

NOMBRES - Curiosités, théorie et usages

SIGMA & PHI

Sigma: somme des diviseurs de n

Phi: quantité de nombres premiers avec n

Retour: [phi ou totient d'Euler](#)
[sigma ou somme des diviseurs](#)

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But

Comparaison entre n et combinaisons de phi et sigma

Exemple Pour le nombre 87, $\sigma(87) = 120$; $\phi(120) = 56$ et $\sigma(56) = 120$.

$$n = \sigma(n)$$

Aucun sauf le nombre 1.

$$n = \sigma(n) - n$$

Nombres [parfaits](#)

6, 28, 496, 8128, 33550336, 8589869056, 137438691328, 2305843008139952128,
2658455991569831744654692615953842176,
191561942608236107294793378084303638130997321548169216

[A000396](#)

$$n = \phi(n) + k$$

k = 0	1	2	3	4	5	6	7	8	9	10
1	P	4	9	6	25	10	15	12	21	/
				8			49	14	27	
								16		

Records: plus petit nombre tel que $k = n - \phi(n)$ soit plus grand que le précédent

[k, n, phi] => [1, 2, 1], [2, 4, 2], [4, 6, 2], [6, 10, 4], [8, 12, 4], [12, 18, 6], [16, 24, 8], [22, 30, 8], [24, 36, 12], [30, 42, 12], [32, 48, 16], [36, 54, 18], [44, 60, 16], [46, 66, 20], [48, 72, 24], [54, 78, 24], [60, 84, 24], [66, 90, 24], [70, 102, 32], [72, 108, 36], [78, 114, 36], [88, 120, 32], [90, 126, 36], [92, 132, 40], [94, 138, 44], [96, 144, 48], [110, 150, 40], [120, 168, 48], [132, 180, 48], [138, 198, 60], [140, 204, 64], [162, 210, 48], [176, 240, 64], [180, 252,

72], [184, 264, 80], [198, 270, 72], [210, 294, 84], [220, 300, 80], [250, 330, 80], [264, 360, 96], [270, 378, 108], [294, 390, 96], [324, 420, 96], [330, 450, 120], [342, 462, 120], [352, 480, 128], [360, 504, 144], [382, 510, 128], [396, 540, 144], [402, 546, 144], [426, 570, 144], [440, 600, 160], [486, 630, 144], [500, 660, 160], [514, 690, 176], [522, 714, 192], [528, 720, 192], [550, 750, 200], [588, 780, 192], [594, 810, 216], [648, 840, 192], [660, 900, 240], [684, 924, 240], [690, 930, 240], [704, 960, 256], [750, 990, 240]

pour n jusqu'à 1000.

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$$n = \varphi(\sigma(n))$$

1, 2, 8, 12, 128, 240, 720, 6 912, 32 768, 142 560, 712 800, ...

$$n = \sigma(\varphi(n))$$

1, 3, 15, 28, 255, 744, 2418, 20440, 65535, 548856, 2835756, 4059264, 4451832, 10890040, 13192608, 23001132, 54949482, 110771178, 220174080, 445701354, 4294967295, 16331433888, 18377794080, 94951936080, 204721968000, 386940247200, 601662398400, 1433565580920

[A018784](#)

$$\sigma(\varphi(n)) = \varphi(\sigma(n))$$

1, 9, 225, 242, 516, 729, 3872, 13932, 14406, 17672, 18225, 20124, 21780, 29262, 29616, 45996, 65025, 76832, 92778, 95916, 106092, 106308, 114630, 114930, 121872, 125652, 140130, 140625, 145794, 149124, 160986, 179562, 185100, 234876, 248652, 252978, 256860, ...

[A033632](#)

$$\sigma(n) = \varphi(\sigma(n))$$

1, 87, 362, 1257, 1798, 5002, 9374, 21982, 22436, 25978, 35306, 38372, 41559, 50398, 51706, 53098, 53314, 56679, 65307, 68037, 89067, 108946, 116619, 124677, 131882, 136551, 136762, 138975, 144014, 160629, 165554, 170037, 186231, 192394, 197806, 205438, 214605, 232898, 248026, 252417, 258975, 259785, 271814, 300242, 320595, 329156, 338306, 350283, 356259, 374031, 377834, 380559, 387106, 398452, 402346, 414922, 428967, 439118, 446235, 468602, 475922, 477723, 478558, 481887, 492771, 493246, 502274, 510111, 522982, 526186, 527781, 530865, 544665, 553755, 555446, 597434, 599205, 609634, 609855, 613538, 621878, 635259, 636962, 642694, 666405, 672051, 697262, 728222, 737978, 770186, 777998, 790562, 804346, 806702, 814228, 832162, 866379, 876956, 887794, 896931, 936856, 937485, 957578, 961785, 973682, 980894, 991479, 997106, ...

$$\varphi(n) = \varphi(\sigma(n))$$

1, 2.

$$\varphi(n) = \varphi(\sigma(n) - n)$$

[2, 4, 6, 10, 16, 28, 78, 114, 152, 165, 186, 222, 224, 238, 256, 402, 496, 654, 704, 738, 762, 834, 942, 1086, 1194, 1266, 1456, 1485, 1665, 1722, 1842, 1972, 2022, 2132, 2223, 2274, 2454, 2528, 2754, 2922, 2994, 3246, 3426, 3462, 3472, 3786, 4506, 4614, 4722, 4816, 4850, 4866, 4974, 5262, 5514, 5622, 5848, 5946, 6054, 6234, 6237, 6578, 6702, 7206, 7746, 7782, 7962, 8128, 8286, 8295, 8394, 8418, 8528, 8754, 8757, 8826, 9009, 9225, 9402, 9726], ...

[n, Phi(n), Sigma(n)]

[2, 1, 3], [4, 2, 7], [6, 2, 12], [10, 4, 18], [16, 8, 31], [28, 12, 56], [78, 24, 168], [114, 36, 240], [152, 72, 300], [165, 80, 288], [186, 60, 384], [222, 72, 456], [224, 96, 504], [238, 96, 432], [256, 128, 511], [402, 132, 816], [496, 240, 992], [654, 216, 1320], [704, 320, 1524], [738, 240, 1638], [762, 252, 1536], [834, 276, 1680], [942, 312, 1896], [1086, 360, 2184], [1194, 396, 2400], [1266, 420, 2544], [1456, 576, 3472], [1485, 720, 2880], [1665, 864, 2964], [1722, 480, 4032], [1842, 612, 3696], [1972, 896, 3780], [2022, 672, 4056], [2132, 960, 4116], [2223, 1296, 3640], [2274, 756, 4560], [2454, 816, 4920], [2528, 1248, 5040], [2754, 864, 6534], [2922, 972, 5856], [2994, 996, 6000], [3246, 1080, 6504], [3426, 1140, 6864], [3462, 1152, 6936], [3472, 1440, 7936], [3786, 1260, 7584], [4506, 1500, 9024], [4614, 1536, 9240], [4722, 1572, 9456], [4816, 2016, 10912], [4850, 1920, 9114], [4866, 1620, 9744], [4974, 1656, 9960], [5262, 1752, 10536], [5514, 1836, 11040], [5622, 1872, 11256], [5848, 2688, 11880], [5946, 1980, 11904], [6054, 2016, 12120], [6234, 2076, 12480], [6237, 3240, 11616], [6578, 2640, 12096], [6702, 2232, 13416], [7206, 2400, 14424], [7746, 2580, 15504], [7782, 2592, 15576], [7962, 2652, 15936], [8128, 4032, 16256], [8286, 2760, 16584], [8295, 3744, 15360], [8394, 2796, 16800], [8418, 2640, 17856], [8528, 3840, 18228], [8754, 2916, 17520], [8757, 4968, 14560], [8826, 2940, 17664], [9009, 4320, 17472], [9225, 4800, 16926], [9402, 3132, 18816], [9726, 3240, 19464], ...

$$\sigma(n) = \sigma(\varphi(n))$$

1.

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$$\varphi(n) = \sigma(\varphi(n))$$

1, 3, 15, 26, 39, 45, 74, 104, 111, 117, 122, 146, 175, 183, 195, 219, 296, 314, 333, 357, 386, 471, 488, 549, 554, 555, 579, 584, 585, 608, 626, 646, 657, 794, 831, 842, 914, 915, 939, 962, 1071, 1082, 1095, 1191, 1226, 1256, 1263, 1292, 1322, 1346, 1371, 1413, 1443, 1466, 1508, 1514, 1544, 1586, 1623, 1664, 1665, 1737, 1754, 1839, 1898, 1983, 1994, 2019, 2186, 2199, 2216, 2271, 2275, 2295, 2306, 2355, 2379, 2402, 2426, 2474, 2493, 2504, 2631, 2642, 2745, 2762, 2817, 2847, 2895, 2906, 2991, 3176, 3242, 3279, 3285, 3314, 3368, 3459, 3506, 3573, 3603, 3639, 3656, 3711, 3746, 3789, 3848, 3866, 3963, 3986, 4034, 4082, 4113, 4143, 4155, 4274, 4328, 4329, 4359, 4514, 4641, 4682, 4695, 4736, 4845, 4863, 4869, 4904, 4946, 4971, 5018, 5114, 5186, 5259, 5288, 5384, 5402, 5517, 5594, 5619, 5714, 5799, 5834, 5864, 5949, 5955, 5979, 6051, 6056, 6057, 6122, 6123, 6232, 6315, 6344, 6411, 6434, 6475, 6506, 6597, 6626, 6771, 6813, 6855, 7016, 7023, 7034, 7052, 7065, 7137, 7202, 7215, 7419, 7466, 7527, 7592, 7671, 7779, 7803, 7808, 7893, 7976, 8042, 8103, 8114, 8115, 8138, 8354, 8391, 8398, 8522, 8541, 8546, 8571, 8685, 8714, 8744, 8751, 8882, 8906, 8973, 9122, 9183, 9195, 9224, 9242, 9344, 9526, 9608, 9651, 9704, 9759, 9837, 9866, 9896, 9915, 9939

[A006872](#)

$$\sigma(n) + \varphi(n) = k \cdot n$$

[n, sigma(n), phi(n)]

k = 1: Aucun

k = 2

[1, 1, 1], [2, 3, 1], [3, 4, 2], [5, 6, 4], [7, 8, 6], [11, 12, 10], [13, 14, 12], [17, 18, 16], [19, 20, 18], [23, 24, 22], [29, 30, 28], [31, 32, 30], [37, 38, 36], [41, 42, 40], [43, 44, 42], [47, 48, 46], [53, 54, 52], [59, 60, 58], [61, 62, 60], [67, 68, 66], [71, 72, 70], [73, 74, 72], [79, 80, 78], [83, 84, 82], [89, 90, 88], [97, 98, 96], [101, 102, 100], [103, 104, 102], [107, 108, 106], [109, 110, 108], [113, 114, 112], [127, 128, 126], [131, 132, 130], [137, 138, 136], [139, 140, 138], [149, 150, 148], [151, 152, 150], [157, 158, 156], [163, 164, 162], [167, 168, 166], [173, 174, 172], [179, 180, 178], [181, 182, 180], [191, 192, 190], [193, 194, 192], [197, 198, 196], [199, 200, 198], [211, 212, 210], [223, 224, 222], [227, 228, 226], [229, 230, 228], [233, 234, 232], [239, 240, 238], [241, 242, 240], [251, 252, 250], [257, 258, 256], [263, 264, 262], [269, 270, 268], [271, 272, 270], [277, 278, 276], [281, 282, 280], [283, 284, 282], [293, 294, 292], [307, 308, 306], [311, 312, 310], [313, 314, 312], [317, 318, 316], [331, 332, 330], [337, 338, 336], [347, 348, 346], [349, 350, 348], [353, 354, 352], [359, 360, 358], [367, 368, 366], [373, 374, 372], [379, 380, 378], [383, 384, 382], [389, 390, 388], [397, 398, 396], [401, 402, 400], [409, 410, 408], [419, 420, 418], [421, 422, 420], [431, 432, 430], [433, 434, 432], [439, 440, 438], [443, 444, 442], [449, 450, 448], [457, 458, 456], [461, 462, 460], [463, 464, 462], [467, 468, 466], [479, 480, 478], [487, 488, 486], [491, 492, 490], [499, 500, 498], [503, 504, 502]

k = 3

[312, 840, 96], [560, 1488, 192], [588, 1596, 168], [1400, 3720, 480], [85632, 228480, 28416], [147492, 396396, 46080], [556160, 1468800, 199680], [569328, 1525200, 182784], ...

k = 4

[23760, 89280, 5760], [59400, 223200, 14400], [153720, 580320, 34560]

k = 5 Aucun jusqu'à 1 000 000

$$\sigma(n) \cdot \varphi(n) = k^4$$

1, 170, 595, 714, 121056, 480441, 529620, 706063, 706237, 729752, 755972, 815654,
2162808, 2449062, 2827789, 2927848, 2957416, 2994681, 2995419, 3010227, 3019028,
3019772, 3080140, 3093860, 3103464, 3206364, 3213804, ...

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