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Why is the number 1729 special

Natural number ← 1728 1729 1730 → List of numbers — Integers ← 0 1k 2k 3k 4k 5k 6k 7k 8k 9k →Cardinalone thousand seven hundred twenty-nineOrdinal1729th(one thousand seven hundred twenty-ninth)Factorization7 × 13 × 19Divisors1, 7, 13, 19, 91, 133, 247, 1729Greek numeral,ΑΨΚΘ´Roman numeralMDCCXXIXBinary110110000012Ternary21010013Octal33018Duodecimal100112Hexadecimal6C116 1729 is the natural number following 1728 and preceding 1730. It is a number of taxis, and is variously known as the Romanujan number and the Ramanujan-Hardy number, following an anecdote by the British mathematician G. H. Hardy when he visited the Indian mathematician Srinivasa Rmanujan in hospital. He mixed up their conversation:[1][2][3][4] I remember once I was going to see him when he was sick in Putney. I had ridden in the taxi number 1729 and noticed that the number seemed rather dull to me, and that I hoped it wasn't an unfavorable aneon. No, he replied, it's a very interesting number; is the smallest number expressed as the sum of the two cubes in two different ways. The two different ways are: 1729 = 13 + 123 = 93 + 103 The offer is sometimes expressed using the term positive cubes, since it allows negative perfect cubes (the cube of a negative integer) gives the smallest solution as 91 (which is divisor 1729): 91 = 63 + (−5)3 = 43 + 33 Numbers which is the smallest number that can be expressed as the sum of the two cubes in n distinct ways[5] have been named taxi numbers. The number was also found in one of the rmanujan notebooks dated years before the incident, and was noted by Frénicle de Ofstedy in 1657. A commemorative plaque is now displayed at the site of the Ramanujan-Hardy incident, at 2 Colinette Road in Putney. [6] The same expression defines 1729 as the first in the series of Fermat near failures (sequence A050794 in OEIS) is defined, in relation to the last Fermat theorem, as numbers of the form 1 + z3 which are also expressed as the sum of the other two cubes. Other properties 1729 are also the third number Carmichael, the first number Chernick-Carmichael (sequence A033502 in OEIS), and the first absolute pseudoprime Euler. It's also a wedge number. 1729 is a Zeisel number. [7] It is a centered cube number,[8] as well as a dodecagonal number,[9] a number of 24-gonal[10] and 84-gonal number. By researching pairs of distinct square forms with an integer value representing each integer the same number of times, Schiemann found that these square shapes must be in four or more variables and the least possible distinguish of a pair of four variables is 1729. [11] 1729 is the lowest number that can be reproduced from a square form of Loeschian a2 + ab + b2 with four the positive integers a and b. Integer pairs (a,b) are (25,23), (32,15), (37,8) and (40,3). [12] See also a disappearing number, a 2007 game for Rmanujan in England World War I. Interesting paradox number 4104, the second positive integer that can be expressed as the sum of the two positive cubes in two different ways. Reports ^ Reports from Hardy Archived 2012-07-16 at Wayback Machine ^ Singh, Simon (October 15, 2013). Why is the number 1,729 hidden in Futurama episodes?. BBC News Online. Retrieved October 15, 2013. ^ Hardy, C X (1940). Ramanuyan. New York: Cambridge University Press (original). p. 12. ^ Hardy, G. H. (1921), Srinivasa Ramanujan, Proc. London Math. Soc., s2-19 (1): xl-lviii, doi:10.1112/plms/s2-19.1.1-u The anecdote about 1729 appears on pages lvii and lviii ^ Higgins, Peter (2008). Number chain: From count to cryptography. New York: Copernic. p. 13. ISBN 978-1-84800-000-1. ^ Marshall, Michael. A black plate for Rmanujan, Hardy and 1,729. That's a good thought. Retrieved March 7, 2019. ^ Sloane, N. J. A. (ed.). Sequence A051015 (Zeisel numbers). The online encyclopedia of integer sequences. OEIS Foundation. Retrieved 2016-06-02. ^ Sloane, N. J. A. (ed.). Sequence A005898 (cube numbers in the center). The online encyclopedia of integer sequences. OEIS Foundation. Retrieved 2016-06-02. ^ Sloane, N. J. A. (ed.). Sequence A051624 (12-gonal (or dodecagonal) numbers). The online encyclopedia of integer sequences. OEIS Foundation. Retrieved 2016-06-02. ^ Sloane, N. J. A. (ed.). Sequence A051876 (24-gonal numbers). The online encyclopedia of integer sequences. OEIS Foundation. Retrieved 2016-06-02. ^ Press, Richard K. (2004), Unsolved Problems in Number Theory, Problem Books in Mathematics, Volume 1 (3rd ed.), Springer, ISBN 0-387-20860-7 - D1 mentions the number of Rmanujan-Hardy. ^ David Mitchell (February 25, 2017). Tessellating the number Rmanujan-Hardy Taxi, 1729, substrate of the integer sequence A198775. Retrieved July 19, 2018. External links Weisstein, Eric W. Hardy-Rmanujan No. Mathematics. Graeme, James. Bowly, Roger. 1729: Taxi number or Hardy-Rmanujan number. The Arithmetic. Brady Haran. Archived from the original on 2017-03-06. Retrieved 2013-04-02. Why does the number 1729 appear in so many Futurama episodes?, io9.com Retrieved from The number 1729 is known as the Hardy-Ramanujan number after Cambridge professor GH Hardy visited Indian mathematician Sriniva Ramanu Ramajan in a hospital. As Hardy called the taxi number of 1729 dull, Romanujan exclaimed that it was the smallest number expressed as the sum of the two cubes in two different ways, as the sum of cubes of 1, 12 and also 10, 9. short by Gaurav Shroff / 03:07 pm on April 26 Answers Question 1729 is the natural number after 1728 and before It is known as the number Hardy-Rmanujan, after an anecdote by the British mathematician G. H. ... No, he replied, it's a very interesting number; is the as the sum of two cubes in two different ways. Divisions: 1, 7, 13, 19, 91, 133, 247, 1729Roman numeric number: MDCCXXIXCardinal: one thousand seven hundred and twenty ... Tactical: 1729th; (one thousand seven hundred ... 1729 is called Hardy Ramanujan Number which can be written as the sum of cubes of two numbers in two different ways. 1729=1^3+12^3 1729=9^3+10^3 Also 1+7+2+9=19 1729=19×91 It is the smallest number that can be expressed by the sum of two cubes in two different ways. 1) 1×1×1=1 12×12×12=1728 1+1728=1729 2) 9×9×9=729 10 ×10×10=1000 729+1000=1729 Discover new things daily Ultra-processed foods are foods that contain high levels of sugar, fat and/or salt but have almost no vitamins or fiber. Many countries depend on such foods for their daily energy needs, such as sugary or fizzy drinks. Research has linked regular consumption of such foods to over a hundred thousand deaths each year due to diabetes, high blood pressure and cholesterol. Luzon is an island in the Philippines. On the island is Lake Taal. On the lake is a volcano. At the top of the volcano (about 1000 feet above sea level) is another lake. In the center of this lake is a small island called Vulcan Point. Luzon Island itself is located within a group of islands in the Pacific Ocean. This geographical miracle is like nature's nesting doll! Eh'hawl Hotel in Amberg, Germany is the smallest hotel in the world with a width of just 8 feet! It can only have 2 guests at once. Previously in Germany, young couples had to prove they had real estate to get married. A businessman built this little house for couples to buy, marry and sell to the next couple. It's been called the wedding house (Eh'haeusl) ever since. Remember when you'd see him when he was sick in Putney? I had ridden in taxi number 1729 and noticed that the number seemed rather dull to me, and that I hoped it wasn't an unfavorable aneon. No, Ramanuyan replied, it's a very interesting number; is the smallest number expressed as the sum of the two cubes in two different ways. - G.H. Hardy (1918)Left: One of the few photographs of Ramanujan. Right: Ramanuyan's manuscript. Representations of 1729 as the sum of the two cubes are shown in the lower right corner. Photo: Trinity College library. The two different ways 1729 are expressable since the sum of two cubes is 13 + 123 and 93 + 103. The number has since become known as the Hardy-Rmanujan number, the second so-called taxi number, defined as Soa, six taxi numbers have been known. It is: Numbers expressed as the sum of cubes for the first time in 1657 by Bernard Frénicle de Ofstedy, who described the property citing the example of 1729 in his letters to John Wallis and Pierre de Fermat. In 1938, Hardy and E. M. Wright demonstrated that such numbers exist for all positive integers n. The next taxi number, Ta(3) was computer in 1957 by John Leech. The following numbers were found by Rosendstiel et al (1989), J.A. Dardis (1994) and Hollerbach (2008). For ta(7) numbers in T(12) only upper limits are known, found by Boyer in 2006.Famously, Romanujan did his job in notebooks that were later studied extensively in awe by mathematicians and historians alike. As recently as the reference of the number 1729 in the anecdote above, no further information was known about Ramanujan's knowledge of the number. The diofantin equations That Ramanuyan had done work related to the number 1729 were discovered in one of his manuscripts uncovered at the Library of Trinity College Cambridge by mathematician Ken Ono and one of his postgraduate studies, Sarah Trebat-Leder. From the single page presented completely without notes, it is clear that Romanujan was working on almost integer solutions for the diophantine equation:Equation 1 when probably stumbled over the case of x = 9, y = 10. Almost integers are numbers that are very close to being integer, such as sin(11) = -0.99999206.... From their discovery in Ramanujan's manuscripts, Ken Ono said later: We were sitting right next to the librarian's office, turning page by page through the Ramanujan box, Ono recalls. We came across this one page that had on it the two representations of 1729 [as the sum of the cubes]. We started laughing right away. Top line: The number 1729 represented by the sum of two cubes, in two waysThid the two identified was not the number 1729 itself, but rather the number in the two cube amount representations of 93+103 = 13 + 12, which Romanujan had encountered in his investigations of almost integer solutions in equation 1 above. Fermat's latest Theorem Ono and Trebat-Leder discovery were fun, because equation 1 above, of course, is the known equation (for n = 3) from Fermat's last theorem, the famous guess proposed by the French mathematician Pierre de Fermat in 1637: Calculation in the manuscript of RamanuyanApta the specific case studied by Ramanuyan (n = 3) turned out to have no solutions by Leonard Weller in 1770 (although with a large gap) , the general case of n > 2 was still very unresolved at the time of Ramanujan, not possible solution until Andrew Wiles famously proved the guess in 1994. The relationship between taxi numbers and Fermat's last theorem can be described in the following way: Euler's Diofantin Equation The diofantin equation (describing almost complete solutions to Fermat's last theorem) in which Ramanuyan worked had previously been studied by Euler, and is sometimes called the Diofantin Euler Equation: Equation 2. Euler DiophantineOn still on the same page, above the examples of Romanujan solutions in the equation, also presented three functions, along with extensions to the powers of x (on the origin) origin) to forces of oh (about infinity). From the manuscript, the three functions and their extensions to the forces of x are: Equation 3.1Ecsity 3.2Ecsism 3.3For which the coefficients of a, b, c for the first values of n are: The three functions and their extensions to powers of x are: Equation 4.1Ecusion 4.2Eccumation 4.3For which the coefficients a, b, c for the first values of n are : In addition, Romanujan provided two general expressions, adapted from Euler's Diofantin equation, to create almost integer solutions to Fermat's latest theorem for n = 3:Equations 5 and 6. The equations of Ramanujan for almost integer solutions in the diofantin equation a3 + b3 = c3What Ono and Trebat-Leder had discovered, in other words, it was that the number Hardy-Rmanujan, 1729 was known in Rmanujan as a solution to equation 6 above, explicit as an extension of the powers of x, given by the coefficients a, b, c for n = 0, i.e. α = 9, b - −12, c = −10. Ramanuyan's equations for providing almost integer solutions to the Euler diofantin equationAnd so, when Hardy came to see Ramanuyan at the hospital in Putney that day in 1918, not only did Ramanuyan recognize the properties of the number, but he also knew the formula for producing infinitely many numbers with the same qualities, given by equation 5 and 6 above. Amazing. Each positive integer was one of rmanujan's personal friends. - C.E. LittlewoodThis essay is part of a series of stories about math-related topics, published in Cantor Paradise, a weekly average publication. Thank you for reading! Reading!