

NOMBRES - Curiosités, théorie et usages

NOMBRES de Kaprekar

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Premiers nombres de Kaprekar d'ordre 2 à 5

N^2	Somme
$1^2 = 1$	$0 + 1 = 0$
$9^2 = 81$	$8 + 1 = 8$
$45^2 = 20\ 25$	$20 + 25 = 20$
$55^2 = 30\ 25$	$30 + 25 = 30$
$99^2 = 98\ 01$	$98 + 01 = 98$
$297^2 = 88\ 209$	$088 + 209 = 88$
$703^2 = 494\ 209$	$494 + 209 = 494$
$999^2 = 998\ 001$	$998 + 001 = 998$
$2\ 223^2 = 494\ 1729$	$0494 + 1729 = 494$
$2\ 728^2 = 744\ 1984$	$0744 + 1984 = 744$
$4\ 950^2 = 2450\ 2500$	$2450 + 2500 = 2450$
$5\ 050^2 = 2550\ 2500$	$2550 + 2500 = 2550$
$7\ 272^2 = 5288\ 1984$	$5288 + 1984 = 5288$
$7\ 777^2 = 6048\ 1729$	$6048 + 1729 = 6048$
$9\ 999^2 = 9998\ 0001$	$9998 + 0001 = 9998$
$17\ 344^2 = 3008\ 14336$	$03008 + 14336 = 3008$
$22\ 222^2 = 4938\ 17284$	$04938 + 17284 = 4938$
$77\ 778^2 = 60494\ 17284$	$60494 + 17284 = 60494$
$82\ 656^2 = 68320\ 14336$	$68320 + 14336 = 68320$
$95\ 121^2 = 90480\ 04641$	$90480 + 04641 = 90480$
$99\ 999^2 = 99998\ 00001$	$99998 + 00001 = 99998$

N^3	Somme
$1^3 = 1$	$0 + 0 + 1 = 1$
$8^3 = 512$	$5 + 1 + 2 = 8$
$10^3 = 1000$	$0 + 10 + 00 = 10$
$45^3 = 91125$	$9 + 11 + 25 = 45$
$297^3 = 26\ 198\ 073$	$26 + 198 + 073 = 297$
$2\ 322^3 = 125\ 1949\ 0248$	$125 + 1949 + 0248 = 2322$
$2\ 728^3 = 2030173\ 2352$	$203 + 0173 + 2352 = 2728$
$4\ 445^3 = 878\ 2442\ 1125$	$878 + 2442 + 1125 = 4445$
$4\ 544^3 = 938\ 2422\ 1184$	$938 + 2422 + 1184 = 4544$
$4\ 949^3 = 1212\ 1388\ 2349$	$1212 + 1388 + 2349 = 4949$
$5\ 049^3 = 1287\ 1113\ 2649$	$1287 + 1113 + 2649 = 5049$
$5\ 455^3 = 1623\ 2457\ 1375$	$1623 + 2457 + 1375 = 5455$
$5\ 554^3 = 1713\ 2377\ 1464$	$1713 + 2377 + 1464 = 5554$
$7\ 172^3 = 3689\ 1035\ 2448$	$3689 + 1035 + 2448 = 7172$

N^4	Somme
$1^4 = 1$	$0 + 0 + 0 + 1 = 1$
$7^4 = 2401$	$2 + 4 + 0 + 1 = 7$
$45^4 = 4\ 10\ 06\ 25$	$4 + 10 + 06 + 25 = 45$
$55^4 = 9\ 15\ 0625$	$9 + 15 + 06 + 25 = 55$
$67^4 = 20\ 15\ 11\ 21$	$20 + 15 + 11 + 21 = 67$
$100^4 = 100\ 000\ 000$	$0 + 100 + 000 + 000 = 100$
$433^4 = 35\ 152\ 125\ 121$	$35 + 152 + 125 + 121 = 433$
$4950^4 = 600\ 3725\ 0625\ 0000$	$600 + 3725 + 0625 + 0000 = 4950$
$5050^4 = 650\ 3775\ 0625\ 0000$	$650 + 3775 + 0625 + 0000 = 5050$
$38212^4 = 2132\ 05830\ 11114\ 19136$	$2132 + 05830 + 11114 + 19136 = 38212$
$65068^4 = 17925\ 44030\ 01737\ 01376$	$17925 + 44030 + 01737 + 01376 = 65068$

N^4	Somme
$1^5 = 1$	$0 + 0 + 0 + 0 + 1 = 1$
$10^5 = 10\ 00\ 00$	$0 + 00 + 10 + 00 + 00 = 10$
$1000^5 = 1000\ 0000\ 0000\ 0000$	$0 + 1000 + 0000 + 0000 + 0000 = 1000$
$7776^5 = 2843\ 0288\ 0299\ 2970\ 1376$	$2843 + 0288 + 0299 + 2970 + 1376 = 7776$
$27100^5 = 146\ 16603\ 10351\ 00000\ 00000$	$146 + 16603 + 10351 + 00000 + 00000 = 27100$
$73440^5 = 21363\ 05413\ 26440\ 20224\ 00000$	$21363 + 05413 + 26440 + 20224 + 00000 = 73440$
$95120^5 = 77868\ 03368\ 05052\ 08832\ 00000$	$77868 + 03368 + 05052 + 08832 + 00000 = 95120$



Les 50 nombres de Kaprekar CARRÉS jusqu'à 1 000 000

1, 9, 45, 55, 99, 297, 703, 999, 2223, 2728, 4950, 5050, 7272, 7777, 9999, 17344, 22222, 77778, 82656, 95121, 99999, 142857, 148149, 181819, 187110, 208495, 318682, 329967, 351352, 356643, 390313, 461539, 466830, 499500, 500500, 533170, 538461, 609687, 643357, 648648, 670033, 681318, 791505, 812890, 818181, 851851, 857143, 961038, 994708, 999999

Détail [n, n², a, b] avec a + b = n

1, 1, 0, 1

9, 81, 8, 1

[45](#), 2025, 20, 25

[55](#), 3025, 30, 25

[99](#), 9801, 98, 1

[297](#), 88209, 88, 209

[703](#), 494209, 494, 209

[999](#), 998001, 998, 1

2223, 4941729, 494, 1729

2728, 7441984, 744, 1984

4950, 24502500, 2450, 2500

5050, 25502500, 2550, 2500

7272, 52881984, 5288, 1984

7777, 60481729, 6048, 1729

9999, 99980001, 9998, 1

17344, 300814336, 3008, 14336

22222, 493817284, 4938, 17284

77778, 6049417284, 60494, 17284

82656, 6832014336, 68320, 14336

95121, 9048004641, 90480, 4641

99999, 9999800001, 99998, 1

[142857](#), [20408122449](#), [20408](#), [122449](#)

148149, 21948126201, 21948, 126201

181819, 33058148761, 33058, 148761

187110, 35010152100, 35010, 152100

208495, 43470165025, 43470, 165025

318682, 101558217124, 101558, 217124

329967, 108878221089, 108878, 221089

351352, 123448227904, 123448, 227904

356643, 127194229449, 127194, 229449

390313, 152344237969, 152344, 237969

461539, 213018248521, 213018, 248521

466830, 217930248900, 217930, 248900

499500, 249500250000, 249500, 250000

500500, f, 250500, 250000
 533170, 284270248900, 284270, 248900
 538461, 289940248521, 289940, 248521
 609687, 371718237969, 371718, 237969
 643357, 413908229449, 413908, 229449
 648648, 420744227904, 420744, 227904
 670033, 448944221089, 448944, 221089
 681318, 464194217124, 464194, 217124
 791505, 626480165025, 626480, 165025
 812890, 660790152100, 660790, 152100
 818181, 669420148761, 669420, 148761
 851851, 725650126201, 725650, 126201
 857143, 734694122449, 734694, 122449
 961038, 923594037444, 923594, 37444
 994708, 989444005264, 989444, 5264
 999999, 999998000001, 999998, 1

Les quelques rares avec coupure non centrale

10, 100, 10, 0
 100, 10000, 100, 0
 1000, 1000000, 1000, 0
 4879, 23804641, 238, 4641
 5292, 28005264, 28, 5264
 10000, 100000000, 10000, 0
 38962, 1518037444, 1518, 37444
 100000, 10000000000, 100000, 0
 627615, 393900588225, 39390, 588225
 1000000, 1000000000000, 1000000, 0

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Les 56 nombres de Kaprekar CUBES jusqu'à 1 000 000

1, 8, 10, 45, 297, 2322, 2728, 4445, 4544, 4949, 5049, 5455, 5554, 7172, 27100,
 44443, 55556, 60434, 77778, 143857, 208494, 226071, 279720, 313390, 324675,
 329967, 346060, 368928, 395604, 422577, 427868, 461539, 472823, 478115,
 488214, 494208, 495208, 499500, 500500, 517076, 533170, 543752, 559846,
 565137, 598807, 664741, 670032, 720279, 757835, 791505, 807598, 825175,
 829466, 856142, 966329, 973323,

Détail $[n, n^3, a, b, c]$ avec $a + b + c = n$

1, 1, 0, 0, 1
 8, 512, 5, 1, 2
 10, 1000, 1, 0, 10, 0
 45, 91125, 9, 11, 25

297, 26198073, 26, 198, 73
2322, 12519490248, 125, 1949, 248
2728, 20301732352, 203, 173, 2352
4445, 87824421125, 878, 2442, 1125
4544, 93824221184, 938, 2422, 1184
4949, 121213882349, 1212, 1388, 2349
5049, 128711132649, 1287, 1113, 2649
5455, 162324571375, 1623, 2457, 1375
5554, 171323771464, 1713, 2377, 1464
7172, 368910352448, 3689, 1035, 2448
27100, 19902511000000, 1990, 25110, 0
44443, 87782935806307, 8778, 29358, 6307
55556, 171471879319616, 17147, 18793, 19616
60434, 220721185826504, 22072, 11858, 26504
77778, 470511577514952, 47051, 15775, 14952
143857, 2977097087043793, 2977, 97087, 43793
208494, 9063181647017784, 9063, 181647, 17784
226071, 11554058606155911, 11554, 58606, 155911
279720, 21886209834048000, 21886, 209834, 48000
313390, 30779063611219000, 30779, 63611, 219000
324675, 34225243575046875, 34225, 243575, 46875
329967, 35926219978074063, 35926, 219978, 74063
346060, 41443288617016000, 41443, 288617, 16000
368928, 50214003962314752, 50214, 3962, 314752
395604, 61913024827308864, 61913, 24827, 308864
422577, 75460133084214033, 75460, 133084, 214033
427868, 78330233506116032, 78330, 233506, 116032
461539, 98316229404133819, 98316, 229404, 133819
472823, 105705061351305767, 105705, 61351, 305767
478115, 109294197946170875, 109294, 197946, 170875
488214, 116367227503144344, 116367, 227503, 144344
494208, 120706126590246912, 120706, 126590, 246912
495208, 121440334856038912, 121440, 334856, 38912
499500, 124625374875000000, 124625, 374875, 0
500500, 125375375125000000, 125375, 375125, 0
517076, 138249363851014976, 138249, 363851, 14976
533170, 151564368606013000, 151564, 368606, 13000
543752, 160769107975275008, 160769, 107975, 275008
559846, 175471156639227736, 175471, 156639, 227736
565137, 180493358291026353, 180493, 358291, 26353
598807, 214714120150263943, 214714, 120150, 263943
664741, 293736149984221021, 293736, 149984, 221021
670032, 300806096458272768, 300806, 96458, 272768
720279, 373682068958277639, 373682, 68958, 277639
757835, 435235164725157875, 435235, 164725, 157875
791505, 495862183018112625, 495862, 183018, 112625
807598, 526727149679131192, 526727, 149679, 131192
825175, 561873028927234375, 561873, 28927, 234375
829466, 570684092086166696, 570684, 92086, 166696
856142, 627534213320015288, 627534, 213320, 15288

966329, 902350034690029289, 902350, 34690, 29289
973323, 922085001971049267, 922085, 1971, 49267

Les cubes avec coupure non centrale

100, 134, 783, 972, 1000, 1368, 1611, 2710, 3086, 10000, 19908, 21268, 76581,
100000, 103239, 133334, 199728, 242900, 774270, 1000000

Détails

100, 1000000, 100, 0, 0
100, 1000000, 0, 100, 0
134, 2406104, 24, 6, 104
783, 480048687, 48, 48, 687
972, 918330048, 91, 833, 48
1000, 1000000000, 1000, 0, 0
1000, 1000000000, 0, 1000, 0
1368, 2560108032, 256, 1080, 32
1611, 4181062131, 418, 1062, 131
2710, 19902511000, 199, 2511, 0
3086, 29389200056, 2938, 92, 56
10000, 1000000000000, 10000, 0, 0
10000, 1000000000000, 0, 10000, 0
19908, 7890107061312, 7890, 10706, 1312
21268, 9620108160832, 9620, 10816, 832
76581, 449120728030941, 44912, 728, 30941
100000, 1000000000000000, 100000, 0, 0
100000, 1000000000000000, 0, 100000, 0
103239, 1100351317040919, 11003, 51317, 40919
133334, 2370405926103704, 23704, 5926, 103704
143857, 2977097087043793, 2977, 97087, 43793
199728, 7967404370276352, 79674, 43702, 76352
242900, 1433119958900000, 143311, 99589, 0
774270, 464170244853483000, 46417, 244853, 483000
1000000, 1000000000000000000, 1000000, 0, 0
1000000, 1000000000000000000, 0, 1000000, 0

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Programme Maple

```
L := [ ] :  
for n from 1 to 100 do  
  N := convert(n2, base, 10) : q := nops(N) :  
  if q mod 2 = 0 then qq :=  $\frac{q}{2}$  : else qq :=  $\frac{q+1}{2}$  : fi:  
  a := add(N[i]·10i-1, i = 1 .. qq) :  
  b := add(N[i]·10i-qq-1, i = qq+1 .. q) :  
  s := a + b :  
  if n = s then lprint(n, n2, b, a) : L := [op(L), n] : fi:  
od : L; nops(L) :  
1, 1, 0, 1  
9, 81, 8, 1  
45, 2025, 20, 25  
55, 3025, 30, 25  
99, 9801, 98, 1  
[1, 9, 45, 55, 99]
```

Pour copie dans Maple

```
L := []; for n to 100 do N := convert(n2, base, 10); q := nops(N); if `mod`(q, 2) =  
0 then qq := (1/2)*q else qq := (q+1)*(1/2) end if; a := add(N[i]*10(i-1), i = 1 ..  
qq); b := add(N[i]*10(i-qq-1), i = qq+1 .. q); s := a+b; if n = s then lprint(n, n2,  
b, a); L := [op(L), n] end if end do: L; nops(L):
```

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Cette page: <http://villemin.gerard.free.fr/Wwwgvm/Iteration/Kaprekar.pdf>

