a random length unit. Moreover, if {area_unit} or {volume_unit} are found, arg.length_unit is set accordingly too. If arg.length_unit does already exist, then arg.area_unit will be set accordingly (and not randomly any more).

{*_unitN}, <*_unit> and <*_unitN> tags will be handled the same way by this function.

If the tag embbeds a value, like in {capacity_unit=dL}, then it's ignored by this function. If arg already has an attribute matching the tag, then it's also ignored by this function.

Parameters

- **arg** (*object*) – the object that attributes must be checked and possibly set
- **sentence** (*str*) – the sentence where to look for "unit" tags.

Return type None

mathmaker.lib.tools.wording.**insert_nonbreaking_spaces**(*sentence: str*)
Replace spaces by nonbreaking ones between a number and the next word.

Parameters **sentence** – the sentence to process

mathmaker.lib.tools.wording.**is_unit**(*word: str*) → bool
Return True if word is a "unit" tag (e.g. ends with _unit}).

Punctuation has no effect.

Parameters **word** – the word to inspect

mathmaker.lib.tools.wording.**is_unitN**(*word*)
Return True if word is a "unitN" tag (e.g. ends with _unitN}).

Punctuation has no effect.

Parameters **word** – the word to inspect

mathmaker.lib.tools.wording.**is_wrapped**(*word: str*, *braces='{}'*, *extra_braces=''*) → bool
Return True if word is wrapped between braces.

Parameters

- **word** – the word to inspect
- **braces** – to change the default {} braces to something else,

like [] or <> :param extra_braces: to add extra braces around the usual ones. Like in ({tag}) or [{tag}] :Examples:

```
>>> is_wrapped('{word}')
True
>>> is_wrapped('{word},')
False
>>> is_wrapped('<word>')
False
>>> is_wrapped('<word>', braces='<>')
True
>>> is_wrapped('({word})')
False
>>> is_wrapped('({word})', extra_braces='()')
True
>>> is_wrapped('[{word}]', extra_braces='()')
False
```

mathmaker.lib.tools.wording.**is_wrapped_P**(*word: str*, *braces='{}'*, *extra_braces=''*) → bool
Return True if word is wrapped between braces & followed by a punctuation.

Parameters

- **word** – the word to inspect
- **braces** – to change the default {} braces to something else,

like [] or <> :param extra_braces: to add extra braces around the usual ones. Like in ({tag}) or [{tag}]

Examples

```
>>> is_wrapped_P('{word}')
False
>>> is_wrapped_P('{word},')
True
>>> is_wrapped_P('<word>')
False
>>> is_wrapped_P('<word>', braces='<>')
False
>>> is_wrapped_P('<word>:', braces='<>')
True
>>> is_wrapped_P('({word})', extra_braces='()')
False
>>> is_wrapped_P('({word}).', extra_braces='()')
True
>>> is_wrapped_P('[{word}]?', extra_braces='[]')
True
```

mathmaker.lib.tools.wording.**is_wrapped_p**(*word: str*, *braces='{}'*, *extra_braces=''*) → bool

Return True if word is wrapped between braces. Punctuation has no effect.

Parameters

- **word** – the word to inspect
- **braces** – to change the default {} braces to something else,

like [] or <> :param extra_braces: to add extra braces around the usual ones. Like in ({tag}) or [{tag}]

Examples

```
>>> is_wrapped_p('{word}')
True
>>> is_wrapped_p('{word},')
True
>>> is_wrapped_p('<word>')
False
>>> is_wrapped_p('<word>', braces='<>')
True
>>> is_wrapped_p('<word>:', braces='<>')
True
>>> is_wrapped_p('({word}).')
False
>>> is_wrapped_p('({word}).', extra_braces='()')
True
>>> is_wrapped_p('[{word}]?', extra_braces='[]')
True
```

mathmaker.lib.tools.wording.**merge_nb_unit_pairs**(*arg: object*, *w_prefix=''*)

Merge all occurences of {nbN} {*_unit} in arg.wording into {nbN_*_unit}.

In the same time, the matching attribute arg.nbN_*_unit is set to Number(nbN, unit=Unit(arg.*_unit)) (the possible exponent is taken into account too).

Parameters **arg** (*object*) – the object whose attribute wording will be processed. It must have a wording attribute as well as nbN and *_unit attributes.

Return type None

Example

```
>>> class Object(object): pass
...
>>> arg = Object()
>>> arg.wording = 'I have {nb1} {capacity_unit} of water.'
>>> arg.nb1 = 2
>>> arg.capacity_unit = 'L'
>>> merge_nb_unit_pairs(arg)
>>> arg.wording
'I have {nb1_capacity_unit} of water.'
>>> arg.nb1_capacity_unit
'\\SI{2}{L}'
```

mathmaker.lib.tools.wording.**post_process**(*sentence: str*)

Apply all desired post processes to a sentence without {tags}.

So far, this is only the replacement of spaces following a number and preceding a word by nonbreaking spaces.

Parameters **sentence** – the sentence to post process

mathmaker.lib.tools.wording.**process_attr_values**(*sentence: str*) → tuple

Build a dict with all {key=val} occurrences in sentence. Update such tags.

All {key=val} occurrences will be replaced by {key}.

Parameters **sentence** – the sentence to process

Returns this couple: (transformed_sentence, {key:val, ...})

mathmaker.lib.tools.wording.**setup_wording_format_of**(*w_object: object*, *w_prefix=''*)

Set w_object's attributes according to the tags found in w_object.wording.

This is the complete process of the wording. w_object.wording will also be modified in the process.

For instance, if w_object.wording is: "Here are one {name}, {nb1} {length_unit1} of roads, and a cube of {nb2} {volume_unit=cm}. What is the side's length of the cube? |hint:length_unit|"

Then w_object.wording becomes: "Here are one {name}, {nb1_length_unit1} of roads, and a cube of {nb2_volume_unit}. What is the side's length of the cube?"

w_object.name will be set with a random name,

w_object.nb1_length_unit1 will be set with: '\SI{<value of nb1>}{<random length unit>}'

w_object.length_unit will be set to centimeters

w_object.nb2_volume_unit will be set with: '\SI{<value of nb2>}{cm^{3}}'

w_object.hint will be set with: '\si{cm}'

If w_prefix is set, the "wording" processed attributes will be w_object.<prefix>wording and w_object.<prefix>wording_format. This allows to process several different wordings.

Parameters

- **w_object** – The object having a 'wording' attribute to process.
- **w_prefix** – The possible prefix of the "wording" attributes to

process.

mathmaker.lib.tools.wording.**wrap**(*word: str*, *braces='{}'*, *o_str=None*, *e_str=None*) → str

Return the word wrapped between the two given strings.

Using o_str and e_str (e.g. opening str and ending str) will override braces content. It's interesting when one want to wrap the word with something longer than a char.

Parameters

- **word** (*str*) – the chunk of text to be wrapped
- **braces** (*str*) – the pair of braces that will wrap the word
- **o_str** (*str*) – prefix the word.
- **e_str** (*str*) – suffix the word

Return type str

Examples

```
>>> wrap('wonderful')
'{wonderful}'
>>> wrap('wonderful', braces='<>')
'<wonderful>'
>>> wrap('wonderful', o_str='<<', e_str='>>')
'<<wonderful>>'
>>> wrap('wonderful', e_str='}*')
'{wonderful}*'
```

mathmaker.lib.tools.wording.**wrap_latex_keywords**(*s: str*) → str
Replace some {kw} by {{kw}}, to prevent format() from using them as keys.

mathmaker.lib.tools.xml module

mathmaker.lib.tools.xml.**check_q_consistency**(*q_attrib*, *sources*)
(Unfinished) Check the consistency of question's kind, subkind and source.

mathmaker.lib.tools.xml.**get_exercises_list**(*file_name*)
Retrieves the exercises' list from *file_name*.

Parameters **file_name** (*str*) – The XML file name.

Return type list

mathmaker.lib.tools.xml.**get_sheet_config**(*file_name*)
Retrieves the sheet configuration values from *file_name*.

Parameters **file_name** (*str*) – The XML file name.

Return type tuple

mathmaker.lib.tools.xml.**get_xml_schema_path**()

mathmaker.lib.tools.xml.**get_xml_sheets_paths**()
Returns all paths to default xml frameworks.

They are returned as a dictionary like: {id: path_to_matching_file.xml, ...} the id being the filename without its extension.

Return type dict

Module contents

Various auxiliary functions.

mathmaker.lib.tools.**check_unique_letters_words**(*words_list*, *n*)
Check if each word of the list contains exactly n letters, all unique.

class mathmaker.lib.tools.**ext_dict**
Bases: dict

A dict with more methods.

flat(*sep='.'*)
Return a recursively flattened dict.

If the dictionary contains nested dictionaries, this function will return a one-level ("flat") dictionary.

Example

```
>>> d = ext_dict({'a': {'a1': 3, 'a2': {'z': 5}}, 'b': 'data'})
>>> d.flat() == {'a.a1': 3, 'a.a2.z': 5, 'b': 'data'}
True
```

recursive_update(*d2*)
Update self with d2 key/values, recursively update nested dicts.

Example

```
>>> d = ext_dict({'a': 1, 'b': {'a': 7, 'c': 10}})
>>> d.recursive_update({'a': 24, 'd': 13, 'b': {'c': 100}})
>>> print(d == {'a': 24, 'd': 13, 'b': {'a': 7, 'c': 100}})
True
```

mathmaker.lib.tools.**fix_math_style2_fontsize**(*text*)
Turn all frac to dfrac.

Return type str

mathmaker.lib.tools.**generate_preamble_comment**(*document_format*, *comment_symbol='%'*)
Return the preamble comment for output text files.

mathmaker.lib.tools.**load_config**(*file_tag*, *settingsdir*)
Will load the values from the yaml config file, named file_tag.yaml.

The default configuration values are loaded from mathmaker/settings/default/*.yaml, then load_config will update with values found successively in /etc/mathmaker/*.yaml, then in ~/.config/mathmaker/*.yaml, finally in mathmaker/settings/dev/*.yaml.

mathmaker.lib.tools.**parse_layout_descriptor**(*d*, *sep=None*, *special_row_chars=None*, *min_row=0*, *min_col=0*)
Parse a "layout" string, e.g. '3×4'. Return number of rows, number of cols.

Parameters

- **d** (*str*) – the "layout" string
- **sep** (*None or str or a list of str*) – the separator's list. Default to '×'
- **special_row_chars** (*None or list*) – a list of special characters allowed instead of natural numbers. Defaults to []
- **min_row** (*positive int*) – a minimal value that the number of rows must respect. It is not checked is nrow is a special char
- **min_col** (*positive int*) – a minimal value that the number of columns must respect

Return type tuple

mathmaker.lib.tools.**po_file_get_list_of**(*what*, *language*, *arg*)

mathmaker.lib.tools.**rotate**(*l*, *n*)
Rotate list l of n places, to the right if n > 0; else to the left.

Submodules

mathmaker.lib.shared module

mathmaker.lib.shared.**init**()

Module contents

mathmaker.settings package

Module contents

class mathmaker.settings.**ContextFilter**(*name=''*)
Bases: logging.Filter

Removes the 'dbg.' at the beginning of logged messages.

filter(*record*)
Determine if the specified record is to be logged.

Is the specified record to be logged? Returns 0 for no, nonzero for yes. If deemed appropriate, the record may be modified in-place.

mathmaker.settings.**config_dbglogger**(*sd*)
Configures dbg_logger, using to the configuration file values.

class mathmaker.settings.**default_object**
Bases: object

mathmaker.settings.**init**()

class mathmaker.settings.**path_object**(*dd=None*, *logger=None*)
Bases: object

2.5.2 Submodules

2.5.3 mathmaker.cli module

mathmaker.cli.**entry_point**()

2.5.4 mathmaker.daemon module

2.5.5 Module contents

CHAPTER 3

Indices and tables

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