Harold's Prime Numbers
Cheat Sheet

5 May 2026

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

Copyright © 2022-2026 by Harold Toomey, WyzAnt Tutor

Range	#	Prime Numbers
2401–2500	10	2411, 2417, 2423, 2437, 2441, 2447, 2459, 2467, 2473, 2477
2501–2600	11	2503, 2521, 2531, 2539, 2543, 2549, 2551, 2557, 2579, 2591, 2593
2601–2700	15	2609, 2617, 2621, 2633, 2647, 2657, 2659, 2663, 2671, 2677, 2683, 2687, 2689, 2693, 2699
2701–2800	14	2707, 2711, 2713, 2719, 2729, 2731, 2741, 2749, 2753, 2767, 2777, 2789, 2791, 2797
2801–2900	12	2801, 2803, 2819, 2833, 2837, 2843, 2851, 2857, 2861, 2879, 2887, 2897
2901–3000	11	2903, 2909, 2917, 2927, 2939, 2953, 2957, 2963, 2969, 2971, 2999
3001–3100	12	3001, 3011, 3019, 3023, 3037, 3041, 3049, 3061, 3067, 3079, 3083, 3089
3101–3200	10	3109, 3119, 3121, 3137, 3163, 3167, 3169, 3181, 3187, 3191
3201–3300	11	3203, 3209, 3217, 3221, 3229, 3251, 3253, 3257, 3259, 3271, 3299
3301–3400	15	3301, 3307, 3313, 3319, 3323, 3329, 3331, 3343, 3347, 3359, 3361, 3371, 3373, 3389, 3391
3401–3500	11	3407, 3413, 3433, 3449, 3457, 3461, 3463, 3467, 3469, 3491, 3499
3501–3600	11	3527, 3533, 3539, 3541, 3547, 3557, 3559, 3571, 3581, 3583, 3593
3601–3700	13	3607, 3613, 3617, 3623, 3631, 3637, 3643, 3659, 3671, 3673, 3677, 3691, 3697
3701–3800	12	3701, 3709, 3719, 3727, 3733, 3739, 3761, 3767, 3769, 3779, 3793, 3797
3801–3900	11	3803, 3821, 3823, 3833, 3847, 3851, 3853, 3863, 3877, 3881, 3889
3901–4000	11	3907, 3911, 3917, 3919, 3923, 3929, 3931, 3943, 3947, 3967, 3989
4001–4100	15	4001, 4003, 4007, 4013, 4019, 4021, 4027, 4049, 4051, 4057, 4073, 4079, 4091, 4093, 4099
4101–4200	8	4127, 4129, 4133, 4139, 4153, 4157, 4159, 4177
4201–4300	16	4201, 4211, 4217, 4219, 4229, 4231, 4241, 4243, 4253, 4259, 4261, 4271, 4273, 4283, 4289, 4297
4301–4400	9	4327, 4337, 4339, 4349, 4357, 4363, 4373, 4391, 4397
4401–4500	11	4409, 4421, 4423, 4441, 4447, 4451, 4457, 4463, 4481, 4483, 4493
4501–4600	11	4513, 4517, 4519, 4523, 4547, 4549, 4561, 4567, 4583, 4591, 4597
4601–4700	11	4621, 4637, 4639, 4643, 4649, 4651, 4657, 4663, 4673, 4679, 4691
4701–4800	12	4703, 4721, 4723, 4729, 4733, 4751, 4759, 4783, 4787, 4789, 4793, 4799
4801–4900	8	4801, 4813, 4817, 4831, 4861, 4871, 4877, 4889
4901–5000	15	4903, 4909, 4919, 4931, 4933, 4937, 4943, 4951, 4957, 4967, 4969, 4973, 4987, 4993, 4999
5000–5100	12	5003, 5009, 5011, 5021, 5023, 5039, 5051, 5059, 5077, 5081, 5087, 5099
5101–5200	10	5107, 5113, 5119, 5147, 5153, 5167, 5171, 5179, 5189, 5197
5201–5300	10	5209, 5227, 5231, 5233, 5237, 5261, 5273, 5279, 5281, 5297
5301–5400	10	5303, 5309, 5323, 5333, 5347, 5351, 5381, 5387, 5393, 5399
5401–5500	12	5413, 5417, 5419, 5431, 5437, 5441, 5443, 5449, 5471, 5477, 5479, 5483
5501–5600	13	5501, 5503, 5507, 5519, 5521, 5527, 5531, 5557, 5563, 5569, 5573, 5581, 5591
5601–5700	12	5623, 5639, 5641, 5647, 5651, 5653, 5657, 5659, 5669, 5683, 5689, 5693
5701–5800	10	5701, 5711, 5717, 5737, 5741, 5743, 5749, 5779, 5783, 5791
5801–5900	17	5801, 5807, 5813, 5821, 5827, 5839, 5843, 5849, 5851, 5857, 5861, 5867, 5869, 5879, 5881, 5897

Copyright © 2022-2026 by Harold Toomey, WyzAnt Tutor

Primes

Term	Definition or Formula
Prime Number (p)	• A natural number which has exactly two factors, 1 and itself. • $p > 1$
Composite Number (n)	• A natural number that has more than two factors. • It can be divided by 1, itself, and by at least one other natural number. • 1 is not a composite number.
The Fundamental Theorem of Arithmetic	• Each positive integer is either prime or the product of powers of primes. • Every integer greater than 1 can be factored uniquely 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	$n = p_1^{e_1} \cdot p_2^{e_2} \cdot p_3^{e_3} \cdot \ldots \cdot p_k^{e_k}$ where e_i is the multiplicity of prime p_i
Greatest Common Divisor (GCD)	Given $x = p_1^{\alpha_1} \cdot p_2^{\alpha_2} \cdot p_3^{\alpha_3} \cdot \ldots \cdot p_k^{\alpha_k}$ $y = p_1^{\beta_1} \cdot p_2^{\beta_2} \cdot p_3^{\beta_3} \cdot \ldots \cdot p_k^{\beta_k}$ $gcd\ (x,y) = p_1^{min\{\alpha_1,\beta_1\}} \cdot p_2^{min\{\alpha_2,\beta_2\}} \cdot p_k^{min\{\alpha_k,\beta_k\}}$ The largest positive integer that is a factor of both x and y. e.g., Take the minimum exponent for each prime. Similar to Intersection ($\cap$) of α_i, β_i.
Least Common Multiple (LCM)	$lcm\ (x,y) = p_1^{max\{\alpha_1,\beta_1\}} \cdot p_2^{max\{\alpha_2,\beta_2\}} \cdot p_k^{max\{\alpha_k,\beta_k\}}$ The smallest positive integer that is an integer multiple of both x and y. e.g., Take the maximum exponent for each prime. Similar to Union ($\cup$) of α_i, β_i.
Relatively Prime (Coprime)	$gcd(x,y) = 1$

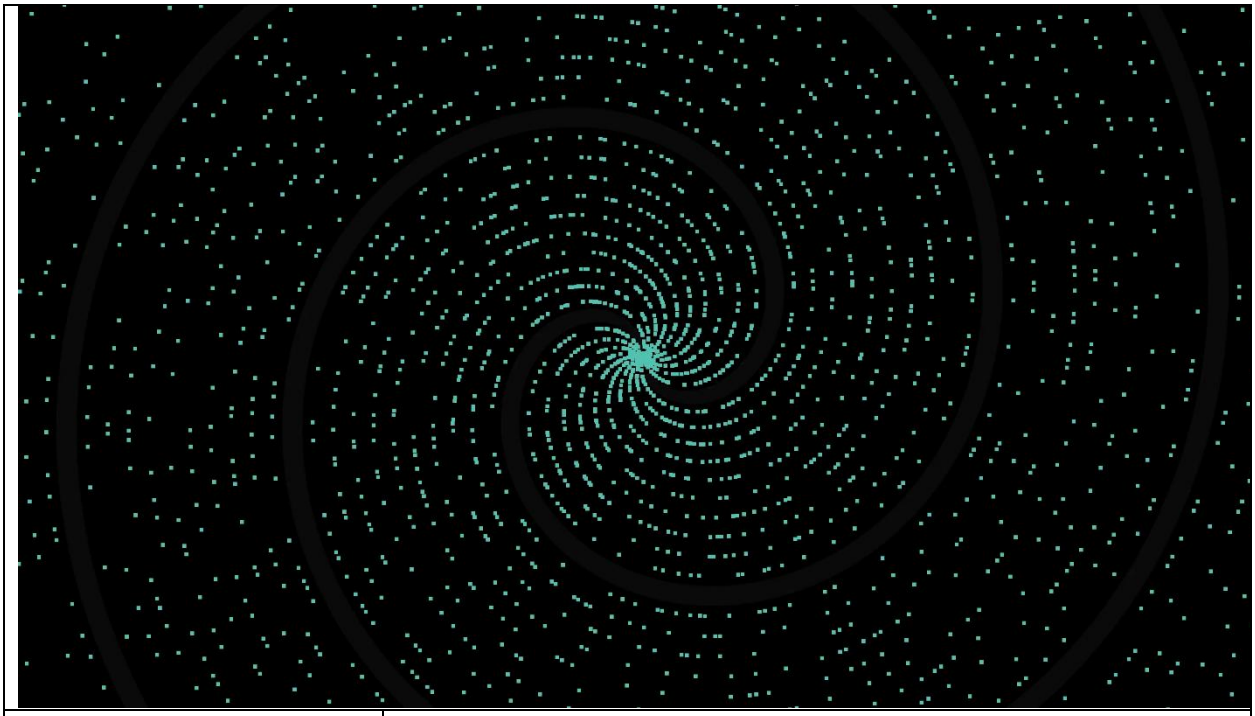
Copyright © 2022-2026 by Harold Toomey, WyzAnt Tutor

Prime Theorems

Theorem	Description
Euclid's Theorem	There are an infinite (∞) number of primes. Proof: Assume finitely many primes $p_1, \dots, p_n$. Consider $N = p_1 p_2 \cdots p_n + 1$. No listed prime divides N, making this a contradiction.
Prime Number Theorem (Counting)	Let π(x) be the number of primes in the range from 2 through x. $\pi(x) \approx \frac{x}{ln\, x} \quad or \quad \lim_{x \to \infty} \frac{\pi(x)}{x/ln\, x} = 1$ $\frac{x}{ln\, x} < \pi(x) < 1.25506\, \frac{x}{ln\, x}\ for\ x \geq 17$
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	$p_n \approx n(ln(n) + ln(ln(n)) - 1$
Bertrand's Postulate (Chebyshev's Theorem)	For every integer $n > 1$, there is always a prime between n and $2n$.
Euler's Quadratic	$n^2 + n + 41$ • Produces primes for every integer $n = 0$ to 39.
Jones–Sato–Wada–Wiens Polynomial	$P(a, b, c, \dots, z, k)$ such that: k is prime $\iff \exists a, b, c, \dots, z \in \mathbb{N}$ with $P(a, b, c, \dots, z, k) = 0$. • All primes can be generated using an explicit polynomial with 26 variables, all with integer coefficients, such that: ○ A number k is prime if and only if this polynomial outputs a 0 for some choice of the other 25 variables.
Wilson's Theorem (Prime Test)	p is prime $\iff (p-1)! \equiv -1 \pmod{p}$ • Not a generator and too slow for big primes.
Mersenne Primes	p prime and $2^p - 1$ prime ⇒ Mersenne prime • Generates some of the largest primes ever found. • Works only for certain primes p, but when it hits, it hits big.
The "Prime Indicator" Using Sine	$P(n) = 1 - \prod_{k=2}^{n-1} \left(1 - \sin^2\left(\frac{n\pi}{k}\right)\right)$ • This bizarre expression equals 1 if n is prime, 0 otherwise. • Completely impractical, but fascinating.

Copyright © 2022-2026 by Harold Toomey, WyzAnt Tutor

Prime Number Spirals



Spiral Points	$(r, \theta) = (p, p)$
Significance of Primes	The role prime numbers play in math is similar to the role atoms play in chemistry. They're the fundamental building blocks of the integers.

Sources:

- SNHU MAT 230 - Discrete Mathematics, zyBooks.
- SNHU MAT 260 - Cryptology, Invitation to Cryptology, 1st Edition, Thomas Barr, 2001.
- The *Is This Prime?* Game. https://isthisprime.com/game/
- Sanderson, Grant (8 Oct 2019). 3Blue1Brown, Why do prime numbers make these spirals? https://www.3blue1brown.com/lessons/prime-spirals

Copyright © 2022-2026 by Harold Toomey, WyzAnt Tutor