THE HISTORY OF ZERO pdf

1: What is the origin of zero? How did we indicate nothingness before zero? - Scientific American

"The Indian [or numerical] zero, widely seen as one of the greatest innovations in human history, is the cornerstone of modern mathematics and physics, plus the spin-off technology," said Peter.

During an air raid over Dutch Harbor on June 4, , one A6M fighter was hit by ground-based anti-aircraft fire. Koga died instantly of head injuries his neck was broken by the tremendous impact , but the relatively-undamaged fighter was found over a month later by an American salvage team and was shipped to Naval Air Station North Island , where testing flights of the repaired A6M revealed both strengths and deficiencies in design and performance. The instrument panel was a "marvel of simplicity The Japanese method was much slower, but resulted in a very strong structure and improved close maneuverability. While stable on the ground despite its light weight, the aircraft was designed purely for the attack role, emphasizing long range, maneuverability, and firepower at the expense of protection of its pilot. Most lacked self-sealing tanks and armor plating. The Zero had ruled the roost totally and was the finest fighter in the world until mid It first flew on 1 April, and passed testing within a remarkably short period. By September, it had already been accepted for Navy testing as the A6M1 Type 0 Carrier Fighter, with the only notable change being a switch to a three-bladed propeller to cure a vibration problem. Mitsubishi had its own engine of this class in the form of the Kinsei , so they were somewhat reluctant to use the Sakae. The new version was so promising that the Navy had 15 built and shipped to China before they had completed testing. They arrived in Manchuria in July , and first saw combat over Chungking in August. There they proved to be completely untouchable by the Polikarpov Is and Is that had been such a problem for the A5Ms when in service. In one encounter, 13 Zeros shot down 27 Is and Is in under three minutes without loss. After hearing of these reports, the navy immediately ordered the A6M2 into production as the Type 0 Carrier Fighter, Model There they were dismissed by most military officials, who thought it was impossible for the Japanese to build such an aircraft. After the delivery of the 65th aircraft, a further change was worked into the production lines, which introduced folding wingtips to allow them to fit on aircraft carriers. When the lines switched to updated models, Model 21s had been completed by Mitsubishi, and another by Nakajima. Two other versions of the Model 21 were built in small numbers, the Nakajima-built A6M2-N "Rufe" floatplane based on the Model 11 with a slightly modified tail , and the A6M2-K two-seat trainer of which a total of were built by Hitachi and the Sasebo Naval Air Arsenal. A prototype Zero with the new engine was first flown on July 15, The cowling was redesigned to enlarge the cowl flaps, revise the oil cooler air intake, and move the carburetor air intake to the upper half of the cowling. The wings also included larger ammunition boxes and thus allowing rounds per cannon. On the downside, turning and range, which were the strengths of the Model 21, suffered due to smaller ailerons, decreased lift and greater fuel consumption. The shorter range proved a significant limitation during the Solomons Campaign, during which Zeros based at Rabaul had to travel nearly to their maximum range to reach Guadalcanal and return. Soon after, it was realized that it was simply a new model of the "Zeke" and was termed "Zeke 32". This variant was flown by only a small number of units, and only were built. A6M3 Type 0 Model 22[edit] In order to correct the deficiencies of the Model 32, a new version with folding wingtips and redesigned wing was introduced. More important, it regained back its capabilities for long operating ranges, similar to the previous A6M2 Model 21, which was vastly shortened by the Model However, before the new design type was accepted formally by the Navy, the A6M3 Model 22 already stood ready for service in December Approximately aircraft of the new type had been produced in the meantime by Mitsubishi Jukogyo K. While the engine cowling is the same of previous Model 32 and 22, the theory proposes that the plane is an early production Model Some researchers believe "A6M4" was applied to one or two prototype planes fitted with an experimental turbo-supercharged Sakae engine designed for high altitude. It shows a turbo unit mounted in the forward left fuselage. Lack of suitable alloys for use in the manufacture of a turbo-supercharger and its related ducting caused numerous ruptures, resulting in fires and poor performance. Consequently, further development of a turbo-supercharged A6M was cancelled. The lack of acceptance by the navy suggests that the navy did not bestow model number 41 or 42 formally, although it

appears that the arsenal did use the designation "A6M4". The prototype engines nevertheless provided useful experience for future engine designs. A6M5c Zeros preparing to take part in a kamikaze attack in early Sometimes considered as the most effective variant, [48] the Model 52 was developed to again shorten the wings to increase speed and dispense with the folding wing mechanism. In addition, ailerons, aileron trim tab and flaps were revised. The prototype was made in June by modifying an A6M3 and was first flown in August Bunzo Komine published by Mr. Kenji Miyazaki states that aircraft through had the same exhaust system and cowl flaps as on the Model Stan Gajda and Mr. Halls, production number and , respectively. A new exhaust system provided an increment of thrust by aiming the stacks aft and distributing them around the forward fuselage. The new exhaust system required "notched" cowl flaps and heat shields just aft of the stacks. Note, however, that the handling manual translation states that the new style of exhaust commenced with number Whether this is correct, indicates retrofitting intentions, refers to the prototype but not to all subsequent planes, or is in error is not clear. From production number , the wing fuel tanks received carbon dioxide fire extinguishers. This caused hot exhaust to burn the forward edge of the landing gear doors and heat the tires. Therefore, from number Mitsubishi began to install shorter bottom stacks. Thicker wing skinning was installed to permit higher diving speeds. The larger weapon required an enlarged opening, creating a distinctive asymmetric appearance to the top of the cowling, and a revised gas outlet near the windscreen. In addition, each wing cannon received a fairing at the wing leading edge. A larger propeller spinner was fitted, suggesting a change to the propeller. The first of this variant was completed in April and it was produced until October The first of this variant was completed in September To intercept Bs and other night-flying aircraft, an air arsenal converted some Model 52s to night fighters. Perhaps seven Model 52 planes were ostensibly converted into A6M5-K two-seat trainers. The carburetor intake was much larger, a long duct like that on the Nakajima B6N Tenzan was added, and a large spinnerâ€”like that on the Yokosuka D4Y Suisei with the Kinsei 62â€”was mounted. The larger cowling meant of the fuselage-mounted machine gun, armament change to 2x Two prototypes were completed in April but the chaotic situation of Japanese industry and the end of the war obstructed the start of the ambitious program of production for 6, machines, none being completed.

THE HISTORY OF ZERO pdf

2: The Story of Zero

0 (zero) is both a number and the numerical digit used to represent that number in www.enganchecubano.com number 0 fulfills a central role in mathematics as the additive identity of the integers, real numbers, and many other algebraic structures.

They used hieroglyphs for the digits and were not positional. The symbol nfr, meaning beautiful, was also used to indicate the base level in drawings of tombs and pyramids and distances were measured relative to the base line as being above or below this line. The lack of a positional value or zero was indicated by a space between sexagesimal numerals. Nor was it used at the end of a number. Only context could differentiate them. The glyphs surrounding the date are thought to be one of the few surviving examples of Epi-Olmec script. The Mesoamerican Long Count calendar developed in south-central Mexico and Central America required the use of zero as a place-holder within its vigesimal base positional numeral system. Although zero became an integral part of Maya numerals , with a different, empty tortoise -like " shell shape " used for many depictions of the "zero" numeral, it is assumed to have not influenced Old World numeral systems. Quipu , a knotted cord device, used in the Inca Empire and its predecessor societies in the Andean region to record accounting and other digital data, is encoded in a base ten positional system. Zero is represented by the absence of a knot in the appropriate position. They asked themselves, "How can nothing be something? The paradoxes of Zeno of Elea depend in large part on the uncertain interpretation of zero. The way in which it is used can be seen in his table of chords in that book. Because it was used alone, not just as a placeholder, this Hellenistic zero was perhaps the earliest documented use of a numeral representing zero in the Old World. Another zero was used in tables alongside Roman numerals by first known use by Dionysius Exiguus , but as a word, nulla meaning "nothing", not as a symbol. These medieval zeros were used by all future medieval calculators of Easter. China This is a depiction of zero expressed in Chinese counting rods , based on the example provided by A History of Mathematics. An empty space is used to represent zero. According to A History of Mathematics, the rods "gave the decimal representation of a number, with an empty space denoting zero. The symbol 0 for denoting zero is a variation of this character. Zero was not treated as a number at that time, but as a "vacant position". It is not known how the birch bark fragments from different centuries that form the manuscript came to be packaged together. This work considers not only zero, but negative numbers, and the algebraic rules for the elementary operations of arithmetic with such numbers. In some instances, his rules differ from the modern standard, specifically the definition of the value of zero divided by zero as zero. The earliest known material use of zero as a decimal figure. History of the Hinduâ€”Arabic numeral system The Arabic -language inheritance of science was largely Greek , [42] followed by Hindu influences. This title means "al-Khwarizmi on the Numerals of the Indians". For this reason, the numerals came to be known in Europe as "Arabic numerals". The Italian mathematician Fibonacci or Leonardo of Pisa was instrumental in bringing the system into European mathematics in , stating: There, following my introduction, as a consequence of marvelous instruction in the art, to the nine digits of the Hindus, the knowledge of the art very much appealed to me before all others, and for it I realized that all its aspects were studied in Egypt, Syria, Greece, Sicily, and Provence, with their varying methods; and at these places thereafter, while on business. I pursued my study in depth and learned the give-and-take of disputation. But all this even, and the algorism, as well as the art of Pythagoras, I considered as almost a mistake in respect to the method of the Hindus Modus Indorum. I have striven to compose this book in its entirety as understandably as I could, dividing it into fifteen chapters. Almost everything which I have introduced I have displayed with exact proof, in order that those further seeking this knowledge, with its pre-eminent method, might be instructed, and further, in order that the Latin people might not be discovered to be without it, as they have been up to now. If I have perchance omitted anything more or less proper or necessary, I beg indulgence, since there is no one who is blameless and utterly provident in all things. The nine Indian figures are: With these nine figures, and with the sign The most popular was written by Johannes de Sacrobosco , about and was one of the earliest scientific books to be printed in Zero is an even number [48] because it is divisible by 2 with no remainder. Zero is a number which

quantifies a count or an amount of null size. In most cultures , 0 was identified before the idea of negative things, or quantities less than zero, was accepted. The value, or number, zero is not the same as the digit zero, used in numeral systems using positional notation. Successive positions of digits have higher weights, so inside a numeral the digit zero is used to skip a position and give appropriate weights to the preceding and following digits. A zero digit is not always necessary in a positional number system, for example, in the number In some instances, a leading zero may be used to distinguish a number. Elementary algebra The number 0 is the smallest non-negative integer. The natural number following 0 is 1 and no natural number precedes 0. The number 0 may or may not be considered a natural number , but it is an integer, and hence a rational number and a real number as well as an algebraic number and a complex number. The number 0 is neither positive nor negative and is usually displayed as the central number in a number line. It is neither a prime number nor a composite number. It cannot be prime because it has an infinite number of factors , and cannot be composite because it cannot be expressed as a product of prime numbers 0 must always be one of the factors. The following are some basic elementary rules for dealing with the number 0. These rules apply for any real or complex number x, unless otherwise stated. That is, 0 is an identity element or neutral element with respect to addition. The sum of 0 numbers the empty sum is 0, and the product of 0 numbers the empty product is 1. Other branches of mathematics In set theory , 0 is the cardinality of the empty set: In fact, in certain axiomatic developments of mathematics from set theory, 0 is defined to be the empty set. When this is done, the empty set is the Von Neumann cardinal assignment for a set with no elements, which is the empty set. The cardinality function, applied to the empty set, returns the empty set as a value, thereby assigning it 0 elements. Also in set theory, 0 is the lowest ordinal number , corresponding to the empty set viewed as a well-ordered set. In propositional logic , 0 may be used to denote the truth value false. In abstract algebra , 0 is commonly used to denote a zero element , which is a neutral element for addition if defined on the structure under consideration and an absorbing element for multiplication if defined.

THE HISTORY OF ZERO pdf

3: History Of Zero - Interesting & Amazing Information On Origin & Background Of Zero

The number zero as we know it arrived in the West circa , most famously delivered by Italian mathematician Fibonacci (aka Leonardo of Pisa), who brought it, along with the rest of the Arabic.

Thousands of chunks and slabs of stone covered the dirt floor: It was a lifelong love that led me to this threshold. I grew up on a cruise ship in the Mediterranean that often called at Monte Carlo, and I was drawn to the alluring numbers on roulette wheels: We use them with such ease that we take them for granted. Surprisingly, our number system took hold in the West only in the 13th century, after the Italian mathematician Leonardo of Pisaâ€"better known as Fibonacciâ€"introduced the numerals to Europeans. Virtually everything in our lives is digital, numerical, or quantified. The story of how and where we got these numerals, which we so depend on, has for thousands of years been shrouded in mystery. Unique in representing absolute nothingness, its role as a placeholder gives our number system its power. It enables the numerals to cycle, acquiring different meanings in different locations compare 3,, and With the exception of the Mayan system, whose zero glyph never left the Americas, ours is the only one known to have a numeral for zero. Babylonians had a mark for nothingness, say some accounts, but treated it primarily as punctuation. Romans and Egyptians had no such numeral either. A circle inscribed at a temple in Gwalior, India, dating to the ninth century, had been widely considered the oldest version of zero in our system, the Hindu-Arabic. At the time it was made, trade with the Arab empire connected East and West, so it could have come from anywhere. I was after an older zero, a particular instance arguing for an Eastern origin. Assigned the identifying label K, the inscription reads like a bill of sale and includes references to slaves, five pairs of oxen and sacks of white rice. Its date was thus A. Two centuries older than the one at Gwalior, it predated wide-ranging Arab trade. I describe my obsession with finding this earliest zero in my forthcoming book, Finding Zero. I spent countless hours poring over old texts in libraries from London to Delhi and emailing and calling anyone who might know someone who could help me locate K I made several unsuccessful trips to Cambodia, spending a significant amount of my own money. On the verge of giving up, I received a grant from the Alfred P. Sloan Foundation and forged ahead. When I was turned away twice, Touch graciously made a phone call, and in early January , I was invited in. And yet, within two hours, the roulette wheel had spun in my favor. I dared not touch the stone surface for fear I might harm it. Were numbers discovered or invented? The majority view is that numbers exist outside of the human mind. What gave numbers their power was the very act of naming them and writing them down.

THE HISTORY OF ZERO pdf

4: Mitsubishi A6M Zero - Wikipedia

Understanding and working with zero is the basis of our world today; without zero we would lack calculus, financial accounting, the ability to make arithmetic computations quickly, and, especially in today's connected world, computers.

Version for printing One of the commonest questions which the readers of this archive ask is: Why then have we not written an article on zero as one of the first in the archive? The reason is basically because of the difficulty of answering the question in a satisfactory form. If someone had come up with the concept of zero which everyone then saw as a brilliant innovation to enter mathematics from that time on, the question would have a satisfactory answer even if we did not know which genius invented it. The historical record, however, shows quite a different path towards the concept. Zero makes shadowy appearances only to vanish again almost as if mathematicians were searching for it yet did not recognise its fundamental significance even when they saw it. The first thing to say about zero is that there are two uses of zero which are both extremely important but are somewhat different. One use is as an empty place indicator in our place-value number system. Hence in a number like the zero is used so that the positions of the 2 and 1 are correct. Clearly means something quite different. The second use of zero is as a number itself in the form we use it as 0. There are also different aspects of zero within these two uses, namely the concept, the notation, and the name. Our name "zero" derives ultimately from the Arabic sifr which also gives us the word "cipher". Neither of the above uses has an easily described history. It just did not happen that someone invented the ideas, and then everyone started to use them. Also it is fair to say that the number zero is far from an intuitive concept. Numbers in early historical times were thought of much more concretely than the abstract concepts which are our numbers today. There are giant mental leaps from 5 horses to 5 "things" and then to the abstract idea of "five". If ancient peoples solved a problem about how many horses a farmer needed then the problem was not going to have 0 or as an answer. One might think that once a place-value number system came into existence then the 0 as an empty place indicator is a necessary idea, yet the Babylonians had a place-value number system without this feature for over years. Moreover there is absolutely no evidence that the Babylonians felt that there was any problem with the ambiguity which existed. Remarkably, original texts survive from the era of Babylonian mathematics. The Babylonians wrote on tablets of unbaked clay, using cuneiform writing. The symbols were pressed into soft clay tablets with the slanted edge of a stylus and so had a wedge-shaped appearance and hence the name cuneiform. Many tablets from around BC survive and we can read the original texts. Of course their notation for numbers was quite different from ours and not based on 10 but on 60 but to translate into our notation they would not distinguish between and the context would have to show which was intended. The two wedges were not the only notation used, however, and on a tablet found at Kish, an ancient Mesopotamian city located east of Babylon in what is today south-central Iraq, a different notation is used. This tablet, thought to date from around BC, uses three hooks to denote an empty place in the positional notation. Other tablets dated from around the same time use a single hook for an empty place. There is one common feature to this use of different marks to denote an empty position. This is the fact that it never occured at the end of the digits but always between two digits. One has to assume that the older feeling that the context was sufficient to indicate which was intended still applied in these cases. If this reference to context appears silly then it is worth noting that we still use context to interpret numbers today. Yet if the same answer is given to the question about the cost of a flight from Edinburgh to New York then I know that three hundred and fifty pounds is what is intended. We can see from this that the early use of zero to denote an empty place is not really the use of zero as a number at all, merely the use of some type of punctuation mark so that the numbers had the correct interpretation. Now the ancient Greeks began their contributions to mathematics around the time that zero as an empty place indicator was coming into use in Babylonian mathematics. The Greeks however did not adopt a positional number system. It is worth thinking just how significant this fact is. How could the brilliant mathematical advances of the Greeks not see them adopt a number system with all the advantages that the Babylonian place-value system possessed? The real answer to this question is more subtle than the simple answer that we are about to give, but basically the Greek mathematical achievements were based on geometry.

In other words Greek mathematicians did not need to name their numbers since they worked with numbers as lengths of lines. Numbers which required to be named for records were used by merchants, not mathematicians, and hence no clever notation was needed. Now there were exceptions to what we have just stated. The exceptions were the mathematicians who were involved in recording astronomical data. Here we find the first use of the symbol which we recognise today as the notation for zero, for Greek astronomers began to use the symbol O. There are many theories why this particular notation was used. Some historians favour the explanation that it is omicron, the first letter of the Greek word for nothing namely "ouden". Neugebauer , however, dismisses this explanation since the Greeks already used omicron as a number - it represented 70 the Greek number system was based on their alphabet. Other explanations offered include the fact that it stands for "obol", a coin of almost no value, and that it arises when counters were used for counting on a sand board. The suggestion here is that when a counter was removed to leave an empty column it left a depression in the sand which looked like O. Ptolemy in the Almagest written around AD uses the Babylonian sexagesimal system together with the empty place holder O. By this time Ptolemy is using the symbol both between digits and at the end of a number and one might be tempted to believe that at least zero as an empty place holder had firmly arrived. This, however, is far from what happened. Only a few exceptional astronomers used the notation and it would fall out of use several more times before finally establishing itself. The idea of the zero place certainly not thought of as a number by Ptolemy who still considered it as a sort of punctuation mark makes its next appearance in Indian mathematics. The scene now moves to India where it is fair to say the numerals and number system was born which have evolved into the highly sophisticated ones we use today. Of course that is not to say that the Indian system did not owe something to earlier systems and many historians of mathematics believe that the Indian use of zero evolved from its use by Greek astronomers. As well as some historians who seem to want to play down the contribution of the Indians in a most unreasonable way, there are also those who make claims about the Indian invention of zero which seem to go far too far. For example Mukherjee in [6] claims: What is certain is that by around AD the use of zero as a number came into Indian mathematics. The Indians also used a place-value system and zero was used to denote an empty place. In fact there is evidence of an empty place holder in positional numbers from as early as AD in India but some historians dismiss these as later forgeries. Let us examine this latter use first since it continues the development described above. In around AD Aryabhata devised a number system which has no zero yet was a positional system. He used the word "kha" for position and it would be used later as the name for zero. There is evidence that a dot had been used in earlier Indian manuscripts to denote an empty place in positional notation. It is interesting that the same documents sometimes also used a dot to denote an unknown where we might use x. Later Indian mathematicians had names for zero in positional numbers yet had no symbol for it. The first record of the Indian use of zero which is dated and agreed by all to be genuine was written in We have an inscription on a stone tablet which contains a date which translates to The inscription concerns the town of Gwalior, km south of Delhi, where they planted a garden by hastas which would produce enough flowers to allow 50 garlands per day to be given to the local temple. Both of the numbers and 50 are denoted almost as they appear today although the 0 is smaller and slightly raised. We now come to considering the first appearance of zero as a number. Let us first note that it is not in any sense a natural candidate for a number. From early times numbers are words which refer to collections of objects. Certainly the idea of number became more and more abstract and this abstraction then makes possible the consideration of zero and negative numbers which do not arise as properties of collections of objects. Of course the problem which arises when one tries to consider zero and negatives as numbers is how they interact in regard to the operations of arithmetic, addition, subtraction, multiplication and division. In three important books the Indian mathematicians Brahmagupta , Mahavira and Bhaskara tried to answer these questions. Brahmagupta attempted to give the rules for arithmetic involving zero and negative numbers in the seventh century. He explained that given a number then if you subtract it from itself you obtain zero. He gave the following rules for addition which involve zero: Subtraction is a little harder: Brahmagupta then says that any number when multiplied by zero is zero but struggles when it comes to division: Zero divided by a negative or positive number is either zero or is expressed as a fraction with zero as numerator and the finite quantity as

denominator. Zero divided by zero is zero. Clearly he is struggling here. He is certainly wrong when he then claims that zero divided by zero is zero. However it is a brilliant attempt from the first person that we know who tried to extend arithmetic to negative numbers and zero. He correctly states that: Since this is clearly incorrect my use of the words "seem to lead him into error" might be seen as confusing. The reason for this phrase is that some commentators on Mahavira have tried to find excuses for his incorrect statement. Bhaskara wrote over years after Brahmagupta. Despite the passage of time he is still struggling to explain division by zero. This fraction is termed an infinite quantity. In this quantity consisting of that which has zero for its divisor, there is no alteration, though many may be inserted or extracted; as no change takes place in the infinite and immutable God when worlds are created or destroyed, though numerous orders of beings are absorbed or put forth. At first sight we might be tempted to believe that Bhaskara has it correct, but of course he does not. The Indian mathematicians could not bring themselves to the point of admitting that one could not divide by zero. Perhaps we should note at this point that there was another civilisation which developed a place-value number system with a zero. This was the Maya people who lived in central America, occupying the area which today is southern Mexico, Guatemala, and northern Belize.

5: Who Invented Zero?

It might seem like an obvious piece of any numerical system, but the zero is a surprisingly recent development in human history. In fact, this ubiquitous symbol This website uses cookies for.

September 18, Iraidka Shutterstock Though people have always understood the concept of nothing or having nothing, the concept of zero is relatively new; it fully developed in India around the fifth century A. Before then, mathematicians struggled to perform the simplest arithmetic calculations. Today, zero â€” both as a symbol or numeral and a concept meaning the absence of any quantity â€” allows us to perform calculus, do complicated equations, and to have invented computers. The foundation, based in the Netherlands, researches the origins of the zero digit. Angled wedges Zero as a placeholder was invented independently in civilizations around the world, said Dr. Annette van der Hoek, Indiologist and research coordinator at the Zero Project. The Babylonians got their number system from the Sumerians, the first people in the world to develop a counting system. Developed 4, to 5, years ago, the Sumerian system was positional â€” the value of a symbol depended on its position relative to other symbols. However, Charles Seife, author of "Zero: The Biography of a Dangerous Idea," disagrees that the wedges represented a placeholder. There, Kaplan agrees, a symbol appeared that was clearly a placeholder â€” a way to tell 10 from or to signify that in the number 2,, there is no number in the hundreds column. Initially, the Babylonians left an empty space in their cuneiform number system, but when that became confusing, they added a symbol â€” double angled wedges â€” to represent the empty column. However, they never developed the idea of zero as a number. Zero in the Americas Six hundred years later and 12, miles from Babylon, the Mayans developed zero as a placeholder around A. Despite being highly skilled mathematicians, the Mayans never used zero in equations, however. Kaplan describes the Mayan invention of zero as the "most striking example of the zero being devised wholly from scratch. Where zero became a number Some scholars assert that the Babylonian concept wove its way down to India, but others, including those at the Zero Project, give Indians credit for developing numerical zero independently. If philosophical and cultural factors found in India were important to the development of zero as a mathematical concept, it would explain why other civilizations did not develop zero as a mathematical concept, said van der Hoek. George Gheverghese Joseph, the concept of zero first appeared in India around A. He developed a symbol for zero: An inscription on a temple wall in Gwalior, India, dates back to the ninth century, and has been considered the oldest recorded example of a zero, according to the University of Oxford. Another example is an ancient Indian scroll called the Bhakshali manuscript. Discovered in a field in , researchers thought it also had originated in the ninth century. However, recent carbon dating has revealed that it was probably written in the third or fourth century, which pushes the earliest recorded use of zero back years. Marcus du Sautoy, a professor of mathematics at the University of Oxford, said, "Today we take it for granted that the concept of zero is used across the globe and is a key building block of the digital world. But the creation of zero as a number in its own right, which evolved from the placeholder dot symbol found in the Bakhshali manuscript, was one of the greatest breakthroughs in the history of mathematics. The findings show how vibrant mathematics have been in the Indian sub-continent for centuries. According to Nils-Bertil Wallin of YaleGlobal , by , zero reached Baghdad where it became part of the Arabic number system, which is based upon the Indian system. A Persian mathematician, Mohammed ibn-Musa al-Khowarizmi, suggested that a little circle should be used in calculations if no number appeared in the tens place. The Arabs called this circle "sifr," or "empty. Al-Khowarizmi also developed quick methods for multiplying and dividing numbers, which are known as algorithms â€” a corruption of his name. Zero found its way to Europe through the Moorish conquest of Spain and was further developed by Italian mathematician Fibonacci, who used it to do equations without an abacus, then the most prevalent tool for doing arithmetic. Medieval religious leaders in Europe did not support the use of zero, van der Hoek said. They saw it as satanic. Everything that was not was of the devil," she said. Wallin points out that the Italian government was suspicious of Arabic numbers and outlawed the use of zero. Merchants continued to use it illegally and secretively, and the Arabic word for zero, "sifr," brought about the word "cipher," which not only means a numeric character, but also came to mean "code.

THE HISTORY OF ZERO pdf

Calculus paved the way for physics, engineering, computers and much of financial and economic theory. The numeral and concept of zero, imported from India, has manifested in various ways.

THE HISTORY OF ZERO pdf

6: Zero - Simple English Wikipedia, the free encyclopedia

Zero divided by a negative or positive number is either zero or is expressed as a fraction with zero as numerator and the finite quantity as denominator. Really Brahmagupta is saying very little when he suggests that n divided by zero is n /0.

For centuries, the power of zero savored of the demonic; once harnessed, became the most important tool in mathematics. Zero has journeyed through history as an Eastern philosophical concept and struggled to gain acceptance in Europe, and has become the apotheosis of the mystery of the black hole. Today, zero lies at the heart of one of the biggest scientific controversies of all time, the quest for a theory of everything For centuries together, the use of zero in numerical system has been quite controversial. Many theories have been formulated on this concept, with some even drawing comparisons between this symbol, and the Supreme Power, stating that the existence of this symbol is contentious and debatable just like God Himself. Do you know the history of zero - as to how it came into being? Of them, the contributions made by the Babylonians of Egypt and the Hindus of India are worth mentioning. The complex and sophisticated Sexagesimal base Positional numeral system of the Babylonian mathematics showed a gap in between the numerals to indicate a positional value or zero. In BCE, a punctuation symbol indicated by two slant wedges was used to fill the gap. The origin of this symbol evoked much speculation and conjectures among the Greeks, who were uncertain about the status of zero as a number. The paradoxes of Zeno of Elea Greek philosopher , or his philosophical examination and evaluation of the infinite, heavily depended on the doubtful interpretation of zero. It was only in India, during the early part of the 9th century, that the concept of zero gained significant importance and the digit was allotted a place in the numerical system. Even before the Indians began to use zero, several attempts were made to perceive it as a number and not merely a symbol. In this respect, the contributions made by the Romans can be cited, who denoted this symbol as nulla meaning nothing. To symbolize the digit zero, they made use of a small circle, and illustrations of this text can be still found in the Chaturbhuja Temple at Gwalior India. In these inscriptions, one can find a number of documents on copper plates, with a small zero in them. This symbol and the positional number system, developed by the scholars of India, were later introduced to the Islamic civilization by Al-Khwarizmi. In his book on arithmetic, Khwarizmi made his own contributions in providing significant explanation on the usage of zero. He also synthesized the information provided on zero by the Hindu and the Greek scholars. Though Khwarizmi had written his book earlier, it was only during the later years of the 12th century that his findings and the Arabic numeral system was revealed to the rest of the world, through Latin translations of his arithmetic. Later, Brahmagupta also elaborated on the rules for the use of zero in his book Brahmasputha Siddhanta The Opening of the Universe. In the 16th century, the Italian mathematician Fibonacci brought the Arabic numeral system to Europe and zero soon came into common usage all through the continent. Within some time, the digit came to be used extensively all over the world. Quite interestingly, it is impossible to imagine modern mathematics of today, without a zero!

7: 9/ Rebuilding of Ground Zero - HISTORY

A Short History of Zero How could the world operate without the concept of zero? It functions as a placeholder to correctly state an amount. Is it 75, , 75,, ,?

History of zero[change change source] The idea of zero was first thought about in Babylon , India and in Central America at different times. Some places and countries did not know about a zero, which may have made it harder for those people to do mathematics. In India, zero was discovered by the 7th century mathematician Bramhaguptha. Over hundreds of years the idea of zero was passed from country to country. The Europeans learned about zero from the Arabs , and the word is from the Arabic language. The place of zero as a number[change change source] Zero is almost never used as a place number ordinal number. This means that it is not used like 1, 2, or 3 to indicate the order, or place, of something, like 1st, 2nd, or 3rd. An exception to this is seen in many programming languages. Some other things about zero: The number zero is a whole number. The number zero is not a positive number. The number zero is not a negative number , either. The number zero is a neutral number. Any number divided by itself equals one, except if that number is zero. For example, when a person is counting down the time to the start of something, such as a foot race or when a rocket takes off, the count is: Zero is the exact time of the start of the race or when the rocket takes off into the sky. It means "courageous one" in hieroglyphics. Zero is a number which means an amount of null size; that is, if the number of your brothers is zero, that means the same thing as having no brothers, and if something has a weight of zero, it has no weight. If the difference between the numbers of pieces in two piles is zero, it means the two piles have an equal number of pieces. Before counting starts, the result can be assumed to be zero; that is the number of items counted before you count the first item and counting the first item brings the result to one. And if there are no items to be counted, zero remains the final result. While mathematicians all accept zero as a number, some non-mathematicians would say that zero is not a number, arguing that one cannot have zero of something. Others say that if one has a bank balance of zero, one has a specific quantity of money in that account, namely none. It is that latter view which is accepted by mathematicians and most others. Normally speaking, there was no year zero between 1 BC and 1 AD. More exactly, almost all historians leave out the year zero from the proleptic Gregorian and Julian calendars that is, from the normal calendar used in English-speaking countries , but astronomers include it in these same calendars. However, the phrase Year Zero may be used to describe any event considered so important, that someone might want to start counting years all over again from zero. In old-style fonts with text figures , 0 is usually the same height as a lowercase x. On the seven-segment displays of calculators, watches, etc. The four-segment 0 is not common. The number zero as in the "zero brothers" example above is not the same as the numeral or digit zero, used in numeral systems using positional notation. Successive positions of digits have higher values, so the digit zero is used to skip a position and give appropriate value to the preceding and following digits. A zero digit is not always necessary in a different positional number system. Something called bijective numeration is a possible example of a system without zeroes. The numerical digit zero[change change source] 0 zero is also used as a numerical digit used to represent that number in numerals. In the numeral 10, which stands for one times ten and zero units or ones. In the numeral , which stands for one times a hundred plus zero tens plus zero units. Telling zero and the letter O apart[change change source] The number 0 and the letter O are both round, so what is the difference? The difference is important on a computer. For one thing, a computer will not do arithmetic with the letter O, because it does not know that it should have been a zero. The oval-shaped zero and circular letter O came into use together on modern character displays. The zero with a dot in the centre seems to have begun as a choice on IBM controllers this has the problem that it looks like the Greek letter theta. The slashed zero, looking like the letter O with a diagonal line drawn inside it, is used in old-style ASCII graphic sets that came from the default typewheel on the well-known ASR Teletype. The rule which has the letter O with a slash and the zero without was used at IBM and a few other early mainframe makers; this is even more of a problem for Scandinavians because it looks like two of their letters at the same time. And yet another convention common on early line printers left zero without any extra dots or slashes but

added a tail or hook to the letter O so that it resembled an inverted Q or cursive capital letter O. A German licence plate showing zeroes The letters used on some European number plates for cars make the two symbols look different. This is done by making the zero rather egg-shaped and the O more circular, but most of all by cutting open the zero on the upper right side, so the circle is not closed any more as in German plates. FE Schrift , meaning "script which is harder to falsify". But those used in the United Kingdom do not make the letter o and the number 0 look different from each other, because there can never be any mistake if the letters are correctly spaced. In paper writing you do not have to make the 0 and O look different at all. Or you may add a slash across the zero in order to show the difference, although this sometimes causes mistakes in the number 0. Zeroes of a function[change change source] Functions are explained in the Function mathematics article. Zeroes of a function are used because they are another way to talk about solving an equation , which is a main goal in algebra. The right-hand side has to be zero, because we subtracted it from itself. Finding the zeroes of this function is the same as solving this equation. So if we could find zeroes of functions, we could solve any equation.

8: Zero History - Wikipedia

Hannah Fry explains how zero came about, from its origins in ancient civilisations, through the resistance it faced from the Roman numeral system, to being the cornerstone of calculus.

Neither did Pythagoras or Euclid or other ancient mathematicians. The Hindu number system developed in India. The value of a number could be determined by its place in a row of numbers: There was a row for 1s, a row for 10s, s, s, and so on. He was a scholar and worked in the House of Wisdom, a combination library, university, research lab, and translation service in Baghdad. At a time when the largest library in Europe contained far fewer than a thousand volumes, the Abbasids amassed a library believed to have held a million books. While working for the Abbasids in the House of Wisdom, al-Khwarizmi specialized in astronomy and mathematics. He spent most of his time finding useful real-world applications for mathematical concepts and explaining them in ways that reasonably-intelligent non-mathematicians could understand. Those Hindu numbers opened up a whole new world of mathematical possibility. The circle was the key: If this seems less than Earth-shaking, consider this: The Hindu system was based on the abacus, a counting device that some scholars say goes back B. The earliest versions used pebbles lined up in columns to represents 1s, 10s, s, s, etc. Later versions used beads strung on wires inside a frame. With this type of abacus, when you counted past nine, you flipped one bead into the 10s column and pushed the beads in the 1s column back to nothing. British mathematician Lancelot Hogben succinctly explained what was so amazing about the Hindu circle: The invention of sunya zero liberated the human intellect from the prison bars of the counting frame. That, in a nutshell, is the humble beginning of zero. But a circle used as a placeholder is only half of the story about nothing. He studied everything he could find about math from the ancient Greeks and others, and he began considering the existence of negative numbers, in particular what happens when you subtract a larger number from a smaller one. Something about the available literature bugged him. There was something missing. Everybody had figured out that the answer was Al-Khwarizmi gave zero its rightful place: He began using the round placeholder 0 as the missing number in calculations, and suddenly math with negative numbers worked. His zero also provoked heated philosophical discussions along the line of: It was called, fittingly, On the Calculation with Hindu Numerals. In his own words, it was to explainâ€¦ â€¦what is easiest and most useful in arithmetic, such as men constantly require in cases of inheritance, legacies, partition, lawsuits, and trade, and in all their dealings with one another, or where the measuring of lands, the digging of canals, geometrical computation, and other objects of various sorts and kinds are concerned. But it would take a surprisingly long time before his concepts spread beyond the Muslim world and into Europe. When the Roman Empire collapsed in A. As a young monk, Gerbert had traveled to Muslim-controlled Spain to study advanced science, astronomy, and mathematicsâ€”disciplines that had been virtually lost to the Western world. One man in particular was interested: Otto the Great, the Holy Roman Emperor. In Otto III, in his new role as emperor of the Holy Roman Empire, used his influence to get his former teacher elected to the papacy. Gerbert saw his election as an opportunity to introduce Arabic numerals into the Church, replacing those unwieldy Roman numerals. Born in Pisa to a wealthy Italian merchant around , Fibonacci is said to have been the best Western mathematician of the Middle Ages not that he had a lot of competition. As a young man, Fibonacci traveled enough to encounter other number systems being used in the West, including the awkward Roman numeral system still reigning in Europe. He returned to Pisa as an adult and, in , published Liber Abaci Book of Calculation to share the knowledge of how to use the Hindu-Arabic system in practical ways, including the conversion of measures and currency, allocation of profit, and the computation of interest. Italian merchants and bankers loved it. Soon most of them had switched over to the new system. For one thing, Fibonacci lived in the days before printing, so his books were hand written. If someone wanted a copy, it had to be copied by hand. The first one in English was The Crafte of Nombrynge, published around That book may have been read by one William Shakespeare, the first writer known to have used the Arabic zero in literature. I am better than thou art now, I am a Fool, thou art nothing. The zero appears on a Mayan stela a stone monument carved sometime between and A.

9: Who invented the zero? - HISTORY

The Mayans had several calendars. There was a day civil year, a day religious year and, key to their invention of zero, the complicated Long Count calendar which measured time from the start of the.

The symbol for the number zero is "0". Arithmetic with zero Adding a number to zero results in that number. For example, adding zero to three gives three. For example, subtracting zero from three gives three. For example, multiplying forty-three by zero gives zero. For example, dividing zero by forty-three gives zero. Zero divided by zero has no answer. History of zero The idea of zero was first thought about in Babylon , India and in Central America at different times. Some places and countries did not know about a zero, which may have made it harder for those people to do mathematics. Over hundreds of years the idea of zero was passed from country to country. The Europeans learned about zero from the Arabs. The place of zero as a number Zero is almost never used as a place number ordinal number. This means that it is not used like 1, 2, or 3 to indicate the order, or place, of something, like 1st, 2nd, or 3rd. An exception to this is seen in many programming languages. Some other things about zero: The number zero is a whole number. The number zero is not a positive number. The number zero is not a negative number , either. The number zero is a neutral number. Any number divided by itself equals one, except if that number is zero. For example, when a person is counting down the time to the start of something, such as a foot race or when a rocket takes off, the count is: Zero is the exact time of the start of the race or when the rocket takes off into the sky. It means "courageous one" in hieroglyphics. Zero is a number which means an amount of null size; that is, if the number of your brothers is zero, that means the same thing as having no brothers, and if something has a weight of zero, it has no weight. If the difference between the numbers of pieces in two piles is zero, it means the two piles have an equal number of pieces. Before counting starts, the result can be assumed to be zero; that is the number of items counted before you count the first item and counting the first item brings the result to one. And if there are no items to be counted, zero remains the final result. While mathematicians all accept zero as a number, some non-mathematicians would say that zero is not a number, arguing that one cannot have zero of something. Others say that if one has a bank balance of zero, one has a specific quantity of money in that account, namely none. It is that latter view which is accepted by mathematicians and most others. Normally speaking, there was no year zero between 1 BC and 1 AD. More exactly, almost all historians leave out the year zero from the proleptic Gregorian and Julian calendars that is, from the normal calendar used in English-speaking countries , but astronomers include it in these same calendars. However, the phrase Year Zero may be used to describe any event considered so important, that someone might want to start counting years all over again from zero. In old-style fonts with text figures , 0 is usually the same height as a lowercase x. On the seven-segment displays of calculators, watches, etc. The four-segment 0 is not common. The number zero as in the "zero brothers" example above is not the same as the numeral or digit zero, used in numeral systems using positional notation. Successive positions of digits have higher values, so the digit zero is used to skip a position and give appropriate value to the preceding and following digits. A zero digit is not always necessary in a different positional number system. Something called bijective numeration is a possible example of a system without zeroes. The numerical digit zero 0 zero is also used as a numerical digit used to represent that number in numerals. In the numeral 10, which stands for one times ten and zero units or ones. In the numeral , which stands for one times a hundred plus zero tens plus zero units. Telling zero and the letter O apart The number 0 and the letter O are both round, so what is the difference? The difference is important on a computer. For one thing, a computer will not do arithmetic with the letter O, because it does not know that it should have been a zero. The oval-shaped zero and circular letter O came into use together on modern character displays. The zero with a dot in the centre seems to have begun as a choice on IBM controllers this has the problem that it looks like the Greek letter theta. The slashed zero, looking like the letter O with a diagonal line drawn inside it, is used in old-style ASCII graphic sets that came from the default typewheel on the well-known ASR Teletype. The rule which has the letter O with a slash and the zero without was used at IBM and a few other early mainframe makers; this is even more of a problem for Scandinavians because it

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