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Edition 2017

Thème : Introduction à Mathematica - § 3 Listes
Lien vers les énoncés des exercices:
https://www.deleze.name/marcel/sec2/applmaths/csud/initiation_mathematica/3-Listes.pdf

Corrigé de l'exercice 3-1-1

```
Table[k, {k, 1, 12}]
```
table

$$\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

```
Table[k π/4, {k, 0, 8}]
```
table

$$\left\{0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}, 2\pi\right\}$$

```
Table[1/k^2, {k, 1, 10}]
```
table

$$\left\{1, \frac{1}{4}, \frac{1}{9}, \frac{1}{16}, \frac{1}{25}, \frac{1}{36}, \frac{1}{49}, \frac{1}{64}, \frac{1}{81}, \frac{1}{100}\right\}$$

```
Table[k/(k + 1), {k, 2, 14, 2}]
```
table

$$\left\{\frac{2}{3}, \frac{4}{5}, \frac{6}{7}, \frac{8}{9}, \frac{10}{11}, \frac{12}{13}, \frac{14}{15}\right\}$$

```
tableau = Table[{k, 1/k}, {k, 1, 10}]
```
table

$$\left\{\{1, 1\}, \left\{2, \frac{1}{2}\right\}, \left\{3, \frac{1}{3}\right\}, \left\{4, \frac{1}{4}\right\}, \left\{5, \frac{1}{5}\right\}, \left\{6, \frac{1}{6}\right\}, \left\{7, \frac{1}{7}\right\}, \left\{8, \frac{1}{8}\right\}, \left\{9, \frac{1}{9}\right\}, \left\{10, \frac{1}{10}\right\}\right\}$$

```
TableForm[tableau, TableHeadings → {None, {"x", "y"}}]
```
forme de table | en-têtes de table | aucun

x	y
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$
4	$\frac{1}{4}$
5	$\frac{1}{5}$
6	$\frac{1}{6}$
7	$\frac{1}{7}$
8	$\frac{1}{8}$
9	$\frac{1}{9}$
10	$\frac{1}{10}$

Corrigé de l'exercice 3-1-2

```
Clear[successeur];
```
efface
```
successeur[x_] := -x;
NestList[successeur, 1, 13]
```
liste d'imbrication

```
{1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1}
```

```
Clear[successeur];
```
efface
```
successeur[x_] := x^2;
NestList[successeur, 3, 7]
```
liste d'imbrication

```
{3, 9, 81, 6561, 43 046 721, 1 853 020 188 851 841, 3 433 683 820 292 512 484 657 849 089 281,
 11 790 184 577 738 583 171 520 872 861 412 518 665 678 211 592 275 841 109 096 961}
```

```
Clear[successeur];
```
efface
```
successeur[x_] := Sqrt[x];
NestList[successeur, 16, 11]
```
liste d'imbrication

$$\left\{16, 4, 2, \sqrt{2}, 2^{1/4}, 2^{1/8}, 2^{1/16}, 2^{1/32}, 2^{1/64}, 2^{1/128}, 2^{1/256}, 2^{1/512}\right\}$$

Corrigé de l'exercice 3-1-3

a) Numériquement, la suite atteint un point fixe

```
N[FixedPointList[Cos, π/4.], 16]
```
liste de point fixe cosinus

```
{0.785398, 0.707107, 0.760245, 0.724667, 0.74872, 0.732561, 0.743464,
 0.736128, 0.741074, 0.737744, 0.739988, 0.738477, 0.739495, 0.738809, 0.739271,
 0.73896, 0.739169, 0.739028, 0.739123, 0.739059, 0.739103, 0.739073, 0.739093,
 0.73908, 0.739089, 0.739083, 0.739087, 0.739084, 0.739086, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085,
 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085, 0.739085}
```

b) Le point fixe est solution de l'équation cox(x) = x

Soit r un point fixe de la fonction cos. Cela signifie que r désigne la dernière valeur de la liste des itérées et que le terme suivant cos(r) lui est égal, c'est-à-dire cos(r) = r.

c) La suite de nombres est

$$x_0 = 1.5,\quad x_1 = \sqrt{1.5},\quad x_2 = \sqrt[4]{1.5},\quad x_3 = \sqrt[8]{1.5},\qquad x_4 = \sqrt[16]{1.5},\qquad \ldots\ldots$$

$$x_n = \sqrt[2^n]{1.5}$$

Cette suite tend vers 1.

d) L'équation est $\sqrt{x} = x$

Le nombre $x = 1$ est donc solution de cette équation.

L'équation possède aussi une autre solution : $x = 0$.

Corrigé de l'exercice 3-1-4

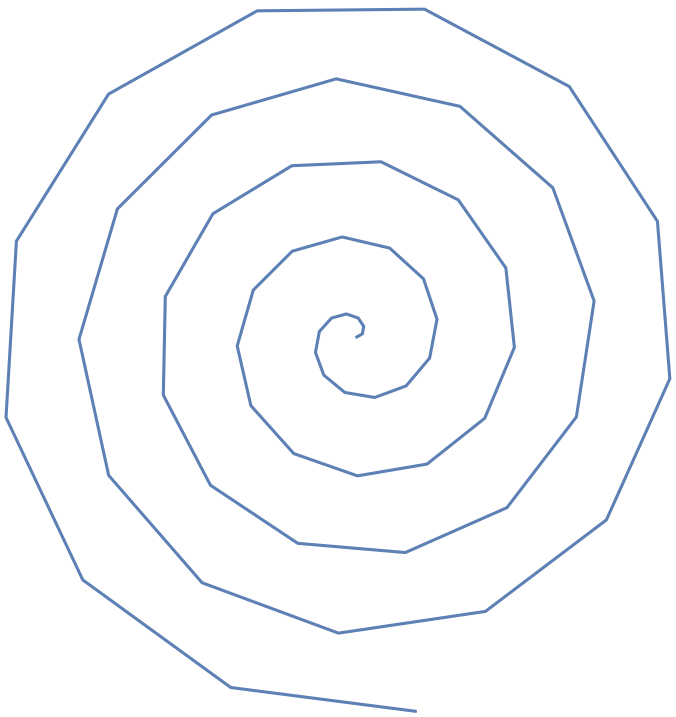
```
lPts = Table[{i, (-1)^i}, {i, -6, 6}]
```
table

```
{{-6, 1}, {-5, -1}, {-4, 1}, {-3, -1}, {-2, 1},
 {-1, -1}, {0, 1}, {1, -1}, {2, 1}, {3, -1}, {4, 1}, {5, -1}, {6, 1}}
```

```
ListLinePlot[lPts, Axes → False, AspectRatio → Automatic]
```
tracé de liste de ligne axes faux rapport d'aspect automatique

```
lPts = Table[{t Cos[t], t Sin[t]}, {t, 0, 30, 0.5`}];
ListLinePlot[lPts, Axes → False, AspectRatio → Automatic]
```
table cosinus sinus

tracé de liste de ligne axes faux rapport d'aspect automatique



Corrigé de l'exercice 3-2-1

```
ls = Table[Sin[k π/5 + π/10], {k, -5, 15}]
```
table sinus

$$\left\{\frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1-\sqrt{5}\right), -1, \frac{1}{4}\left(-1-\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1+\sqrt{5}\right),\right.$$
$$1, \frac{1}{4}\left(1+\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1-\sqrt{5}\right), -1, \frac{1}{4}\left(-1-\sqrt{5}\right),$$
$$\left.\frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1+\sqrt{5}\right), 1, \frac{1}{4}\left(1+\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right)\right\}$$

```
lt = Table[(-1)^i, {i, -5, 15}]
```
table

```
{-1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1}
```

a) Nombre d'occurrences de 1 dans ls:

```
Count[ls, 1]
```
compte

```
2
```

b) Position des 1 dans ls:

```
Position[ls, 1]
```
position

```
{{1, 2, 1}, {5, 2, 1}, {7, 2, 1}, {8}, {9, 2, 1},
 {11, 2, 1}, {15, 2, 1}, {17, 2, 1}, {18}, {19, 2, 1}, {21, 2, 1}}
```

On ne s'intéresse qu'aux 1 situés au niveau 1 (level 1):

```
? Position
```

Position[*expr*, *pattern*] gives a list of the positions at which objects matching *pattern* appear in *expr*.
Position[*expr*, *pattern*, *levelspec*] finds only objects that appear on levels specified by *levelspec*.
Position[*expr*, *pattern*, *levelspec*, *n*] gives the positions of the first *n* objects found.
Position[*pattern*] represents an operator form of Position that can be applied to an expression. ≫

```
Position[ls, 1, 1]
```
position

```
{{8}, {18}}
```

Corrigé de l'exercice 3-2-2

```
liste = Table[{i, (-1)^i}, {i, -6, 6}]
```
table

```
{{-6, 1}, {-5, -1}, {-4, 1}, {-3, -1}, {-2, 1},
 {-1, -1}, {0, 1}, {1, -1}, {2, 1}, {3, -1}, {4, 1}, {5, -1}, {6, 1}}
```

a)

```
liste[[3]]
```

{-4, 1}

```
liste[[-2]]
```

{5, -1}

b)

```
Position[liste, {-1, -1}]
```
position

{{6}}

```
Position[liste, {1, -1}]
```
position

{{8}}

Corrigé de l'exercice 3-3-1

```
Range[3, 53, 5]
```
plage

{3, 8, 13, 18, 23, 28, 33, 38, 43, 48, 53}

$$3 + 2^{\text{Range}[0,10]}$$

{4, 5, 7, 11, 19, 35, 67, 131, 259, 515, 1027}

$$\text{Range}[-2, 5]^3$$

{-8, -1, 0, 1, 8, 27, 64, 125}

$$\text{Range}\left[-\frac{\pi}{4}, \frac{3\pi}{4}, \frac{\pi}{6}\right]$$
plage

$$\left\{-\frac{\pi}{4}, -\frac{\pi}{12}, \frac{\pi}{12}, \frac{\pi}{4}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{3\pi}{4}\right\}$$

Corrigé de l'exercice 3-3-2

```
lp = Table[{p, Prime[p]}, {p, 1, 10}]
```
table nombre premier

{{1, 2}, {2, 3}, {3, 5}, {4, 7}, {5, 11}, {6, 13}, {7, 17}, {8, 19}, {9, 23}, {10, 29}}

```
MatrixForm[Transpose[lp]]
```
apparence m··· transposée

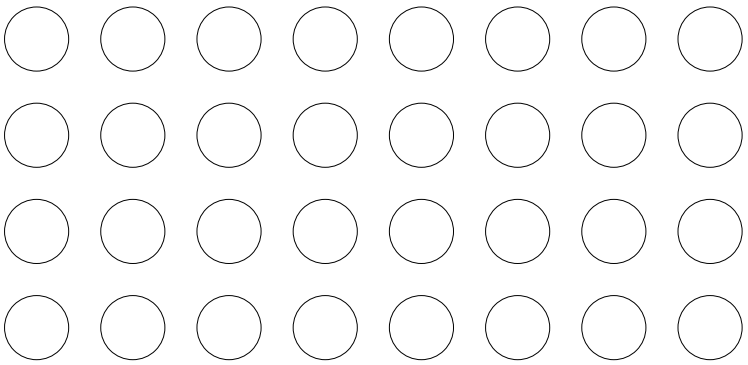
$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ 2 & 3 & 5 & 7 & 11 & 13 & 17 & 19 & 23 & 29 \end{pmatrix}$$

```
MatrixForm[lp]
```
apparence matricielle

$$\begin{pmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 5 \\ 4 & 7 \\ 5 & 11 \\ 6 & 13 \\ 7 & 17 \\ 8 & 19 \\ 9 & 23 \\ 10 & 29 \end{pmatrix}$$

Corrigé de l'exercice 3-3-3

```
Graphics[Table[Circle[{x, y}, 1/3], {x, 1, 8}, {y, 1, 4}],
 AspectRatio → Automatic, Axes → None, ImageSize → {400, 200}]
```
graphique table cercle — rapport d'aspect automatique axes aucun taille d'image



Corrigé de l'exercice 3-3 -4

```
f[x_] := (x^3 - 5)/x
```

```
x = Range[-3/4, 10 + 1/4, 1/2]
```
plage

$$\left\{-\frac{3}{4}, -\frac{1}{4}, \frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \frac{9}{4}, \frac{11}{4}, \frac{13}{4}, \frac{15}{4}, \frac{17}{4}, \frac{19}{4}, \frac{21}{4}, \frac{23}{4}, \frac{25}{4}, \frac{27}{4}, \frac{29}{4}, \frac{31}{4}, \frac{33}{4}, \frac{35}{4}, \frac{37}{4}, \frac{39}{4}, \frac{41}{4}\right\}$$

```
y = f[x]
```

$$\left\{\frac{347}{48}, \frac{321}{16}, -\frac{319}{16}, -\frac{293}{48}, -\frac{39}{16}, \frac{23}{112}, \frac{409}{144}, \frac{1011}{176}, \frac{1877}{208}, \frac{611}{48}, \frac{4593}{272}, \frac{6539}{304}, \frac{8941}{336}, \frac{11\,847}{368}, \frac{3061}{80}, \frac{19\,363}{432}, \frac{24\,069}{464}, \frac{29\,471}{496}, \frac{35\,617}{528}, \frac{8511}{112}, \frac{50\,333}{592}, \frac{58\,999}{624}, \frac{68\,601}{656}\right\}$$

```
p = Transpose[{x, y}]
```
transposée

$$\left\{\left\{-\frac{3}{4}, \frac{347}{48}\right\}, \left\{-\frac{1}{4}, \frac{321}{16}\right\}, \left\{\frac{1}{4}, -\frac{319}{16}\right\}, \left\{\frac{3}{4}, -\frac{293}{48}\right\}, \left\{\frac{5}{4}, -\frac{39}{16}\right\}, \left\{\frac{7}{4}, \frac{23}{112}\right\}, \left\{\frac{9}{4}, \frac{409}{144}\right\},\right.$$
$$\left\{\frac{11}{4}, \frac{1011}{176}\right\}, \left\{\frac{13}{4}, \frac{1877}{208}\right\}, \left\{\frac{15}{4}, \frac{611}{48}\right\}, \left\{\frac{17}{4}, \frac{4593}{272}\right\}, \left\{\frac{19}{4}, \frac{6539}{304}\right\}, \left\{\frac{21}{4}, \frac{8941}{336}\right\},$$
$$\left\{\frac{23}{4}, \frac{11\,847}{368}\right\}, \left\{\frac{25}{4}, \frac{3061}{80}\right\}, \left\{\frac{27}{4}, \frac{19\,363}{432}\right\}, \left\{\frac{29}{4}, \frac{24\,069}{464}\right\}, \left\{\frac{31}{4}, \frac{29\,471}{496}\right\},$$
$$\left.\left\{\frac{33}{4}, \frac{35\,617}{528}\right\}, \left\{\frac{35}{4}, \frac{8511}{112}\right\}, \left\{\frac{37}{4}, \frac{50\,333}{592}\right\}, \left\{\frac{39}{4}, \frac{58\,999}{624}\right\}, \left\{\frac{41}{4}, \frac{68\,601}{656}\right\}\right\}$$

```
Max[y]
```
maximum

$$\frac{68\,601}{656}$$

```
Position[y, Max[y]]
```
position maximum

```
{{23}}
```

```
Flatten[Position[y, Max[y]]]
```
aplatis position maximum

```
{23}
```

```
posMax = Flatten[Position[y, Max[y]]][[1]]
```
aplatis position maximum

```
23
```

```
x[[posMax]]
```

$$\frac{41}{4}$$

```
Min[y]
```
minimum

$$-\frac{319}{16}$$

```
Position[y, Min[y]]
```
position minimum

```
{{3}}
```

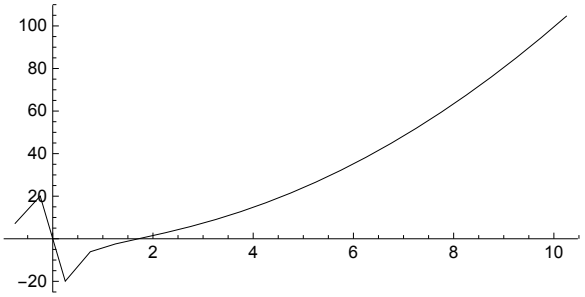
```
posMin = Flatten[Position[y, Min[y]]][[1]]
```
aplatis position minimum

```
3
```

```
x[[posMin]]
```

$$\frac{1}{4}$$

```
Graphics[Line[p], Axes → True, ImageSize → {300, 200}, AspectRatio → 1 / 2]
```
graphique ligne axes vrai taille d'image rapport d'aspect




```
Sign[y]
```
signe

```
{1, 1, -1, -1, -1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1}
```

```
Position[Sign[y], 1]
```
position signe

```
{{1}, {2}, {6}, {7}, {8}, {9}, {10}, {11}, {12}, {13},
 {14}, {15}, {16}, {17}, {18}, {19}, {20}, {21}, {22}, {23}}
```

```
pos = Flatten[Position[Sign[y], 1]]
```
aplatis position signe

```
{1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23}
```

```
p[[pos]]
```

$$\left\{\left\{-\frac{3}{4}, \frac{347}{48}\right\}, \left\{-\frac{1}{4}, \frac{321}{16}\right\}, \left\{\frac{7}{4}, \frac{23}{112}\right\}, \left\{\frac{9}{4}, \frac{409}{144}\right\}, \left\{\frac{11}{4}, \frac{1011}{176}\right\},\right.$$
$$\left\{\frac{13}{4}, \frac{1877}{208}\right\}, \left\{\frac{15}{4}, \frac{611}{48}\right\}, \left\{\frac{17}{4}, \frac{4593}{272}\right\}, \left\{\frac{19}{4}, \frac{6539}{304}\right\}, \left\{\frac{21}{4}, \frac{8941}{336}\right\},$$
$$\left\{\frac{23}{4}, \frac{11\,847}{368}\right\}, \left\{\frac{25}{4}, \frac{3061}{80}\right\}, \left\{\frac{27}{4}, \frac{19\,363}{432}\right\}, \left\{\frac{29}{4}, \frac{24\,069}{464}\right\}, \left\{\frac{31}{4}, \frac{29\,471}{496}\right\},$$
$$\left.\left\{\frac{33}{4}, \frac{35\,617}{528}\right\}, \left\{\frac{35}{4}, \frac{8511}{112}\right\}, \left\{\frac{37}{4}, \frac{50\,333}{592}\right\}, \left\{\frac{39}{4}, \frac{58\,999}{624}\right\}, \left\{\frac{41}{4}, \frac{68\,601}{656}\right\}\right\}$$

```
TableForm[N[p[[pos]]]]
```
forme de ta··· valeur numérique

−0.75	7.22917
−0.25	20.0625
1.75	0.205357
2.25	2.84028
2.75	5.74432
3.25	9.02404
3.75	12.7292
4.25	16.886
4.75	21.5099
5.25	26.6101
5.75	32.1929
6.25	38.2625
6.75	44.8218
7.25	51.8728
7.75	59.4173
8.25	67.4564
8.75	75.9911
9.25	85.022
9.75	94.5497
10.25	104.575

Corrigé de l'exercice 3-3-5

```
Clear[moyenne];
```
efface

$$\text{moyenne}[x\_\text{List}] := \frac{\text{Apply}[\text{Plus}, x]}{\text{Length}[x]}$$

```
sArith = Table[3 + 5 i, {i, 0, 10}]
```
table

```
{3, 8, 13, 18, 23, 28, 33, 38, 43, 48, 53}
```

```
Apply[Plus, sArith]
```
remp··· plus

```
308
```

```
Apply[Times, sArith]
```
remp··· multiplication

```
496 130 658 895 872
```

```
moyenne[sArith]
```

```
28
```

```
suite = Table[3 + 2^k, {k, 0, 10}]
```
table

```
{4, 5, 7, 11, 19, 35, 67, 131, 259, 515, 1027}
```

```
Apply[Plus, suite]
```
remp··· plus

```
2080
```

```
Apply[Times, suite]
```
remp··· multiplication

```
1 231 305 732 007 851 500
```

```
moyenne[suite]
```

$$\frac{2080}{11}$$

```
N[moyenne[suite]]
```
valeur numérique

```
189.091
```

```
sCube = Table[n^3, {n, -2, 5}]
```
table

```
{-8, -1, 0, 1, 8, 27, 64, 125}
```

```
Apply[Plus, sCube]
```
remp··· plus

```
216
```

```
Apply[Times, sCube]
```
remp··· multiplication

```
0
```

```
moyenne[sCube]
```

```
27
```

```
sAngles = Table[π/4 + k π/6, {k, -3, 3}]
```
table

$$\left\{-\frac{\pi}{4}, -\frac{\pi}{12}, \frac{\pi}{12}, \frac{\pi}{4}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{3\pi}{4}\right\}$$

```
Apply[Plus, sAngles]
```
remp··· plus

$$\frac{7\pi}{4}$$

```
Apply[Times, sAngles]
```
remp··· multiplication

$$\frac{35\pi^7}{442\,368}$$

```
moyenne[sAngles]
```

$$\frac{\pi}{4}$$

Corrigé de l'exercice 3-3-6

```
Clear[f, x];
```
efface

```
f[x_] := (x - 1)/(2 x + 1)
```

```
valeurs = Map[f, Range[-10, 10]]
```
applique plage

$$\left\{\frac{11}{19}, \frac{10}{17}, \frac{3}{5}, \frac{8}{13}, \frac{7}{11}, \frac{2}{3}, \frac{5}{7}, \frac{4}{5}, 1, 2, -1, 0, \frac{1}{5}, \frac{2}{7}, \frac{1}{3}, \frac{4}{11}, \frac{5}{13}, \frac{2}{5}, \frac{7}{17}, \frac{8}{19}, \frac{3}{7}\right\}$$

```
points = Transpose[{Range[-10, 10], valeurs}]
```
transposée plage

$$\left\{\left\{-10, \frac{11}{19}\right\}, \left\{-9, \frac{10}{17}\right\}, \left\{-8, \frac{3}{5}\right\}, \left\{-7, \frac{8}{13}\right\}, \left\{-6, \frac{7}{11}\right\}, \left\{-5, \frac{2}{3}\right\},\right.$$
$$\left\{-4, \frac{5}{7}\right\}, \left\{-3, \frac{4}{5}\right\}, \{-2, 1\}, \{-1, 2\}, \{0, -1\}, \{1, 0\}, \left\{2, \frac{1}{5}\right\}, \left\{3, \frac{2}{7}\right\},$$
$$\left.\left\{4, \frac{1}{3}\right\}, \left\{5, \frac{4}{11}\right\}, \left\{6, \frac{5}{13}\right\}, \left\{7, \frac{2}{5}\right\}, \left\{8, \frac{7}{17}\right\}, \left\{9, \frac{8}{19}\right\}, \left\{10, \frac{3}{7}\right\}\right\}$$

Corrigé de l'exercice 3-3-7

```
a = {-1, -2}; b = {1, 5}; c = {7, 3};
```

```
norme[u_List] := Sqrt[u.u];
angle[u_List, v_List] := ArcCos[u.v/(norme[u] norme[v])]
```
arc cosinus

```
{norme[c - b], norme[c - a], norme[b - a]}
```

$$\left\{2\sqrt{10}, \sqrt{89}, \sqrt{53}\right\}$$

```
{angle[b - a, c - a], angle[a - b, c - b], angle[a - c, b - c]} 180./π
```

```
{42.0492, 87.5104, 50.4403}
```

Corrigé de l'exercice 3-3-8

```
moyennePonderee[n_List, c_List] := n.c/Apply[Plus, c]
```

```
notes = {4.5, 5, 3.5, 4, 6, 5.5};
coeff = {3, 2, 1, 1, 1/2, 1/2};
moyennePonderee[notes, coeff]
```

```
4.59375
```

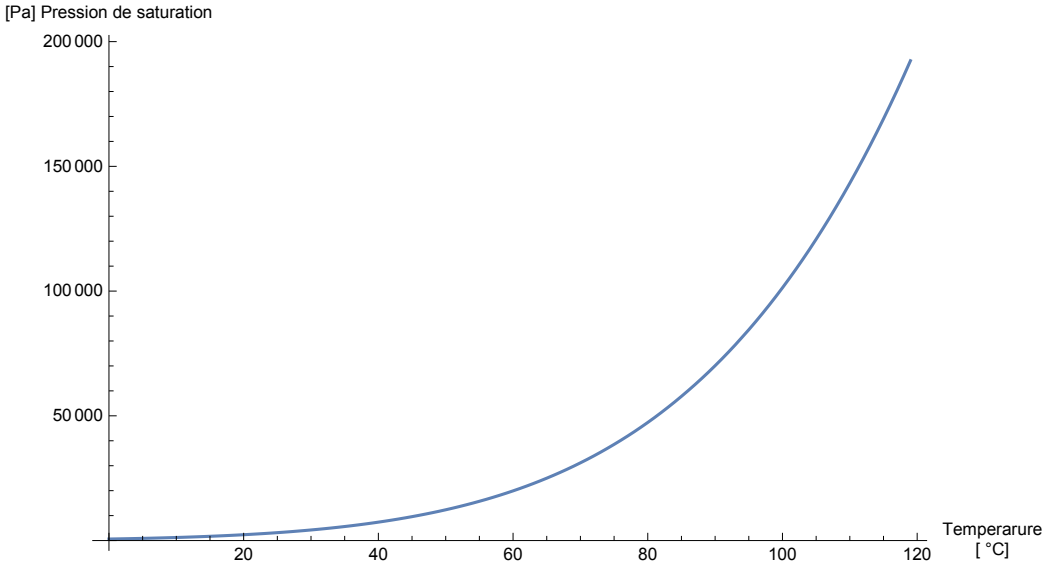
Corrigé de l'exercice 3-3-9

```
psat = {611, 657, 706, 758, 813, 872, 935, 1002, 1073, 1148, 1228, 1312, 1402, 1497, 1598,
   1705, 1818, 1937, 2063, 2197, 2338, 2487, 2643, 2809, 2983, 3167, 3360, 3564, 3780,
   4005, 4243, 4492, 4755, 5030, 5319, 5623, 5941, 6275, 6625, 6992, 7375, 7778, 8199,
   8639, 9101, 9583, 10086, 10612, 11160, 11735, 12334, 12959, 13611, 14292, 15000,
   15737, 16505, 17308, 18143, 19012, 19916, 20856, 21834, 22849, 23906, 25003, 26143,
   27326, 28554, 29828, 31157, 32517, 33944, 35424, 36957, 38543, 40183, 41877,
   43636, 45463, 47343, 49289, 51316, 53409, 55569, 57809, 60115, 62488, 64941,
   67474, 70096, 72801, 75592, 78474, 81477, 84513, 87675, 90935, 94295, 97757,
   101325, 105000, 108772, 112673, 116665, 120799, 125046, 129403, 133912, 138511,
   143263, 148148, 153153, 158310, 163620, 169050, 174644, 180378, 186275, 192335};
```

```
points = Transpose[{Range[0, 119], psat}]
         transposée   plage
```

```
{{0, 611}, {1, 657}, {2, 706}, {3, 758}, {4, 813}, {5, 872}, {6, 935}, {7, 1002}, {8, 1073},
 {9, 1148}, {10, 1228}, {11, 1312}, {12, 1402}, {13, 1497}, {14, 1598}, {15, 1705},
 {16, 1818}, {17, 1937}, {18, 2063}, {19, 2197}, {20, 2338}, {21, 2487}, {22, 2643},
 {23, 2809}, {24, 2983}, {25, 3167}, {26, 3360}, {27, 3564}, {28, 3780}, {29, 4005},
 {30, 4243}, {31, 4492}, {32, 4755}, {33, 5030}, {34, 5319}, {35, 5623}, {36, 5941},
 {37, 6275}, {38, 6625}, {39, 6992}, {40, 7375}, {41, 7778}, {42, 8199}, {43, 8639},
 {44, 9101}, {45, 9583}, {46, 10086}, {47, 10612}, {48, 11160}, {49, 11735}, {50, 12334},
 {51, 12959}, {52, 13611}, {53, 14292}, {54, 15000}, {55, 15737}, {56, 16505},
 {57, 17308}, {58, 18143}, {59, 19012}, {60, 19916}, {61, 20856}, {62, 21834},
 {63, 22849}, {64, 23906}, {65, 25003}, {66, 26143}, {67, 27326}, {68, 28554},
 {69, 29828}, {70, 31157}, {71, 32517}, {72, 33944}, {73, 35424}, {74, 36957},
 {75, 38543}, {76, 40183}, {77, 41877}, {78, 43636}, {79, 45463}, {80, 47343},
 {81, 49289}, {82, 51316}, {83, 53409}, {84, 55569}, {85, 57809}, {86, 60115},
 {87, 62488}, {88, 64941}, {89, 67474}, {90, 70096}, {91, 72801}, {92, 75592},
 {93, 78474}, {94, 81477}, {95, 84513}, {96, 87675}, {97, 90935}, {98, 94295},
 {99, 97757}, {100, 101325}, {101, 105000}, {102, 108772}, {103, 112673}, {104, 116665},
 {105, 120799}, {106, 125046}, {107, 129403}, {108, 133912}, {109, 138511},
 {110, 143263}, {111, 148148}, {112, 153153}, {113, 158310}, {114, 163620},
 {115, 169050}, {116, 174644}, {117, 180378}, {118, 186275}, {119, 192335}}
```

```
ListLinePlot[points, AxesLabel → {"Temperarure\n[ °C]", "[Pa] Pression de saturation"},
```
tracé de liste de ligne titre d'axe
```
 ImageSize → {540, 400}]
```
taille d'image

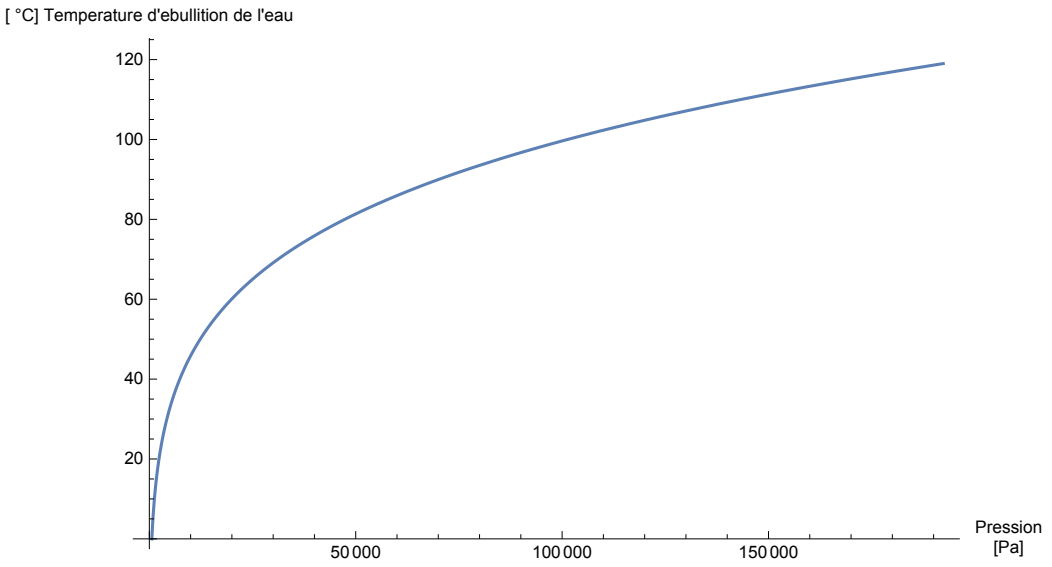



```
points = Transpose[{psat, Range[0, 119]}]
```
transposée plage

```
{{611, 0}, {657, 1}, {706, 2}, {758, 3}, {813, 4}, {872, 5}, {935, 6}, {1002, 7}, {1073, 8},
 {1148, 9}, {1228, 10}, {1312, 11}, {1402, 12}, {1497, 13}, {1598, 14}, {1705, 15},
 {1818, 16}, {1937, 17}, {2063, 18}, {2197, 19}, {2338, 20}, {2487, 21}, {2643, 22},
 {2809, 23}, {2983, 24}, {3167, 25}, {3360, 26}, {3564, 27}, {3780, 28}, {4005, 29},
 {4243, 30}, {4492, 31}, {4755, 32}, {5030, 33}, {5319, 34}, {5623, 35}, {5941, 36},
 {6275, 37}, {6625, 38}, {6992, 39}, {7375, 40}, {7778, 41}, {8199, 42}, {8639, 43},
 {9101, 44}, {9583, 45}, {10086, 46}, {10612, 47}, {11160, 48}, {11735, 49}, {12334, 50},
 {12959, 51}, {13611, 52}, {14292, 53}, {15000, 54}, {15737, 55}, {16505, 56},
 {17308, 57}, {18143, 58}, {19012, 59}, {19916, 60}, {20856, 61}, {21834, 62},
 {22849, 63}, {23906, 64}, {25003, 65}, {26143, 66}, {27326, 67}, {28554, 68},
 {29828, 69}, {31157, 70}, {32517, 71}, {33944, 72}, {35424, 73}, {36957, 74},
 {38543, 75}, {40183, 76}, {41877, 77}, {43636, 78}, {45463, 79}, {47343, 80},
 {49289, 81}, {51316, 82}, {53409, 83}, {55569, 84}, {57809, 85}, {60115, 86},
 {62488, 87}, {64941, 88}, {67474, 89}, {70096, 90}, {72801, 91}, {75592, 92},
 {78474, 93}, {81477, 94}, {84513, 95}, {87675, 96}, {90935, 97}, {94295, 98},
 {97757, 99}, {101325, 100}, {105000, 101}, {108772, 102}, {112673, 103}, {116665, 104},
 {120799, 105}, {125046, 106}, {129403, 107}, {133912, 108}, {138511, 109},
 {143263, 110}, {148148, 111}, {153153, 112}, {158310, 113}, {163620, 114},
 {169050, 115}, {174644, 116}, {180378, 117}, {186275, 118}, {192335, 119}}
```

```
ListLinePlot[points,
 AxesLabel → {"Pression\n[Pa]", "[ °C] Temperature d'ebullition de l'eau"},
 ImageSize → {540, 400}]
```

tracé de liste de ligne
titre d'axe
taille d'image




```
tabl = Table[psat[[u + 10 * d + 1]], {d, 0, 11}, {u, 0, 9}]
```

table

```
{{611, 657, 706, 758, 813, 872, 935, 1002, 1073, 1148},
 {1228, 1312, 1402, 1497, 1598, 1705, 1818, 1937, 2063, 2197},
 {2338, 2487, 2643, 2809, 2983, 3167, 3360, 3564, 3780, 4005},
 {4243, 4492, 4755, 5030, 5319, 5623, 5941, 6275, 6625, 6992},
 {7375, 7778, 8199, 8639, 9101, 9583, 10 086, 10 612, 11 160, 11 735},
 {12 334, 12 959, 13 611, 14 292, 15 000, 15 737, 16 505, 17 308, 18 143, 19 012},
 {19 916, 20 856, 21 834, 22 849, 23 906, 25 003, 26 143, 27 326, 28 554, 29 828},
 {31 157, 32 517, 33 944, 35 424, 36 957, 38 543, 40 183, 41 877, 43 636, 45 463},
 {47 343, 49 289, 51 316, 53 409, 55 569, 57 809, 60 115, 62 488, 64 941, 67 474},
 {70 096, 72 801, 75 592, 78 474, 81 477, 84 513, 87 675, 90 935, 94 295, 97 757},
 {101 325, 105 000, 108 772, 112 673, 116 665, 120 799, 125 046, 129 403, 133 912, 138 511},
 {143 263, 148 148, 153 153, 158 310, 163 620, 169 050, 174 644, 180 378, 186 275, 192 335}}
```

```
Needs["Tableaux`",
 "https://www.deleze.name/marcel/sec2/applmaths/packages/Tableaux.m"]
```

nécessite

```
formatNum[nbChiffres_][v_] :=
 Map[PaddedForm[#, nbChiffres] &, v, {Length[Dimensions[v]]}]
```

app· forme de remplissage longueur dimensions

```
tableauGraph[formatNum[3][Range[0, 110, 10]], Range[0, 9], formatNum[6][tabl]]
                                  plage                    plage
```

	0	1	2	3	4	5	6	7	8	9
0	611	657	706	758	813	872	935	1002	1073	1148
10	1228	1312	1402	1497	1598	1705	1818	1937	2063	2197
20	2338	2487	2643	2809	2983	3167	3360	3564	3780	4005
30	4243	4492	4755	5030	5319	5623	5941	6275	6625	6992
40	7375	7778	8199	8639	9101	9583	10086	10612	11160	11735
50	12334	12959	13611	14292	15000	15737	16505	17308	18143	19012
60	19916	20856	21834	22849	23906	25003	26143	27326	28554	29828
70	31157	32517	33944	35424	36957	38543	40183	41877	43636	45463
80	47343	49289	51316	53409	55569	57809	60115	62488	64941	67474
90	70096	72801	75592	78474	81477	84513	87675	90935	94295	97757
100	101325	105000	108772	112673	116665	120799	125046	129403	133912	138511
110	143263	148148	153153	158310	163620	169050	174644	180378	186275	192335

Corrigé de l'exercice 3-4-1

```
liste = Table[{x, Cos[x]}, {x, -6, 6}]
        table      cosinus
```

```
{{-6, Cos[6]}, {-5, Cos[5]}, {-4, Cos[4]}, {-3, Cos[3]}, {-2, Cos[2]}, {-1, Cos[1]},
 {0, 1}, {1, Cos[1]}, {2, Cos[2]}, {3, Cos[3]}, {4, Cos[4]}, {5, Cos[5]}, {6, Cos[6]}}
```

```
quadrant1Q[{x_, y_}] := x > 0 ∧ y > 0
```

```
quadrant2Q[{x_, y_}] := x < 0 ∧ y > 0
```

```
quadrant3Q[{x_, y_}] := x < 0 ∧ y < 0
```

```
quadrant4Q[{x_, y_}] := x > 0 ∧ y < 0
```

```
lp1 = Select[liste, quadrant1Q]
      sélectionne
{{1, Cos[1]}, {5, Cos[5]}, {6, Cos[6]}}

lp2 = Select[liste, quadrant2Q]
      sélectionne
{{-6, Cos[6]}, {-5, Cos[5]}, {-1, Cos[1]}}

lp3 = Select[liste, quadrant3Q]
      sélectionne
{{-4, Cos[4]}, {-3, Cos[3]}, {-2, Cos[2]}}

lp4 = Select[liste, quadrant4Q]
      sélectionne
{{2, Cos[2]}, {3, Cos[3]}, {4, Cos[4]}}
```

Corrigé de l'exercice 3-4-2

Idée: Formons l'ensemble des carrés parfaits qui sont inférieurs à 1000.
Dans cet ensemble, sélectionnons ceux qui sont de la forme 4*n+1.

```
Floor[Sqrt[1000]]
entier··· racine carrée
31

candidats = Table[x^2, {x, 0, Floor[Sqrt[1000]]}]
            table          entier··· racine carrée
{0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256,
 289, 324, 361, 400, 441, 484, 529, 576, 625, 676, 729, 784, 841, 900, 961}
```

Les nombres de la forme $4*n+1$ sont ceux dont le reste de la division par 4 est 1.

```
Clear[critQ]
efface
critQ[x_] := Mod[x, 4] == 1
             modulo mod
Select[candidats, critQ]
sélectionne
{1, 9, 25, 49, 81, 121, 169, 225, 289, 361, 441, 529, 625, 729, 841, 961}
```

Listes - Exercices de récapitulation

Corrigé de l'exercice 3 - R 1

```
Clear[x];
efface
a = Table[x^k, {k, 1, 36}]
    table
{x, x^2, x^3, x^4, x^5, x^6, x^7, x^8, x^9, x^10, x^11, x^12, x^13, x^14, x^15, x^16, x^17, x^18, x^19,
 x^20, x^21, x^22, x^23, x^24, x^25, x^26, x^27, x^28, x^29, x^30, x^31, x^32, x^33, x^34, x^35, x^36}
```

```
b = Table[1/k, {k, 1, 36}]
```
table

$$\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}, \frac{1}{11}, \frac{1}{12}, \frac{1}{13}, \frac{1}{14}, \frac{1}{15}, \frac{1}{16}, \frac{1}{17}, \frac{1}{18}, \frac{1}{19}, \frac{1}{20}, \frac{1}{21}, \frac{1}{22}, \frac{1}{23}, \frac{1}{24}, \frac{1}{25}, \frac{1}{26}, \frac{1}{27}, \frac{1}{28}, \frac{1}{29}, \frac{1}{30}, \frac{1}{31}, \frac{1}{32}, \frac{1}{33}, \frac{1}{34}, \frac{1}{35}, \frac{1}{36}\right\}$$

```
c = Table[(-1)^k, {k, 0, 35}]
```
table

```
{1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1,
 -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1}
```

```
d = a b c
```

$$\left\{x, -\frac{x^2}{2}, \frac{x^3}{3}, -\frac{x^4}{4}, \frac{x^5}{5}, -\frac{x^6}{6}, \frac{x^7}{7}, -\frac{x^8}{8}, \frac{x^9}{9}, -\frac{x^{10}}{10}, \frac{x^{11}}{11}, -\frac{x^{12}}{12}, \frac{x^{13}}{13}, -\frac{x^{14}}{14}, \frac{x^{15}}{15}, -\frac{x^{16}}{16}, \frac{x^{17}}{17}, -\frac{x^{18}}{18}, \frac{x^{19}}{19}, -\frac{x^{20}}{20}, \frac{x^{21}}{21}, -\frac{x^{22}}{22}, \frac{x^{23}}{23}, -\frac{x^{24}}{24}, \frac{x^{25}}{25}, -\frac{x^{26}}{26}, \frac{x^{27}}{27}, -\frac{x^{28}}{28}, \frac{x^{29}}{29}, -\frac{x^{30}}{30}, \frac{x^{31}}{31}, -\frac{x^{32}}{32}, \frac{x^{33}}{33}, -\frac{x^{34}}{34}, \frac{x^{35}}{35}, -\frac{x^{36}}{36}\right\}$$

```
e = Apply[Plus, d]
```
remp··· plus

$$x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \frac{x^6}{6} + \frac{x^7}{7} - \frac{x^8}{8} + \frac{x^9}{9} - \frac{x^{10}}{10} + \frac{x^{11}}{11} - \frac{x^{12}}{12} + \frac{x^{13}}{13} - \frac{x^{14}}{14} + \frac{x^{15}}{15} - \frac{x^{16}}{16} + \frac{x^{17}}{17} - \frac{x^{18}}{18} + \frac{x^{19}}{19} - \frac{x^{20}}{20} + \frac{x^{21}}{21} - \frac{x^{22}}{22} + \frac{x^{23}}{23} - \frac{x^{24}}{24} + \frac{x^{25}}{25} - \frac{x^{26}}{26} + \frac{x^{27}}{27} - \frac{x^{28}}{28} + \frac{x^{29}}{29} - \frac{x^{30}}{30} + \frac{x^{31}}{31} - \frac{x^{32}}{32} + \frac{x^{33}}{33} - \frac{x^{34}}{34} + \frac{x^{35}}{35} - \frac{x^{36}}{36}$$

```
f = e /. x → 0.8
```

```
0.587783
```

Corrigé de l'exercice 3 - R 2

```
Clear[successeur];
```
efface

$$\text{successeur}[x\_] := \frac{1.}{2. + x}$$

```
NestList[successeur, 0, 35]
```
liste d'imbrication

```
{0, 0.5, 0.4, 0.416667, 0.413793, 0.414286, 0.414201, 0.414216,
 0.414213, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214,
 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214,
 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214,
 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214, 0.414214}
```

```
FixedPoint[successeur, 0]
```
point fixe

```
0.414214
```

Corrigé de l'exercice 3 - R 3

```
rayons = Table[1/2^k, {k, 0, 9}]
         table
```

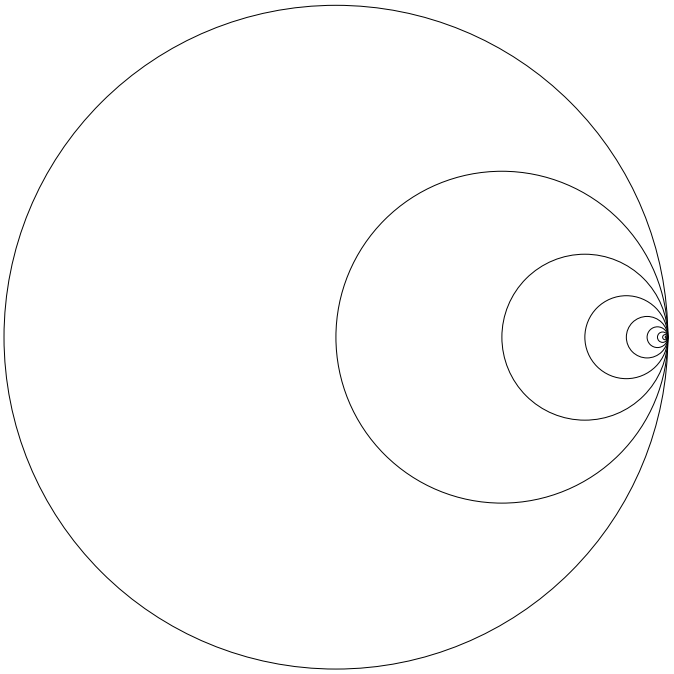
$$\left\{1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \frac{1}{128}, \frac{1}{256}, \frac{1}{512}\right\}$$

```
Clear[cercle];
efface
cercle[r_] := Circle[{1 - r, 0}, r]
              cercle
```

```
famCercles = Map[cercle, rayons]
             applique
```

$$\left\{\text{Circle}[\{0, 0\}, 1], \text{Circle}\left[\left\{\frac{1}{2}, 0\right\}, \frac{1}{2}\right], \text{Circle}\left[\left\{\frac{3}{4}, 0\right\}, \frac{1}{4}\right], \text{Circle}\left[\left\{\frac{7}{8}, 0\right\}, \frac{1}{8}\right],\right.$$
$$\text{Circle}\left[\left\{\frac{15}{16}, 0\right\}, \frac{1}{16}\right], \text{Circle}\left[\left\{\frac{31}{32}, 0\right\}, \frac{1}{32}\right], \text{Circle}\left[\left\{\frac{63}{64}, 0\right\}, \frac{1}{64}\right],$$
$$\left.\text{Circle}\left[\left\{\frac{127}{128}, 0\right\}, \frac{1}{128}\right], \text{Circle}\left[\left\{\frac{255}{256}, 0\right\}, \frac{1}{256}\right], \text{Circle}\left[\left\{\frac{511}{512}, 0\right\}, \frac{1}{512}\right]\right\}$$

```
Graphics[famCercles, AspectRatio → Automatic, PlotRange → All]
graphique            rapport d'aspect  automatique  zone de tracé  tout
```



§ 3-Listes - Supplément S1 Ensembles

Corrigé de l'exercice 3-S1

```
ls = Table[Sin[k π/5 + π/10], {k, -5, 15}]
```
table sinus

$$\left\{\frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1-\sqrt{5}\right), -1, \frac{1}{4}\left(-1-\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1+\sqrt{5}\right),\right.$$
$$1, \frac{1}{4}\left(1+\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1-\sqrt{5}\right), -1, \frac{1}{4}\left(-1-\sqrt{5}\right),$$
$$\left.\frac{1}{4}\left(1-\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1+\sqrt{5}\right), 1, \frac{1}{4}\left(1+\sqrt{5}\right), \frac{1}{4}\left(-1+\sqrt{5}\right), \frac{1}{4}\left(1-\sqrt{5}\right)\right\}$$

```
lt = Table[(-1)^i, {i, -5, 15}]
```
table

```
{-1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1}
```

a) Intersection des ensembles ls et lt:

```
ls ⋂ lt
```

```
{-1, 1}
```

b) Coïncidences des listes ls et lt:

```
Position[lt - ls, 0]
```
position

```
{{3}, {8}, {13}, {18}}
```

```
pos = Flatten[Position[lt - ls, 0]]
```
aplatis position

```
{3, 8, 13, 18}
```

```
ls[[pos]]
```

```
{-1, 1, -1, 1}
```

Corrigé de l'exercice 3-S2-1

```
Floor[Sqrt[1000]]
```
entier··· racine carrée

```
31
```

```
candidats = Table[k^2, {k, 0, Floor[Sqrt[1000]]}]
```
table entier··· racine carrée

```
{0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256,
 289, 324, 361, 400, 441, 484, 529, 576, 625, 676, 729, 784, 841, 900, 961}
```

Première méthode:

Posons la condition : le reste de la division par 4 doit donner 1.

```
Cases[candidats, x_Integer /; Mod[x, 4] == 1]
```
cas dans modulo mod

```
{1, 9, 25, 49, 81, 121, 169, 225, 289, 361, 441, 529, 625, 729, 841, 961}
```

Deuxième méthode:

Posons la condition : si on soustrait 1 puis on divise par 4, on doit obtenir un nombre entier q

```
q = Cases[(candidats - 1) / 4, _Integer]
```
cas unité imagina

```
{0, 2, 6, 12, 20, 30, 42, 56, 72, 90, 110, 132, 156, 182, 210, 240}
```

```
4 * q + 1
```

```
{1, 9, 25, 49, 81, 121, 169, 225, 289, 361, 441, 529, 625, 729, 841, 961}
```

Corrigé de l'exercice 3-S2-2

Lorsqu'on utilise l'instruction Table avec plusieurs indices, le deuxième court plus vite que le premier et on obtient une liste de listes. Par exemple,

```
Table[i * 10 + j, {i, 1, 9}, {j, 0, 9}]
```
table

```
{{10, 11, 12, 13, 14, 15, 16, 17, 18, 19},
 {20, 21, 22, 23, 24, 25, 26, 27, 28, 29}, {30, 31, 32, 33, 34, 35, 36, 37, 38, 39},
 {40, 41, 42, 43, 44, 45, 46, 47, 48, 49}, {50, 51, 52, 53, 54, 55, 56, 57, 58, 59},
 {60, 61, 62, 63, 64, 65, 66, 67, 68, 69}, {70, 71, 72, 73, 74, 75, 76, 77, 78, 79},
 {80, 81, 82, 83, 84, 85, 86, 87, 88, 89}, {90, 91, 92, 93, 94, 95, 96, 97, 98, 99}}
```

Flatten permet d'obtenir une liste simple:

```
Flatten[Table[i * 10 + j, {i, 1, 9}, {j, 0, 9}]]
```
aplatis table

```
{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33,
 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55,
 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77,
 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99}
```

Dans notre problème:

```
a = Range[100, 999];
```
plage

```
b = Flatten[Table[i^3 + j^3 + k^3, {i, 1, 9}, {j, 0, 9}, {k, 0, 9}]]
```
aplatis table

```
{1, 2, 9, 28, 65, 126, 217, 344, 513, 730, 2, 3, 10, 29, 66, 127, 218, 345, 514, 731, 9, 10,
 17, 36, 73, 134, 225, 352, 521, 738, 28, 29, 36, 55, 92, 153, 244, 371, 540, 757, 65,
 66, 73, 92, 129, 190, 281, 408, 577, 794, 126, 127, 134, 153, 190, 251, 342, 469, 638,
 855, 217, 218, 225, 244, 281, 342, 433, 560, 729, 946, 344, 345, 352, 371, 408, 469,
 560, 687, 856, 1073, 513, 514, 521, 540, 577, 638, 729, 856, 1025, 1242, 730, 731,
 738, 757, 794, 855, 946, 1073, 1242, 1459, 8, 9, 16, 35, 72, 133, 224, 351, 520, 737,
 9, 10, 17, 36, 73, 134, 225, 352, 521, 738, 16, 17, 24, 43, 80, 141, 232, 359, 528,
 745, 35, 36, 43, 62, 99, 160, 251, 378, 547, 764, 72, 73, 80, 99, 136, 197, 288, 415,
 584, 801, 133, 134, 141, 160, 197, 258, 349, 476, 645, 862, 224, 225, 232, 251, 288,
 349, 440, 567, 736, 953, 351, 352, 359, 378, 415, 476, 567, 694, 863, 1080, 520, 521,
 528, 547, 584, 645, 736, 863, 1032, 1249, 737, 738, 745, 764, 801, 862, 953, 1080,
 1249, 1466, 27, 28, 35, 54, 91, 152, 243, 370, 539, 756, 28, 29, 36, 55, 92, 153, 244,
 371, 540, 757, 35, 36, 43, 62, 99, 160, 251, 378, 547, 764, 54, 55, 62, 81, 118, 179,
 270, 397, 566, 783, 91, 92, 99, 118, 155, 216, 307, 434, 603, 820, 152, 153, 160, 179,
 216, 277, 368, 495, 664, 881, 243, 244, 251, 270, 307, 368, 459, 586, 755, 972, 370,
 371, 378, 397, 434, 495, 586, 713, 882, 1099, 539, 540, 547, 566, 603, 664, 755, 882,
 1051, 1268, 756, 757, 764, 783, 820, 881, 972, 1099, 1268, 1485, 64, 65, 72, 91, 128,
 189, 280, 407, 576, 793, 65, 66, 73, 92, 129, 190, 281, 408, 577, 794, 72, 73, 80,
 99, 136, 197, 288, 415, 584, 801, 91, 92, 99, 118, 155, 216, 307, 434, 603, 820, 128,
 129, 136, 155, 192, 253, 344, 471, 640, 857, 189, 190, 197, 216, 253, 314, 405, 532,
 701, 918, 280, 281, 288, 307, 344, 405, 496, 623, 792, 1009, 407, 408, 415, 434, 471,
 532, 623, 750, 919, 1136, 576, 577, 584, 603, 640, 701, 792, 919, 1088, 1305, 793,
 794, 801, 820, 857, 918, 1009, 1136, 1305, 1522, 125, 126, 133, 152, 189, 250, 341,
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 762, 979, 341, 342, 349, 368, 405, 466, 557, 684, 853, 1070, 468, 469, 476, 495, 532,
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 945, 946, 953, 972, 1009, 1070, 1161, 1288, 1457, 1674, 343, 344, 351, 370, 407, 468,
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 1198, 1367, 1584, 1072, 1073, 1080, 1099, 1136, 1197, 1288, 1415, 1584, 1801, 512,
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 1458, 730, 731, 738, 757, 794, 855, 946, 1073, 1242, 1459, 737, 738, 745, 764, 801,
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 1457, 1584, 1753, 1970, 1458, 1459, 1466, 1485, 1522, 1583, 1674, 1801, 1970, 2187}
```

```
pos = Position[a - b, 0]
```
position

```
{{54}, {271}, {272}, {308}}
```

```
pos = Flatten[pos]
```
aplatis

```
{54, 271, 272, 308}
```

```
a[[pos]]
```

```
{153, 370, 371, 407}
```

Autre méthode

Pour un nombre x de 3 chiffres:

le premier chiffre de x est Quotient[x, 100];

le dernier chiffre de x est Mod[x, 10];

le deuxième chiffre de x est Mod[Quotient[x, 10], 10].

```
Clear[critQ]
```
efface

```
critQ[x_] := Quotient[x, 100]^3 + Mod[Quotient[x, 10], 10]^3 + Mod[x, 10]^3 == x
```
quotient m··· quotient modulo mod

```
Select[a, critQ]
```
sélectionne

```
{153, 370, 371, 407}
```

Corrigé de l'exercice 3-S2-3

```
Prime[26]
```
nombre premier

```
101
```

```
p = Flatten[Table[{Prime[i], Prime[j]}, {i, 1, 25}, {j, 1, 25}], 1]
```
aplatis table nombre p··· nombre premier

```
{{2, 2}, {2, 3}, {2, 5}, {2, 7}, {2, 11}, {2, 13}, {2, 17}, {2, 19}, {2, 23}, {2, 29},
 {2, 31}, {2, 37}, {2, 41}, {2, 43}, {2, 47}, {2, 53}, {2, 59}, {2, 61}, {2, 67}, {2, 71},
 {2, 73}, {2, 79}, {2, 83}, {2, 89}, {2, 97}, {3, 2}, {3, 3}, {3, 5}, {3, 7}, {3, 11},
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```

```
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{97, 61}, {97, 67}, {97, 71}, {97, 73}, {97, 79}, {97, 83}, {97, 89}, {97, 97}}
```

Première méthode:

```
Clear[critQ]
```
efface

```
critQ[{x_, y_}] := x^2 + y^2 == x * y + 4863
```

```
Select[p, critQ]
```
sélectionne

```
{{53, 79}, {79, 53}}
```

Deuxième méthode:

```
Clear[critQ]
```
efface

```
critQ[x_] := x[[1]]^2 + x[[2]]^2 == x[[1]] * x[[2]] + 4863
```

```
Select[p, critQ]
```
sélectionne

```
{{53, 79}, {79, 53}}
```

Troisième méthode:

```
c = Table[p[[i]][[1]]^2 + p[[i]][[2]]^2, {i, 1, Length[p]}];
```
table longueur

```
a = Table[p[[i]][[1]] * p[[i]][[2]] + 4863, {i, 1, Length[p]}];
```
table longueur

```
r = Position[c - a, 0]
```
position

```
{{397}, {541}}
```

```
p[[Flatten[r]]]
```
aplatis

```
{{53, 79}, {79, 53}}
```

Corrigé de l'exercice 3-S2-4

```
t = Table[2^2^n + 1, {n, 2, 7}]
```
table

```
{17, 257, 65 537, 4 294 967 297, 18 446 744 073 709 551 617,
  340 282 366 920 938 463 463 374 607 431 768 211 457}
```

Sous-liste des nombres premiers :

```
p = Select[t, PrimeQ]
```
sélectionne nombre pr

```
{17, 257, 65 537}
```

Sous-listes des nombres non premiers :

```
f = Complement[t, p]
```

complément

{4 294 967 297, 18 446 744 073 709 551 617, 340 282 366 920 938 463 463 374 607 431 768 211 457}