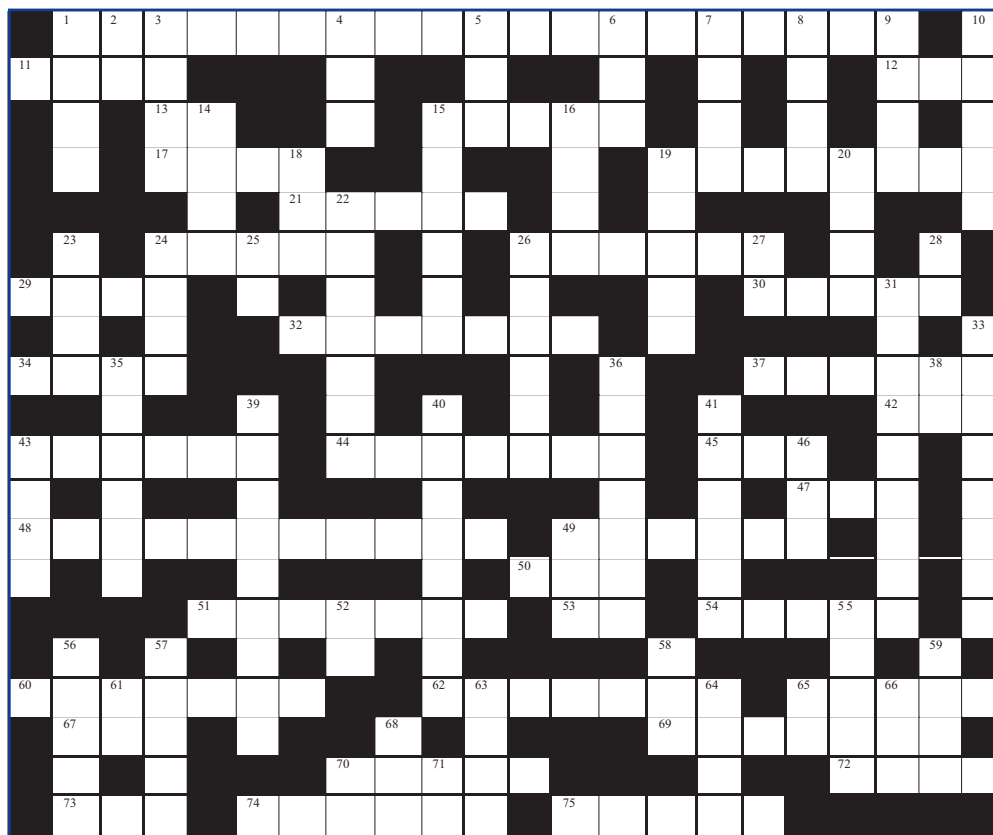


Number Theory Crossword Puzzle

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- 32 An example of a pair of Ruth-Aaron numbers are $(714, 700 + n)$, where $n = \underline{\hspace{1cm}}$
- 34 He proved $M_{67} = 2^{67} - 1$ was composite at the 1903 meeting of the AMS
- 37 Divisor
- 42 Period of time
- 43 How to see your homework if the electricity goes out
- 44 The E in John E. Littlewood, who was famous for his association with Hardy
- 45 If n has a representation as a sum of two squares, then no $(4k + 3)$ -prime can appear to $a(n)$ power in the canonical representation of n
- 47 Organization founded in 1888 to “further mathematical research and scholarship” (abbrev.)

ACROSS

- 1 Number theory conjecture that is one of the seven Clay Mathematics Institute prize problems
- 11 Eat this black and white cookie while you do homework
- 12 Use this to listen to number theory lectures
- 13 Euclid Alexandria
- 15 The continued fraction $[1; 1, 1, 1, \dots]$ is not the Silver Sum or the Copper Product, but rather the Golden
- 17 A number with as many digits as its name
- 19 This symbol is a number theoretic function which is defined to equal either $+1$ or -1
- 21 What one hopes to do with a conjecture
- 24 A Sophie Germain prime is, by definition, a prime p such that $2p + 1$ is
- 26 His last theorem was scribbled in the margin of his copy of Diophantus’s *Arithmetica*
- 29 Riemann function
- 30 He originated the symbols $f(x)$, e , i , p , and Σ
- 48 He was the first to give the general solution to linear Diophantine equations
- 49 Archimedes’ cattle once grazed on the fields of this Mediterranean isle
- 50 An elementary check of multiplication which makes use of the congruence $10^n \equiv 1 \pmod{9}$, “casting nines”
- 51 He founded, in 1996, the Great Internet Mersenne Prime Search
- 53 First and last letters in abbreviation for one million cycles per second
- 54 In 1971 Brillhart and Morrison were able to factor the Fermat number F_n , where n is equal to
- 60 All even perfect numbers beyond 6 have a root of one
- 62 Both he and his father were mathematical lecturers at Oxford, but he became famous for his interactions with the daughter of the Dean at Christ Church, Oxford
- 65 Author of the Tower of Hanoi puzzle
- 67 2 is not a for a Pythagorean triangle

- 69 She completed papers on number theory and the curvature of surfaces before dying of breast cancer in 1831
- 70 Roger Federer, 2004 Wimbledon tennis champion, and Leonhard Euler have this in common
- 72 Littlewood’s youngest brother died at age 8 by falling into one of these
- 73 Finite or infinite collection of objects
- 74 Birth city of mathematician Jose Anastacio de Cunha
- 75 “The magic _____ are squeamish ossifrage”
- 31 Galois fields include each _____ of the integers modulo a prime p
- 33 A continued _____ is a representation of real numbers in terms of a sequence of integers
- 35 German mathematician who obtained asymptotic estimates as to how many integers are $\leq x$ that are expressible as a sum of two squares
- 36 His famous theorem says that for any irrational number x there exist infinitely many rational p/q such that

$$\left| x - \frac{p}{q} \right| < \frac{1}{\sqrt{5}q^2}$$

DOWN

- 1 The series of reciprocals of all twin primes converges to a value named after this Norwegian, Viggo _____
- 2 Latin abbreviation for “that is”
- 3 Not the floor function, but this function
- 4 Pascal and Fermat used mathematics to study gaming and chance to _____
- 5 If you excel in number theory, you may be qualified for a job at this cryptologic organization
- 6 The order of 12 modulo 13
- 7 The most obvious way to compute $12^{10} \pmod{23}$ is to multiply 12 this many times, reducing the result mod 23 at each step
- 8 Robert P. Langlands, who received the Cole Prize in Number Theory in 1982 for his pioneering work on automorphic forms, received his PhD from this school
- 9 You must do this to your number theory textbook
- 10 The _____ of 2 (mod 7) is 3
- 14 Any positive integer can be expressed as a sum of this many squares
- 15 In the popular RSA encryption scheme, the letter “R” represents this person
- 16 Popular Beatles tune “Let _____“ (two words)
- 18 How fast a motor turns (abbrev.)
- 19 If $p(n)$ denotes the number of partitions of the integer, then the _____ as $n \rightarrow \infty$ of $[p(n)]^{1/n}$ is 1
- 20 The set of 2-digit positive integers < 50 that can be expressed as a sum of two squares in two different ways
- 22 If the congruence $x^2 \equiv 5 \pmod{31}$ has a solution, then 5 is a quadratic _____ of 31
- 23 If φ denotes the Euler phi-function, then $\varphi(n) \equiv c \pmod{2} \forall n > 2$; thus c equals this
- 24 Turn the _____
- 25 The “i” in *iff*
- 26 These medals in mathematics are the equivalents of Nobel Prizes
- 27 Initials of a famous American inventor born in Ohio
- 28 One’s title upon completing a PhD degree
- 38 The “ \vee ” in $p \vee q$ stands for this
- 39 Italian Maurolico proved that every even perfect number is also a _____ number
- 40 He conjectured that a prime always exists between a number and its double
- 41 His name is attached to an inversion formula and a strip of paper.
- 43 Square-full numbers can be written as a product of a square and this
- 46 Pi _____ is celebrated on March 14
- 49 The Four Squares Theorem asserts that every natural number is the _____ of 4 integer squares
- 52 Abel, Eisenstein, and Ramanujan all died from this (abbrev.)
- 55 “Well, I have done one thing *you* could never have done, and that is to have collaborated with both Littlewood and Ramanujan on something like _____ terms.”
- 56 He successfully proved Fermat’s Last Theorem
- 57 During his lifetime Gauss produced this many proofs of the Law of Quadratic Reciprocity
- 58 The number of primes \leq any given x is approximately equal to x divided by its _____
- 59 The _____ of a set is the least ordinal number greater than the rank of any member of the set
- 61 The symbol for the element germanium
- 63 This type of interval does not include its endpoints
- 64 If you complete this puzzle, you are a math _____
- 65 First and last letters in the abbreviation for the least common multiple
- 66 Government agency which provides the President with national security intelligence
- 68 This is where Hardy and Ramanujan found the number 1729
- 70 Degree most undergraduate mathematics majors will receive (abbrev.)
- 71 “_____ what?”

For the solution, visit www.maa.org/mathhorizons.