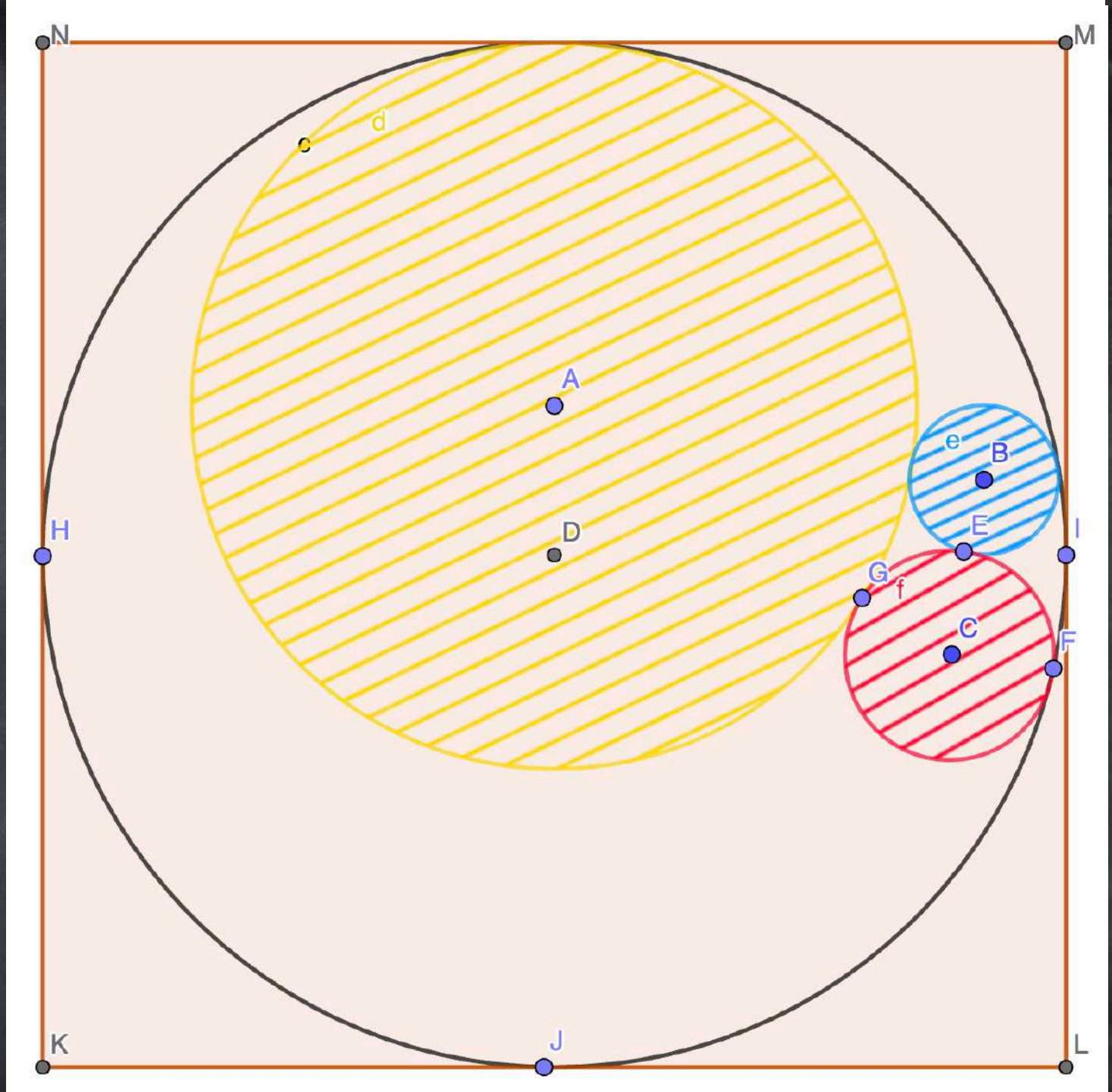
Math en Jean

Les Médailles



Sujet

Critère 1 : Le plus grand diamètre est égal à la somme des 3 autres diamètres

Critère 2 : Lorsque l'on dispose les 3 médailles sur la plus grande; les 3 plus petites sont tangente une à une

Critère 3 : Placées comme cela , la partie non recouverte de la grande médaille à la même aire que le disque de cette même médaille inscrit dans un carré d'aire 4830mm²

Traduction de l'énoncé 1

$$d = a + b + c$$

Traduction de l'énoncé 3

$$\left(\frac{\sqrt{4830}}{2}\right)^2 \pi = \left(\frac{d}{2}\right)^2 \pi - \left(\frac{a}{2}\right)^2 \pi - \left(\frac{b}{2}\right)^2 \pi - \left(\frac{c}{2}\right)^2 \pi$$

$$d^2 - a^2 - b^2 - c^2 = 4830$$

$$ab + bc + ac = 2415$$

On peut ensuite réaliser une équation qui nous permet d'isoler *c* afin de tester dans un tableur les valeurs plausibles

$$ab + bc + ac = 2415$$

$$ab + c(b + a) = 2415$$

$$c(b + a) = 2415 - ab$$

$$c = \frac{2415 - ab}{a + b}$$

Les valeurs de b

Les valeurs de a

	50	51	52	53	54	55	56	57	58
1	46.37255	45.46154	44.58491	43.74074	42.92727	42.14286	41.38596	40.65517	39.94915
2	44.51923	43.64151	42.7963	41.98182	41.19643	40.4386	39.7069	39	38.31667
3	42.73585	41.88889	41.07273	40.28571	39.52632	38.7931	38.08475	37.4	36.7377
4	41.01852	40.2	39.41071	38.64912	37.91379	37.20339	36.51667	35.85246	35.20968
5	39.36364	38.57143	37.80702	37.06897	36.35593	35.66667	35	34.35484	33.73016
6	37.76786	37	36.25862	35.54237	34.85	34.18033	33.53226	32.90476	32.29688
7	36.22807	35.48276	34.76271	34.06667	33.39344	32.74194	32.11111	31.5	30.90769
8	34.74138	34.01695	33.31667	32.63934	31.98387	31.34921	30.73438	30.13846	29.56061
9	33.30508	32.6	31.91803	31.25806	30.61905	30	29.4	28.81818	28.25373
10	31.91667	31.22951	30.56452	29.92063	29.29688	28.69231	28.10606	27.53731	26.98529
11	30.57377	29.90323	29.25397	28.625	28.01538	27.42424	26.85075	26.29412	25.75362
12	29.27419	28.61905	27.98438	27.36923	26.77273	26.19403	25.63235	25.08696	24.55714
13	28.01587	27.375	26.75385	26.15152	25.56716	25	24.44928	23.91429	23.39437
14	26.79688	26.16923	25.56061	24.97015	24.39706	23.84058	23.3	22.77465	22.26389
15	25.61538	25	24.40299	23.82353	23.26087	22.71429	22.1831	21.66667	21.16438
16	24.4697	23.86567	23.27941	22.71014	22.15714	21.61972	21.09722	20.58904	20.09459
17	23.35821	22.76471	22.18841	21.62857	21.08451	20.55556	20.0411	19.54054	19.05333
18	22.27941	21.69565	21.12857	20.57746	20.04167	19.52055	19.01351	18.52	18.03947

	40	41	42
1	57.92683	56.52381	55.18605
2	55.59524	54.25581	52.97727
3	53.37209	52.09091	50.86667
4	51.25	50.02222	48.84783
5	49.22222	48.04348	46.91489
6	47.28261	46.14894	45.0625
7	45.42553	44.33333	43.28571
8	43.64583	42.59184	41.58
9	41.93878	40.92	39.94118
10	40.3	39.31373	38.36538
11	38.72549	37.76923	36.84906
12	37.21154	36.28302	35.38889
13	35.75472	34.85185	33.98182
14	34.35185	33.47273	32.625
15	=(2415-(B1*$A16))/($B$1+$A16)		

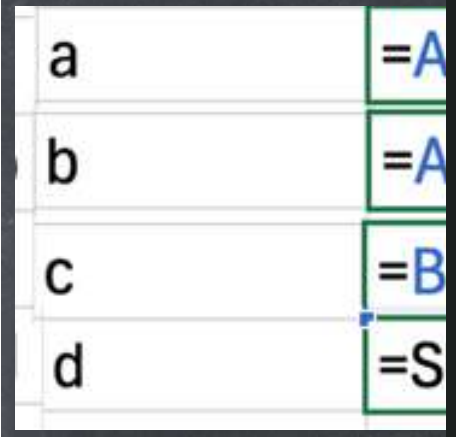
Traduction de l'énoncé 2

Théorème de Descartes

Cercle (c_4) tangent extérieurement à (c_1), (c_2) et (c_3)

$$(k_1 + k_2 + k_3 + k_4)^2 = 2(k_1^2 + k_2^2 + k_3^2 + k_4^2)$$

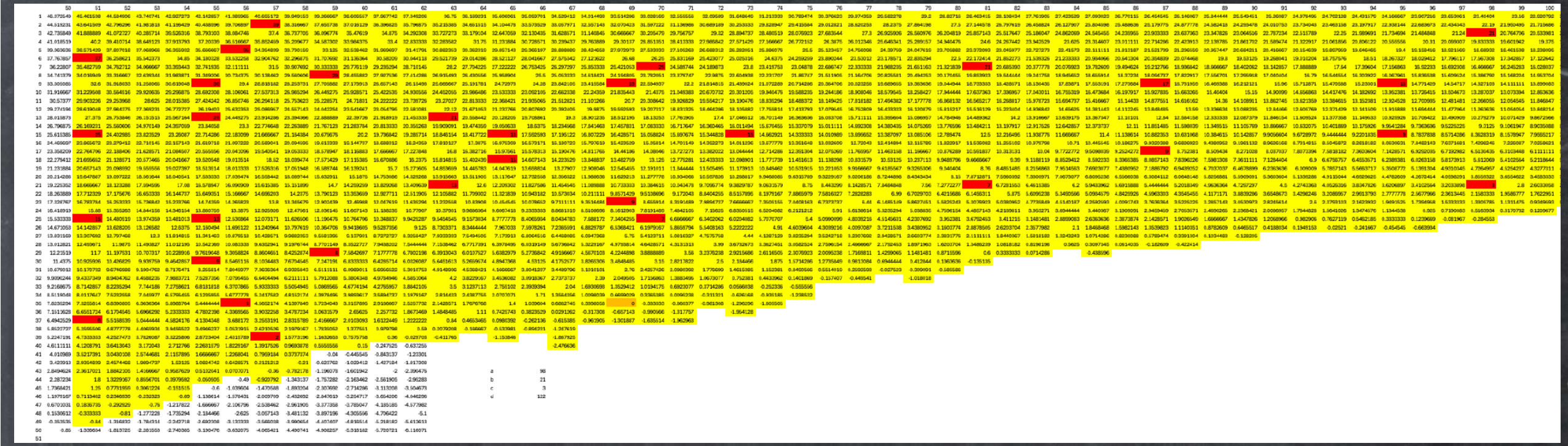
Traduction de l'énoncé 2



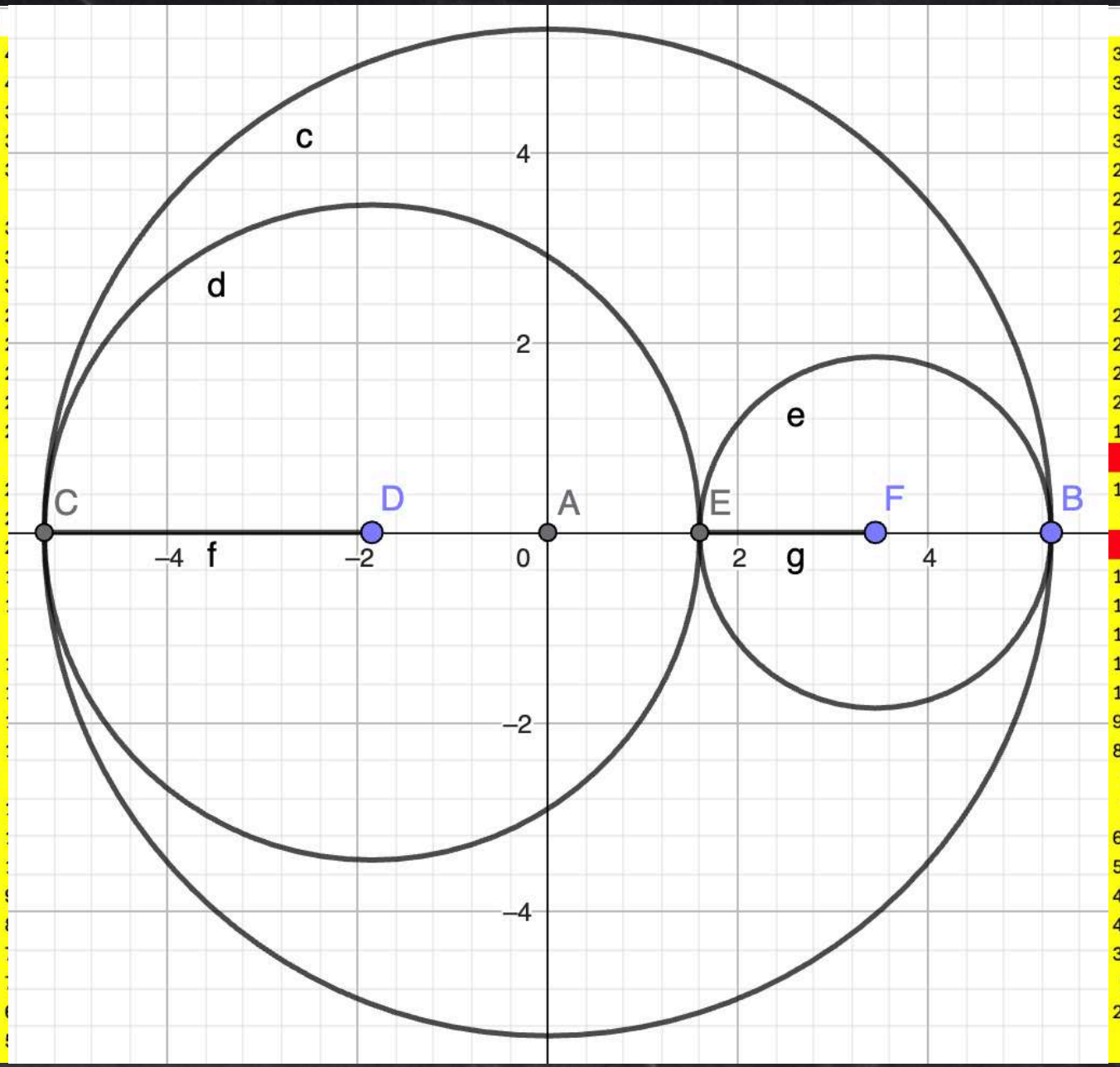

```python
a = 1
b = 1
c = (2415-a*b)/(a+b)
c=float(c)
d = a + b + c
d=float(d)
nonreponse=[]
reponse=[]

for i in range(10000):
    for i in range(10000):
        if 2*((1/a)**2+(1/b)**2+(1/c)**2-(1/d)**2)==(1/a+1/b+1/c-1/d)**2:
            reponse.append(a)
            reponse.append(b)
            a=a+1
        else:
            nonreponse.append(a)
            nonreponse.append(b)
            a=a+1
    b = b+1

print(reponse)
```



	50	51	52	53
1	46.372549	45.461538	44.584906	43.740741
2	44.519231	43.641509	42.796296	41.981818
3	42.735849	41.888889	41.072727	40.285714
4	41.018519	40.2	39.410714	38.649123
5	39.363636	38.571429	37.807018	37.068966
6	37.767857	37	36.258621	35.542373
7	36.22807	35.482759	34.762712	34.066667
8	34.741379	34.016949	33.316667	32.639344
9	33.305085	32.6	31.918033	31.258065
10	31.916667	31.229508	30.564516	29.920635
11	30.57377	29.903226	29.253968	28.625
12	29.274194	28.619048	27.984375	27.369231
13	28.015873	27.375	26.753846	26.151515
14	26.796875	26.169231	25.560606	24.970149
15	25.615385	25	24.402985	23.823529
16	24.469697	23.865672	23.279412	22.710145
17	23.358209	22.764706	22.188406	21.628571
18	22.279412	21.695652	21.128571	20.577465
19	21.231884	20.657143	20.098592	19.555556
20	20.214286	19.647887	19.097222	18.561644
21	19.225352	18.666667	18.123288	17.594595
22	18.263889	17.712329	17.175676	16.653333
23	17.328767	16.783784	16.253333	15.736842
24	16.418919	15.88	15.355263	14.844156
25	15.533333	15	14.480519	13.974359
26	14.671053	14.142857	13.628205	13.126582
27	13.831169	13.307692	12.797468	12.3
28	13.012821	12.493671	11.9875	11.493827
29	12.21519	11.7	11.197531	10.707317
30	11.4375	10.925926	10.426829	9.939759
31	10.679012	10.170732	9.6746988	9.1904762
32	9.9390244	9.4337349	8.9404762	8.4588235
33	9.2168675	8.7142857	8.2235294	7.744186
34	8.5119048	8.0117647	7.5232558	7.045977
35	7.823294	7.3255814	6.8390805	6.3636364



65	66	67	68	69
35.606061	35.059701	34.529412	34.014493	33.514286
34.104478	33.573529	33.057971	32.557143	32.070423
32.647059	32.130435	31.628571	31.140845	30.666667
31.231884	30.728571	30.239437	29.763889	29.30137
29.857143	29.366197	28.888889	28.424658	27.972973
28.521127	28.041667	27.575342	27.121622	26.68
27.222222	26.753425	26.297297	25.853333	25.421053
25.958904	25.5	25.053333	24.618421	24.194805
24.72973	24.28	23.842105	23.415584	23
23.533333	23.092105	22.662338	22.24359	21.835443
22.368421	21.935065	21.512821	21.101266	20.7
21.233766	20.807692	20.392405	19.9875	19.592593
20.128205	19.708861	19.3	18.901235	18.512195
19.050633	18.6375	18.234568	17.841463	17.457831
18	17.592593	17.195122	16.807229	16.428571
16.975309	16.573171	16.180723	15.797619	15.423529
15.97561	15.578313	15.190476	14.811765	14.44186
15	14.607143	14.223529	13.848837	13.482759
14.047619	13.658824	13.27907	12.908046	12.545455
13.117647	12.732558	12.356322	11.988636	11.629213
12.209302	11.827586	11.454545	11.089888	10.733333
11.321839	10.943182	10.573034	10.211111	9.8571429
10.454545	10.078652	9.7111111	9.3516484	9
9.6067416	9.2333333	8.8681319	8.5108696	8.1612903
8.7777778	8.4065934	8.0434783	7.688172	7.3404255
7.967033	7.5978261	7.2365591	6.8829787	6.5368421
7.173913	6.8064516	6.4468085	6.0947368	5.75
6.3978495	6.0319149	5.6736842	5.3229167	4.9793814
5.6382979	5.2736842	4.9166667	4.5670103	4.2244898
4.8947368	4.53125	4.1752577	3.8265306	3.4848485
4.1666667	3.8041237	3.4489796	3.1010101	2.76
3.4536082	3.0918367	2.7373737	2.39	2.049505
2.755102	2.3939394	2.04	1.6930693	1.3529412
2.0707071	1.71	1.3564356	1.0098039	
1.4	1.039604	0.6862745	0.339858	0

Observation:

Il y a un effet de symétrie.
On observe la répétition du triplet : 3-21-98 et 9-15-95

	95	96	97	98
2	24.16667	23.90722	23.65306	23.40404
3	22.93814	22.68367	22.43434	22.19
4	21.73469	21.48485	21.24	21
5	20.55556	20.31	20.06931	19.83333
6	19.4	19.15842	18.92157	18.68932
7	18.26733	18.02941	17.79612	17.56731
8	17.15686	16.92233	16.69231	16.46667
9	16.06796	15.83654	15.60952	15.38679
10	15	14.77143	14.54717	14.3271
11	13.95238	13.72642	13.50467	13.28704
12	12.92453	12.70093	12.48148	12.26606
13	11.91589	11.69444	11.47706	11.26364
14	10.92593	10.70642	10.49091	10.27928
15	9.954128	9.736364	9.522523	9.3125
16	9	8.783784	8.571429	8.362832
17	8.063063	7.848214	7.637168	7.429825
18	7.142857	6.929204	6.719298	6.513043
19	6.238938	6.026316	5.817391	5.612069
20	5.350877	5.13913	4.931034	4.726496
21	4.478261	4.267241	4.059829	3.855932
22	3.62069	3.410256	3.20339	3
23	2.777778	2.567797	2.361345	2.158333
24	1.949153	1.739496	1.533333	1.330579
25	1.134454	0.925	0.719008	0.516393
26	0.333333	0.123967	-0.08197	-0.28455