1/5 to the 4th power

The notion of logarites arose from the powers of numbers. If the properties of the forces are familiar to you, you can quickly skim through the material below. If not- well, here are the details. The forces of the number are produced by multiplying it by itself. For example, 2.2 can be written 22 Two squares or 2 to 2nd power 2.2.2 and 23 . Two cubes or 2 to 3rd power 2.2.2.2 and 24 Two to 4th power or just 2 to 4th. 2.2.2.2 25 Two to 5th power or just 2 to 5th 2.2.2.2.2 and 26 Two to 6th power or just 2 to 6th and so on... The superscript number is known as the exhibitor. Special titles for square and cube come because side 2 square has an area of 22 and the side 2 cube has a volume of 23. Similarly, the square side of 16.3 has an area (16.3)2 and the 9.25 side cube has a volume (9.25)3. Pay attention to the use of braces - they are not absolutely necessary, but they help clear that rises to second or third power. Fast quiz: Greek pythagoras showed (about 500 BC) that if (a,b,c) are the lengths of the sides of the right-angle triangle, with the c longest, then a2 q b2 q c2 In a triangle at right angles, a 12, b 5. Can you guess c? What's more --23 or 32? 27 or 53? A small modification of the old puzzle goes: As I walked in St Ives I met a man with seven wives Each wife had seven bags Each bag had seven cats Each cat had seven sets of kits, a cat, a man, a wife - how much of St. Ives? All this includes powers 7: Man - 70 1 wife - 71 and 7 bags - 72 th 49 (but they are not part of the count) Cats - 73 and 343 Kits - 74 2401 Total: 1 No 7 343 2401 and 2752 As noted it's slightly altered from the original puzzle, which asks: How many of them were going to St Ives? The answer, of course, is only one, man telling the riddle. Many listeners, however, are distracted by many details, given skip the difference and perform a higher calculation. Their answer is wrong then! The famous Indian mathematician Ramanujan fell ill in the hospital (tuberculosis, probably) when he was visited by his friend mathematician G.H. Hardy, who had previously invited him to England. Hardy later said: I remember once going to see him when he was sick in Putney. I went to taxi number 1729 and noticed that the room seemed to me rather boring and that I was hoping it wasn't an unfavorable omen. No, he replied, it's a very interesting number; it's the smallest number, you can express it as a sum of two cubes in two different ways. Cuba is the third force. What is it, in this example? Try to guess, the choice is limited. Note that (23). (22) 25, since the first term contributes to three factors 2, and the second term contributes two - together, 5 multiplications by 2. The same will happen if 2 is replaced So if that number is represented x we get (x3). (x2) x5 and in general (since there is nothing special about 2 and 3 that will not hold for other whole numbers) (xa). (xb) x (a'b), where a and b are whole numbers. The most widely used powers on all numbers, for users of the decimal system, of course, those of 10,101 and 10 (ten) 102 and 100 (hundreds) 103 and 1000 (thousand) 104 and 10,000 (ten thousand)) 105 and 100,000 (hundreds) 106 and 1,000,000 (million) please note that here the power index also gives a number of zeros. For the big numbers, before that in the U.S. 109 and 1,000,000,000 was named a billion, while in Europe it was called a billion, and had to move to 1012 to reach a billion. These days, the U.S. convention is gaining momentum, but the world is still divided between countries where the comma denotes what we call a decimal point, while the dot divides a large number, for example, 109 and 100,000,000 (in the U.S. commas will be used). It should also be noted that some cultures have named some other forces 10 - for example, the Greeks used the myriad for 10,000 while the Jewish Bible called it r'vavah, and in India Lakh still means 100,000, while the crore is 10,000,000. A 9-year-old in 1920 coined the name Googol for 10100, but the word found little use for inspiring the name of a search engine on the world wide web. Thus, very similar to the above, we can write (25) / (22) 23, because the separation of power 2 into some smaller power means the abolition of the numerator a number of factors equal to those in the denominator. Writing it in detail (2.2.2.2.2) / (2.2) and 2.2.2 Here too number, raised to higher power should not be 2 - again, mark it x-- and the power should not be 5 and 2, but there may be any two whole numbers, say a and b: (xa) / (xb) x (a-b) Here however a new spin is added, because subtraction can also give zero, or even negative numbers. Before you explore this direction, it helps to chart a common course to follow. Back in the dim beginning of mankind, numbers simply meant positive whole numbers (whole numbers): one apple, two apples, three apples... Simple factions were also found useful - 1/2, 1/3 and so on. Then a zero was added, originally from India. The negative numbers were then given full status - instead of treating subtraction as a separate operation, it was reconstrued as adding a negative number. Similarly, each x integrator was the reverse number (1/x) (many calculators have a 1/x button). In ancient Egypt, 5,000 years ago, these were the only recognized factions, and so they are still sometimes called Egyptian factions. When the Egyptian of that time wanted to express 3/4, he was presented as (1/2 and 1/4). Sometimes you need long expressions, such as 99/100, 1/2, 1/4, and 1/25, but it always worked. Worked. The ancient Greeks went further and defined as a rational number (or logical numbers - rational derived from Latin) any multiple such reverse, such as 4/13, 22/7 or 355/113. Rational numbers are dense: no matter how close the two of them are to each other, it is always possible to place another rational number between them - for example, half of their sum is one choice of many. Tithing fractions that stop at some length are rational numbers too, although decimal fractions having infinite length, but with a repetitive pattern (0.33333..., 0.575757... etc.) can always be expressed as rational fractions. Therefore, Greek philosophers in the early days of mathematics were surprised that, despite this density, some additional numbers can still hide between rational and cannot be represented by any rational number. For example, √2 of this class, the number of which is 2. Most of the square roots and solutions of equations are as similar as π, the ratio between the circumference of the circle and its diameter (denoted by the Greek letter pi). Pi has a fair approximation at 22/7 and a much better one at 355/113, but its exact value can never be represented by any faction. Mathematicians view all previous types of numbers as a single class of real numbers. Logarithms positive numbers are real numbers, too. When one writes 2 and 100.3010299. so 0.3010299. - Log 2 (the dots are an irregular sequel) treats it as 10, raised to a power that is a real number. Previously, the powers were integrators, denoting at some time a number multiplied on itself. Therefore, in order for the above expression to become meaningful, the concept of increasing the number to some capacity where any real number can be a power index needs to be summarized. It's all whole numbers: 101 and 10 so magazine 10 - 1,102 - 100, so magazine 100 - 2 103 - 1000, so magazine 1000 and 3 104 and 10,000 so magazine10,000 4 105 - 100,000, 100,000, so the magazine is 100,000 and 5,106 - 1,000,000, so the magazine 1,000,000 and 6 These logarithms also meet the rules that we found (xa). (xb) - x (a'b) So if x-10 U (10a) V (10b) W (10(a'b)- U.V. a'b) - W magazine we have logV and magazine U (U.V) This ratio has whenever you and V are the powers of 10: logarithm product amount is logarithms. as demonstrated in the review in the previous section. As the concept of logarite expands, this property always remains. This is what originally made logarithms useful: the conversion of multiplication in addition. Instead of multiplying you and V, we only need to add their logarithms and then look for a number whose logarithm equals that amount: it will be a product (U.V). Similarly, (xa) / (xb) x (a-b) (a-b) if x 10, U (10a) V (10b) W (10(a-b)) - U/V, then in division we have logU - logU and journal (U/V) or logarith coefficient - is the difference between logarites of divided numbers, for example, 107 / 104 and 103, which agrees with 7 - 4 3. Separation, however, opens up a new territory: under the same rule, for example, 1040 / 1043 - 10-3 - 0.001 and 104 / 104 - 100 - 1, because the number divided by itself should equal 1. Indeed, this is consistent with the rule, adding or subtracting 1 to logarithm moves its number one decimal to the right left. Earlier 106 = 1,000,000 so log 1,000,000 = 6 105 = 100,000 so log 100,000 = 5 104 = 10,000 so log10,000 = 4 103 = 1000 so log 1000 = 3 102 = 100 so log 100 = 2 101 = 10 so log 10 = 1 and now this can be extended, dividing by 10 at each step 100 = 1 so log 1 = 0 10–1 = 0.1 so log 0.1 = –1 10–2 = 0.01 so log 0.01 = –2 10–3 = 0.001 so log 0.001 = –3 10– 4 = 0.000 1 so log 0.000 1 = –4 10–5 = 0.000 01 so log 0.000 01 = –5 10–6 = 0.000 001 so log 0.000 001 = –6 The above demonstrates another property of logarithms: Log (VQ) = Q log V For the special case V = 10 LogV No. 1 The number with which scientists work is sometimes very small or very large. Then it is convenient (for calculation, as well as for the application of logarithms) to divide the number into two parts - the number from 1 to 10, giving its structure, and the power of 10, giving a value. An electric charge, for example, is measured in pendants: about one pendant flows every second through a 100-watt light bulb. This current is carried out by a huge number of tiny negative particles found in any atom known as electrons. Each electron carries a charge of q 1.60219 10-19 pendant If it were written as a decimal fraction, the expression would take about half a line, with 18 zeros after the decimal point in front of significant numbers - and a quick look at it wouldn't give much information, still would have to count zeros. The mass of the electron is also small m 9.1095 10-29 kg Scientific notation makes it easier to write such numbers. Another example is the speed of light, as the decimal number (accuracy to 6 digits) 299,792,000, in scientific notation c 2.99792 108 meters/second Scientific notation also makes multiplication and division easier and less prone to errors. One multiplies or divides separately numerical factors, each of which is from 1 to 10, and usually sees at a glance if the result has the correct range of magnitude. Separately, one adds together all the power exhibitors of multiplied factors, and subtracts those of the separated ones, in order to obtain the 10 room power that then appears in scientific notation. Of course, in any calculation, you need to use sequential units - it's do not do to mix meters and inches, or pounds and grams (such inconsistent use apparently led to an error that caused the space probe to Mars to miss the planet and get lost). The most common sequential system in physics and technology is the MKS system, measuring distance in meters, mass in kilograms and time in seconds. All other units are determined by the choice of these three standards, and as long as one remains in the MKS system, the results correspond to the units of that system too (for example, if the energy is calculated, it always goes out in the joules). The electrons of the aurora (Northern Lights) travel at a speed of about 1/5 speed of light, in the B magnetic field, which near the Earth is about 5 10-5 Tesla (Tesla is a block of MKS magnetic field: at the pole of an iron magnet you get about 1 Tesla). The magnetic field causes the electron to spiral around the direction of magnetic force (magnetic field line) with a radius of r q mv/(qB), where v is part of the speed perpendicular to direction B. If the component perpendicular to B is half the total speed (i.e.c/10), what is r? We have m 9,1095 10-29 kg v 2.99791 107 m/s (0.1 g) q 1.60219 10-19 pendant B and 5 10-5 Tesla Gathering of all numerical factors, and rounding up 3 decimal marks (9.11). (3.00)/q (1.6). (5) - 3.42 Gathering of all exhibitors (- 29'7) - (-19 - 5) - (-22) - (-24) - No. 2 Radius, This is the order of the radius of a very thin aurora beam visible from the ground.