

CRIP: Práctica 1



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Índice

1. Funciones utilizadas	3
2. Salida por pantalla	4
3. Ejecución de la práctica	17

1. Funciones utilizadas

Para realizar la práctica he implementado las siguientes funciones:

En algunas funciones aparece el parámetro booleano `pr`. Este parámetro cuando es `True` muestra por pantalla información de algunos pasos que está realizando. Por defecto está en `False`.

- **potencia_modular(x,y,z)**: Función que se encarga de realizar $x^y \bmod z$ usando el algoritmo que vimos en clase.
- **descomponer(a)**: Función que descompone el número `p` como $2^c \cdot b$. La función devuelve `c` y `b`.
- **miller_rabin(p, ft=None, pr=False)**: Esta función es la encargada de realizar el test de Miller-Rabin. Recibe como parámetro un número `p`, `ft` con el que podemos indicar que pruebe si el número `p` pasa el test usando como testigo `ft` (si no se especifica se escoge aleatoriamente entre 2 y `p-2`). Devuelve `True` si pasa el test y `False` en caso contrario.
- **buscar_n_falsos_testigos(p, n=None, pr=False)**: Esta función devuelve los falsos testigos del número `p` (aquellos valores con los que el número `p` pasa el test de Miller-Rabin. Recibe como parámetro `p` (número en cuestión), `n` (número de pruebas que queremos hacer, si no se especifica prueba con todos los números desde 2 a `p-2`). Devuelve una lista con los falsos testigos encontrados.
- **es_primo(p, testigo=None, n=10)**: Función que ejecuta `n` veces el test de Miller-Rabin. Si especificamos un testigo se realizará dicho test con el testigo especificado. Devuelve `True` si ha pasado el test las `n` veces y falso si ha fallado en una de las `n` veces.
- **siguiente_primo(p)**: Función que calcula el siguiente primo del número `p`.
- **primo_fuerte(n)**: Función que calcula el siguiente primo fuerte a `n`.
- **primo_fuerte_n_bits(n)**: Función que calcula un primo fuerte de `n` bits.
- **primo_n_bits(n)**: Función que calcula un primo de `n` bits.

En el caso de las dos últimas funciones, existe la posibilidad (muy baja) de que el número escogido aleatoriamente sea muy cercano a 2^n y la función acabe devolviendo un primo que necesite más de `n` bits para ser representado. Para intentar solucionar esto se repite la operación hasta que el primo encontrado sea menor que 2^n y para evitar que se quede en un bucle infinito, tras 10 intentos se sale del bucle.

2. Salida por pantalla

La salida de una ejecución es:

13 es posible primo

13 es posible primo usando como testigo 5

Los falsos testigos de 13 son: [2, 3, 4, 5, 6, 7, 8, 9, 10]

El siguiente primo a 13 es: 17

El siguiente primo fuerte a 13 es: 23

561 no es primo

Los falsos testigos de 561 son: [50, 101, 103, 256, 305, 458, 460, 511]

El siguiente primo a 561 es: 563

El siguiente primo fuerte a 561 es: 563

6299 es posible primo

6299 es posible primo usando como testigo 1963

Los falsos testigos de 6299 son: [esta lista contendría todos los números desde 2 a 6297, ya que 6299 es primo]

El siguiente primo a 6299 es: 6301

El siguiente primo fuerte a 6299 es: 6599

921 no es primo

Los falsos testigos de 921 son: []

El siguiente primo a 921 es: 929

El siguiente primo fuerte a 921 es: 983

Un primo fuerte de 8 bits es: 167

Los falsos testigos de 6601 son: [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]

Los falsos testigos de 8911 son: [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, 145, 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, 656, 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, 990, 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, 1149, 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, 1290, 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, 1411, 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, 1553, 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, 1713, 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, 1863, 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, 1986, 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, 2138, 2139, 2140, 2153, 2155, 2158, 2162, 2167, 2176, 2187, 2197, 2209, 2218, 2220, 2221, 2222, 2227, 2228, 2230, 2231, 2234, 2238, 2245, 2248, 2251, 2252, 2257, 2258, 2264, 2265, 2270, 2274, 2284, 2297, 2300, 2304, 2309, 2320, 2325, 2330, 2336, 2342, 2346, 2350, 2354, 2358, 2360, 2361, 2367, 2381, 2382, 2383, 2384, 2390, 2393, 2397, 2405, 2406, 2410, 2425, 2433, 2437, 2438, 2442, 2446, 2452, 2453, 2463, 2468, 2469, 2484, 2491, 2493, 2494, 2496, 2497, 2500, 2511, 2514, 2515, 2523, 2528, 2530, 2537, 2538, 2540, 2543, 2550, 2552, 2554, 2558, 2563, 2570, 2571, 2585, 2596, 2601, 2608, 2616, 2619, 2621, 2624, 2627, 2629, 2644, 2648, 2650, 2651, 2656, 2659, 2663, 2669, 2670, 2687, 2690, 2691, 2693, 2696, 2699, 2700, 2703, 2704, 2708, 2712, 2734, 2745, 2749, 2750, 2753, 2754, 2762, 2766, 2777, 2780, 2783, 2789, 2792, 2794, 2802, 2805, 2809, 2818, 2823, 2826, 2827, 2829, 2834, 2836, 2837, 2841, 2845, 2851, 2852, 2862, 2874, 2878, 2883, 2885, 2895, 2901, 2914, 2915, 2916, 2922, 2925, 2929, 2930, 2935, 2937, 2938, 2939, 2949, 2953, 2959, 2960, 2962, 2965, 2966, 2969, 2970, 2978, 2984, 3001, 3007, 3019, 3020, 3023, 3025, 3032, 3043, 3058, 3070, 3072, 3075, 3090, 3093, 3098, 3100, 3103, 3117, 3128, 3134, 3144, 3148, 3156, 3158, 3159, 3162, 3165, 3167, 3169, 3176, 3181, 3182, 3183, 3189, 3191, 3195, 3196, 3202, 3203, 3208, 3217, 3219, 3222, 3223, 3231, 3235, 3244, 3256, 3261, 3267, 3282, 3284, 3286, 3292, 3295, 3298, 3312, 3314, 3321, 3322, 3324, 3328, 3335, 3348, 3352, 3358, 3364, 3369, 3377, 3383, 3384, 3389, 3394, 3399, 3400, 3406, 3410, 3418, 3419, 3422, 3427, 3428, 3431, 3435, 3446, 3447, 3449, 3461, 3468, 3470, 3481, 3488, 3489, 3491, 3492, 3494, 3501, 3527, 3539, 3543, 3547, 3557, 3560, 3582, 3588, 3594, 3600, 3601, 3603, 3604, 3607, 3616, 3625, 3627, 3631, 3634, 3635, 3650, 3655, 3660, 3665, 3666, 3672, 3681,

3683, 3688, 3691, 3711, 3713, 3714, 3715, 3721, 3723, 3725, 3727, 3736, 3737, 3740, 3747, 3749, 3751, 3755, 3757, 3764, 3765, 3767, 3768, 3772, 3783, 3788, 3793, 3813, 3816, 3817, 3818, 3821, 3823, 3827, 3832, 3844, 3845, 3846, 3853, 3854, 3858, 3860, 3866, 3867, 3868, 3869, 3870, 3873, 3887, 3888, 3891, 3896, 3897, 3898, 3900, 3901, 3915, 3916, 3921, 3932, 3942, 3947, 3950, 3957, 3959, 3960, 3963, 3965, 3977, 3978, 3981, 4003, 4013, 4015, 4023, 4026, 4029, 4031, 4034, 4038, 4065, 4075, 4082, 4096, 4098, 4100, 4107, 4110, 4111, 4113, 4114, 4119, 4120, 4124, 4127, 4133, 4134, 4135, 4146, 4150, 4156, 4157, 4182, 4187, 4192, 4198, 4208, 4212, 4216, 4217, 4220, 4222, 4225, 4226, 4233, 4243, 4244, 4246, 4252, 4255, 4257, 4259, 4260, 4266, 4269, 4281, 4286, 4287, 4290, 4292, 4296, 4308, 4314, 4315, 4331, 4337, 4345, 4346, 4348, 4356, 4366, 4373, 4376, 4377, 4379, 4385, 4390, 4399, 4401, 4414, 4416, 4419, 4428, 4429, 4430, 4432, 4447, 4464, 4479, 4481, 4482, 4483, 4492, 4495, 4497, 4510, 4512, 4521, 4526, 4532, 4534, 4535, 4538, 4545, 4555, 4563, 4565, 4566, 4574, 4580, 4596, 4597, 4603, 4615, 4619, 4621, 4624, 4625, 4630, 4642, 4645, 4651, 4652, 4654, 4656, 4659, 4665, 4667, 4668, 4678, 4685, 4686, 4689, 4691, 4694, 4695, 4699, 4703, 4713, 4719, 4724, 4729, 4754, 4755, 4761, 4765, 4776, 4777, 4778, 4784, 4787, 4791, 4792, 4797, 4798, 4800, 4801, 4804, 4811, 4813, 4815, 4829, 4836, 4846, 4873, 4877, 4880, 4882, 4885, 4888, 4896, 4898, 4908, 4930, 4933, 4934, 4946, 4948, 4951, 4952, 4954, 4961, 4964, 4969, 4979, 4990, 4995, 4996, 5010, 5011, 5013, 5014, 5015, 5020, 5023, 5024, 5038, 5041, 5042, 5043, 5044, 5045, 5051, 5053, 5057, 5058, 5065, 5066, 5067, 5079, 5084, 5088, 5090, 5093, 5094, 5095, 5098, 5118, 5123, 5128, 5139, 5143, 5144, 5146, 5147, 5154, 5156, 5160, 5162, 5164, 5171, 5174, 5175, 5184, 5186, 5188, 5190, 5196, 5197, 5198, 5200, 5220, 5223, 5228, 5230, 5239, 5245, 5246, 5251, 5256, 5261, 5276, 5277, 5280, 5284, 5286, 5295, 5304, 5307, 5308, 5310, 5311, 5317, 5323, 5329, 5351, 5354, 5364, 5368, 5372, 5384, 5410, 5417, 5419, 5420, 5422, 5423, 5430, 5441, 5443, 5450, 5462, 5464, 5465, 5476, 5480, 5483, 5484, 5489, 5492, 5493, 5501, 5505, 5511, 5512, 5517, 5522, 5527, 5528, 5534, 5542, 5547, 5553, 5559, 5563, 5576, 5583, 5587, 5589, 5590, 5597, 5599, 5613, 5616, 5619, 5625, 5627, 5629, 5644, 5650, 5655, 5667, 5676, 5680, 5688, 5689, 5692, 5694, 5703, 5708, 5709, 5715, 5716, 5720, 5722, 5728, 5729, 5730, 5735, 5742, 5744, 5746, 5749, 5752, 5753, 5755, 5763, 5767, 5777, 5783, 5794, 5808, 5811, 5813, 5818, 5821, 5836, 5839, 5841, 5853, 5868, 5879, 5886, 5888, 5891, 5892, 5904, 5910, 5927, 5933, 5941, 5942, 5945, 5946, 5949, 5951, 5952, 5958, 5962, 5972, 5973, 5974, 5976, 5981, 5982, 5986, 5989, 5995, 5996, 5997, 6010, 6016, 6026, 6028, 6033, 6037, 6049, 6059, 6060, 6066, 6070, 6074, 6075, 6077, 6082, 6084, 6085, 6088, 6093, 6102, 6106, 6109, 6117, 6119, 6122, 6128, 6131, 6134, 6145, 6149, 6157, 6158, 6161, 6162, 6166, 6177, 6199, 6203, 6207, 6208, 6211, 6212, 6215, 6218, 6220, 6221, 6224, 6241, 6242, 6248, 6252, 6255, 6260, 6261, 6263, 6267, 6282, 6284, 6287, 6290, 6292, 6295, 6303, 6310, 6315, 6326, 6340, 6341, 6348, 6353, 6357, 6359, 6361, 6368, 6371, 6373, 6374, 6381, 6383, 6388, 6396, 6397, 6400, 6411, 6414, 6415, 6417, 6418, 6420, 6427, 6442, 6443, 6448, 6458, 6459, 6465, 6469, 6473, 6474, 6478, 6486, 6501, 6505, 6506, 6514, 6518, 6521, 6527, 6528, 6529, 6530, 6544, 6550, 6551, 6553, 6557, 6561, 6565, 6569, 6575, 6581, 6586, 6591, 6602, 6607, 6611, 6614, 6627, 6637, 6641, 6646, 6647, 6653, 6654, 6659, 6660, 6663, 6666, 6673, 6677, 6680, 6681, 6683, 6684, 6689, 6690, 6691, 6693, 6702, 6714, 6724, 6735, 6744, 6749, 6753, 6756, 6758, 6771, 6772, 6773, 6774, 6779, 6784, 6792, 6795, 6806, 6810, 6817, 6822, 6824, 6826, 6827, 6842, 6852, 6857, 6872, 6877, 6880, 6883, 6886, 6889, 6891, 6900, 6912, 6917, 6919, 6920, 6925, 6927, 6928, 6929, 6941, 6943, 6947, 6949, 6955, 6960, 6964, 6974, 6975, 6990, 6997, 7001, 7006, 7008, 7010, 7013, 7015, 7019, 7022, 7026, 7036, 7038, 7039, 7040, 7048, 7050, 7058, 7060, 7062, 7072, 7074, 7076, 7080, 7083, 7101, 7123, 7141, 7142, 7143,

7146, 7149, 7151, 7152, 7159, 7170, 7171, 7179, 7181, 7183, 7186, 7191, 7193, 7198, 7205, 7213, 7215, 7218, 7222, 7225, 7230, 7240, 7241, 7246, 7275, 7279, 7299, 7306, 7311, 7312, 7314, 7319, 7324, 7326, 7338, 7340, 7346, 7348, 7349, 7355, 7356, 7358, 7359, 7379, 7389, 7390, 7396, 7404, 7407, 7412, 7417, 7418, 7423, 7435, 7438, 7439, 7444, 7452, 7459, 7473, 7475, 7479, 7481, 7482, 7484, 7488, 7489, 7491, 7492, 7500, 7507, 7517, 7529, 7533, 7538, 7540, 7541, 7542, 7545, 7556, 7565, 7568, 7569, 7570, 7584, 7585, 7590, 7591, 7592, 7597, 7604, 7606, 7611, 7612, 7614, 7615, 7620, 7621, 7622, 7625, 7629, 7639, 7640, 7650, 7655, 7656, 7662, 7670, 7673, 7674, 7684, 7687, 7689, 7691, 7702, 7710, 7711, 7713, 7715, 7717, 7730, 7744, 7747, 7748, 7755, 7762, 7766, 7778, 7783, 7788, 7795, 7803, 7804, 7807, 7817, 7822, 7824, 7834, 7837, 7838, 7846, 7848, 7850, 7856, 7857, 7858, 7859, 7863, 7872, 7880, 7881, 7886, 7887, 7921, 7928, 7932, 7936, 7937, 7939, 7944, 7946, 7950, 7953, 7957, 7964, 7968, 7969, 7970, 7976, 7977, 7989, 7993, 7996, 8007, 8010, 8011, 8014, 8021, 8038, 8039, 8044, 8054, 8061, 8065, 8070, 8073, 8074, 8079, 8080, 8083, 8088, 8090, 8097, 8100, 8109, 8112, 8117, 8122, 8124, 8125, 8129, 8136, 8143, 8153, 8156, 8165, 8171, 8182, 8198, 8202, 8213, 8216, 8233, 8234, 8235, 8236, 8237, 8247, 8249, 8250, 8255, 8257, 8259, 8262, 8273, 8276, 8279, 8286, 8287, 8290, 8294, 8298, 8315, 8321, 8327, 8331, 8335, 8336, 8340, 8345, 8348, 8349, 8354, 8356, 8367, 8376, 8378, 8382, 8390, 8404, 8406, 8413, 8415, 8419, 8420, 8422, 8427, 8437, 8438, 8443, 8454, 8464, 8469, 8471, 8473, 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, 8605, 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, 8765, 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, 8884, 8886, 8888, 8895, 8898, 8899, 8902, 8907, 8908]

Los falsos testigos de 10585 son: [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]

Los falsos testigos de 15841 son: [2, 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,

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Los falsos testigos de 29341 son: [2, 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, 531, 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, 1202, 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, 1458, 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, 1614, 1623,

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Multiplicamos 1 por 23

Multiplicamos 23 por 23

Multiplicamos 529 por 19

Multiplicamos 10051 por 29

Multiplicamos 291479 por 31

El numero compuesto por varios primos pequeños es: 9035849

El numero compuesto por dos primos grandes $17377 * 1013$ es: 17602901

Los 200 falsos positivos de 9035849 son: []

Los 200 falsos positivos de 17602901 son: []

Los 200 falsos positivos de 3215031751 son: [1512284775, 1627214434, 2937601165, 1103524861, 846148608, 2834932134, 1246743327, 1526525161, 673095891, 2349082778, 333000035, 297611957, 1980596929, 151053164, 2429423353, 2984782922, 376907706, 2869403146, 2107899634, 1420884974, 898023154, 859438026, 1732901502, 1782638958, 2663657350, 882378851, 459649831, 1189381885, 1173318934, 1683394390, 1313680413, 1796357031, 1446572392, 127531279, 442195325, 2192914505, 2276623758, 1753434984, 1612463949, 2251296944, 1802848948, 2279182824, 2899165787, 410661858, 255052883, 525479914, 1592379644]

Los 200 falsos positivos de 2199733160881 son: [403070899294, 1681687633107, 1170481756055, 1452056841925, 2138555063683, 817947095821, 1619455317921, 1421368486775, 146229661732, 614811483752, 1417915464599, 470803508107, 312007682137, 881292621936, 1303369696893, 1459837236701, 569696493853, 942653619259, 879844947316, 92174365425]

3. Ejecución de la práctica

Para ejecutar la práctica lanzar el script de Python.