Criptografía y Computación

Curso 2018-19

Práctica 1. Primalidad

Autor[1]: Víctor García Carrera

Síntesis.

Esta presente memoria recoge las instrucciones para ejecutar en Linux los diversos apartados de la primera práctica de la asignatura de Criptografía y Computación, donde desarrollamos el test de primalidad de Miller-Rabin junto con una serie de funciones para encontrar números primos y primos fuertes.

Apartado 1.

Implementa el test de primalidad de Miller-Rabin con 10 testigos para un número de entrada dado “num”

Ejecución en Linux: python miller-rabin.py “num”

Apartado 2.

Implementamos una versión de prueba del test de primalidad de Miller-Rabin donde para un número de entrada dado “num” comprueba si el número “test” es un FALSO TESTIGO (cuando da un falso positivo en el test sin ser primo)

Ejecución en Linux: python miller-rabin-testigo.py “num” “test”

Apartados 3,4 y 5.

Utilizan el test de primalidad de Miller-Rabin para definir funciones que calculan, para un número de entrada dado “num”, su siguiente número primo y su siguiente número primo fuerte, además de calcular un primo fuerte de “nbit” bits de tamaño

Ejecución en Linux: python nextPrime.py “num” “nbit”

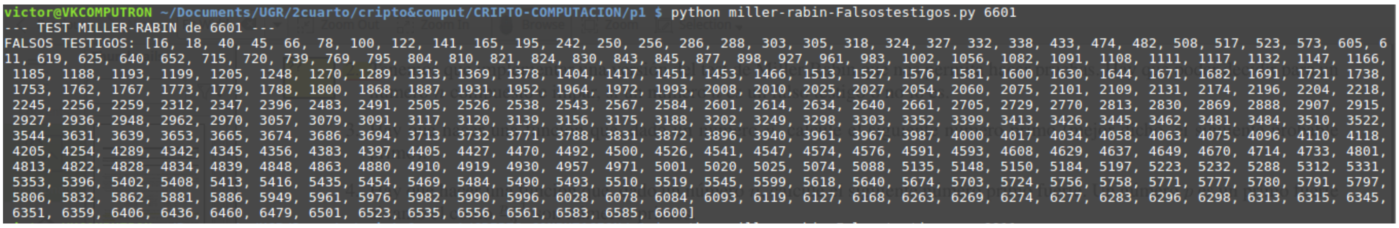
Apartado 6.

Utiliza el test de primalidad de Miller-Rabin para encontrar todos los falsos testigos del valor “num” (6601, 8911, 10585, 15841, 29341)

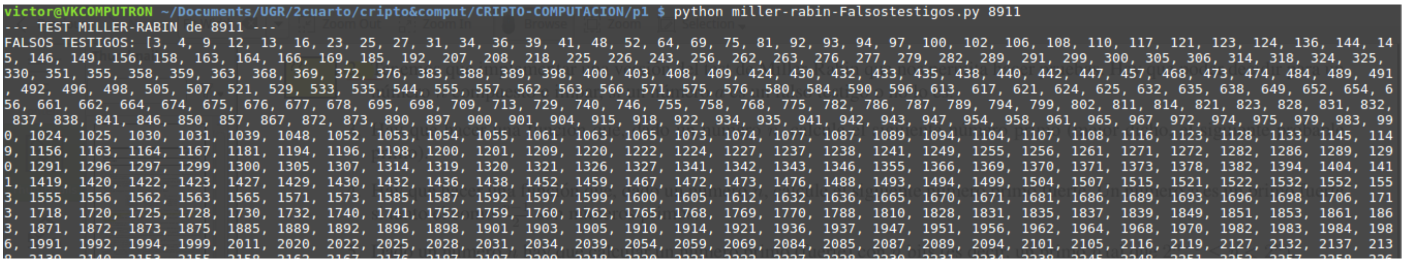
Ejecución en Linux: python miller-rabin-Falsostestigos.py “num”

A continuación se muestran las imágenes de las salidas obtenidas:

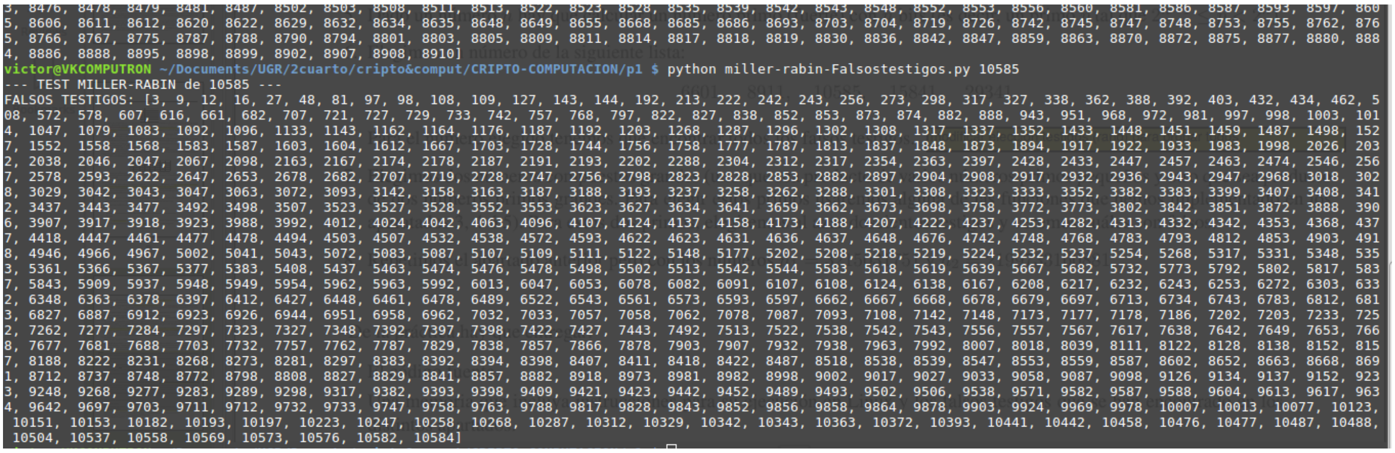
[1] Como autor declaro que los contenidos del presente documento son originales y elaborados por mi. De no cumplir con este compromiso, soy consciente de que, de acuerdo con la “Normativa de evaluación y de calificaciones de los estudiantes de la Universidad de Granada” esto “conllevará la calificación numérica de cero … independientemente del resto de calificaciones que el estudiante hubiera obtenido ...”



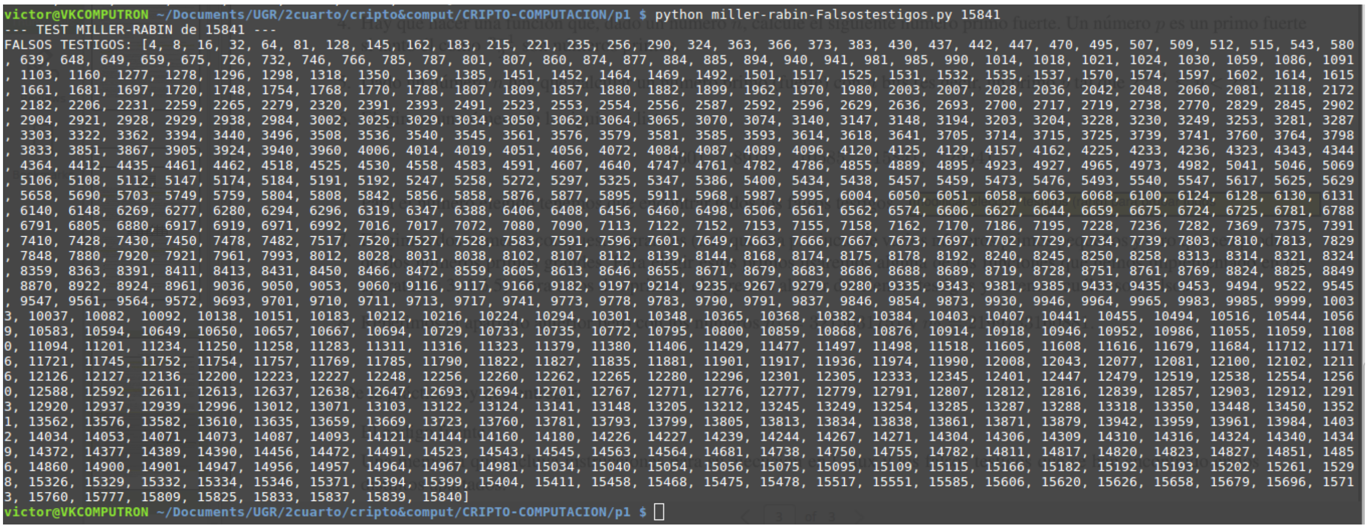
```
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ python miller-rabin-Falsostestigos.py 6601
--- TEST MILLER-RABIN de 6601 ---
FALSOS TESTIGOS: [16, 18, 40, 45, 66, 78, 100, 122, 141, 165, 195, 242, 250, 256, 286, 288, 303, 305, 318, 324, 327, 332, 338, 433, 474, 482, 508, 517, 523, 573, 605, 6
11, 619, 625, 640, 652, 715, 720, 739, 769, 795, 804, 810, 821, 824, 830, 843, 845, 877, 898, 927, 961, 983, 1002, 1056, 1082, 1091, 1108, 1111, 1117, 1132, 1147, 1166,
 1185, 1188, 1193, 1199, 1205, 1248, 1270, 1289, 1313, 1369, 1378, 1404, 1417, 1451, 1453, 1466, 1513, 1527, 1576, 1581, 1600, 1630, 1644, 1671, 1682, 1691, 1721, 1738,
 1753, 1762, 1767, 1773, 1779, 1788, 1800, 1868, 1887, 1931, 1952, 1964, 1972, 1993, 2008, 2010, 2025, 2027, 2054, 2060, 2075, 2101, 2109, 2131, 2174, 2196, 2204, 2218,
 2245, 2256, 2259, 2312, 2347, 2396, 2483, 2491, 2505, 2526, 2538, 2543, 2567, 2584, 2601, 2614, 2634, 2640, 2661, 2705, 2729, 2770, 2813, 2830, 2869, 2888, 2907, 2915,
 2927, 2936, 2948, 2962, 2970, 3057, 3079, 3091, 3117, 3120, 3139, 3156, 3175, 3188, 3202, 3249, 3298, 3303, 3352, 3399, 3413, 3426, 3445, 3462, 3481, 3484, 3510, 3522,
 3544, 3631, 3639, 3653, 3665, 3674, 3686, 3694, 3713, 3732, 3771, 3788, 3831, 3872, 3896, 3940, 3961, 3967, 3987, 4000, 4017, 4034, 4058, 4063, 4075, 4096, 4110, 4118,
 4205, 4254, 4289, 4342, 4345, 4356, 4383, 4397, 4405, 4427, 4470, 4492, 4500, 4526, 4541, 4547, 4574, 4576, 4591, 4593, 4608, 4629, 4637, 4649, 4670, 4714, 4733, 4801,
 4813, 4822, 4828, 4834, 4839, 4848, 4863, 4880, 4910, 4919, 4930, 4957, 4971, 5001, 5020, 5025, 5074, 5088, 5135, 5148, 5150, 5184, 5197, 5223, 5232, 5288, 5312, 5331,
 5353, 5396, 5402, 5408, 5413, 5416, 5435, 5454, 5469, 5484, 5490, 5493, 5510, 5519, 5545, 5599, 5618, 5640, 5674, 5703, 5724, 5756, 5758, 5771, 5777, 5780, 5791, 5797,
 5806, 5832, 5862, 5881, 5886, 5949, 5961, 5976, 5982, 5990, 5996, 6028, 6078, 6084, 6093, 6119, 6127, 6168, 6263, 6269, 6274, 6277, 6283, 6296, 6298, 6313, 6315, 6345,
 6351, 6359, 6406, 6436, 6460, 6479, 6501, 6523, 6535, 6556, 6561, 6583, 6585, 6600]
```



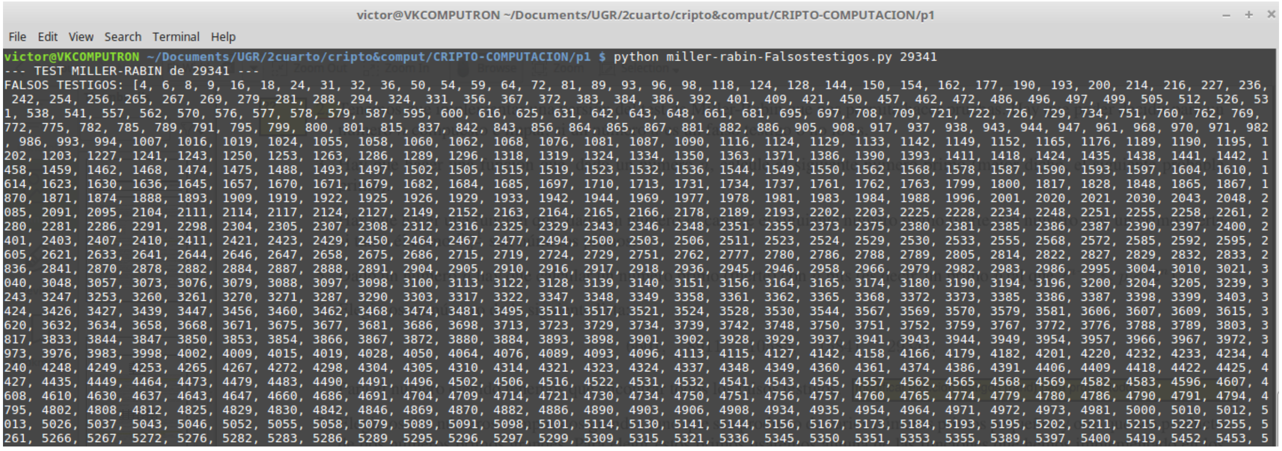
```
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ python miller-rabin-Falsostestigos.py 8911
--- TEST MILLER-RABIN de 8911 ---
FALSOS TESTIGOS: [3, 4, 9, 12, 13, 16, 23, 25, 27, 31, 34, 36, 39, 41, 48, 52, 64, 69, 75, 81, 92, 93, 94, 97, 100, 102, 106, 108, 110, 117, 121, 123, 124, 136, 144, 14
5, 146, 149, 156, 158, 163, 164, 166, 169, 185, 192, 207, 208, 218, 225, 226, 243, 256, 262, 263, 276, 277, 279, 282, 289, 291, 299, 300, 305, 306, 314, 318, 324, 325,
330, 351, 355, 358, 359, 363, 368, 369, 372, 376, 383, 388, 389, 398, 400, 403, 408, 409, 424, 430, 432, 433, 435, 438, 440, 442, 447, 457, 468, 473, 474, 484, 489, 491
, 492, 496, 498, 505, 507, 521, 529, 533, 535, 544, 555, 557, 562, 563, 566, 571, 575, 576, 580, 584, 590, 596, 613, 617, 621, 624, 625, 632, 635, 638, 649, 652, 654, 6
56, 661, 662, 664, 674, 675, 676, 677, 678, 695, 698, 709, 713, 729, 740, 746, 755, 758, 768, 775, 782, 786, 787, 789, 794, 799, 802, 811, 814, 821, 823, 828, 831, 832,
 837, 838, 841, 846, 850, 857, 867, 872, 873, 890, 897, 900, 901, 904, 915, 918, 922, 934, 935, 941, 942, 943, 947, 954, 958, 961, 965, 967, 972, 974, 975, 979, 983, 99
0, 1024, 1025, 1030, 1031, 1039, 1048, 1052, 1053, 1054, 1055, 1061, 1063, 1065, 1073, 1074, 1077, 1087, 1089, 1094, 1104, 1107, 1108, 1116, 1123, 1128, 1133, 1145, 114
9, 1156, 1163, 1164, 1167, 1181, 1194, 1196, 1198, 1200, 1201, 1209, 1220, 1222, 1224, 1227, 1237, 1238, 1241, 1249, 1255, 1256, 1261, 1271, 1272, 1282, 1286, 1289, 129
0, 1291, 1296, 1297, 1299, 1300, 1305, 1307, 1314, 1319, 1320, 1321, 1326, 1327, 1341, 1342, 1343, 1346, 1355, 1366, 1369, 1370, 1371, 1373, 1378, 1382, 1394, 1404, 141
1, 1419, 1420, 1422, 1423, 1427, 1429, 1430, 1432, 1436, 1438, 1452, 1459, 1467, 1472, 1473, 1476, 1488, 1493, 1494, 1499, 1504, 1507, 1515, 1521, 1522, 1532, 1552, 155
3, 1555, 1556, 1562, 1563, 1565, 1571, 1573, 1585, 1587, 1592, 1597, 1599, 1600, 1605, 1612, 1632, 1636, 1665, 1670, 1671, 1681, 1686, 1689, 1693, 1696, 1698, 1706, 171
3, 1718, 1720, 1725, 1728, 1730, 1732, 1740, 1741, 1752, 1759, 1760, 1762, 1765, 1768, 1769, 1770, 1788, 1810, 1828, 1831, 1835, 1837, 1839, 1849, 1851, 1853, 1861, 186
3, 1871, 1872, 1873, 1875, 1885, 1889, 1892, 1896, 1898, 1901, 1903, 1905, 1910, 1914, 1921, 1936, 1937, 1947, 1951, 1956, 1962, 1964, 1968, 1970, 1982, 1983, 1984, 198
6, 1991, 1992, 1994, 1999, 2011, 2020, 2022, 2025, 2028, 2031, 2034, 2039, 2054, 2059, 2069, 2084, 2085, 2087, 2089, 2094, 2101, 2105, 2116, 2119, 2127, 2132, 2137, 213
```



```
3, 8476, 8478, 8479, 8481, 8487, 8502, 8503, 8508, 8511, 8513, 8522, 8523, 8528, 8535, 8539, 8542, 8543, 8548, 8552, 8553, 8556, 8560, 8581, 8586, 8587, 8593, 8597, 860
5, 8606, 8611, 8612, 8620, 8622, 8629, 8632, 8634, 8635, 8648, 8649, 8655, 8668, 8685, 8686, 8693, 8703, 8704, 8719, 8726, 8742, 8745, 8747, 8748, 8753, 8755, 8762, 876
5, 8766, 8767, 8775, 8787, 8788, 8790, 8794, 8801, 8803, 8805, 8809, 8811, 8814, 8817, 8818, 8819, 8830, 8836, 8842, 8847, 8859, 8863, 8870, 8872, 8875, 8877, 8880, 888
4, 8886, 8888, 8895, 8898, 8899, 8902, 8907, 8908, 8910]
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ python miller-rabin-Falsostestigos.py 10585
--- TEST MILLER-RABIN de 10585 ---
FALSOS TESTIGOS: [3, 9, 12, 16, 27, 48, 81, 97, 98, 108, 109, 127, 143, 144, 192, 213, 222, 242, 243, 256, 273, 298, 317, 327, 338, 362, 388, 392, 403, 432, 434, 462, 5
08, 572, 578, 607, 616, 661, 682, 707, 721, 727, 729, 733, 742, 757, 768, 797, 822, 827, 838, 852, 853, 873, 874, 882, 888, 943, 951, 968, 972, 981, 997, 998, 1003, 101
4, 1047, 1079, 1083, 1092, 1096, 1133, 1143, 1162, 1164, 1176, 1187, 1192, 1203, 1268, 1287, 1296, 1302, 1308, 1317, 1337, 1352, 1433, 1448, 1451, 1459, 1487, 1498, 152
7, 1552, 1558, 1568, 1583, 1587, 1603, 1604, 1612, 1667, 1703, 1728, 1744, 1756, 1758, 1777, 1787, 1813, 1837, 1848, 1873, 1894, 1917, 1922, 1933, 1983, 1998, 2026, 203
2, 2038, 2046, 2047, 2067, 2098, 2163, 2167, 2174, 2178, 2187, 2191, 2193, 2202, 2288, 2304, 2312, 2317, 2354, 2363, 2397, 2428, 2433, 2447, 2457, 2463, 2474, 2546, 256
7, 2578, 2593, 2622, 2647, 2653, 2678, 2682, 2707, 2719, 2728, 2747, 2756, 2798, 2823, 2828, 2853, 2882, 2897, 2904, 2908, 2917, 2932, 2936, 2943, 2947, 2968, 3018, 302
8, 3029, 3042, 3043, 3047, 3063, 3072, 3093, 3142, 3158, 3163, 3187, 3188, 3193, 3237, 3258, 3262, 3288, 3301, 3308, 3323, 3333, 3352, 3382, 3383, 3399, 3407, 3408, 341
2, 3437, 3443, 3477, 3492, 3498, 3507, 3523, 3527, 3528, 3552, 3553, 3623, 3627, 3634, 3641, 3659, 3662, 3673, 3698, 3758, 3772, 3773, 3802, 3842, 3851, 3872, 3888, 390
6, 3907, 3917, 3918, 3923, 3988, 3992, 4012, 4024, 4042, 4063, 4096, 4107, 4124, 4137, 4158, 4173, 4188, 4207, 4222, 4237, 4253, 4282, 4313, 4332, 4342, 4353, 4368, 437
7, 4418, 4447, 4461, 4477, 4478, 4494, 4503, 4507, 4532, 4538, 4572, 4593, 4622, 4623, 4631, 4636, 4637, 4648, 4676, 4742, 4748, 4768, 4783, 4793, 4812, 4853, 4903, 491
8, 4946, 4966, 4967, 5002, 5041, 5043, 5072, 5083, 5087, 5107, 5109, 5111, 5122, 5148, 5177, 5202, 5208, 5218, 5219, 5224, 5232, 5237, 5254, 5268, 5317, 5331, 5348, 535
3, 5361, 5366, 5367, 5377, 5383, 5408, 5437, 5463, 5474, 5476, 5478, 5498, 5502, 5513, 5542, 5544, 5583, 5618, 5619, 5639, 5667, 5682, 5732, 5773, 5792, 5802, 5817, 583
7, 5843, 5909, 5937, 5948, 5949, 5954, 5962, 5963, 5992, 6013, 6047, 6053, 6078, 6082, 6091, 6107, 6108, 6124, 6138, 6167, 6208, 6217, 6232, 6243, 6253, 6272, 6303, 633
2, 6348, 6363, 6378, 6397, 6412, 6427, 6448, 6461, 6478, 6489, 6522, 6543, 6561, 6573, 6593, 6597, 6662, 6667, 6668, 6678, 6679, 6697, 6713, 6734, 6743, 6783, 6812, 681
3, 6827, 6887, 6912, 6923, 6926, 6944, 6951, 6958, 6962, 7032, 7033, 7057, 7058, 7062, 7078, 7087, 7093, 7108, 7142, 7148, 7173, 7177, 7178, 7186, 7202, 7203, 7233, 725
2, 7262, 7277, 7284, 7297, 7323, 7327, 7348, 7392, 7397, 7398, 7422, 7427, 7443, 7492, 7513, 7522, 7538, 7542, 7543, 7556, 7557, 7567, 7617, 7638, 7642, 7649, 7653, 766
8, 7677, 7681, 7688, 7703, 7732, 7757, 7762, 7787, 7829, 7838, 7857, 7866, 7878, 7903, 7907, 7932, 7938, 7963, 7992, 8007, 8018, 8039, 8111, 8122, 8128, 8138, 8152, 815
7, 8188, 8222, 8231, 8268, 8273, 8281, 8297, 8383, 8392, 8394, 8398, 8407, 8411, 8418, 8422, 8487, 8518, 8538, 8539, 8547, 8553, 8559, 8587, 8602, 8652, 8663, 8668, 869
1, 8712, 8737, 8748, 8772, 8798, 8808, 8827, 8829, 8841, 8857, 8882, 8918, 8973, 8981, 8982, 8998, 9002, 9017, 9027, 9033, 9058, 9087, 9098, 9126, 9134, 9137, 9152, 923
3, 9248, 9268, 9277, 9283, 9289, 9298, 9317, 9382, 9393, 9398, 9409, 9421, 9423, 9442, 9452, 9489, 9493, 9502, 9506, 9538, 9571, 9582, 9587, 9588, 9604, 9613, 9617, 963
4, 9642, 9697, 9703, 9711, 9712, 9732, 9733, 9747, 9758, 9763, 9788, 9817, 9828, 9843, 9852, 9856, 9858, 9864, 9878, 9903, 9924, 9969, 9978, 10007, 10013, 10077, 10123,
 10151, 10153, 10182, 10193, 10197, 10223, 10247, 10258, 10268, 10287, 10312, 10329, 10342, 10343, 10363, 10372, 10393, 10441, 10442, 10458, 10476, 10477, 10487, 10488,
 10504, 10537, 10558, 10569, 10573, 10576, 10582, 10584]
```



```
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ python miller-rabin-Falsostestigos.py 15841
--- TEST MILLER-RABIN de 15841 ---
FALSOS TESTIGOS: [4, 8, 16, 32, 64, 81, 128, 145, 162, 183, 215, 221, 235, 256, 290, 324, 363, 366, 373, 383, 430, 437, 442, 447, 470, 495, 507, 509, 512, 515, 543, 580
, 639, 648, 649, 659, 675, 726, 732, 746, 766, 785, 787, 801, 807, 860, 874, 877, 884, 885, 894, 940, 941, 981, 985, 990, 1014, 1018, 1021, 1024, 1030, 1059, 1086, 1091
, 1103, 1160, 1277, 1278, 1296, 1298, 1318, 1350, 1369, 1385, 1451, 1452, 1464, 1469, 1492, 1501, 1517, 1525, 1531, 1532, 1535, 1537, 1570, 1574, 1597, 1602, 1614, 1615
, 1661, 1681, 1697, 1720, 1748, 1754, 1768, 1770, 1788, 1807, 1809, 1857, 1880, 1882, 1899, 1962, 1970, 1980, 2003, 2007, 2028, 2036, 2042, 2048, 2060, 2081, 2118, 2172
, 2182, 2206, 2231, 2259, 2265, 2279, 2320, 2391, 2393, 2491, 2523, 2553, 2554, 2556, 2587, 2592, 2596, 2629, 2636, 2693, 2700, 2717, 2719, 2738, 2770, 2829, 2845, 2902
, 2904, 2921, 2928, 2929, 2938, 2984, 3002, 3025, 3029, 3034, 3050, 3062, 3064, 3065, 3070, 3074, 3140, 3147, 3148, 3194, 3203, 3204, 3228, 3230, 3249, 3253, 3281, 3287
, 3303, 3322, 3362, 3394, 3440, 3496, 3508, 3536, 3540, 3545, 3561, 3576, 3579, 3581, 3585, 3593, 3614, 3618, 3641, 3705, 3714, 3715, 3725, 3739, 3741, 3760, 3764, 3798
, 3833, 3851, 3867, 3905, 3924, 3940, 3960, 4006, 4014, 4019, 4051, 4056, 4072, 4084, 4087, 4089, 4096, 4120, 4125, 4129, 4157, 4162, 4225, 4233, 4236, 4323, 4343, 4344
, 4364, 4412, 4435, 4461, 4462, 4518, 4525, 4530, 4558, 4583, 4591, 4607, 4640, 4747, 4761, 4782, 4786, 4855, 4889, 4895, 4923, 4927, 4965, 4973, 4982, 5041, 5046, 5069
, 5106, 5108, 5112, 5147, 5174, 5184, 5191, 5192, 5247, 5258, 5272, 5297, 5325, 5347, 5386, 5400, 5434, 5438, 5457, 5459, 5473, 5476, 5493, 5540, 5547, 5617, 5625, 5629
, 5658, 5690, 5703, 5749, 5759, 5804, 5808, 5842, 5856, 5858, 5876, 5877, 5895, 5911, 5968, 5987, 5995, 6004, 6050, 6051, 6058, 6063, 6068, 6100, 6124, 6128, 6130, 6131
, 6140, 6148, 6269, 6277, 6280, 6294, 6296, 6319, 6347, 6388, 6406, 6408, 6456, 6460, 6498, 6506, 6561, 6562, 6574, 6606, 6627, 6644, 6659, 6675, 6724, 6725, 6781, 6788
, 6791, 6805, 6880, 6917, 6919, 6971, 6992, 7016, 7017, 7072, 7080, 7090, 7113, 7122, 7152, 7153, 7155, 7158, 7162, 7170, 7186, 7195, 7228, 7236, 7282, 7369, 7375, 7391
, 7410, 7428, 7430, 7450, 7478, 7482, 7517, 7520, 7527, 7528, 7583, 7591, 7596, 7601, 7649, 7663, 7666, 7667, 7673, 7697, 7702, 7729, 7734, 7739, 7803, 7810, 7813, 7829
, 7848, 7880, 7920, 7921, 7961, 7993, 8012, 8028, 8031, 8038, 8102, 8107, 8112, 8139, 8144, 8168, 8174, 8175, 8178, 8192, 8240, 8245, 8250, 8258, 8313, 8314, 8321, 8324
, 8359, 8363, 8391, 8411, 8413, 8431, 8450, 8466, 8472, 8559, 8605, 8613, 8646, 8655, 8671, 8679, 8683, 8686, 8688, 8689, 8719, 8728, 8751, 8761, 8769, 8824, 8825, 8849
, 8870, 8922, 8924, 8961, 9036, 9050, 9053, 9060, 9116, 9117, 9166, 9182, 9197, 9214, 9235, 9267, 9279, 9280, 9335, 9343, 9381, 9385, 9433, 9435, 9453, 9494, 9522, 9545
, 9547, 9561, 9564, 9572, 9693, 9701, 9710, 9711, 9713, 9717, 9741, 9773, 9778, 9783, 9790, 9791, 9837, 9846, 9854, 9873, 9930, 9946, 9964, 9965, 9983, 9985, 9999, 1003
3, 10037, 10082, 10092, 10138, 10151, 10183, 10212, 10216, 10224, 10294, 10301, 10348, 10365, 10368, 10382, 10384, 10403, 10407, 10441, 10455, 10494, 10516, 10544, 1056
9, 10583, 10594, 10649, 10650, 10657, 10667, 10694, 10729, 10733, 10735, 10772, 10795, 10800, 10859, 10868, 10876, 10914, 10918, 10946, 10952, 10986, 11055, 11059, 1108
0, 11094, 11201, 11234, 11250, 11258, 11283, 11311, 11316, 11323, 11379, 11380, 11406, 11429, 11477, 11497, 11498, 11518, 11605, 11608, 11616, 11679, 11684, 11712, 1171
6, 11721, 11745, 11752, 11754, 11757, 11769, 11785, 11790, 11822, 11827, 11835, 11881, 11901, 11917, 11936, 11974, 11990, 12008, 12043, 12077, 12081, 12100, 12102, 1211
6, 12126, 12127, 12136, 12200, 12223, 12227, 12248, 12256, 12260, 12262, 12265, 12280, 12296, 12301, 12305, 12333, 12345, 12401, 12447, 12479, 12519, 12538, 12554, 1256
0, 12588, 12592, 12611, 12613, 12637, 12638, 12647, 12693, 12694, 12701, 12767, 12771, 12776, 12777, 12779, 12791, 12807, 12812, 12816, 12839, 12857, 12903, 12912, 1291
3, 12920, 12937, 12939, 12996, 13012, 13071, 13103, 13122, 13124, 13141, 13148, 13205, 13212, 13245, 13249, 13254, 13285, 13287, 13288, 13318, 13350, 13448, 13450, 1352
1, 13562, 13576, 13582, 13610, 13635, 13659, 13669, 13723, 13760, 13781, 13793, 13799, 13805, 13813, 13834, 13838, 13861, 13871, 13879, 13942, 13959, 13961, 13984, 1403
2, 14034, 14053, 14071, 14073, 14087, 14093, 14121, 14144, 14160, 14180, 14226, 14227, 14239, 14244, 14267, 14271, 14304, 14306, 14309, 14310, 14316, 14324, 14340, 1434
9, 14372, 14377, 14389, 14390, 14456, 14472, 14491, 14523, 14543, 14545, 14563, 14564, 14681, 14738, 14750, 14755, 14782, 14811, 14817, 14820, 14823, 14827, 14851, 1485
6, 14860, 14900, 14901, 14947, 14956, 14957, 14964, 14967, 14981, 15034, 15040, 15054, 15056, 15075, 15095, 15109, 15115, 15166, 15182, 15192, 15193, 15202, 15261, 1529
8, 15326, 15329, 15332, 15334, 15346, 15371, 15394, 15399, 15404, 15411, 15458, 15468, 15475, 15478, 15517, 15551, 15585, 15606, 15620, 15626, 15658, 15679, 15696, 1571
3, 15760, 15777, 15809, 15825, 15833, 15837, 15839, 15840]
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ 
```



victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1
File
Edit
View
Search
Terminal
Help

```
victor@VKCOMPUTRON ~/Documents/UGR/2cuarto/cripto&comput/CRIPTO-COMPUTACION/p1 $ python miller-rabin-Falsostestigos.py 29341
--- TEST MILLER-RABIN de 29341 ---
FALSOS TESTIGOS: [4, 6, 8, 9, 16, 18, 24, 31, 32, 36, 50, 54, 59, 64, 72, 81, 89, 93, 96, 98, 118, 124, 128, 144, 150, 154, 162, 177, 190, 193, 200, 214, 216, 227, 236,
 242, 254, 256, 265, 267, 269, 279, 281, 288, 294, 324, 331, 356, 367, 372, 383, 384, 386, 392, 401, 409, 421, 450, 457, 462, 472, 486, 496, 497, 499, 505, 512, 526, 53
1, 538, 541, 557, 562, 570, 576, 577, 578, 579, 587, 595, 600, 616, 625, 631, 642, 643, 648, 661, 681, 695, 697, 708, 709, 721, 722, 726, 729, 734, 751, 760, 762, 769,
772, 775, 782, 785, 789, 791, 795, 799, 800, 801, 815, 837, 842, 843, 856, 864, 865, 867, 881, 882, 886, 905, 908, 917, 937, 938, 943, 944, 947, 961, 968, 970, 971, 982
, 986, 993, 994, 1007, 1016, 1019, 1024, 1055, 1058, 1060, 1062, 1068, 1076, 1081, 1087, 1090, 1116, 1124, 1129, 1133, 1142, 1149, 1152, 1165, 1176, 1189, 1190, 1195, 1
202, 1203, 1227, 1241, 1243, 1250, 1253, 1263, 1286, 1289, 1296, 1318, 1319, 1324, 1334, 1350, 1363, 1371, 1386, 1390, 1393, 1411, 1418, 1424, 1435, 1438, 1441, 1442, 1
458, 1459, 1462, 1468, 1474, 1475, 1488, 1493, 1497, 1502, 1505, 1515, 1519, 1523, 1532, 1536, 1544, 1549, 1550, 1562, 1568, 1578, 1587, 1590, 1593, 1597, 1604, 1610, 1
614, 1623, 1630, 1636, 1645, 1657, 1670, 1671, 1679, 1682, 1684, 1685, 1697, 1710, 1713, 1731, 1734, 1737, 1761, 1762, 1763, 1799, 1800, 1817, 1828, 1848, 1865, 1867, 1
870, 1871, 1874, 1888, 1893, 1909, 1919, 1922, 1925, 1926, 1929, 1933, 1942, 1944, 1969, 1977, 1978, 1981, 1983, 1984, 1988, 1996, 2001, 2020, 2021, 2030, 2043, 2048, 2
085, 2091, 2095, 2104, 2111, 2114, 2117, 2124, 2127, 2149, 2152, 2163, 2164, 2165, 2166, 2178, 2189, 2193, 2202, 2203, 2225, 2228, 2234, 2248, 2251, 2255, 2258, 2261, 2
280, 2281, 2286, 2291, 2298, 2304, 2305, 2307, 2308, 2312, 2316, 2325, 2329, 2343, 2346, 2348, 2351, 2355, 2373, 2375, 2380, 2381, 2385, 2386, 2387, 2390, 2397, 2400, 2
401, 2403, 2407, 2410, 2411, 2421, 2423, 2429, 2450, 2464, 2467, 2477, 2494, 2500, 2503, 2506, 2511, 2523, 2524, 2529, 2530, 2533, 2555, 2568, 2572, 2585, 2592, 2595, 2
605, 2621, 2633, 2641, 2644, 2646, 2647, 2658, 2675, 2686, 2715, 2719, 2724, 2729, 2751, 2762, 2777, 2780, 2786, 2788, 2789, 2805, 2814, 2822, 2827, 2829, 2832, 2833, 2
836, 2841, 2870, 2878, 2882, 2884, 2887, 2888, 2891, 2904, 2905, 2910, 2916, 2917, 2918, 2936, 2945, 2946, 2958, 2966, 2979, 2982, 2983, 2986, 2995, 3004, 3010, 3021, 3
040, 3048, 3057, 3073, 3076, 3079, 3088, 3097, 3098, 3100, 3113, 3122, 3128, 3139, 3140, 3151, 3156, 3164, 3165, 3174, 3180, 3190, 3194, 3196, 3200, 3204, 3205, 3239, 3
243, 3247, 3253, 3260, 3261, 3270, 3271, 3287, 3290, 3303, 3317, 3322, 3347, 3348, 3349, 3358, 3361, 3362, 3365, 3368, 3372, 3373, 3385, 3386, 3387, 3398, 3399, 3403, 3
424, 3426, 3427, 3439, 3447, 3456, 3460, 3462, 3468, 3474, 3481, 3495, 3511, 3517, 3521, 3524, 3528, 3530, 3544, 3567, 3569, 3570, 3579, 3581, 3606, 3607, 3609, 3615, 3
620, 3632, 3634, 3658, 3668, 3671, 3675, 3677, 3681, 3686, 3698, 3713, 3723, 3729, 3734, 3739, 3742, 3748, 3750, 3751, 3752, 3759, 3767, 3772, 3776, 3788, 3789, 3803, 3
817, 3833, 3844, 3847, 3850, 3853, 3854, 3866, 3867, 3872, 3880, 3884, 3893, 3898, 3901, 3902, 3928, 3929, 3937, 3941, 3943, 3944, 3949, 3954, 3957, 3966, 3967, 3972, 3
973, 3976, 3983, 3998, 4002, 4009, 4015, 4019, 4028, 4050, 4064, 4076, 4089, 4093, 4096, 4113, 4115, 4127, 4142, 4158, 4166, 4179, 4182, 4201, 4220, 4232, 4233, 4234, 4
240, 4248, 4249, 4253, 4265, 4267, 4272, 4298, 4304, 4305, 4310, 4314, 4321, 4323, 4324, 4337, 4348, 4349, 4360, 4361, 4374, 4386, 4391, 4406, 4409, 4418, 4422, 4425, 4
427, 4435, 4449, 4464, 4473, 4479, 4483, 4490, 4491, 4496, 4502, 4506, 4516, 4522, 4531, 4532, 4541, 4543, 4545, 4557, 4562, 4565, 4568, 4569, 4582, 4583, 4596, 4607, 4
608, 4610, 4630, 4637, 4643, 4647, 4660, 4686, 4691, 4704, 4709, 4714, 4721, 4730, 4734, 4750, 4751, 4756, 4757, 4760, 4765, 4774, 4779, 4780, 4786, 4790, 4791, 4794, 4
795, 4802, 4808, 4812, 4825, 4829, 4830, 4842, 4846, 4869, 4870, 4882, 4886, 4890, 4903, 4906, 4908, 4934, 4935, 4954, 4964, 4971, 4972, 4973, 4981, 5000, 5010, 5012, 5
013, 5026, 5037, 5043, 5046, 5052, 5055, 5058, 5079, 5089, 5091, 5098, 5101, 5114, 5130, 5141, 5144, 5156, 5167, 5173, 5184, 5193, 5195, 5202, 5211, 5215, 5227, 5255, 5
261, 5266, 5267, 5272, 5276, 5282, 5283, 5286, 5289, 5295, 5296, 5297, 5299, 5309, 5315, 5321, 5336, 5345, 5350, 5351, 5353, 5355, 5389, 5397, 5400, 5419, 5452, 5453, 5
```

En el Anexo se encuentra la salida obtenida de las listas de falsos testigos de algunos de los ejemplos

Apartados 7 y 8.

Utiliza el test de primalidad de Miller-Rabin y las funciones previamente implementadas para elegir 2 números compuestos, elegir 200 testigos al azar y ver cuáles son falsos testigos. Se han elegido arbitrariamente los 2 primeros números compuestos (el primero presenta en ocasiones falsos testigos)

Ejecución en Linux: python apartados78.py

Anexo.

$ python miller-rabin-Falsostestigos.py 6601

--- TEST MILLER-RABIN de 6601 ---

FALSOS TESTIGOS: [16, 18, 40, 45, 66, 78, 100, 122, 141, 165, 195, 242, 250, 256, 286, 288, 303, 305, 318, 324, 327, 332, 338, 433, 474, 482, 508, 517, 523, 573, 605, 611, 619, 625, 640, 652, 715, 720, 739, 769, 795, 804, 810, 821, 824, 830, 843, 845, 877, 898, 927, 961, 983, 1002, 1056, 1082, 1091, 1108, 1111, 1117, 1132, 1147, 1166, 1185, 1188, 1193, 1199, 1205, 1248, 1270, 1289, 1313, 1369, 1378, 1404, 1417, 1451, 1453, 1466, 1513, 1527, 1576, 1581, 1600, 1630, 1644, 1671, 1682, 1691, 1721, 1738, 1753, 1762, 1767, 1773, 1779, 1788, 1800, 1868, 1887, 1931, 1952, 1964, 1972, 1993, 2008, 2010, 2025, 2027, 2054, 2060, 2075, 2101, 2109, 2131, 2174, 2196, 2204, 2218, 2245, 2256, 2259, 2312, 2347, 2396, 2483, 2491, 2505, 2526, 2538, 2543, 2567, 2584, 2601, 2614, 2634, 2640, 2661, 2705, 2729, 2770, 2813, 2830, 2869, 2888, 2907, 2915, 2927, 2936, 2948, 2962, 2970, 3057, 3079, 3091, 3117, 3120, 3139, 3156, 3175, 3188, 3202, 3249, 3298, 3303, 3352, 3399, 3413, 3426, 3445, 3462, 3481, 3484, 3510, 3522, 3544, 3631, 3639, 3653, 3665, 3674, 3686, 3694, 3713, 3732, 3771, 3788, 3831, 3872, 3896, 3940, 3961, 3967, 3987, 4000, 4017, 4034, 4058, 4063, 4075, 4096, 4110, 4118, 4205, 4254, 4289, 4342, 4345, 4356, 4383, 4397, 4405, 4427, 4470, 4492, 4500, 4526, 4541, 4547, 4574, 4576, 4591, 4593, 4608, 4629, 4637, 4649, 4670, 4714, 4733, 4801, 4813, 4822, 4828, 4834, 4839, 4848, 4863, 4880, 4910, 4919, 4930, 4957, 4971, 5001, 5020, 5025, 5074, 5088, 5135, 5148, 5150, 5184, 5197, 5223, 5232, 5288, 5312, 5331, 5353, 5396, 5402, 5408, 5413, 5416, 5435, 5454, 5469, 5484, 5490, 5493, 5510, 5519, 5545, 5599, 5618, 5640, 5674, 5703, 5724, 5756, 5758, 5771, 5777, 5780, 5791, 5797, 5806, 5832, 5862, 5881, 5886, 5949, 5961, 5976, 5982, 5990, 5996, 6028, 6078, 6084, 6093, 6119, 6127, 6168, 6263, 6269, 6274, 6277, 6283, 6296, 6298, 6313, 6315, 6345,

```
6351, 6359, 6406, 6436, 6460, 6479, 6501, 6523, 6535, 6556, 6561, 6583, 6585, 6600]

$ python miller-rabin-Falsostestigos.py 10585

--- TEST MILLER-RABIN de 10585 ---

FALSOS TESTIGOS: [3, 9, 12, 16, 27, 48, 81, 97, 98, 108, 109, 127, 143, 144, 192, 213, 222, 242, 243, 256,
273, 298, 317, 327, 338, 362, 388, 392, 403, 432, 434, 462, 508, 572, 578, 607, 616, 661, 682, 707, 721, 727,
729, 733, 742, 757, 768, 797, 822, 827, 838, 852, 853, 873, 874, 882, 888, 943, 951, 968, 972, 981, 997, 998,
1003, 1014, 1047, 1079, 1083, 1092, 1096, 1133, 1143, 1162, 1164, 1176, 1187, 1192, 1203, 1268, 1287,
1296, 1302, 1308, 1317, 1337, 1352, 1433, 1448, 1451, 1459, 1487, 1498, 1527, 1552, 1558, 1568, 1583,
1587, 1603, 1604, 1612, 1667, 1703, 1728, 1744, 1756, 1758, 1777, 1787, 1813, 1837, 1848, 1873, 1894,
1917, 1922, 1933, 1983, 1998, 2026, 2032, 2038, 2046, 2047, 2067, 2098, 2163, 2167, 2174, 2178, 2187,
2191, 2193, 2202, 2288, 2304, 2312, 2317, 2354, 2363, 2397, 2428, 2433, 2447, 2457, 2463, 2474, 2546,
2567, 2578, 2593, 2622, 2647, 2653, 2678, 2682, 2707, 2719, 2728, 2747, 2756, 2798, 2823, 2828, 2853,
2882, 2897, 2904, 2908, 2917, 2932, 2936, 2943, 2947, 2968, 3018, 3028, 3029, 3042, 3043, 3047, 3063,
3072, 3093, 3142, 3158, 3163, 3187, 3188, 3193, 3237, 3258, 3262, 3288, 3301, 3308, 3323, 3333, 3352,
3382, 3383, 3399, 3407, 3408, 3412, 3437, 3443, 3477, 3492, 3498, 3507, 3523, 3527, 3528, 3552, 3553,
3623, 3627, 3634, 3641, 3659, 3662, 3673, 3698, 3758, 3772, 3773, 3802, 3842, 3851, 3872, 3888, 3906,
3907, 3917, 3918, 3923, 3988, 3992, 4012, 4024, 4042, 4063, 4096, 4107, 4124, 4137, 4158, 4173, 4188,
4207, 4222, 4237, 4253, 4282, 4313, 4332, 4342, 4353, 4368, 4377, 4418, 4447, 4461, 4477, 4478, 4494,
4503, 4507, 4532, 4538, 4572, 4593, 4622, 4623, 4631, 4636, 4637, 4648, 4676, 4742, 4748, 4768, 4783,
4793, 4812, 4853, 4903, 4918, 4946, 4966, 4967, 5002, 5041, 5043, 5072, 5083, 5087, 5107, 5109, 5111,
5122, 5148, 5177, 5202, 5208, 5218, 5219, 5224, 5232, 5237, 5254, 5268, 5317, 5331, 5348, 5353, 5361,
5366, 5367, 5377, 5383, 5408, 5437, 5463, 5474, 5476, 5478, 5498, 5502, 5513, 5542, 5544, 5583, 5618,
5619, 5639, 5667, 5682, 5732, 5773, 5792, 5802, 5817, 5837, 5843, 5909, 5937, 5948, 5949, 5954, 5962,
5963, 5992, 6013, 6047, 6053, 6078, 6082, 6091, 6107, 6108, 6124, 6138, 6167, 6208, 6217, 6232, 6243,
6253, 6272, 6303, 6332, 6348, 6363, 6378, 6397, 6412, 6427, 6448, 6461, 6478, 6489, 6522, 6543, 6561,
6573, 6593, 6597, 6662, 6667, 6668, 6678, 6679, 6697, 6713, 6734, 6743, 6783, 6812, 6813, 6827, 6887,
6912, 6923, 6926, 6944, 6951, 6958, 6962, 7032, 7033, 7057, 7058, 7062, 7078, 7087, 7093, 7108, 7142,
7148, 7173, 7177, 7178, 7186, 7202, 7203, 7233, 7252, 7262, 7277, 7284, 7297, 7323, 7327, 7348, 7392,
7397, 7398, 7422, 7427, 7443, 7492, 7513, 7522, 7538, 7542, 7543, 7556, 7557, 7567, 7617, 7638, 7642,
7649, 7653, 7668, 7677, 7681, 7688, 7703, 7732, 7757, 7762, 7787, 7829, 7838, 7857, 7866, 7878, 7903,
7907, 7932, 7938, 7963, 7992, 8007, 8018, 8039, 8111, 8122, 8128, 8138, 8152, 8157, 8188, 8222, 8231,
8268, 8273, 8281, 8297, 8383, 8392, 8394, 8398, 8407, 8411, 8418, 8422, 8487, 8518, 8538, 8539, 8547,
8553, 8559, 8587, 8602, 8652, 8663, 8668, 8691, 8712, 8737, 8748, 8772, 8798, 8808, 8827, 8829, 8841,
8857, 8882, 8918, 8973, 8981, 8982, 8998, 9002, 9017, 9027, 9033, 9058, 9087, 9098, 9126, 9134, 9137,
9152, 9233, 9248, 9268, 9277, 9283, 9289, 9298, 9317, 9382, 9393, 9398, 9409, 9421, 9423, 9442, 9452,
9489, 9493, 9502, 9506, 9538, 9571, 9582, 9587, 9588, 9604, 9613, 9617, 9634, 9642, 9697, 9703, 9711,
9712, 9732, 9733, 9747, 9758, 9763, 9788, 9817, 9828, 9843, 9852, 9856, 9858, 9864, 9878, 9903, 9924,
9969, 9978, 10007, 10013, 10077, 10123, 10151, 10153, 10182, 10193, 10197, 10223, 10247, 10258, 10268,
10287, 10312, 10329, 10342, 10343, 10363, 10372, 10393, 10441, 10442, 10458, 10476, 10477, 10487,
10488, 10504, 10537, 10558, 10569, 10573, 10576, 10582, 10584]
```