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Smarandache–Wellin number

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In **mathematics**, a **Smarandache–Wellin number** is an **integer** that in a given **base** is the **concatenation** of the first *n* **prime numbers** written in that base. Smarandache–Wellin numbers are named after **Florentin Smarandache** and **Paul R. Wellin**.

The first **decimal** Smarandache–Wellin numbers are:

2, 23, 235, 2357, 235711, 23571113, 2357111317, 235711131719, 23571113171923, 2357111317192329, ... (sequence **A019518** in the **OEIS**).

Smarandache–Wellin prime

A Smarandache–Wellin number that is also prime is called a **Smarandache–Wellin prime**. The first three are 2, 23 and 2357 (sequence **A069151** in the **OEIS**). The fourth is 355 digits long: it is the result of concatenating the first 128 prime numbers, through 719.^[1]

The primes at the end of the concatenation in the Smarandache–Wellin primes are

2, 3, 7, 719, 1033, 2297, 3037, 11927, ... (sequence **A046284** in the **OEIS**).

The indices of the Smarandache–Wellin primes in the sequence of Smarandache–Wellin numbers are:

1, 2, 4, 128, 174, 342, 435, 1429, ... (sequence **A046035** in the **OEIS**).

The 1429th Smarandache–Wellin number is a **probable prime** with 5719 digits ending in 11927, discovered by **Eric W. Weisstein** in 1998.^[2] If it is proven prime, it will be the eighth Smarandache–Wellin prime. In March 2009, Weisstein's search showed the index of the next Smarandache–Wellin prime (if one exists) is at least 22077.^[3]

See also

- Copeland–Erdős constant**
- Champernowne constant**, another example of a number obtained by concatenating a representation in a given base.

References

- ↑ **Pomerance, Carl B.**; Crandall, Richard E. (2001). *Prime Numbers: a computational perspective*. Springer. pp. 78 Ex 1.86. **ISBN 0-387-25282-7**.
- ↑ Rivera, Carlos, **Primes by Listing**
- ↑ **Weisstein, Eric W.** **"Integer Sequence Primes"** . *MathWorld*. Retrieved 2011-07-28.

- Weisstein, Eric W.** **"Smarandache–Wellin Number"** . *MathWorld*.
- "Smarandache-Wellin number"** . *PlanetMath*.
- List of first 54 Smarandache–Wellin numbers with factorisations**
- Smarandache–Wellin primes at The Prime Glossary**
- Smith, S. "A Set of Conjectures on Smarandache Sequences." Bull. Pure Appl. Sci. 15E, 101–107, 1996.

External links

- Weisstein, Eric W.** **"Smarandache-Wellin Number"** . *MathWorld*.

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Prime number classes	
By formula	Fermat (2^{2^{<i>n</i>}} + 1) Mersenne (2^{<i>n</i>} − 1) Double Mersenne (2^{2^{<i>n</i>} − 1} − 1) Wagstaff (2^{<i>n</i>} + 1)/3 Proth (<i>k</i> · 2^{<i>n</i>} + 1) Factorial (<i>n</i> ! ± 1) Primorial (<i>p</i>_{<i>n</i>} # ± 1) Euclid (<i>p</i>_{<i>n</i>} # + 1) Pythagorean (4 <i>n</i> + 1) Pierpont (2^{<i>m</i>}·3^{<i>n</i>} + 1) Quartan (<i>x</i>⁴ + <i>y</i>⁴) Solinas (2^{<i>m</i>} ± 2^{<i>n</i>} ± 1) Cullen (<i>n</i> · 2^{<i>n</i>} + 1) Woodall (<i>n</i> · 2^{<i>n</i>} − 1) Cuban (<i>x</i>³ − <i>y</i>³)/(<i>x</i> − <i>y</i>) Leyland (<i>x</i>^{<i>x</i>} + <i>y</i>^{<i>y</i>}) Thabit (3· 2^{<i>n</i>} − 1) Williams ((<i>b</i> −1)· 2^{<i>n</i>} − 1) Mills ((1^{<i>A</i>^{3^{<i>n</i>}}})
By integer sequence	Fibonacci Lucas Pell Newman–Shanks–Williams Perrin Partitions Bell Motzkin
By property	Wieferich (pair) Wall–Sun–Sun Volstenholme Wilson Lucky Fortunate Ramanujan Pillai Regular Strong Stern Supersingular (elliptic curve) Supersingular (moonshine theory) Good Super Higgs Highly cototient
Base-dependent	Palindromic Emirp Repunit (10 ^{<i>n</i>} − 1)/9 Permutable Circular Truncatable Minimal Delicate Primeval Full reptend Unique Happy Self Smarandache–Wellin Strobogrammatic Dihedral Tetradic

Patterns	Twin (<i>p</i>, <i>p</i> + 2) Bi-twin chain (<i>n</i> − 1, <i>n</i> + 1, 2<i>n</i> − 1, 2<i>n</i> + 1, ...) Triplet (<i>p</i>, <i>p</i> + 2 or <i>p</i> + 4, <i>p</i> + 6) Quadruplet (<i>p</i>, <i>p</i> + 2, <i>p</i> + 6, <i>p</i> + 8) <i>k</i> -tuple Cousin (<i>p</i>, <i>p</i> + 4) Sexy (<i>p</i>, <i>p</i> + 6) Chen Sophie Germain/Safe (<i>p</i>, 2<i>p</i> + 1) Cunningham (<i>p</i>, 2<i>p</i> ± 1, 4<i>p</i> ± 3, 8<i>p</i> ± 7, ...) Arithmetic progression (<i>p</i> + <i>a</i> · <i>n</i>, <i>n</i> = 0, 1, 2, 3, ...) Balanced (consecutive <i>p</i> − <i>n</i> , <i>p</i> , <i>p</i> + <i>n</i>)
By size	Mega (1,000,000+ digits) Largest known
Complex numbers	Eisenstein prime Gaussian prime
Composite numbers	Pseudoprime Catalan Elliptic Euler Euler–Jacobi Fermat Frobenius Lucas Somer–Lucas Strong Carmichael number Almost prime Semiprime Interprime Pernicious
Related topics	Probable prime Industrial-grade prime Illegal prime Formula for primes Prime gap
First 60 primes	2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281
List of prime numbers	

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Classes of [natural numbers](#)

[Powers](#) and related numbers

Achilles [Power of 2](#) [Power of 3](#) [Power of 10](#) [Square](#) [Cube](#) [Fourth power](#) [Fifth power](#) [Sixth power](#) [Seventh power](#) [Eighth power](#) [Perfect power](#) [Powerful](#) [Prime power](#)

Of the form $a \times 2^b \pm 1$

[Cullen](#) [Double Mersenne](#) [Fermat Mersenne](#) [Proth](#) [Thabit](#) [Woodall](#)

Other polynomial numbers

[Hilbert](#) [Idoneal](#) [Leyland](#) [Loeschian](#) [Lucky numbers of Euler](#)

[Recursively](#) defined numbers

[Fibonacci](#) [Jacobsthal](#) [Leonardo](#) [Lucas](#) [Padovan](#) [Pell](#) [Perrin](#)

Possessing a specific set of other numbers

[Congruent](#) [Knödel](#) [Riesel](#) [Sierpiński](#)

Expressible via specific sums

[Nonhypotenuse](#) [Polite](#) [Practical](#) [Primary pseudoperfect](#) [Ulam](#) [Wolstenholme](#)

[Figurate numbers](#)

2-dimensional	centered	Centered triangular Centered square Centered pentagonal Centered hexagonal Centered heptagonal Centered octagonal Centered nonagonal Centered decagonal Star
	non-centered	Triangular Square Square triangular Pentagonal Hexagonal Heptagonal Octagonal Nonagonal Decagonal Dodecagonal
3-dimensional	centered	Centered tetrahedral Centered cube Centered octahedral Centered dodecahedra Centered icosahedral
	non-centered	Tetrahedral Cubic Octahedral Dodecahedral Icosahedral Stella octangula
	pyramidal	Square pyramidal
4-dimensional	non-centered	Pentatope Squared triangular Tesseract

Combinatorial numbers

[Bell](#) [Cake](#) [Catalan](#) [Dedekind](#) [Delannoy](#) [Euler](#) [Eulerian](#) [Fuss–Catalan](#) [Lah](#) [Lazy caterer's sequence](#) [Lobb](#) [Motzkin](#) [Narayana](#) [Ordered Bell](#) [Schröder](#) [Schröder–Hipparchus](#) [Stirling first](#) [Stirling second](#)

[Primes](#)

[Wieferich](#) [Wall–Sun–Sun](#) [Wolstenholme prime](#) [Wilson](#)

[Pseudoprimes](#)

[Carmichael number](#) [Catalan pseudoprime](#) [Elliptic pseudoprime](#) [Euler pseudoprime](#) [Euler–Jacobi pseudoprime](#) [Fermat pseudoprime](#) [Frobenius pseudoprime](#) [Lucas pseudoprime](#) [Lucas–Carmichael number](#) [Somer–Lucas pseudoprime](#) [Strong pseudoprime](#)

[Arithmetic functions](#) and [dynamics](#)

Divisor functions	Abundant Almost perfect Arithmetic Betrothed Colossally abundant Deficient Descartes Hemiperfect Highly abundant Highly composite Hyperperfect Multiply perfect Perfect Practical Primitive abundant Quasiperfect Refactorable Semiperfect Sublime Superabundant Superior highly composite Superperfect	
	Prime omega functions	Almost prime Semiprime
	Euler's totient function	Highly cototient Highly totient Noncototient Nontotient Perfect totient Sparsely totient
Aliquot sequences	Amicable Perfect Sociable Untouchable	
Primorial	Euclid Fortunate	

Other [prime factor](#) or [divisor](#) related numbers

[Blum](#) [Cyclic](#) [Erdős–Nicolas](#) [Erdős–Woods](#) [Friendly](#) [Giuga](#) [Harmonic divisor](#) [Lucas–Carmichael](#) [Pronic](#) [Regular](#) [Rough](#) [Smooth](#) [Sphenic](#) [Størmer](#) [Super-Poulet](#) [Zeisel](#)

<u>Numeral system</u> -dependent numbers		
<u>Arithmetic functions</u> and <u>dynamics</u>	<u>Persistence</u>	
	Additive	
	Multiplicative	
	<u>Digit sum</u>	<u>Digit sum</u> <u>Digital root</u> <u>Self Sum-product</u>
	<u>Digit product</u>	<u>Multiplicative digital root</u> <u>Sum-product</u>
	Coding-related	<u>Meertens</u>
	Other	<u>Dudeney</u> <u>Factorion</u> <u>Kaprekar</u> <u>Kaprekar's constant</u> <u>Keith Lychrel</u> <u>Narcissistic</u> <u>Perfect digit-to-digit invariant</u> <u>Perfect digital invariant</u>
		<u>Happy</u>
P-adic numbers-related	<u>Automorphic</u>	
	<u>Trimorphic</u>	
<u>Digit-composition</u> related	<u>Palindromic</u> <u>Pandigital</u> <u>Repdigit</u> <u>Repunit</u> <u>Self-descriptive</u> <u>Smarandache–Wellin</u> <u>Strictly non-palindromic</u> <u>Undulating</u>	
<u>Digit-permutation</u> related	<u>Cyclic</u> <u>Digit-reassembly</u> <u>Parasitic</u> <u>Primeval</u> <u>Transposable</u>	
Divisor-related	<u>Equidigital</u> <u>Extravagant</u> <u>Frugal</u> <u>Harshad</u> <u>Polydivisible</u> <u>Smith</u> <u>Vampire</u>	
Other	<u>Friedman</u>	
<u>Binary numbers</u>		
<u>Evil</u> <u>Odious</u> <u>Pernicious</u>		
Generated via a <u>sieve</u>		
<u>Lucky</u> <u>Prime</u>		
<u>Sorting</u> related		
<u>Pancake number</u> <u>Sorting number</u>		
<u>Natural language</u> related		
<u>Aronson's sequence</u> <u>Ban</u>		
<u>Graphemics</u> related		
<u>Strobogrammatic</u>		
 <u>Mathematics portal</u>		

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