

Number Mysticism

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Abstract

Numbers are an important concept in the everyday world. Although individuals may not think critically about numbers in their everyday lives, many individuals still place importance on certain numbers without knowing they are doing so. Some numbers may not have the typical mystical quality, but rather are important because of the historical background attached to the number. One such number is the number $\sqrt{2}$. Other numbers are important facets of one's life based on the qualities that they are believed to possess. Numbers themselves are deemed to have characteristics that make them distinguishable from other numbers. With the rise of numerology, such numbers as 666 have become significant with the biblical references attached to the number. Modern number superstitions, such as those involving the number 7 and the number 13, also have historical roots comparable to $\sqrt{2}$. These two numbers have maintain prominence in today's society because of the background and superstition attached to these numbers.

1 Introduction

Numbers are used in our everyday world for many things. Although numbers are used to count and measure, they often have meanings, or "inwardnesses" [3] (p 1). Some numbers are considered magical and often a reification of the number will occur. These numbers are given qualities and characteristics that persistently remain as a part of the description of that number. Some numbers were given positive or negative descriptions based on their historical or biblical backgrounds.

One number considered of great importance, based of its historical background, is $\sqrt{2}$. The significance of this number is derived from Pythagoras and his well known theorem, the Pythagorean theorem. This theorem states that $a^2 + b^2 = c^2$. Pythagoras was the founder of the Pythagorean society, which was a very intellectual, secretive brotherhood that was concerned and interested in the meaning and sanctity of numbers. To this society, mathematics was fundamental to life and reality. When the Pythagorean theorem was discovered by Pythagoras, naturally solutions to the theorem followed. Ultimately, the $\sqrt{2}$ emerged as an answer to this theorem. This number caused great confusion for the brotherhood, as the $\sqrt{2}$ was not a whole or rational number. These whole and rational numbers were the foundation of the society, which emphasized numbers that were harmonious to the soul. Since $\sqrt{2}$ was irrational, the society attempted to keep its discovery a

secret. One version of this story states that when a brother of the society disclosed the irrational number, he was forced to leave the society. His death soon followed in a ship accident, and the society believed that his death was punishment for disclosing the irrational number, $\sqrt{2}$.

Since Pythagoras was very concerned with the mysticism of numbers, he is often linked to the concept of numerology. The Pythagorean society originally believed that certain numbers possessed specific qualities. This concept was the notion of giving nonnumeric descriptions to numbers. Thus the foundation of numerology. Numerology is the process of relating numbers to alphabetic letters and other objects, then attaching certain beliefs and characteristics to that number. Numerology involves the process of digital rooting, which will later be explained in section 3. The single digit that evolves from digital rooting embodies its own description, and therefore the object or letter related to that number also embodies that description [10].

The foundation for the significance of the number 666 is often based on this numerology concept. Primarily many see the number as one associated with biblical references and apocalyptic meanings. With further investigations, a Bible verse states that the 666 is affiliated to a person who is more commonly known as the Antichrist. Using the numerology process, public figures such as Ronald Reagan are linked to this apocalyptic number [9].

Other modern superstitious numbers, like the number seven and thirteen, have manifested throughout history and have been able to maintain their characteristics of mystical and powerful meaning. The number seven is associated with many events through history. This number is connected to the creation of the world, along with other religious items such as the seven deadly sins and the seven virtues. The mysticism related to the number thirteen is attributed to its folklore background. This story is related to having 13 dinner guests at the dinner table. Lastly, the number 13 is focused on in relation to the Last Supper, where there are thirteen participants at the last supper with Jesus.

2 Pythagorean History

Pythagoras was born around 580 BC. He was a Greek philosopher that helped progress and advance subjects such as mathematics, astronomy, and the theory of music [1]. Research has shown that Pythagoras was most likely the student of Thales of Miletus, who lived around 624 to 548 B.C. Under Thales of Miletus leadership, Pythagoras attained much of the mathematical knowledge that he would learn. Pythagoras and Thales of Miletus traveled around the world, visiting such places as India and Brittany. Most of the intellectual knowledge Pythagoras attained would be through his voyages, learning mathematical tools from the Egyptians and the Babylonians.

After twenty years of traveling and obtaining knowledge from other cultures, Pythagoras turned to the idea of teaching. He journeyed back to his native land of Samos with the intention of beginning a school that would be committed to mathematics and devoted to philosophy. Initially, Pythagoras had difficulty inviting students to the school, with the political environment in Samos not apt to a growing intellectual atmosphere. Eventually, Pythagoras offered a student payment to enter the school. To measure the student's will to learn, Pythagoras stopped payment to the student and told him that he would have to cease all lessons. The student, having gained enthusiasm for learning, volunteered to pay for his education. This student was the Pythagoras's first disciple,

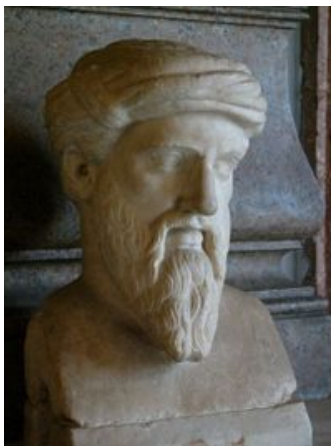


Figure 1: Bust of Pythagoras [13]

and thus began the Pythagorean school. Due to the political reforms on the island of Samos, Pythagoras and his disciple were forced to flee. They sailed to Italy and settled in the town of Croton. There, Pythagoras became acquainted with Milo, one of the richest men in the city. Knowledge of Pythagoras had traveled to Croton, but with the advocacy of Milo, the Pythagorean Brotherhood was founded and was able to flourish [7].

This brotherhood was a group of individuals very involved with learning, meditation and studying. The use of numbers was very important to this society, but they depended on numbers for more than just arithmetic. This brotherhood was a group of 600 disciples that were able to create new ideas and proofs with Pythagoras. To become accepted as a disciple was very difficult. Only the most brilliant were accepted in the society. The Brotherhood was an egalitarian society, where women and men were both admitted. There were two stages an individual had to pass to be considered a member of this secretive society. First, one had to show that they were capable of silence. Pythagoras was more interested in the disciple's silence than what he had to say. Secondly, the individuals endured lessons given by Pythagoras. The classroom was divided by a curtain, in which Pythagoras was on one side and the candidates sat on the other side. The applicants could not see Pythagoras, but only hear his teachings. This test lasted five years. Once a candidate successfully passed Pythagoras's test, he or she was allowed to cross the curtain to Pythagoras's side. [7].

This society was very secretive with all communication written with double meaning. This communication could not be understood by all in the society, with only the inner circle of the society able to translate what was being said. All mathematical and philosophical thought was transmitted orally so that no written trace existed. Each member of the society had to increasingly use their memory abilities to preserve the secrecy of their brotherhood. The society governed themselves with very strict rules of conduct. Members that lived at the school called themselves the *Mathematikoi*. On becoming a member, the disciple had to donate all of his belongings to the society and required to assume a vegetarian diet. There were other students who did not live at the school but were still permitted to attend. These members called themselves the *Akousmatikoi*. They were allowed to keep their belongings and permitted to eat meat [7].

The society had high standards of conduct and abided by many rules. There were certain statements

that the society adhered to as fundamental to each individual's existence in the Brotherhood. These were :

1. reality is fundamentally mathematical
2. philosophy can lead to spiritual purification
3. the soul can rise to union with the divine
4. certain symbols have mystical significance
5. all members of the order should observe strict loyalty and secrecy [12] (p 259).

Pythagoras's death occurred around 500 BC. The story of his death begins with mutiny that broke out in 510 BC in the neighboring city of Sybaris. This uprising manifested during the sixty-seventh Olympic games. The leader of the mutiny, Telys, persecuted the citizens of Sybaris who did not follow his rule. These citizens fled to Croton to take refuge, but Telys demanded that these citizens be brought back to Sybaris and be punished. Milo and Pythagoras convinced the citizens of Croton to resist Telys and protect those that had fled. Telys was furious and gathered an army of 300,000 men and marched to Croton, which attempted to defend the city with only 100,000 men. After seventy days of war, the city of Croton won and enacted vengeance on Telys by flooding the city of Sybaris. After the war in Croton, the city was divided over how to distribute the loot that materialized from the war. Fearing that the Pythagorean elite would take over, the people of the city began to resent the society. Led by Cylon, one of the rejected applicants to the school, the school was set on fire and burnt down. Pythagoras, and many of his followers, were said to be inside the school and died in the fire [7]. Another version of this story suggests that Pythagoras did escape this horrendous fire and committed suicide after this attack on the school[12].

2.1 Mysticism of Numbers

The mysticism of numbers started in ancient Greece in the sixth century B.C. with Pythagoras. Pythagoras said "all is number" after making the discovery that the sum of odd numbers starting at 1 is square.

$$1 + 3 = 2^2, \quad 1 + 3 + 5 = 5^2, \quad 1 + 3 + 5 + 7 = 4^2 \dots$$

This discovery so awed Pythagoras that is he commenced examination of the mysticism and abilities of numbers. Since then, Pythagoras was often considered "number-mystical" [3] (p 13).

Odd numbers were considered to have a male quality while even numbers possessed the female characteristic. There were ten fundamental opposites in this society, since ten was considered a holy number to the society. This can be seen in Figure 2.

$$10 = 1 + 2 + 3 + 4$$

Some of these opposites included odd and even, limited and unlimited, one and many, masculine and feminine, rest and motion, straight and crooked, light and darkness, good and evil, right and left, and square and oblong [3].

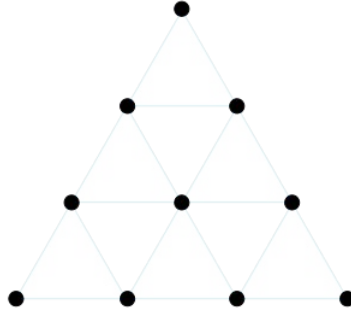


Figure 2: Tetractys [17]

There were also other qualities that numbers could possess. The core of number mysticism is the concept of giving nonnumeric attachments to numbers. The number one was associated with intellect and moral wisdom. This number is the origin and all numbers follows from it [3]. It had added strength and stature because this number was not able to be divided by any other number [9]. Below is a table of other associated meanings that the Pythagorean society attached to numbers [3].

Number	Associated Meaning
1	Reason
2	Opinion
3	Harmony
4	Justice
5	Marriage
6	Creation

The number five was associated with marriage because of the fact :

$$5 = 2 + 3.$$

The number 2 is the first female number while the number 3 is the first male number. The number six was also thought of very highly by the society. Six is the first perfect number. A perfect number is defined as “an integer which is the sum of its proper positive divisors, that is, the sum of the positive divisors not including the number” [1] (p 119). The cause of the number six being considered so unique was that if all integers are divided into triads, starting from 1, the number six eventually evolves from the following equations [3]. The first triad is :

$$1 + 2 + 3 = 6$$

This equation is equal to 6. The second triad is :

$$4 + 5 + 6 = 15$$

This second triad is equal to 15, but after summing the solution’s two digits of 1 and 5,

$$1 + 5 = 6$$

the number 6 does evolve. Keeping with the same method, the next triad is

$$7 + 8 + 9 = 24$$

and by adding the solution's digits,

$$2 + 4 = 6$$

6 evolves yet again. Finally, the next triad is

$$10 + 11 + 12 = 33$$

If the solution's digits are again added, one gets

$$3 + 3 = 6$$

which is equal to 6.

2.2 The Square Root of Two, $\sqrt{2}$

Pythagoras's believed, "God in number; number in God" [4] (p 193). With numbers so important to the Pythagorean society, opposition to their beliefs offered much confusion. The essence of this confusion is one of Pythagoras's most significant accomplishments during his life of mathematics. This was his Pythagorean theorem. Pythagoras is often credited with the discovery of the theorem which states that "in a right-angled triangle the area of the square whose side is the hypotenuse (the side opposite the right angle), c , is equal to the sum of the areas of the squares of the other two sides, b and a " [12] (p 261). That is,

$$a^2 + b^2 = c^2$$

Many mathematicians have proved this theorem. This theorem is shown, proved algebraically :

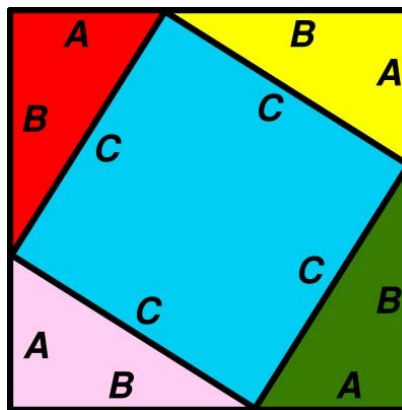


Figure 3: Pythagorean Theorem Proof [15]

$$\begin{aligned}
length &= a + b \\
area_1 &= (a + b)^2 \\
area_2 &= \frac{1}{2}ab \cdot 4 + c^2 \\
area_1 &= area_2 \\
(a + b)^2 &= 4 \cdot \frac{1}{2}ab + c^2 \\
a^2 + 2ab + b^2 &= 2ab + c^2 \\
a^2 + b^2 &= c^2
\end{aligned}$$

The most significant outcome and consequence of the Pythagorean theorem is “the incommensurability of the diagonal and the side of the square” [12] (p 261). Thus confusion was created with the discovery of an irrational number, the $\sqrt{2}$. The proof that shows that the $\sqrt{2}$ is indeed irrational is as follows.

Assume $\sqrt{2}$ is rational.

$$\begin{aligned}
\sqrt{2} &= \frac{p}{q} && \text{where } q \neq 0 \text{ and } p, q \text{ have no common divisors} \\
2 &= \frac{p^2}{q^2} \\
2q^2 &= p^2
\end{aligned}$$

Therefore, $2q^2$ is even, which means p^2 is even. If it is true that p^2 is even, p is even. Therefore,

$$\begin{aligned}
p &= 2k && \text{for some } k \\
2q^2 &= 2k^2 \\
&= 4k^2 \\
q^2 &= 2k^2
\end{aligned}$$

This means that q^2 and q is even. This contradicts our assumption that p and q have no common divisors. Must be true that $\sqrt{2} \neq \frac{p}{q}$.

Research states that Pythagoras or one of his followers may have discovered this irrational solution to the Pythagorean theorem while working with an isosceles right triangle [4]. When the Pythagoras first learned of this solution, he was distraught with the idea of a irrational number and attempted

to keep it a secret. One version explains when one member named Hippasos attempted to disclose the society's secret, the $\sqrt{2}$, he was banned from returning to the society. After Hippasos left the society, his death soon followed in a ship accident. This accident, as Pythagoras acknowledged afterward, was God's sentence for what he had done [12].

The $\sqrt{2}$, being an irrational number, was a very significant number to the society. The Pythagorean society made numbers the chief foundation of their philosophy and their system of holiness and purity that they maintained. The rules that the society adhered to were immersed with mysticism of numbers. These numbers helped each member of the society maintain harmony with oneself. They sought "the origin of all things in number" [4] (p 193). The society wanted to keep $\sqrt{2}$ a secret because it involved the destruction of their system's foundation. "The Pythagoreans regarded the discovery as one of the greatest of antiquity and made it a point to guard the discovery carefully" [4](p 194). The Pythagorean society regarded numbers as fundamental to existing objects in life. Numbers were behind everything that occurred. To acknowledge the $\sqrt{2}$ meant the acknowledgement of the collapse of their foundation of life.

3 Numerology

Since the introduction by Pythagoras and the Pythagorean society, number mysticism has remained prevalent throughout modern society. Attaching human characteristics to numbers is a important part of number mysticism, and is the foundation of the now modern concept of numerology. There is not one person accredited for the invention of the term "numerology," but this concept has grown increasingly popular with the success of astrology.

On the surface it would appear that some numerologists attempt to discover much significance from the method of numerology. Although many do not believe numerology to be an authentic mathematical method, it is slowly becoming accepted into dictionaries and library systems. The father of numerology, Pythagoras, said that although numerology was not a specific mathematical theory, he still considered it a love of numbers [6].

Numerology refers to "any of many systems, traditions or beliefs in a mystical or esoteric relationship between numbers and physical objects or living things" [10] (p 15). In modern numerology, each number, 1 through 9, encompass a specific quality or characteristic. To begin the process of numerology, each letter of the alphabet is represented by a specific number. This table shows the numerical value given to each letter in the alphabet. Most numerologists often only utilize the numbers 1 through 9 [10].

A to I	J to R	S to Z
A = 1	J = 1	S = 1
B = 2	K = 2	T = 2
C = 3	L = 3	U = 3
D = 4	M = 4	V = 4
E = 5	N = 5	W = 5
F = 6	O = 6	X = 6
G = 7	P = 7	Y = 7
H = 8	Q = 8	X = 8
I = 9	R = 9	

The above will be referred to as the Numerical Value Per Letter Table [10].

The process of numerology includes the representation of each letter of the alphabet to a specific number and another method called digital rooting. Digital rooting is where one adds all digits given to obtain a sum; the digits of this sum are then added together to create a new digit. This continues on until a single-digit number is reached. This one digit then signifies it's own character traits [10]. For example, the numbers 333, 33, and 3 are given together. Using the digital root process :

$$333 + 33 + 3 = 369$$

One then adds the sum's digits 3, 6 and 9 together.

$$3 + 6 + 9 = 18$$

To finish, one would add the digits 1 and 8.

$$1 + 8 = 9$$

The digital root of the numbers 333, 33, and 3 then is 9.

Numerologists often utilized their methods on names. By giving each letter of the name a singular number, then using the digital rooting method with these numbers, numerologists are able to to associated the digital root of the name to certain characteristics. For example, let's examine the name John Doe. First, each letter is assigned to a numerical value, using the Numerical Value Per Letter table from above [6].

J	O	H	N	D	O	E
1	6	8	5	4	6	5

Continuing on with the digital root process, one adds together all the digits pertaining to the name John Doe, until a single digit evolves.

$$1 + 6 + 8 + 5 + 4 + 6 + 5 = 35$$

$$3 + 5 = 8$$

Therefore, this name embodies the characteristic of the number 8. Being the number 8, “he has a lot of characteristics such as wishing to manage big affairs, the power to struggle against opposition and in general is a corner-stone in the community” [6] (p 448). This same method can be applied to several different aspects of life, such as birthdays and addresses [6].

3.1 The Number 666

Initially, looking at the number 666, it may be difficult to see its association with the concept of numerology. The number 666 has many images and descriptions attached to it. In the Bible, the heretical number is one associated with the Apocalypse, given as the number of the Beast [9]. In the book of Revelation, chapter 13, verse 18 it states : “Here is the key; and anyone who has intelligence may work out the number of the beast. The number represents a man’s name, and the numerical value of its letters is six hundred and sixty six” [3] (p 55).

Thus, numerology establishes its correlation to this mystical number. The number 666 is given negative qualities. Using the process of numerology, many individual’s names have been associated with this dismal number. Because of the name, the person then is also considered to also to have negative qualities, and perhaps even the beast that is named in the Bible verse above. This beast is commonly translated to the more common name of the Antichrist [9]. Various individuals have tried to prove their claim that certain public figures should be considered the next “beast,” or the Anti-Christ, because when numerology is done, their name is equal to 666.

Much research has been done to commit a certain name and attach it to this negative connotation of being the ”beast”. And, with a little effort and force, many public figures can be associated to this 666 with the process of numerology. Numerologists have a mass of names to choose from to create the output of 666, often with modifications to the name. With some elaboration and new arrangement of letters, Ronald Reagan numerical value was cast to 666. In this example, the numerologist who cast Reagan’s numerical value, changed his last name from Reagan to Reagun, so that it produced the 666 output. This numerologist also changed the numerical values for the letters, so to create the better result [9]:

$$a = 101, \quad b = 102, \quad \dots \quad z = 126$$

R	E	A	G	U	N
118	105	101	107	121	114

Originally individuals who think of this apocalyptic number often do not see the various mathematical properties of the number 666. This number 6 is triangular, which means that it “can be represented in the form of a triangular grid of points where the first row contains a single element and each subsequent row contains one more element than the previous one...a number is obtained by adding all positive integers less than or equal to a given positive integer n” [9] (p 165). The number 666 is also palindromic, meaning that it is symmetrical, in that it can be read the same way from the first number to the last, and back from the last number to the first [9].

666 is also the sum of the first 36 natural numbers (i.e. $1 + 2 + 3... + 34 + 35 + 36 = 666$), and thus a triangular number. Another fact is that the number 666 is equal to the sum of all consecutive integers from 1 to 6^2 [9].

There are also some other interesting mathematical properties concerning the number 666. The number is the simple sum and difference of the first three natural numbers raised to their sixth powers [8].

$$\begin{aligned}666 &= 1^6 - 2^6 + 3^6 \\ &= 1 - 64 + 729 \\ &= 666\end{aligned}$$

And also it is "equal to the sum of its digits plus the cubes of its digits" [8](p 176).

$$\begin{aligned}666 &= 6 + 6 + 6 + 6^3 + 6^3 + 6^3 \\ &= 6 + 6 + 6 + 216 + 216 + 216 \\ &= 666\end{aligned}$$

And lastly "the sum of the squares of the first 7 primes is 666" [8](p 176).

$$\begin{aligned}666 &= 2^2 + 3^2 + 5^2 + 7^2 + 11^2 + 13^2 + 17^2 \\ &= 4 + 9 + 25 + 49 + 121 + 169 + 289 \\ &= 666\end{aligned}$$

The number 666 has unique mathematical qualities, but maintains more interest throughout society because of the negative characteristics associated to this number. The biblical reference to 666 construe this number as one of significant meaning. This number is able to maintain mystical qualities in our modern society.

4 Modern Number Mysticism

In recent decades, certain numbers have transcended their historical backgrounds and have been developed into as lucky or unlucky numbers. The number 7 and the number 13 have both become superstitious numbers, both with different connotations attached to them. Often the number seven is deemed more a number of good luck. The number thirteen has had the opposite in modern society. It is often regarded as an unlucky number, a number to beware of and to maintain caution around.

4.1 The Number Seven, 7

Initially, one may not see the historical background as reasoning for the number 7 becoming such a fascination throughout society. Seven has become more noteworthy in modern society, although

the foundation for its importance is derived from sacred sources. The number appears frequently throughout the world, although an individual may have to look quite strenuously to find some of these occurrences [18].

The number 7 does occur more often than any other number in the Bible, although many do not know this. This number is not restricted to simply the religion of Christianity, as it occurs in other religions such as Hebrewism and in the Jewish religion [18]. Seven is associated with the day of rest following the creation of the World. There are also the Seven Virtues, which are ranked in ascending order of sanctity. These are chastity, abstinence, liberality, diligence, patience, kindness, and humility. Opposite, there are also the Seven Deadly Sins, which are lust, gluttony, greed, sloth, wrath, envy and pride. There is also the legend of the Seven Sleepers. It is a story of seven young men who fall asleep in a cave, only to wake up after a great deal of time has passed. This Seven Sleepers are view as saints in the Christian religion [18].

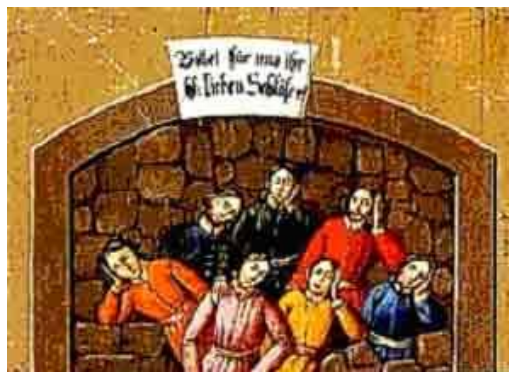


Figure 4: The Seven Sleepers [16]

In the Christian religion, again seven is shown more often than any other number in the Bible. There are the “seven joys of Mary” and the “seven last words,” both which are considered very significant events throughout the religion [18](p 258). There is discussion of the number seven being sacred, but the number seven is also seen as a negative number, with “seven horsemen” of the Apocalypse and the “seven-branched candlestick” [18](p 258).

Although there are many biblical references to the number 7, the number in modern society has transformed. It is associated with the something of a distinguished series. There are “seven wonders of the ancient world and, throughout the years, men have yearned to attain the ecstasies of their seventh heaven” [9] (p 157).

Many other legends and folklore are linked to the number seven. The story of the city of Jericho is a story about the city walls falling on the seventh blast of trumpets on the seventh day of soldiers attempting to penetrate the city. Another story is one concerning Greek mythology. Hercules was known as a man of extraordinary strength and courage. In a confrontation with the Lernaean Hydra, a serpent like creature, Hercules is able to defeat the seven headed creature [9].

4.1.1 Divisibility by Seven

The number seven is a unique number in that not many numbers can be divisible by 7. There are many methods created to determine if a number is divisible by 7. Of those, there are some mathematical formulas created to determine if the number is divisible by seven. The following numbers that are divisible by 7 :

1. Any number in the form aba , where $a + b$ is divisible by 7.

aba is divisible by 7 when $a + b$ is divisible by 7.

Assume $7k = a + b$ for some $k \in \mathbb{Z}$.

Show $7 \mid aba$ i.e. $aba = 7l$ for some $l \in \mathbb{Z}$.

$$\begin{aligned}aba &= a(100) + b(10) + a \\&= a(10 \cdot 10) + b(10) + a \\&= 10(10a + b) + a \\&= 10(9a + a + b) + a \\&= 10(9a + 7k) + a && \text{since } a + b = 7k \\&= 90a + 70k + a \\&= 91a + 70k \\&= 7 \cdot 13a + 7 \cdot 10k \\&= 7(13a + 10k)\end{aligned}$$

So $7 \mid aba$

Some examples are the numbers 343, 616, 959.

The number 616 is divisible by 7 when $a + b$ is divisible by 7.

$$\begin{aligned}a &= 6 \\b &= 1 \\aba &= 616 \\a + b &= 6 + 1 \\&= 7\end{aligned}$$

So $7 \mid 7$, therefore 616 is divisible by 7.

2. Any number in the form baa , where $b + a + a$ is divisible by 7.

baa is divisible by 7 when $b + a + a$ is divisible by 7.

Assume $7k = b + a + a$ for some $k \in \mathbb{Z}$

Therefore $b = 7k - 2a$.

Show $7 \mid baa$ i.e. $baa = 7l$ for some $l \in \mathbb{Z}$.

$$\begin{aligned}
baa &= b(100) + a(10) + a \\
&= 100b + 11a \\
&= 100(7k - 2a) + 11a && \text{since } b = 7k - 2a \\
&= 700k - 200a + 11a \\
&= 700k - 189a \\
&= 7 \cdot 100k - 7 \cdot 27a \\
&= 7(100k + 27a)
\end{aligned}$$

So $7 \mid baa$

Some examples are the numbers 322, 833, 966.

The number 833 is divisible by 7 when $b + a + a$ is divisible by 7.

$$\begin{aligned}
b &= 8 \\
a &= 3 \\
baa &= 833 \\
b + a + a &= 8 + 3 + 3 \\
&= 14
\end{aligned}$$

So $7 \mid 14$, therefore 833 is divisible by 7.

3. Any number in the form baa , where b is a two-digit number and b (as a number and not as the sum of its digits) $+ a + a$ is divisible by 7.

Some examples are the numbers 1022, 5022, 8288, 9933.

4. Any number in the form aab , where $a + a - b$ is divisible by 7.

aab is divisible by 7 when $a + a - b$ is divisible by 7.

Assume $7k = a + a - b$ for some $k \in \mathbb{Z}$.

Therefore $b = a + a - 7k$.

Show $7 \mid aab$ i.e. $aab = 7l$ for some $l \in \mathbb{Z}$.

$$\begin{aligned}
aab &= a(100) + a(10) + b \\
&= 110a + b \\
&= 110a + (a + a - 7k) && \text{since } b = a + a - 7k \\
&= 110a + 2a - 7k \\
&= 112a - 7k \\
&= 7 \cdot 16a + 7 \cdot k \\
&= 7(16a + k)
\end{aligned}$$

So $7 \mid aab$

Some examples are the numbers 553, 882.

The number 553 is divisible by 7 when $a + a - b$ is divisible by 7.

$$\begin{aligned}
a &= 5 \\
b &= 3 \\
aab &= 553 \\
a + a - b &= 5 + 5 - 3 \\
&= 7
\end{aligned}$$

So $7 \mid 553$, therefore 553 is divisible by 7 [11](p 290).

4.2 The Number Thirteen

The number thirteen is not as often associated with biblical references, as the number seven more commonly appears. It does not appear frequently in any of the many religions of the world. But it does unexpectedly play a meaningful part in Mayan astronomical calculations. And it does play a significant role in Tibetan and Mongolian cultures. In Tibetan cosmology, history, and religion, the number thirteen does appear quite frequently. The early kings of Tibet would begin to rule at the age of thirteen, while Tibet was divided into thirteen districts. It is also shown in the religious aspect of the Tibetans. Heaven was considered to be composed of thirteen layers, while meditation cycles were measured around periods of thirteen, such as days, months or years. In the Mongolian culture, thirteen was also considered a lucky number among travelers. The Mongolian culture also utilized the number thirteen in their religious sphere, using the number to categorize the primal gods of their society [5].

Also in Egyptian lore, 13 is also important. It is said that there are thirteen steps for Egyptians to take between life and death. Thirteen may have been given a negative reputation among the Teutons. The story is of a dinner party in Norse mythology. There were twelve Norse gods at a banquet when a mischievous evil spirit named Loki makes an appearance. Loki crashes the banquet, which makes thirteen people at the dinner party, and kills one of the guests with an arrow. This may lead to why most times the myths about the number thirteen involve the unluckiness of having thirteen guests at the dinner table. In particular, there is focus on the thirteen people seen at the Last Supper. In the Christian religion, the Last Supper was the last meal that Jesus shared with his Twelve Apostles. [2].

In non-religious or non-mythical environments, the number 13 is also prominent. In Germany and in France there are often street numbers $12 \frac{1}{2}$, with the exclusion of the number thirteen. Much of American society chooses to omit the number thirteen and puts superstition on the number. Frequently this is the case with Friday the 13th and the lack of the 13th floor in most hotels [2].



Figure 5: The Lack of the 13th Floor [17]

5 Conclusion

Every number discussed had a certain quality that made it unique. Numbers are of significance importance in the everyday world. Some numbers rise in importance because of the historical background that is attached to them. Although individuals may not analyze these numbers on a daily basis, they still play some part in an individual's life. $\sqrt{2}$ was able to provide shock and awe, as many numbers of today still are able to do. Each number does possess some characteristic that people reference as the number. Some numbers with certain characteristics and qualities, such as the number 666, rise in importance because of the biblical background that makes them interesting in today's society. Some of these numbers arise because of mathematical significance, showing more the importance they may have in modern society. Although some numbers are more significant because of the folklore and myth attached to them, these numbers seem to contain qualities and characteristics that continue to make them unique and vibrant in our society.

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