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 \([1; 1, 1, 1, \ldots]\) 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 \(\Sigma\)

32  An example of a pair of Ruth-Aaron numbers are \((714, 700 + n)\), where \(n\) = ___
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.)
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 \(10^p \equiv 1 \pmod{9}\), “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".

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 $n \to \infty$ 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 $\varphi$ denotes the Euler phi-function, then $\varphi(n) = c$ (mod 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.
31  Galois fields include each _____ of the integers modulo a prime $p$.
32  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 $|x - p/q| < \frac{1}{\sqrt{q^2}}$.
38  The “$\lor$” in $p \lor q$ 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.