

Harold's Prime Numbers
Cheat Sheet
 22 October 2022

Prime Numbers

Range	#	Prime Numbers
1 to 100	25	2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97
101-200	21	101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199
201-300	16	211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269, 271, 277, 281, 283, 293
301-400	16	307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397
401-500	17	401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499
501-600	14	503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599
601-700	16	601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691
701-800	14	701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797
801-900	15	809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887
901-1000	14	907, 911, 919, 929, 937, 941, 947, 953, 967, 971, 977, 983, 991, 997
1001-1100	16	1009, 1013, 1019, 1021, 1031, 1033, 1039, 1049, 1051, 1061, 1063, 1069, 1087, 1091, 1093, 1097
1101-1200	12	1103, 1109, 1117, 1123, 1129, 1151, 1153, 1163, 1171, 1181, 1187, 1193
1201-1300	15	1201, 1213, 1217, 1223, 1229, 1231, 1237, 1249, 1259, 1277, 1279, 1283, 1289, 1291, 1297
1301-1400	11	1301, 1303, 1307, 1319, 1321, 1327, 1361, 1367, 1373, 1381, 1399
1401-1500	17	1409, 1423, 1427, 1429, 1433, 1439, 1447, 1451, 1453, 1459, 1471, 1481, 1483, 1487, 1489, 1493, 1499
1501-1600	12	1511, 1523, 1531, 1543, 1549, 1553, 1559, 1567, 1571, 1579, 1583, 1597
1601-1700	15	1601, 1607, 1609, 1613, 1619, 1621, 1627, 1637, 1657, 1663, 1667, 1669, 1693, 1697, 1699
1701-1800	12	1709, 1721, 1723, 1733, 1741, 1747, 1753, 1759, 1777, 1783, 1787, 1789
1801-1900	12	1801, 1811, 1823, 1831, 1847, 1861, 1867, 1871, 1873, 1877, 1879, 1889
1901-2000	13	1901, 1907, 1913, 1931, 1933, 1949, 1951, 1973, 1979, 1987, 1993, 1997, 1999
2001-2100	14	2003, 2011, 2017, 2027, 2029, 2039, 2053, 2063, 2069, 2081, 2083, 2087, 2089, 2099
2101-2200	10	2111, 2113, 2129, 2131, 2137, 2141, 2143, 2153, 2161, 2179
2201-2300	15	2203, 2207, 2213, 2221, 2237, 2239, 2243, 2251, 2267, 2269, 2273, 2281, 2287, 2293, 2297
2301-2400	15	2309, 2311, 2333, 2339, 2341, 2347, 2351, 2357, 2371, 2377, 2381, 2383, 2389, 2393, 2399

Primes

Term	Definition or Formula
Prime Numbers (p)	<ul style="list-style-type: none"> A natural number which has exactly two factors, 1 and itself. 1 is not a prime number. Negative integers are not prime numbers.
Composite Numbers (n)	<ul style="list-style-type: none"> A natural number that has more than two factors. It can be divided 1, itself, and by at least one natural number. 1 is not a composite number.
The Fundamental Theorem of Arithmetic	<ul style="list-style-type: none"> Each positive integer is either prime or the product of powers of primes. Every integer greater than 1 can be factored <u>uniquely</u> into a product of primes. Every positive integer other than 1 can be expressed uniquely as a product of prime numbers where the prime factors are written in non-decreasing order.
Prime Factorization	$n = p_1^{e_1} p_2^{e_2} p_3^{e_3} \dots p_k^{e_k}$ $x = p_1^{\alpha_1} p_2^{\alpha_2} p_3^{\alpha_3} \dots p_k^{\alpha_k}$ $y = p_1^{\beta_1} p_2^{\beta_2} p_3^{\beta_3} \dots p_k^{\beta_k}$ <p>where e_i is the multiplicity of prime p_i</p>
Greatest Common Divisor (GCD)	$gcd(x, y) = p_1^{\min\{\alpha_1, \beta_1\}} \cdot p_2^{\min\{\alpha_2, \beta_2\}} \cdot p_k^{\min\{\alpha_k, \beta_k\}}$ <p>Largest positive integer that is a factor of both x and y. Think Intersection (\cap) of α_i, β_i.</p>
Least Common Multiple (LCM)	$lcm(x, y) = p_1^{\max\{\alpha_1, \beta_1\}} \cdot p_2^{\max\{\alpha_2, \beta_2\}} \cdot p_k^{\max\{\alpha_k, \beta_k\}}$ <p>Smallest positive integer that is an integer multiple of both x and y. Think Union (\cup) of α_i, β_i.</p>
Relatively Prime (Coprime)	$gcd(x, y) = 1$

Prime Theorems

Theorem	Description
∞ Primes	There are an infinite number of primes.
Prime Number Theorem (Counting)	<p>Let $\pi(x)$ be the number of prime numbers in the range from 2 through x.</p> $\pi(x) \approx \frac{x}{\ln x} \quad \text{or} \quad \lim_{x \rightarrow \infty} \frac{\pi(x)}{x/\ln x} = 1$ $\frac{x}{\ln x} < \pi(x) < 1.25506 \frac{x}{\ln x} \quad \text{for } x \geq 17$
Chance of a Prime #	For a random positive n-digit integer, $P(n) = \frac{1}{n \ln(10)} \approx \frac{0.4343}{n}$.
nth Prime Number	$p_n \sim n \cdot \ln(n)$

Sources:

- [SNHU MAT 230](#) - Discrete Mathematics, zyBooks.
- [SNHU MAT 260](#) - Cryptology, [Invitation to Cryptology](#), 1st Edition, Thomas Barr, 2001.