Mathematicians of india

On page 105 of his first notebook, he formulated an equation that could be used to solve the infinitely nested radicals problem. Using this equation, the answer to the question posed in the Journal was simply 3.

[40] Ramanujan wrote his first formal paper for the Journal on the properties ofBernoulli numbers. One property he discovered was that the denominators (sequence A027642 in OEIS) of the fractions of Bernoulli numbers were always divisible by six. He also devised a method of calculating Bn based on previous Bernoulli numbers.

One of these methods went as follows It will be observed that if n is even but not equal to zero, (i) Bn is a fraction and the numerator of in its lowest terms is a prime number, (ii) the denominator of Bn contains each of the factors 2 and 3 once and only once, (iii) is an integer and consequently is
an odd integer. In his 17–page paper, “ Some Properties of Bernoulli’s Numbers”, Ramanujan gave three proofs, two corollaries and three conjectures.

[41] Ramanujan’s writing initially had many flaws. As Journal editor M. T. Narayana Iyengar noted: Mr.

Ramanujan’s methods were so terse and novel and his presentation so lacking in clearness and precision, that the ordinary [mathematical reader], unaccustomed to such intellectual gymnastics, could hardly follow him. [42] Ramanujan later wrote another paper and also continued to provide problems in the Journal. [43] Contacting English mathematicians Spring, Narayana Iyeru, Ramachandra Rao and E. W. Middlemast tried to present Ramanujan’s work to British mathematicians. One mathematician, M.

J. M. Hill of University College London, commented that Ramanujan's papers were riddled with holes. 48] He said that although Ramanujan had " a taste for mathematics, and some ability", he lacked the educational background and foundation needed to be accepted by mathematicians. [49] Although Hill did not offer to take Ramanujan on as a student, he did give thorough and serious professional advice on his work. With the help of friends, Ramanujan drafted letters to leading mathematicians at Cambridge University.

[50] The first two professors, H. F. Baker and E. W. Hobson, returned Ramanujan's papers without comment.

[51] On 16 January 1913, Ramanujan wrote to G. H. Hardy.

Coming from an unknown mathematician, the nine pages of mathematical wonder made Hardy originally view Ramanujan's manuscripts as a possible " fraud". [52] Hardy recognized some of Ramanujan's formulae but others " seemed scarcely possible to believe. "[53] One of the theorems Hardy found so incredible was found on the bottom of page three (valid for $0 < a < b + 1/2$): Hardy was also impressed by some of Ramanujan's other work relating to infinite series: The first result had already been determined by a mathematician named Bauer.

The second one was new to Hardy.

It was derived from a class of functions called a hypergeometric series which had first been researched by Leonhard Euler and Carl Friedrich Gauss. Compared to Ramanujan's work on integrals, Hardy found these results " much more intriguing". [54] After he saw Ramanujan's theorems on continued fractions on the last page of the manuscripts, Hardy commented that the “[theorems] defeated me completely; I had never seen anything in the least like them before. “[55] He figured that Ramanujan’s theorems “ must be true, because, if they were not true, no one would have the imagination to invent them. [55] Hardy asked a colleague, J.

E. Littlewood, to take a look at the papers. Littlewood was amazed by the mathematical genius of Ramanujan. After discussing the papers with Littlewood, Hardy concluded that the letters were “ certainly the most remarkable I have received” and commented that Ramanujan was “ a mathematician of the highest quality, a man of altogether exceptional originality and power In mathematics, there is a distinction between having an insight and having a proof. Ramanujan’s talent suggested a plethora of formulae that could then be investigated in depth later.

It is said that Ramanujan’s discoveries are unusually rich and that there is often more in it than what initially meets the eye.

As a by-product, new directions of research were opened up. Examples of the most interesting of these formulae include the intriguing
infinite series for ? , one of which is given below This result is based on the negative fundamental discriminant d = ? 4? 58 with class number h(d) = 2 (note that 5? 7? 13? 58 = 26390) and is related to the fact that Compare to Heegner numbers, which have class number 1 and yield similar formulae. Ramanujan’s series for ? onverges extraordinarily rapidly (exponentially) and forms the basis of some of the fastest algorithms currently used to calculate ?. Truncating the sum to the first term also gives the

approximation for ? , which is correct to six decimal places. One of his remarkable capabilities was the rapid solution for problems. He was sharing a room with P.

C. Mahalanobis who had a problem, “ Imagine that you are on a street with houses marked 1 through n. There is a house in between (x) such that the sum of the house numbers to left of it equals the sum of the house numbers to its right.

If n is between 50 and 500, what are n and x.

” This is a bivariate problem with multiple solutions. Ramanujan thought about it and gave the answer with a twist: He gave a continued fraction. The unusual part was that it was the solution to the whole class of problems. Mahalanobis was astounded and asked how he did it.

“ It is simple. The minute I heard the problem, I knew that the answer was a continued fraction. Which continued fraction, I asked myself. Then the answer came to my mind”, Ramanujan replied. [81][82] His intuition also led him to derive some previously unknown identities, such as or all ? , where ? (z) is the gamma function.

Equating coefficients of ? 0, ? 4, and ? 8 gives some deep identities for the hyperbolic secant. In 1918, Hardy and Ramanujan studied the partition function P(n) extensively and gave a non-convergent asymptotic series that permits exact computation of the number of partitions of an integer. Hans Rademacher, in 1937, was able to refine their formula to find an exact convergent series solution to this problem. Ramanujan and Hardy’s work in this area gave rise to a powerful new method for finding asymptotic formulae, called the circle method. 83] He discovered mock theta functions in the last year of his life.

For many years these functions were a mystery, but they are now known to be the holomorphic parts of harmonic weak Maass forms. Hardy–Ramanujan number 1729 A common anecdote about Ramanujan relates to the number 1729. Hardy arrived at Ramanujan’s residence in a cab numbered 1729. Hardy commented that the number 1729 seemed to be uninteresting. Ramanujan is said to have stated on the spot that it was actually a very interesting number mathematically, being the smallest number representable in two different ways as a sum of two cubes: ——————————————————— Brahmagupta (598–668) was an Indian mathematician and astronomer. Brahmagupta wrote important works on mathematics and astronomy.

In particular hewrote Brahmasphutasiddhanta (Correctly Established Doctrine of Brahma), in 628. The work was written in 25 chapters and Brahmagupta tells us in the text that he wrote it at Bhillamal which today is the city of Bhinmal. Mathematics Brahmagupta’s most famous work is his Brahmasphutasiddhanta. It is composed in elliptic verse, as was common ractice in Indian mathematics, and consequently has a poetic ring to it. As no proofs are given, it is not known how Brahmagupta’s mathematics was derived.

[3]]Algebra Brahmagupta gave the solution of the general linear equation in chapter eighteen of Brahmasphutasiddhanta, 18. 43 The difference

between rupas, when inverted and divided by the difference of the unknowns, is the unknown in the equation. The rupas are [subtracted on the side] below that from which the square and the unknown are to be subtracted. [4] Which is a solution equivalent to , where rupas represents constants.

He further gave two equivalent solutions to the general quadratic equation, 18.

44. Diminish by the middle [number] the square-root of the rupas multiplied by four times the square and increased by the square of the middle [number]; divide the remainder by twice the square. [The result is] the middle [number]. 18.

45. Whatever is the square-root of the rupas multiplied by the square [and] increased by the square of half the unknown, diminish that by half the unknown [and] divide [the remainder] by its square. [The result is] the unknown. 4] Which are, respectively, solutions equivalent to, And He went on to solve systems of simultaneous indeterminate equations stating that the desired variable must first be isolated, and then the equation must be divided by the desired variable’s coefficient.

In particular, he recommended using “ the pulverizer” to solve equations with multiple unknown 18. 51. Subtract the colors different from the first color. [The remainder] divided by the first [color’s coefficient] is the measure of the first. [Terms] two by two [are] considered [when reduced to] similar divisors, [and so on] repeatedly.

If there are many [colors], the pulverizer [is to be used].

[4]Like the algebra of Diophantus, the algebra of Brahmagupta was syncopated. Addition was indicated by placing the numbers side by side, subtraction by placing a dot over the subtrahend, and division by placing the divisor below the dividend, similar to our notation but without the bar. Multiplication, evolution, and unknown quantities were represented by abbreviations of appropriate terms. [5] The extent of Greek influence on this syncopation, if any, is not known and it is possible that both Greek and Indian syncopation may be derived from a common Babylonian source.

5]]Arithmetic In the beginning of chapter twelve of his Brahmasphutasiddhanta, entitled Calculation, Brahmagupta details operations on fractions. The reader is expected to know the basic arithmetic operations as far as taking the square root, although he explains how to find the cube and cube-root of an integer and later gives rules facilitating the computation of squares and square roots. He then gives rules for dealing with five types of combinations of fractions, , , , , and . [6]]Series Brahmagupta then goes on to give the sum of the squares and cubes of the first n integers. 2. 20.

The sum of the squares is that [sum] multiplied by twice the [number of] step[s] increased by one [and] divided by three. The sum of the cubes is the square of that [sum] Piles of these with identical balls [can also be computed]. [7] It is important to note here Brahmagupta found the result in terms of the sum of the first n integers, rather than in terms of n as is the modern practice. [8] He gives the sum of the squares of the first n natural numbers as n(n+1)(2n+1)/6 and the sum of the cubes of the first n natural numbers as (n(n+1)/2)?.

Zero Brahmaguptasiddhanta is the very first book that mentions zero as a number. hence Brahmagupta is considered as the man who found zero.

He gave rules of using zero with other numbers. Zero plus a positive number is the positive number etc. Brahmagupta made use of an important concept in mathematics, thenumber zero. The Brahmasphutasiddhanta is the earliest known text to treat zero as a number in its own right, rather than as simply a placeholder digit in representing another number as was done by the Babylonians or as a symbol for a lack of quantity as was done by Ptolemy and the Romans.

In chapter eighteen of his Brahmasphutasiddhanta, Brahmagupta describes operations on negative numbers. He first describes addition and subtraction, 18. 30. [The sum] of two positives is positives, of two negatives negative; of a positive and a negative [the sum] is their difference; if they are equal it is zero. The sum of a negative and zero is negative, [that] of a positive and zero positive, [and that] of two zeros zero. 18.

32. A negative minus zero is negative, a positive [minus zero] positive; zero [minus zero] is zero. When a positive is to be subtracted from a negative or a negative from a positive, then it is to be added. 4] He goes on to describe multiplication, 18. 33. The product of a negative and a positive is negative, of two negatives positive, and of positives positive; the product of zero and a negative, of zero and a positive, or of two zeros is zero.

[4]But his description of division by zero differs from our modern understanding, 18. 34. A positive divided by a positive or a negative divided by a negative is positive; a zero divided by a zero is zero; a positive divided by a negative is negative; a negative divided by a positive is [also] negative. 18.

35.

A negative or a positive divided by zero has that [zero] as its divisor, or zero divided by a negative or a positive [has that negative or positive as its divisor]. The square of a negative or of a positive is positive; [the square] of zero is zero. That of which [the square] is the square is [its] square-root Here Brahmagupta states that and as for the question of where he did not commit himself. [9] His rules for arithmetic on negative numbers and zero are quite close to the modern understanding, except that in modern mathematics division by zero is left undefined.