

# Math mayan calendar essay

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The Mayan Calendar is a system of calendars in Pre-Columbian Mesoamerica, in modern communities in highland Guatemala, in Veracruz, Oaxaca, and Chiapas, Mexico. The calendar is filled with mathematics and a huge math system, but it is not exactly like the math system we use today. The math system hidden inside the Mayan Calendar is called the Vigesimal System. How does the Vigesimal System work? The numbers represent what symbols in the math system? These things have been in the question a long time we still are studying the Mayan Calendar to this day; which was made approximately 5, 000 years ago. The Vigesimal System began by the people in the Mayan civilization counting on their fingers and toes. Since we have ten toes and ten fingers which equals twenty, so instead of having the base unit as ten, the count was done with a base twenty system. The System goes by twenty units for example it goes 1, 20, 400, 8000, 16000, etc. While the Decimal system goes by ten units so it goes: 1, 10, 100, 1000, 10000, etc. This means it has twenty possible digits for a placeholder [0-19], while the decimal system we use today only has ten possible digits for a placeholder [0-9].

So the numbers 3, 30, and 300 would be represented as three, then three times twenty, then three times twenty times twenty, or simply three times four-hundred, which is twenty squared. So in Mayan math, the number 123 doesn't mean you have one 100, two 10's, and three 1's, rather it means you have one 400, two 20's, and three 1's (which in our mathematical system that would be 443). So say we want to set up an equation and we set thirty-one equal to something and we used the Vigesimal System, it would look like this:  $31 = 20 + 11$ , and this is because this mathematical system goes by

twenty units. The Mayan math makes it so instead of positions having a ten-fold, it actually has a twenty-fold. So the positioning system has it so the higher places get multiplied by twenty's instead of ten's. Even though it seems like twenty is the only number that the Vigesimal System deals with, it is not, the number five also has a big role. This is because on each side of our hand and toes we have five fingers and toes. The number five is a multiple of the twenty base unit system, so that adds on to the number five's significance.

Located inside this big mathematical system you only find three symbols for all the numbers. These symbols once again are based on the fact that the Vigesimal System is based on twenty units [0-19]. The three symbols are the dot, bar, and the shell. The dot-worth one unit, the bar- worth five units, and the shell- symbolizes the zero. The zero was actually founded by the Mayan people while in the process of making the Mayan Calendar and is one of the most important numbers that were ever distinguished. These symbols can be combined to represent any number. This Chart below is going to show how the symbols are used to represent the twenty placeholders [0-19]: When you use the Vigesimal System there is a rule that only the higher places get multiplied by twenty's instead of ten's in the Decimal System we use. In the table below the number 168, 421 is going to be compared in the terms, it would be expressed between the Decimal System and the Vigesimal System.

When writing the numbers they can be written vertically or horizontally, When you write in vertical writing the bar that is worth five units is placed horizontally with a dot worth one unit on top of the bar. When writing them vertically they grow from the base up. With the horizontal writing, the bar is

placed vertically and the dots go to their left and higher positions grow left of the first entry. When writing vertical, to write a twenty a zero is placed in the first position (base) with a dot on top of it in the second position. The dot in this situation means one unit of the second order which will equal twenty. To write twenty-one the zero would change to a dot and the subsequent numbers the original 19 counts will be in the first position. As in turn, they reach 19 again they get another dot is added to the second position.

Any number higher than nineteen units in the second position is written using units in the third position. All units of the third position are always worth twenty times twenty, 400. To write the number 401 a dot would go in the first position, a zero in the second position, and a dot would go in the third position too. The numbers even higher than the third position would be multiplied by twenty again. The chart shown below shows an example of the "Mathematical Count": Like any other thing the "mathematical count" does have one exception, it is called the "calendric count" which is when they give the third position a value equal to 360 instead of 400, but the higher positions follow the regular pattern, being multiplied by twenty. The Mayan Long Count inside the Mayan Calendar is another thing that evolves around the Vigesimal System, so it is based around the twenty units. The first position counted single days, called "k' in". The second position is called the "uinal, which is equivalent to twenty "k' in". The twenty "uinal" does not equal the third position; it makes an 18-fold jump instead so that 100 or "tun" in the calendar represents eighteen times twenty or 360 days. That is slightly over 365 days which is the number of days we have in a year.

This then makes a twenty-fold jump increase, so 1000 or one “ k’atun” is expressed by the value  $20 \times 18 \times 20, 7, 200$  days; which is a little less than twenty years. The next position is expressed by  $20 \times 20 \times 18 \times 20, 144, 000$  days which equals one “ b’ak’tun”, a little less than 400 years. When using the Decimal System, they go as high as 9, but in the Vigesimal System, they can go all the way up to 19. So mathematically when we write Mayan numbers we use decimal points to show each digit’s position. We write 1. 17. 19 to represent the Mayan number that equals one “ tun” (360 days), plus seventeen “ uinal” (20 days), plus nineteen “ k’ in” which has a total of 719 days. The Mayan Long Count only reached 12. 19. 19. 17. 19 on December 20th. The way the Mayan people made this calendar with the Vigesimal System was one of the most incredible things ever. Them using the twenty based systems has made a lot of research been done to investigate the math held inside the Mayan Calendar. Being able to use math 5, 000 years ago has shown some determination and intelligence. The math held inside this Mayan Calendar may have made the whole world change, and the mathematics of the Vigesimal System hidden in the Mayan Calendar has shown how math can change the world. It also shows how math is used in everyday life and how if people were not using math a lot of things would not be here to this very day and it shows multiple ways math affects people in their everyday life.