ProfLycee (*simple doc*)
User's Guide for LaTeX (v4.00e)

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The purpose of this simplified documentation is to present the main macros of ProfLycee, including:

- available names (base / French alias / English alias) if available;
- available keys (French / English);
- arguments (optional or not).

The general presentation of this *short* documentation is:

Short explanation | Courte explication [*Syntax*]

```
\macro(*)[opt arg]{arg}

% --- [keys/clés] ------------------------------------------------------------
% key1[en] = key1[fr] = default
% key2[en] = key2[fr] = default
% ...
% ------------------------------------------------------------------------------
```

Short explanation | Courte explication [*Sample(s)*]

```
\LaTeX
```

LaTeX

For further details (especially regarding keys), the French documentation provides additional explanations and examples.

As the commands and keys are currently being anglicized, some may not be included in this documentation. Please note that the vast majority of ProfLycee commands are already compatible with both English and French.

Contents

1 Loading, global usage

1.1 Loading

`Proflycee` can be loaded with:

Loading | Chargement [*Syntax*]

```
\usepackage[options]{ProfLycee}
\usepackage[options]{ProfLycee-Light}

% --- {options} ----------------------------------------------------------
% xcolor                      := load xcolor with [table,svgnames]
% nosiunitxfr = nonsiunitxfr := do not load sinuitx with french parameters
% noamssymb   = nonamssymb   := do not load amssymb
% warningsoff = nonwarnings  := suppress warnings for unicode-math
% notikzbabel = nontikzbabel := do not load tikzbabel library
% nocancel    = noncancel    := do not load cancel
% nofa        = nonfa        := do not load fontawesome (fa5 default loaded)
% fa6                        := load fa6
% fa7                        := load fa7
% french                     := load french version (activated by default)
% english                    := load english version
% german                     := load german version
% spanish                    := load spanish version
% ------------------------------------------------------------------------
```

1.2 Global usage

Modules (libraries) can be loaded in addition to main package:

Libraries | Librairies [*Syntax*]

```
\useproflyclib{lib}

% --- {lib for full} -----------------------------------------------------
% piton
% space       = espace
% mathwriting = ecritures
% ------------------------------------------------------------------------

% --- {lib for light} ----------------------------------------------------
% analysis    = analyse
% listings
% probas
% stats
% arithm
% random      = aleatoire
% seq         = suites
% space       = espace
% mathwriting = ecritures
% piton
% ------------------------------------------------------------------------
```

Language can be loaded with:

Language | Langue [*Syntax*]

```
\setproflyclng{lng}

% --- {lng} --------------------------------------------------------------
% fr / en / de / es
% ------------------------------------------------------------------------
```

2 Core mathematical utilities

2.1 Main macros

Core calculus | Calculs de base [*Syntax*]

```
\pflnum(*)[prec]{expr}
\pflnumfrac[format]{expr}

% --- (starred) ------------------------------------------------------------
% * for real expr
%
% --- [format] -------------------------------------------------------------
% for math output (d/n/t)
% --------------------------------------------------------------------------
```

Core calculus | Calculs de base [*Sample(s)*]

```
\pflnum{2^12+1} |
\pflnum*{4096/(12+1)} |
\pflnum*[4]{4096/(12+1)} |
\pflnum*[5]{sqrt(1+exp(9.75))} |
\pflnumfrac{74+1/5} \pflnumfrac[d]{74+1/5}
```

$4097 \mid 315.076\,923\,076\,923\,1 \mid 315.0769 \mid 130.977\,97 \mid \frac{371}{5}\ \dfrac{371}{5}$

Round | Arrondi [*Syntax*]

```
\pflround(*)[prec]{expr}
\pflarrondi(*)[prec]{expr}

% --- (starred) ------------------------------------------------------------
% * for display sign
% --------------------------------------------------------------------------
```

Round | Arrondi [*Sample(s)*]

```
$1+\dfrac{7}{11} \approx \pflround{1+7/11} \approx \pflround[5]{1+7/11} \approx
\pflround*[2]{1+7/11}$

$\ln\big(1+\e^{4}\big) \approx \pflround[6]{log(1+exp(4))}$
```

$$1+\frac{7}{11} \approx 1.636 \approx 1.636\,36 \approx +1.64$$
$$\ln\left(1+\mathrm{e}^{4}\right) \approx 4.018\,150$$

2.2 Simple conversion between basis

Conversion between basis | Conversion entre bases [*Syntax*]

```
\pflbasetobase{init basis}{final basis}{number}
\pflbasetobase{base départ}{base arrivée}{nombre}
```

Conversion between basis | Conversion entre bases [*Sample(s)*]

```
\pflbasetobase{10}{2}{27} |          % 10 -> 2
\pflbasetobase{10}{16}{456} |        % 10 -> 16
\pflbasetobase{2}{16}{10011111} |    % 2  -> 16
\pflbasetobase{16}{7}{AB5F}          % 16 -> 7
```

$11011 \mid 1C8 \mid 9F \mid 241622$

3 Analysis

3.1 Functions

Determine Maximum | Détermine Max [*Syntax*]

```
\pfldetmax[round]{fct}{init}{step}{final}[\tmpmax][\tmpmaxvalx]
\DetermineMax[arrondi]{fct}{init}{pas}{final}[\tmpmax][\tmpmaxvalx]
```

Determine Maximum | Détermine Max [*Sample(s)*]

```
\pfldetmax{80*x*exp(-0.2*x)}{3}{10}\tmpmax\ in \tmpmaxvalx
```

147.1517764685769 in 5

Determine Minimum | Détermine Min [*Syntax*]

```
\pfldetmin[round]{fct}{init}{step}{final}[\tmpmax][\tmpmaxvalx]
\DetermineMin[arrondi]{fct}{init}{pas}{final}[\tmpmax][\tmpmaxvalx]
```

Determine Minimum | Détermine Min [*Sample(s)*]

```
\pfldetmin[0.001]%
  {log(exp(-x)+1)+0.25*x}{1}{1.2}%
  [\mymin]%
  [\myminx]%
\mymin\ in \myminx
```

0.5623351587104050 in 1.099

Approx sol f(x)=k | Résol approch f(x)=k [*Syntax*]

```
\pflapproxsol[<keys>]{f(x)=k}[macro]
\ResolutionApprochee[<clés>]{f(x)=k}[macro]
\pflresolapproch[<clés>]{f(x)=k}[macro]

% --- [keys/clés] ------------------------------------------------------------
% prec     = Precision  = 2
% var      = Variable   = x
% interval = Intervalle = {0:10}
%
% --- [macro] ----------------------------------------------------------------
% \macrod := round by default
% \macroe := round by excess
% \macroa := round
% ------------------------------------------------------------------------------
```

Approx sol f(x)=k | Résol approch f(x)=k [*Sample(s)*]

```
\pflapproxsol[var=t,interval=-1:2,prec=4]{3*t*exp(-0.5*t+1)=5.365}[SolA]%
$t_1 \approx \num[minimum-decimal-digits=4]{\SolAd}$\\
$t_1 \approx \num[minimum-decimal-digits=4]{\SolAe}$\\
$t_1 \approx \num[minimum-decimal-digits=4]{\SolAa}$
```

$t_1 \approx 1.1968$
$t_1 \approx 1.1969$
$t_1 \approx 1.1969$

Sol by ITV | Sol par TVI *[Syntax]*

```
\pflivtsol[<clés>]{f(x)}{k}
\SolutionTVI[<clés>]{f(x)}{k}
\pflsoltvi[<clés>]{f(x)}{k}

% --- [keys/clés] ------------------------------------------------------------
% fct name    = NomFct       = f
% prec        = Precision    = 2
% sol name    = NomSol       = \alpha
% stretch     = Stretch      = 1.15
% sweep       = Balayage     = false
% calculator  = Calculatrice = false
% capital     = Majuscule    = true
% -----------------------------------------------------------------------------
```

Sol by ITV | Sol by TVI *[Sample(s)]*

```
\pflivtsol[va=1.414,vb=1.415,prec=5]{x**2-2}{0}
```

$$\left\{\begin{array}{l} f(1.414) \approx -0.000\,60 < 0 \\ f(1.415) \approx 0.002\,23 \quad > 0 \end{array}\right| \Rightarrow 1.414 < \alpha < 1.415$$

Canonical form | Forme canonique *[Syntax]*

```
\pflcanonicform(*)[format]{a}{b}{c}
\pflformcanoniq(*)[format]{a}{b}{c}
\FormeCanonique(*)[format]{a}{b}{c}

% --- (starred) --------------------------------------------------------------
% * for minus sign
%
% --- [format] ---------------------------------------------------------------
% for math output (d/n/t)
% -----------------------------------------------------------------------------
```

Canonical form | Forme canonique *[Sample(s)]*

```
$2x^2+4x-6 = \pflcanonicform{2}{4}{-6} = \pflcanonicform*{2}{4}{-6}$
```

$$2x^2+4x-6 = 2(x+1)^2-8 = 2(x-(-1))^2-8$$

Homographic form | Forme homographique *[Syntax]*

```
\pflhomogfct(*)[format]{a}{b}{c}
\pflfcthomogr(*)[format]{a}{b}{c}
\FonctionHomographique(*)[format]{a}{b}{c}

% --- (starred) --------------------------------------------------------------
% * for minus sign
%
% --- [format] ---------------------------------------------------------------
% for math output (d/n/t)
% -----------------------------------------------------------------------------
```

Homographic form | Forme homographique *[Sample(s)]*

```
$\dfrac{11}{3x+6} =
\pflhomogfct{0}{11}{3}{6} = \pflhomogfct*{0}{11}{3}{6}$
```

$$\frac{11}{3x+6} = \frac{\frac{11}{3}}{x+2} = \frac{\frac{11}{3}}{x-(-2)}$$

3.2 Sequences

Calc recurrence | Calcul terme récurrence [*Syntax*]

```
\pflcalcrecurr[<keys>]{fct}
\CalculTermeRecurrence[<clés>]{fct}

% --- [keys/clés] ------------------------------------------------------------
% first n  = No
% first un = UNo
% prec     = Precision  = 3
% final n = N
% ------------------------------------------------------------------------------
```

Calc recurrence | Calcul terme récurrence [*Sample(s)*]

```
\pflcalcrecurr[prec=6,first n=0,first un=50,final n=20]{1/(x+2)}
```

0.414214

Threshold | Seuil [*Syntax*]

```
\pflsolthreshold[<keys>]{fct}{val}
\SolutionSeuil[<clés>]{fct}{val}
\pflsolseuil[<clés>]{fct}{val}

% --- [keys/clés] ------------------------------------------------------------
% prec       = Precision    = 3
% stretch    = Stretch      = 1.15
% sweeping   = Balayage     = false
% calc       = Calculatrice = false
% capital    = Majuscule    = true
% sign       = Sens         = {>}
% exact      = Exact        = false
% exactB     = ExactB       = false
% conclusion = Conclusion   = true
% simple     = Simple       = false
% ------------------------------------------------------------------------------
```

Threshold | Seuil [*Sample(s)*]

```
\pflsolthreshold[prec=4,first n=1,first un=2]{1+(1+x**2)/(1+x)}{10}
```

$$\left\{\begin{array}{l} u_{28} \approx 9.9408 \quad \leqslant 10 \\ u_{29} \approx 10.1236 > 10 \end{array}\right| \Rightarrow n \geqslant 29$$

3.3 Integrals

Integral approx | Approch intégrale [*Syntax*]

```
\pflapproxintegral[<keys>]{fct}{a}{b}
\IntegraleApprochee[<clés>]{fct}{a}{b}
\pflintegrapproch[<clés>]{fct}{a}{b}

% --- [keys/clés] ------------------------------------------------------------
% prec          = Precision     = 3
% nb subdiv     = NbSubDiv      = 10
% method        = Methode       = Simpson
% raw result    = ResultatBrut  = false
% disp formula  = AffFormule    = false
% sign          = Signe         = {\approx}
% expr          = Expr          = f(x)
% var           = Variable      = x
% ------------------------------------------------------------------------------
```

Integral approx | Approch intégrale [*Sample(s)*]

```
\pflapproxintegral[raw result]{sqrt(x)}{4}{10}
```

15.74851726347158

Raw value of integral | Valeur 'brute' d'une intégrale [*Syntax*]

```
\pflcalcintegral(*)[prec]<num of subdiv>{fct}{a}{b}
\CalcIntegrale(*)[prec]<num of subdiv>{fct}{a}{b}
\pflvalintegr(*)[prec]<nb de subdiv>{fct}{a}{b}

% --- (starred) --------------------------------------------------------------
% * for siunitx output
% ------------------------------------------------------------------------------
```

Raw value of integral | Valeur 'brute' d'une intégrale [*Sample(s)*]

```
\CalcIntegrale{80*x*exp(-0.2*x)}{1}{20}
```

1781.797364979251

Average value | Valeur moyenne [*Syntax*]

```
\pflaveragevalintegral(*)[prec]<num of subdiv>{fct}{a}{b}
\pflvalmoyintegr(*)[prec]<nb de subdiv>{fct}{a}{b}

% --- (starred) --------------------------------------------------------------
% * for siunitx output
% ------------------------------------------------------------------------------
```

3.4 Signs, convexity

Sign diagram | Schémas signes [*Syntax*]

```
\pflminisignplot*[<keys>]<tikz options>
\pflschemasignes*[<clés>]<options tikz>
\MiniSchemaSignes*[<clés>]<options tikz>

% --- [keys/clés] ------------------------------------------------------------
% code   = Code    = da+
% color  = Couleur = red
% width  = Largeur = 2
% height = Hauteur = 1
% border = Cadre   = true
% roots  = Racines = 2
% ------------------------------------------------------------------------------
```

Sign diagram | Schémas signes [*Sample(s)*]

```
\pflminisignplot*[code=pa+d+,roots={1/2},color=orange]
```

Sign diagram with tkztab | Schémas signes avec tkztab [*Syntax*]

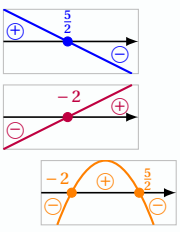
```
\pflminisignplottkztab[<keys>]{line}[scale][hoffset]
\pflschemasignestkztab[<clés>]{line}[scale][hoffset]
\MiniSchemaSignesTkzTab[<clés>]{ligne}[echelle][décal H]

% --- [keys/clés] ------------------------------------------------------------
% code   = Code    = da+
% color  = Couleur = red
% width  = Largeur = 2
% height = Hauteur = 1
% border = Cadre   = true
% roots  = Racines = 2
% ------------------------------------------------------------------------------
```

Sign diagram with tkztab | Schémas signes avec tkztab [*Sample(s)*]

```
\begin{tikzpicture}
  \tkzTabInit[espcl=2]%
    {$x$/1,$-2x+5$/1,$2x+4$/1,$p(x)$/1}{$-\infty$,$-2$,${2.5}$,$+\infty$}
  \tkzTabLine{,+,t,+,z,-,}
  \tkzTabLine{,-,z,+,t,+,}
  \tkzTabLine{,-,z,+,z,-,}
  \pflminisignplottkztab[code=da-,roots={\tfrac{5}{2}},color=blue]{1}
  \pflminisignplottkztab[code=da+,roots={-2},color=purple]{2}
  \pflminisignplottkztab[code=pa-d+,roots={-2/{\tfrac{5}{2}}},color=orange]%
    {3}[0.85][2]
\end{tikzpicture}
```

x	$-\infty$		-2		2.5		$+\infty$
$-2x+5$		$+$		$+$	0	$-$	
$2x+4$		$-$	0	$+$		$+$	
$p(x)$		$-$	0	$+$	0	$-$	



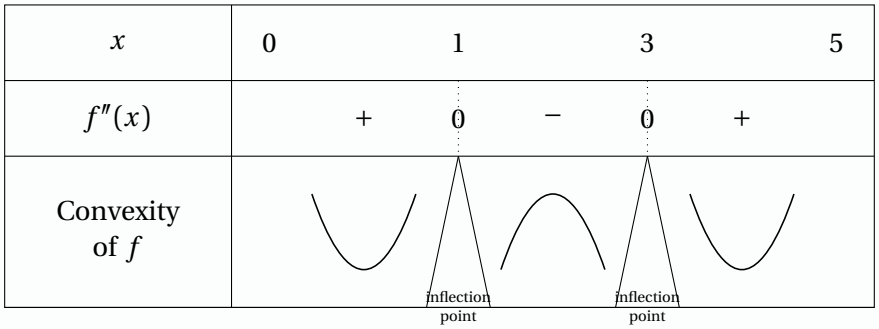
Convexity line with tkztab | Ligne de convexité avec tkztab [*Syntax*]

```
\pfltkztabcvx(*){line}{'cells'}
\tkzTabLineConvex(*){ligne}{liste 'cases'}

% --- (starred) ----------------------------------------------------------
% * for text version
% ------------------------------------------------------------------------
```

Convexity line with tkztab | Ligne de convexité avec tkztab [*Sample(s)*]

```
\begin{tikzpicture}
  \tkzTabInit[lgt=3,espcl=2.5]%
    {$x$/1,$f''(x)$/1,Convexity\\of $f$/2}{$0$,$1$,$3$,$5$}
  \tkzTabLine{,+,z,-,z,+,}
  \pfltkztabcvx{2}{,cvx,i*,ccv,i*,cvx,}
\end{tikzpicture}
```



4 Code presentation

4.1 Python Code

Environment python code listings | Environnement code python listings [*Syntax*]

```
\begin{pflpythoncodelst}*[<keys>]{tcbox options} ... \end{pflpythoncodelst}
\begin{CodePythonLst}*[<clés>]{options tcbox}   ...  \end{CodePythonLst}

% --- (starred) ----------------------------------------------------------
% * for removing line numbers
%
% --- [keys/clés] --------------------------------------------------------
% width      = Largeur    = \linewidth
% first line = PremLigne  = 1
% hsep       = EspaceNum  = 14pt
% ------------------------------------------------------------------------
```

Environment python code listings | Environnement code python listings [*Sample(s)*]

```
\begin{pflpythoncodelst}*[width=0.75\linewidth]{flush right}
nb = int(input("n = "))
if (nb %7 == 0) :
  print(f"{nb} is ok")
#endif

def f(x) :
  return x**2
\end{pflpythoncodelst}
```

Code Python

```
nb = int(input("n = "))
if (nb %7 == 0) :
    print(f"{nb} is ok")
#endif

def f(x) :
    return x**2
```

Environment python code piton | Environnement code python piton [*Syntax*]

```
\begin{pflpitoncode}[<keys>]{tcbox options} ... \end{pflpitoncode}
\begin{CodePiton}[<clés>]{options tcbox}    ... \end{CodePiton}
\pflpitoncodefile[<keys>]{tcbox options}
\CodePitonFichier[<clés>]{options tcbox}

% --- [keys/clés] --------------------------------------------------------
% width        = Largeur        = \linewidth
% align        = Alignement     = center
% lines        = Lignes         = true
% gobble       = Gobble         = {}
% font size    = TaillePolice   = \footnotesize
% watermark    = Filigrane      = false
% style        = Style          = classic/modern/(light)carbon/tab
% border       = Cadre          = true
% title bar    = BarreTitre     = true
% title        = Titre          = ...
% vsep         = EspacementV    = 0.5\baselineskip
% num color    = CouleurNombres = {orange!75!black}
% color        = Couleur        = red
% carbon icons = IconesCarbon   = ...
% ------------------------------------------------------------------------
```

Environment python code piton | Environnement code python piton [*Sample(s)*]

```
\begin{pflpitoncode}%
  [gobble=tabs,width=12cm,style=lightcarbon]{}
def f(x) :
  return x**2
\end{pflpitoncode}
```

Python code

```
1  def f(x) :
2      return x**2
```

Console python piton | Console python piton [*Syntax*]

```
\begin{pflpitonconsole}[<keys>]{tcbox options} ... \end{pflpitonconsole}
\begin{ConsolePiton}[<clés>]{options tcbox}    ... \end{ConsolePiton}

% --- [keys/clés] ------------------------------------------------------------
% logo            = Logo            = true
% width           = Largeur         = \linewidth
% align           = Alignement      = {flush left}
% num color       = CouleurNombres  = {orange!75!black}
% beforeafter sep = CoeffAvantApres = 0.75
% ------------------------------------------------------------------------------
```

Console python piton | Console python piton [*Sample(s)*]

```
\begin{pflpitonconsole}{}
1+1
2**10
\end{pflpitonconsole}
```

Start of Python console

```
>>> 1+1
2
>>> 2**10
1024
```

End of Python console

Thonny piton | Thonny piton [*Syntax*]

```
\begin{pflpitonthonnyeditor}[<keys>]{...}...\end{pflpitonthonnyeditor}
\begin{PitonThonnyEditor}[<clés>]{...}...\end{PitonThonnyEditor}
\pflpitonthonnyeditorfile[<keys>]{...}
\PitonThonnyEditorFichier[<clés>]{...}

% --- [keys/clés] ------------------------------------------------------------
% filename      = NomFichier      = {script.py}
% consolename   = NomConsole      = console
% gobble        = Gobble          = {}
% num color     = CouleurNombres  = {orange!75!black}
% width         = Largeur         = \linewidth
% ------------------------------------------------------------------------------
```

Thonny piton | Thonny piton *[Sample(s)]*

```
\begin{pflpitonthonnyeditor}[NomFichier=tpcapytale.py,Largeur=12cm]{}
nb = int(input("n = "))
if (nb %7 == 0) :
  print(f"{nb} is ok")
#endif

def f(x) :
  return x**2
\end{pflpitonthonnyeditor}
```

tpcapytale.py

```
nb = int(input("n = "))
if (nb %7 == 0) :
    print(f"{nb} is ok")
#endif

def f(x) :
    return x**2
```

Thonny console piton | Thonny console piton *[Syntax]*

```
\begin{pflpitonthonnyconsole}[<keys>]{tcbox} ... \end{pflpitonthonnyconsole}
\begin{PitonThonnyConsole}[<clés>]{tcbox} ...    \end{PitonThonnyConsole}

% --- [keys/clés] ------------------------------------------------------------
% filename      = NomFichier      = {script.py}
% consolename   = NomConsole      = console
% console intro = IntroConsole    = {Python 3.11.6 /usr/bin/python}
% gobble        = Gobble          = {}
% num color     = CouleurNombres  = {orange!75!black}
% width         = Largeur         = \linewidth
% ------------------------------------------------------------------------------
```

Thonny console piton | Thonny console piton *[Sample(s)]*

```
\begin{pflpitonthonnyconsole}[consolename={python 3.8.10},width=12cm]{}
#Run script.py
from random import randint
nb1 = randint(1,100000)
nb2= randint(1,100000)
print(nb1, nb2)
\end{pflpitonthonnyconsole}
```

python 3.8.10

```
Python 3.11.6 /usr/bin/python
 >>> #Run script.py
 >>> from random import randint
 >>> nb1 = randint(1,100000)
 >>> nb2= randint(1,100000)
 >>> print(nb1, nb2)
 92140 55670
```

4.2 Pseudo-Code

Environment pseudocode piton | Environnement pseudocode piton [*Syntax*]

```
\begin{pflpseudocodepiton}[<keys>]{tcbox} ... \end{pflpseudocodepiton}
\begin{PseudoCodePiton}[<clés>]{tcbox}    ... \end{PseudoCodePiton}
\pflpitonpseudocodefile[<keys>]{tcbox}
\PseudoCodePitonFichier[<clés>]{tcbox}

% --- [keys/clés] ------------------------------------------------------------
% width       = Largeur      = \linewidth
% align       = Alignement   = center
% lines       = Lignes       = true
% gobble      = Gobble       = {}
% font size   = TaillePolice = \footnotesize
% watermark   = Filigrane    = false
% style       = Style        = Classique
% border      = Cadre        = true
% title bar   = BarreTitre   = true
% title       = Titre        = ...
% vsep        = EspacementV  = 0.5\baselineskip
% color       = Couleurs     = true
% ------------------------------------------------------------------------------
```

Environment pseudocode piton | Environnement pseudocode piton [*Sample(s)*]

```
%in french...
\begin{PseudoCodePiton}[Lignes=false,Filigrane=false,Couleurs=true]{}
Algorithme : Périmètre de rectangles
Variables  : Long, Larg, Perim (réels)
             Choix (chaîne) # pour refaire ou non l'exécution
Début
  # initialisation de l'indicateur pour entrer dans la boucle
  Choix ← "o"
  # boucle TantQue permettant de refaire le traitement selon le choix
  TantQue Choix = "o" Faire
    # traitement
    Afficher("Donner les dimensions du rectangle") et Saisir(Long,Larg)
    Perim ← 2 × (Long + Larg)
    Afficher("Le périmètre du rectangle est", Perim)
    #saisie du choix de recommencer ou non
  Afficher("Voulez-vous continuer (o/n) ?") et Saisir(Choix)
  FinTantQue
Fin
\end{PseudoCodePiton}
```

Pseudocode

```
Algorithme : Périmètre de rectangles
Variables  : Long, Larg, Perim (réels)
             Choix (chaîne) # pour refaire ou non l'exécution
Début
    # initialisation de l'indicateur pour entrer dans la boucle
    Choix ← "o"
    # boucle TantQue permettant de refaire le traitement selon le choix
    TantQue Choix = "o" Faire
        # traitement
        Afficher("Donner les dimensions du rectangle") et \
        ↪ Saisir(Long,Larg)
        Perim ← 2 × (Long + Larg)
        Afficher("Le périmètre du rectangle est", Perim)
        #saisie du choix de recommencer ou non
    Afficher("Voulez-vous continuer (o/n) ?") et Saisir(Choix)
    FinTantQue
Fin
```

5 Statistics, probabilities

5.1 Statistics

Stats parameters | Paramètres stats [*Syntax*]

```
\DeterminerParamStats(*){liste}[\macromin]...[\macromax]
\pflparamstats(*){liste}[\macromin]...[\macromax]

% --- (starred) ------------------------------------------------------------
% * for data with regroupment
% --------------------------------------------------------------------------
```

Stats parameters | Paramètres stats [*Sample(s)*]

```
\def\listedonnees%
{0.7426,0.7429,0.7435,0.7448,0.7456,0.7478,%
  0.7478,0.748,0.7487,0.7494,0.7494,0.7496}
\pflparamstats{\listedonnees}
\monmin/\monquartileun/\mamediane/\monquartiletrois/\monmax
```

0.7426/0.7435/0.7478/0.7487/0.7496

5.2 Probabilities

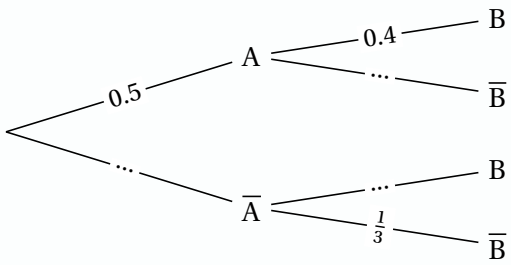
Proba tree | Arbre de probas [*Syntax*]

```
\pflprobtree[<keys>]{data}
\ArbreProbasTikz[<clés>]{donnees}
\pflarbreprobas[<clés>]{donnees}

% --- [keys/clés] ----------------------------------------------------------
% unit           = Unite          = 1cm
% level sep      = EspaceNiveau   = 3.25
% child sep      = EspaceFeuille  = 1
% type           = Type           = 2x2
% font           = Police         = ...
% prob font      = PoliceProbas   = ...
% sloped         = InclineProbas  = true
% arrows         = Fleche         = false
% arc style      = StyleTrait     = {}
% arc thickness  = EpaisseurTrait = semithick
% prob pos       = PositionProbas = {}
% bg color       = CouleurFond    = white
% arc color      = CouleurTraits  = black
% prob color     = CouleurProbas  = black
% node color     = CouleurNoeuds  = black
% root           = Racine         = {}
% --------------------------------------------------------------------------
```

Proba tree | Arbre de probas [*Sample(s)*]

```
\def\ArbreDeuxDeux{
  $A$/\num{0.5}/,
  $B$/\num{0.4}/,
  $\overline{B}$/.../,
  $\overline{A}$/.../,
  $B$/.../,
  $\overline{B}$/$\frac{1}{3}$/
}
\pflprobtree{\ArbreDeuxDeux}
```



5.3 Random

Randint | Randint [*Syntax*]

```
\pflrandnum[n]{a}{b}{macro}
\NbAlea[n]{a}{b}{macro}
\pflnbalea[n]{a}{b}{macro}
```

Rand number | Nombre aléatoire [*Syntax*]

```
\pflvarrandnum{macro}{calculs}
\VarNbAlea{macro}{calculs}
\pflvarnbalea{macro}{calculs}
```

Randint/randnum | Randint/randum [*Sample(s)*]

```
Integer between 1 and 50: \pflrandnum{1}{50}{\FirstNbAlea}
\FirstNbAlea

\pflvarrandnum{\SecondNbAlea}{\FirstNbAlea+randint(0,10)}
\SecondNbAlea

Float between 0 and 10.999... : \pflrandnum[3]{0}{10}{\FirstFloatAlea}
\FirstFloatAlea
```

Integer between 1 and 50: 30
38
Float between 0 and 10.999... : 6.833

Randint list | Liste d'entiers aléatoires [*Syntax*]

```
\pflrandintnumbers[<keys>]{macro}
\TirageAleatoireEntiers[<clés>]{macro}
\pfltiragealeaent[<clés>]{macro}

% --- [keys/clés] ------------------------------------------------------------
% min value  = ValMin     = 1
% max value  = ValMax     = 50
% nb values  = NbVal      = 6
% sep        = Sep        = {,}
% sort       = Tri        = non
% repeat     = Repetition = false
% ------------------------------------------------------------------------------
```

Randint list | Liste d'entiers aléatoires [*Sample(s)*]

```
\pflrandintnumbers{\FirstListAlea}\FirstListAlea
```

17,8,37,49,16,14

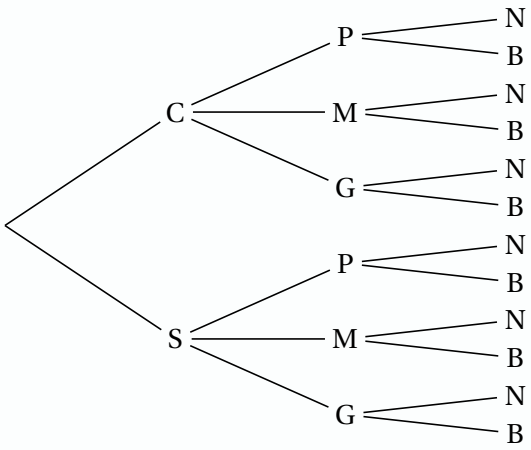
Choice tree | Arbre "sans remise" [*Syntax*]

```
\pflchoicetree[<keys>]<tikz options>{list}
\ArbreChoix[clés]<options tikz>{liste}
\pflarbrechoix[<clés>]<options tikz>{liste}

% --- [keys/clés] ------------------------------------------------------------
% level sep    = EspaceNiveaux   = 2.25
% child sep    = EspaceFeuilles  = 0.5
% scale        = Echelle         = 1
% repeat       = Repet           = {}
% help         = Notice          = {}
% help rules   = TraitsNotice    = false
% level color  = CouleursNiveaux = black
% show results = AffResultats    = false
% result sep   = SepResultats    = {}
% ------------------------------------------------------------------------------
```

Choice tree | Arbre "sans remise" [*Sample(s)*]

```
\pflchoicetree{C/S,P/M/G,N/B}
```



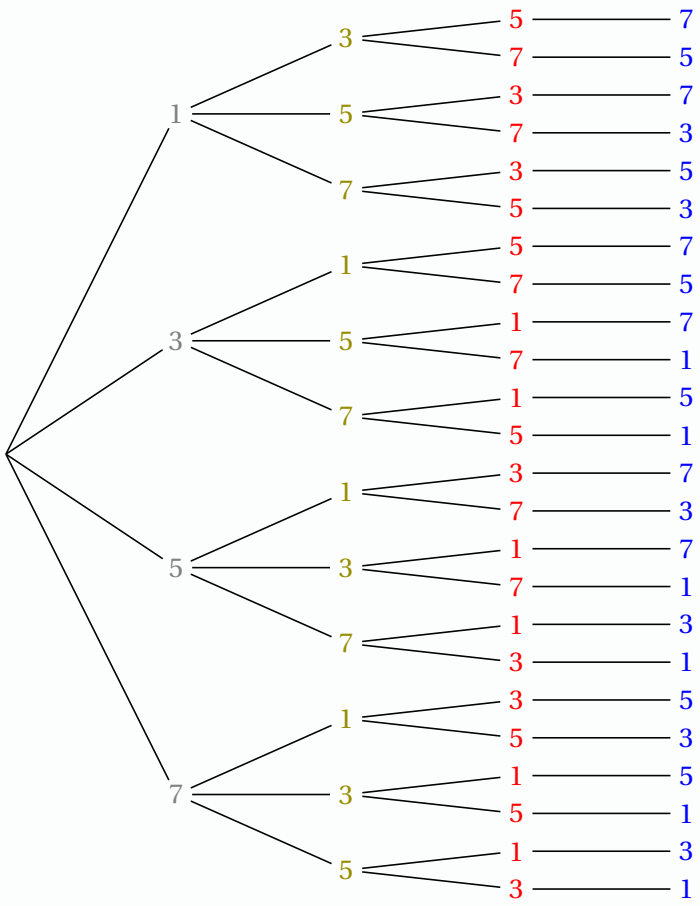
Tree no repeating | Arbre "sans remise" [*Syntax*]

```
\pflchoicetreenorepl<tikz options>{list}
\ArbreChoixSansRemise[clés]<options tikz>{liste}
\pflarbrechoixssremise[<clés>]<options tikz>{liste}

% --- [keys/clés] ------------------------------------------------------------
% level sep     = EspaceNiveaux   = 2.25
% child sep     = EspaceFeuilles  = 0.5
% scale         = Echelle         = 1
% repeat        = Repet           = {}
% help          = Notice          = {}
% help rules    = TraitsNotice    = false
% level color   = CouleursNiveaux = black
% show results = AffResultats    = false
% result sep    = SepResultats    = {}
% ------------------------------------------------------------------------------
```

Tree no repeating | Arbre "sans remise" [*Sample(s)*]

```
\pflchoicetreenorepl[level color={gray,olive,red,blue}]{1,3,5,7}
```



6 Analytical geometry

6.1 Cartesian equation of a plane

Cartesian equation of plane | Équation cartésienne d'un plan [*Syntax*]

```
\pflcartplaneq[keys](normal vect)(point)
%or
\pflcartplaneq[keys](dir vect 1)(dir vect 2)(point)
%or
\pflcartplaneq[keys](point1)(point2)(point3)

\TrouveEqCartPlan[keys].....

% --- [keys/clés] ------------------------------------------------------------
% coeff fmt    = OptionCoeffs  = d
% simpl coeffs = SimplifCoeffs = false
% factor       = Factor        = true
% ------------------------------------------------------------------------------
```

Cartesian equation of plane | Équation cartésienne d'un plan [*Sample(s)*]

```
$\pflcartplaneq(1;2;3)(4,5,6)$\\
$\pflcartplaneq(1/2;2/3;3/5)(4,5,6)$ or
$\pflcartplaneq[simpl coeffs](1/2;2/3;3/5)(4,5,6)$\\
$\pflcartplaneq(2,0,1)(3,1,1)(1,-2,0)$
```

$x+2y+3z-32=0$
$\frac{1}{2}x+\frac{2}{3}y+\frac{3}{5}z-\frac{134}{15}=0$ or $15x+20y+18z-268=0$
$-x+y-z+3=0$

6.2 Cartesian equation of a sphere

Cartesian equation of sphere | Équation cartésienne d'une sphère [*Syntax*]

```
\pfleqsphere[keys](point)(radius or diam point or cart plan)
\TrouveEqSphere[clés](point)(rayon ou diamètre ou éq cart)

% --- [keys/clés] ------------------------------------------------------------
% coeff fmt    = OptionCoeffs  = d
% simpl coeffs = SimplifCoeffs = false
% diameter     = Diam          = false
% expand       = Develop       = true
% sort         = Sort          = true
% ------------------------------------------------------------------------------
```

Cartesian equation of sphere | Équation cartésienne d'une sphère [*Sample(s)*]

```
%center + radius
$\pfleqsphere(1,1,1)(2)$\\
$\pfleqsphere[expand=false](1,1,1)(2)$\\
$\pfleqsphere[sort=false](1,1,1)(2)$
```

$x^2-2x+y^2-2y+z^2-2z-1=0$
$(x-1)^2+(y-1)^2+(z-1)^2=4$
$x^2+y^2+z^2-2x-2y-2z-1=0$

Cartesian equation of sphere | Équation cartésienne d'une sphère [*Sample(s)*]

```
%center + point
$\pfleqsphere(3,1,4)(0,0,0)$\\
$\pfleqsphere[expand=false](3,1,4)(0,0,0)$\\
$\pfleqsphere[sort=false](3,1,4)(0,0,0)$
```

$$x^2-6x+y^2-2y+z^2-8z=0$$
$$(x-3)^2+(y-1)^2+(z-4)^2=26$$
$$x^2+y^2+z^2-6x-2y-8z=0$$

Cartesian equation of sphere | Équation cartésienne d'une sphère [*Sample(s)*]

```
%diameter
$\pfleqsphere[diameter](3,1,4)(0,0,0)$\\
$\pfleqsphere[diameter,expand=false](3,1,4)(0,0,0)$\\
$\pfleqsphere[diameter,sort=false](3,1,4)(0,0,0)$
```

$$x^2-3x+y^2-y+z^2-4z=0$$
$$\left(x-\tfrac{3}{2}\right)^2+\left(y-\tfrac{1}{2}\right)^2+(z-2)^2=\tfrac{13}{2}$$
$$x^2+y^2+z^2-3x-y-4z=0$$

Cartesian equation of sphere | Équation cartésienne d'une sphère [*Sample(s)*]

```
%center + tangent plan
$\pfleqsphere[](1,2,4)(2x+3y-3z+1=0)$\\
$\pfleqsphere[expand=false](1,2,4)(2x+3y-3z+1=0)$\\
$\pfleqsphere[sort=false](1,2,4)(2x+3y-3z+1=0)$
```

$$x^2-2x+y^2-4y+z^2-8z+\tfrac{453}{22}=0$$
$$(x-1)^2+(y-2)^2+(z-4)^2=\tfrac{9}{22}$$
$$x^2+y^2+z^2-2x-4y-8z+\tfrac{453}{22}=0$$

7 Arithmetic

7.1 Conversions

Conversion to dec | Conversion en b10 [*Syntax*]

```
\pflconvtodec[keys]{number}
\pflconvversdec[clés]{nb}
\ConversionVersDec[clés]{nb}

% --- [keys/clés] ------------------------------------------------------------
% base from  = BaseDep  = 2
% show base  = AffBase  = true
% details    = Details  = true
% zeros      = Zeros    = true
% ------------------------------------------------------------------------------
```

Conversion to dec | Conversion en b10 [*Sample(s)*]

```
$\ConversionVersDec[zeros=false,base from=16]{AC0DC}$
```

$$\mathrm{AC0DC}_{16} = 10 \times 16^4 + 12 \times 16^3 + 13 \times 16^1 + 12 \times 16^0 = 704\,732_{10}$$

Conversion from dec | Conversion depuis b10 [*Syntax*]

```
\pflconvdepuisdix[clés]{nombre}{base arrivée}
\pflconvfromten[keys]{number}{final basis}
\ConversionDepuisBaseDix[clés]{nombre}{base arrivée}

% --- [keys/clés] ------------------------------------------------------------
% color     = Couleur    = red
% hsep      = DecalH     = 2pt
% vsep      = DecalV     = 3pt
% rect      = Rect       = true
% node      = Noeud      = EEE
% res color = CouleurRes = false
% ------------------------------------------------------------------------------
```

Conversion from dec | Conversion depuis b10 [*Sample(s)*]

```
\ConversionDepuisBaseDix{78}{2}
```

$$\left\{\begin{array}{l} 78 = 2 \times 39 + 0 \\ 39 = 2 \times 19 + 1 \\ 19 = 2 \times 9 + 1 \\ 9 = 2 \times 4 + 1 \\ 4 = 2 \times 2 + 0 \\ 2 = 2 \times 1 + 0 \\ 1 = 2 \times 0 + 1 \end{array}\right| \Rightarrow 78_{10} = 1001110_2$$

7.2 Prime numbers, PGCD

Isprime ? | Est premier ? [*Syntax*]

```
\pflisprimebool{expr}
\pflboolestpremier{expr}
```

Isprime ? | Est premier ? [*Sample(s)*]

```
\pflisprimebool{25457} and \pflisprimebool{25458}
```

1 and 0

Number factor | Décompo facteurs premiers [*Syntax*]

```
\pflnumberfact(*){expr}
\pfldecompnb(*){expr}

% --- (starred) ------------------------------------------------------------
% * for 1 power
% --------------------------------------------------------------------------
```

Number factor | Décompo facteurs premiers [*Sample(s)*]

```
$24458=\pflnumberfact{24458}=\pflnumberfact*{24458}$
```

$24458 = 2 \times 7 \times 1747 = 2^1 \times 7^1 \times 1747^1$

Gcd presentation | Présentation PGCD [*Syntax*]

```
\pflprespgcd[keys]{a}{b}
\PresentationPGCD[clés]{a}{b}

% --- [keys/clés] ----------------------------------------------------------
% color      = Couleur            = red
% rect sep   = DecalRect          = 2pt
% rect       = Rectangle          = true
% node       = Noeud              = FFF
% res color  = CouleurResultat    = false
% disp ccl   = AfficheConclusion  = true
% disp delim = AfficheDelimiteurs = true
% --------------------------------------------------------------------------
```

Gcd presentation | Présentation PGCD [*Sample(s)*]

```
\pflprespgcd[res color,color=CouleurVertForet]{1250}{450}.
```

$$\left\{\begin{array}{l} 1250 = 450 \times 2 + 350 \\ 450 = 350 \times 1 + 100 \\ 350 = 100 \times 3 + \boxed{50} \\ 100 = 50 \times 2 + 0 \end{array}\right| \Rightarrow \mathrm{PGCD}\,(1250\,;450) = 50.$$

7.3 Divisors

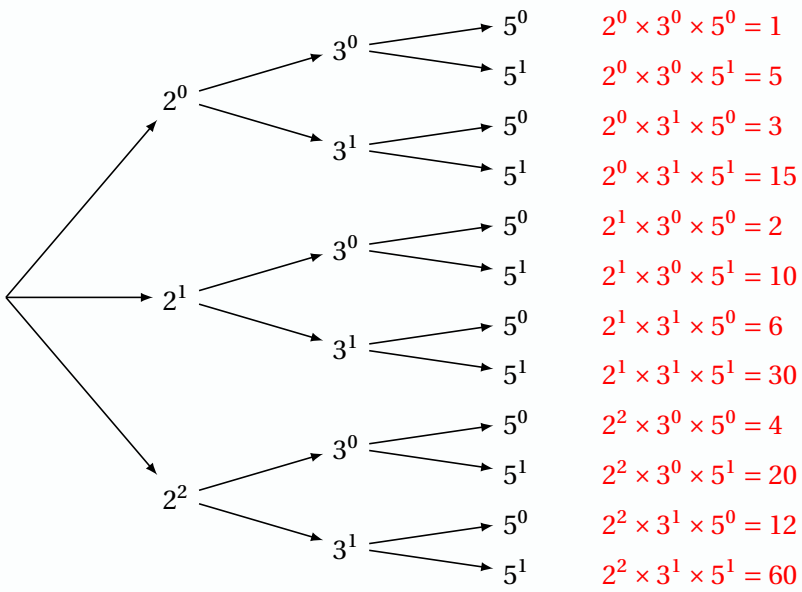
Tree divisors | Arbre des diviseurs [*Syntax*]

```
\pfltreediv[keys]<tikz options>{expr}
\pflarbrediv[clés]<options tikz>{expr}
\ArbreDiviseurs[clés]<options tikz>{expr}

% --- [keys/clés] ----------------------------------------------------------
% level sep     = EspaceNiveau   = 2.25
% child sep     = EspaceFeuille  = 0.66
% details       = Details        = true
% details color = CouleurDetails = red
% scale         = Echelle        = 1
% arrows        = Fleches        = true
% --------------------------------------------------------------------------
```

Tree divisors | Arbre des diviseurs [*Sample(s)*]

```
\pfltreediv{60}
```



7.4 Prime decomposition

Prime decomposition | Décomposition d'un entier [*Syntax*]

```
\pflfactornb[keys]{number}
\DecompFactPremiers[clés]{nombre}

% --- [keys/clés] ------------------------------------------------------------
% long      = Longue         = false
% onepower  = PuissanceUn    = false
% ------------------------------------------------------------------------------
```

Prime decomposition | Décomposition d'un entier [*Sample(s)*]

```
\pflfactornb{2781240}\\
\pflfactornb[onepower]{2781240}\\
\pflfactornb[long]{2781240}
```

$2^3 \times 3 \times 5 \times 7^2 \times 11 \times 43$
$2^3 \times 3^1 \times 5^1 \times 7^2 \times 11^1 \times 43^1$
$2 \times 2 \times 2 \times 3 \times 5 \times 7 \times 7 \times 11 \times 43$

Prime presentation | Présentation de la décomposition [*Syntax*]

```
\pflprimefactpres[keys]{number}
\pflpresfactprem[clés]{nombre}
\PresFactPremiers[clés]{nombre}

% --- [keys/clés] ------------------------------------------------------------
% rulecolor = CouleurTrait    = black
% rulethick = EpaisseurTrait  = 0.4pt
% endbox    = EncadreFin      = false
% ------------------------------------------------------------------------------
```

Prime presentation | Présentation de la décomposition [*Sample(s)*]

```
\pflprimefactpres{2781240}\\
\pflprimefactpres[endbox,rulecolor=red,rulethick=0.8pt]{2781240}
```

2 781 240	2
1 390 620	2
695 310	2
347 655	3
115 885	5
23 177	7
3311	7
473	11
43	43
1	

2 781 240	2
1 390 620	2
695 310	2
347 655	3
115 885	5
23 177	7
3311	7
473	11
43	43
1	

7.5 Miscellaneous

Period fraction | Fraction pédiodique [*Syntax*]

```
\pflperiodfraction[keys]{before period}{period}
\pflfracperiod[clés]{avant période}{période}
\FractionPeriode[clés]{avant période}{période}

% --- [keys/clés] ------------------------------------------------------------
% statement = Enonce   = true
% d                    = true
% unknown   = Inconnue = x
% sol       = Solution = false
% raw       = Brut     = true
% simple    = Simple   = false
% ------------------------------------------------------------------------------
```

Period fraction | Fraction pédiodique [*Sample(s)*]

```
\pflperiodfraction[sol]{45.1}{23}
```

We set $x = 45.1\overline{23}$.
We *shift* the period close to the decimal point by multiplying by 10^1:

$$\boxed{10^1 \times x = 451.\overline{23}} \quad (1)$$

We *shift* the period before the decimal point by multiplying equality (1) by 10^2:

$$10^2 \times 10^1 \times x = 10^2 \times 451.\overline{23} \Rightarrow \boxed{10^3 \times x = 45\,123.\overline{23}} \quad (2)$$

We subtract the two equalities, (2) – (1), which allows us to *remove* the decimal part:

$$\begin{aligned} 10^3 \times x - 10^1 \times x = 45\,123.\overline{23} - 451.\overline{23} &\Rightarrow \left(10^3 - 10^1\right) \times x = 45\,123 - 451 \\ &\Rightarrow 990 \times x = 44\,672 \\ &\Rightarrow x = \frac{44\,672}{990} \end{aligned}$$

Thus we have $45.1\overline{23} = \dfrac{44\,672}{990} = \dfrac{22\,336}{495}$.

8 Recreations

8.1 Fractals

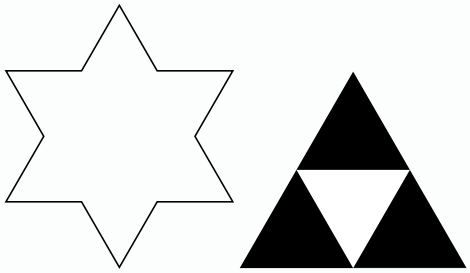
Fractals, with TikZ | Fractales, avec TikZ [*Syntax*]

```
\pfltkzfractal[type=...,<keys>]<tikZ options>
\FractaleTikz[Type=...,<clés>]<options tikz>
\pflfractaltikz[Type=.,<clés>]<options tikz>

% --- [type] ------------------------------------------------------------------
% type         = Type          = Koch or Sierp
%
% --- [keys/clés] -------------------------------------------------------------
% thickness    = Epaisseur     = 0.6pt
% color        = Couleur       = black
% side width   = LongueurCote  = 3
% step         = Etape         = 1
% fill         = Remplir       = false
% fill style   = Remplissage   = lightgray
% start        = Depart        = {(0,0)}
% v align      = AlignV        = false
% offset       = Offset        = 2pt
% -------------------------------------------------------------------------------
```

Fractals, with TikZ | Fractales, avec TikZ [*Sample(s)*]

```
\pfltkzfractal[type=Koch]
\pfltkzfractal[type=Sierp]
```



8.2 House of cards

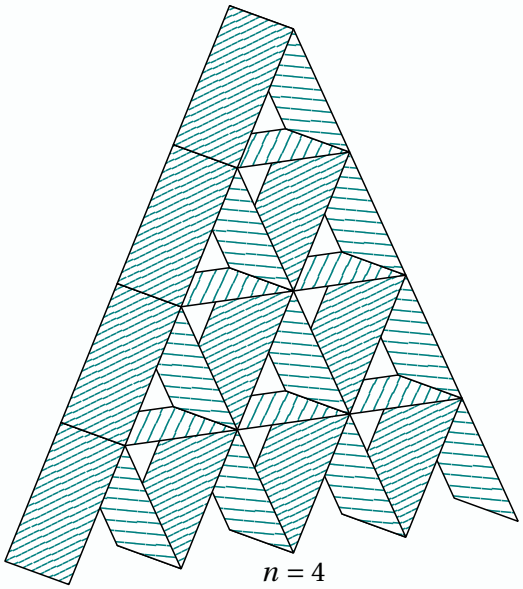
House of cards | Château de cartes [*Syntax*]

```
\pflhouseofcards[keys]{levels}<tikz options>
\pflchateaucartes[clés]{étages}<options tikz>
\ChateauCartes[clés]{étages}<options tikz>

% --- [keys/clés] -------------------------------------------------------------
% scale        = Echelle       = 1
% deco color   = CouleurDeco   = black
% rounded      = Arrondi       = true
% y angle      = AngleY        = 20
% x angle      = AngleX        = 8
% bottom       = Bas           = false
% legend       = Legende       = false
% legend font  = PoliceLegende = \normalsize\normalfont
% deco         = Deco          = remplir
% -------------------------------------------------------------------------------
```

House of cards | Château de cartes [*Sample(s)*]

```
\pflhouseofcards[deco color=teal,deco=hatch,scale=2,legend]{4}
```



8.3 Stack of balls

Stack of balls | Empilement de balles [*Syntax*]

```
\pflballstacking[keys]{levels}<tikz options>
\pflempilballes[clés]{niveaux}<options tikz>
\EmpilementBalles[clés]{niveaux}<options tikz>

% --- [keys/clés] ------------------------------------------------------------
% color    = Couleur  = gray
% rotation = Rotation = -5
% scale    = Echelle  = 1
% ------------------------------------------------------------------------------
```

Stack of balls | Empilement de balles [*Sample(s)*]

```
\pflballstacking[scale=0.33,color=red]{3-8}
```