Ann Street School
The Math Age: An Historical Perspective 2003

Standing from left to right: Vice Principal Carmen E. Salgueiro, Principal Joseph N. Maccia, Xavier Lobo, David Siqueira, Jason Araujo, Daniel Martins, Paul Gaspar, Teacher Manuel Oliveira, Vice Principal Jacquelyn Keene-Owens, Vice Principal Gene Foti.

Sitting from left to right: Rudner De Sa, Marian O'Neil, Catarina Maruqes, Gabriela Santos, Ming Rong Weng, Samantha De Almeida, Ruben Marques

Certificate of Recognition

awarded to the students of:

Mr. Oliviera, Ann St School

for their participation in and contribution to the success of

the Thirteenth Annual Newark Math Fair
The Math Age: An Historical Perspective

May 19-22, 2003
Date

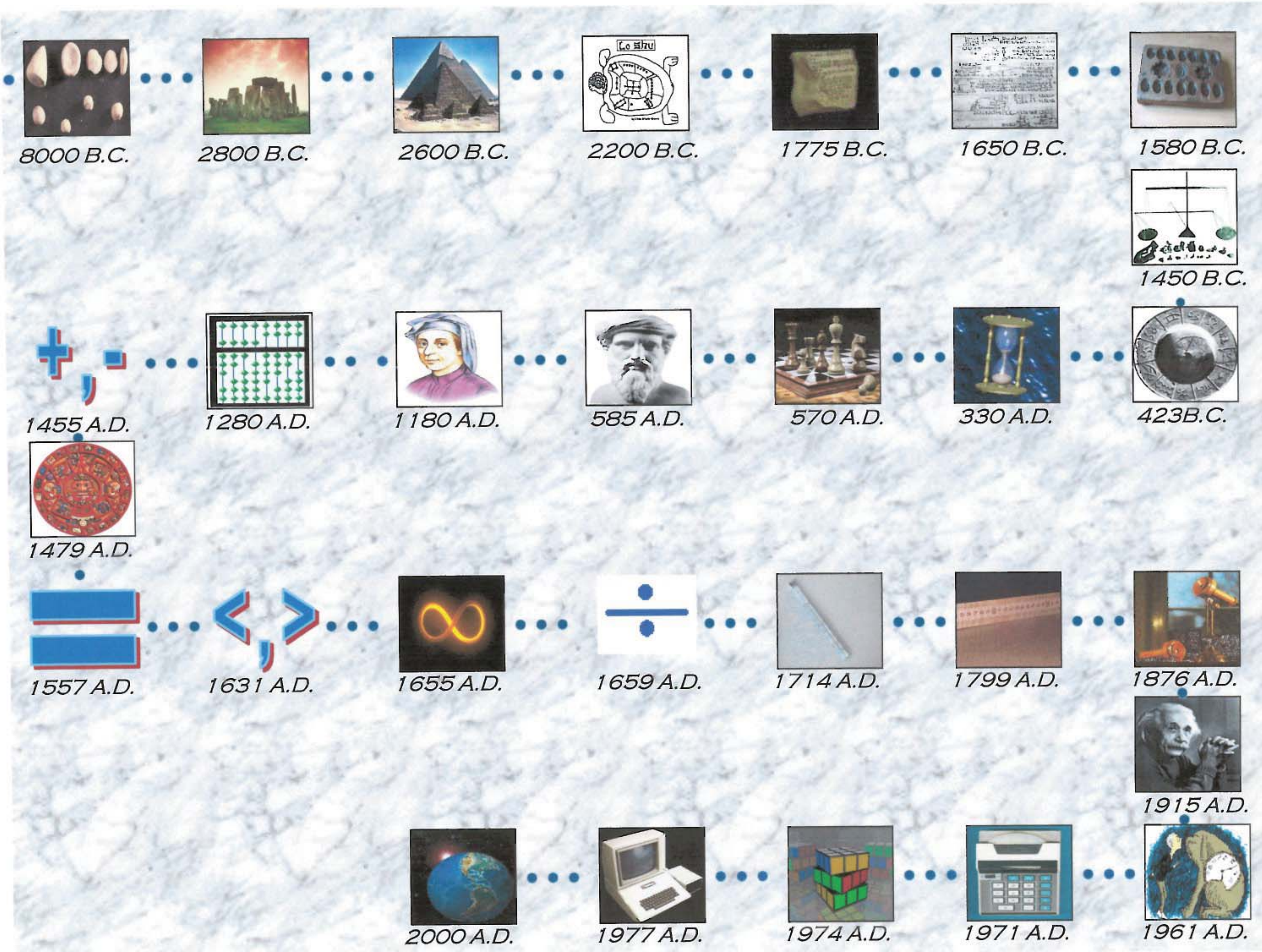
M Samuels
Director, Office of Mathematics

The Math Age: An Historical Perspective

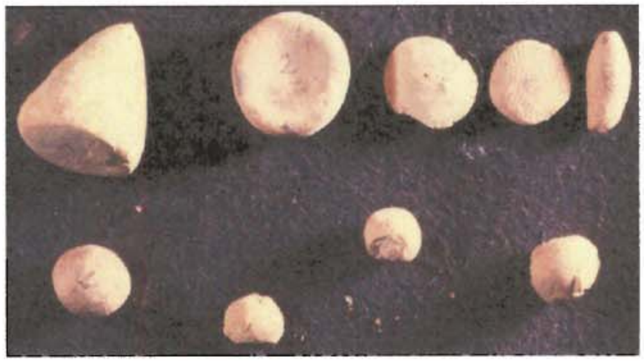
When we were given this year's math fair theme, we felt that there were an infinite number of possibilities of historical contributions towards mathematics that we could use in our project. Since the participants originated from diverse cultures, an object or concept that reflected them personally was chosen. After extensive research, we found that each idea made a unique contribution to math. From hundreds of choices, we narrowed it down to the twenty-nine which had the greatest impact on the development of mathematics.

Throughout the construction of our project, several formulas and mathematical concepts helped us to achieve optimum perfection in our display. For instance, the Pythagorean Theorem was utilized to ensure that each angle of the display case and certain replications were perfect squares. For depictions that were composed of plaster, liquid and dry measurements were used. Furthermore, we used fractions when drilling into wood in order to conjoin two pieces. In brief, numerical concepts played an integral role in the construction of this presentation.

For the past two months, we have been working diligently to accurately replicate original items that were of great importance to mathematics. In the earlier phases of our project, we decided to create a display case that would properly exhibit the replicas in chronological order. It took several days to construct particularly difficult models, for they were of more intricate detail. This project has helped us to become aware that we often unconsciously use mathematical concepts on a daily basis. It is obvious that mathematics is critical to our everyday living!


8000 B.C.
2800 B.C.
2600 B.C.
Lo Shu
2200 B.C.
1775 B.C.
1650 B.C.
1580 B.C.
1450 B.C.
423B.C.
330 A.D.
570 A.D.
585 A.D.
1180 A.D.
1280 A.D.
1455 A.D.
1479 A.D.
1557 A.D.
1631 A.D.
1655 A.D.
1659 A.D.
1714 A.D.
1799 A.D.
1876 A.D.
1915 A.D.
1961 A.D.
1971 A.D.
1974 A.D.
1977 A.D.
2000 A.D.

Mesopotamian Clay Tokens



Tokens are small geometric clay objects found all over the Near East from about 8000 B.C. until the development of writing. Tokens are first identified at around the same time as the local peoples changed from a life based on hunting and gathering to one based on agriculture.

The earliest tokens were simple shapes and they stood for basic agricultural commodities such as grain and sheep. A specific shape of token always represented a specific quantity of a particular item. For example, the cone stood for a small measure of grain, the sphere represented a large measure of grain, the ovoid stood for a jar of oil.

The standardization of the tokens meant that they had great power for record-keeping and contracts in a way that counting using pebbles or twigs would not do. A collection of tokens could represent a future promised transaction or be kept in an archive as a record of a past transaction. The Mesopotamians devised two main systems of storage. One system involved piercing the tokens with small holes, stringing them on a piece of cord and attaching the ends of the string to a solid lump of clay, called a bulla. Any attempt to alter the number or type of tokens would involve breaking the seals.

Stonehenge

Currently the Stonehenge is located in Southwestern England. An Earth wall of ninety-eight meters in diameter surrounds this circular monument. Thirty blocks of gray sandstone, each standing four meters above the ground and averaging twenty-five metric tons, stood in a circle about thirty meters in diameter. Today Archaeologists believe this massive monument was used for religious purposes. However, architects worldwide are still amazed at the quality of this magnificent structure.

Yet, today people have noticed that this monument could also have been used as a calendar of celestial events. It demonstrated both the summer and winter solstices. In other words the Stonehenge could have been used as an early form of a calendar. Over the years, mathematicians have related to this structure as a way to gather information from past. Such information ranges from the dimensions of the stone to how the ancient people knew how to draw perfect circles.

Stonehenge

The Stonehenge was arranged in a circular pattern. The circle was exactly 360^0. They used the formula C=2(pi)r. Th earthen wall around the stone structures were 98 meters diameter.

C=2(3.14)49

C=6.28(49)

C= 307.72 meters

The circumference of the earth wall around the actual Stonehenge is 307.72 meters. Today it is very common that we use the circumference of a circle in our everyday life. For instance, perhaps you want to fit marbles inside a cylinder that is 13 centimeters high and has a raduis of 3 centimeters. The marble has a raduis of 2 centimeters. How many marbles are able to fit into the cylinder. In this case only 3 marbles fit into a cylinder that has a radius of 3 centimeters and a height of 13 centimeters.

Height of cylinder=13 centimeters.

13 divided by 4, the actual diameter of the marble = 3 marbles vertically

Diameter of cylinder is 6 Divided by 4=1 marble horizontally

*As a result only 3 marbles will fit inside the cylinder provided.

The Great Pyramids of Giza

The Great Pyramids of Giza are perhaps the best preserved pyramids throughout all of Egypt. According to archaeologists the early people who constructed these magnificent structures used the golden ratio as a basis. The Golden Ratio Equation is 1 + sqrt{5} /2. This Formula was also used in the building of the Parthaneon. The Great Pyramid Knufu stands one hundred forty meters high. It's base covers five hectares. The other two pyramids at Giza were built for Kings Khafre and Mankaure.

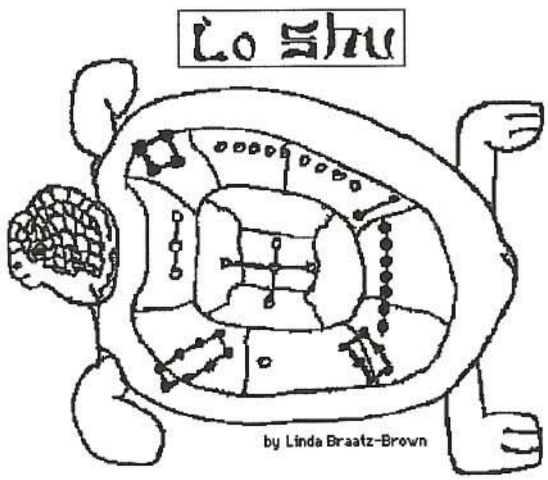
Today the Math world is still marveled by these monuments. How did these early people know to use the Golden Ratio if they didn't even attend school? Perhaps, these people believed that their gods would help them in the after-life. Yet, whatever it was it is proven that these people's knowledge of Math was unbelievable. This is because, over the years the Pyramids still stand as result of calculations solved correctly.

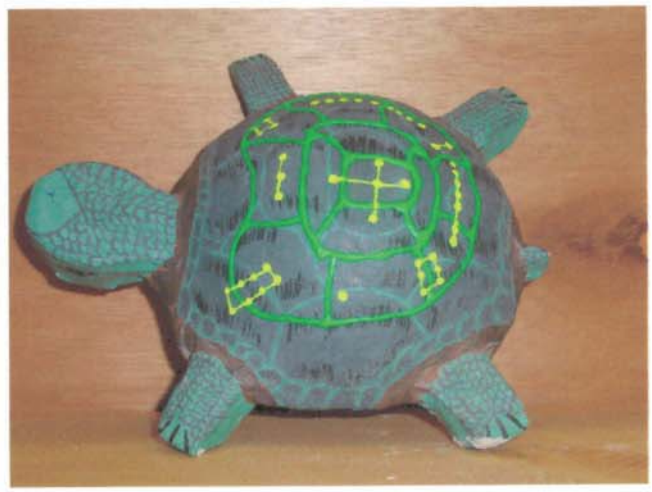
The Great Pyramids of Giza

The Great Pyramids of Giza were constructed based on the Golden ratio. The formula is 1+sq. rt.(5)/2. Archaeologists believe that the dimensions of the Great Pyramid's base which cover about five hectares and stand at approximately 147 meters apply to the Golden Ratio. Today some architects may use the Golden ratio as the Comparisons of either sides of the base. In other words following the examples of the early people today architects are able to design their projects with more accuracy.

For instance, if you have a length of 225 centimeters. Youwould first add 1+ the sq.rt of 225. You would arrive at the answer of 16. This is because the sq. rt. of 225 is 15. 1+15 =16. Afterward you would divide your sum of 16 by 2 arriving at the answer of 8. Today the Golden Ratio can even help us students draw perfect models of the Pyramids of Giza.

Magic Squares





The first magic sqaure was found in China in the Yu dynasty in 2000 B.C. The emperor Yu the Great was showed with the sqaure by two magical animals: a dragon-horse, and a giant tortoise. The Lo Shu which was the magic square found on the back of the Tortoise was recorded in the I-King, which was one of the oldest mathematical works.

In the magic square, the sums of the rows, columns, and diagonals was 15. In the 13th century, a Chinese mathematician Yan Hui studied the magic square. He also came up with some simple rules for the construction of the square. It was not until the European Renaissance that the magic squares were found to be purely mathematical.

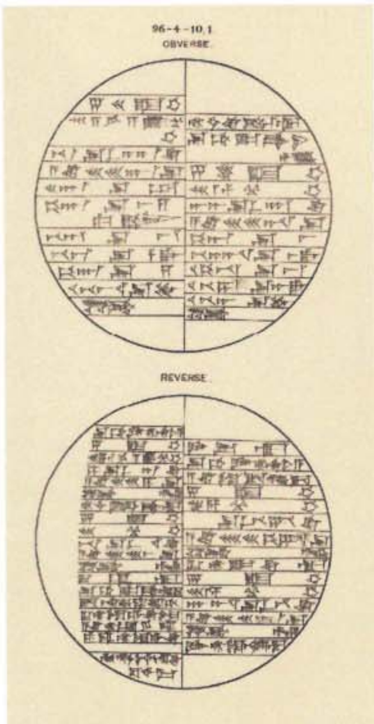
Magic Square

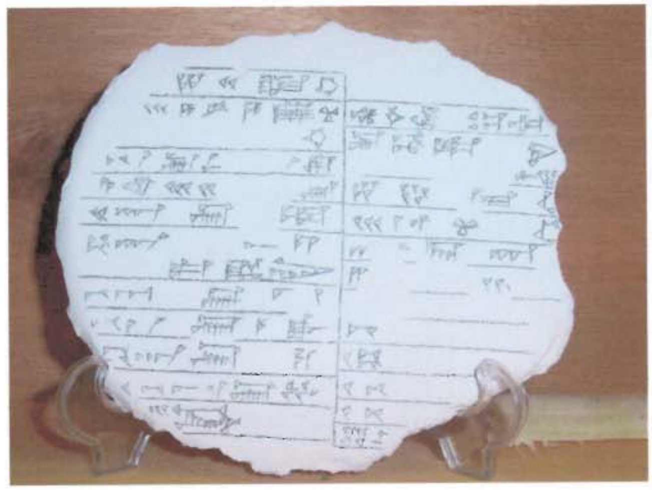
1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

In this magic square, the sum is 34. The four corners add up to 34. The four numbers in the center also add up to 34. The 12 and 8 in the first column and the 9 and 5 in the last one also add up to 34. The four squares in the corners add up to 34. The columns and rows also have the same sum. Moreover, the diagonals also add up to the same sum.

Four corners: 1+4+13+16= 34
Center: 6+7+10+11= 34
First and last columns: 12+8+9+5= 34
Four squares: 1+15+12+6= 34, 8+10+13+3= 34, 14+4+7+9= 34, 11+5+2+16= 34
Columns: 1+12+8+13= 34, 15+6+10+3= 34, 14+7+11+2 = 34, 4+9+5+16= 34
Rows: 1+15+14+4 = 34, 12+6+7+9=34, 8+10+11+5= 34, 13+3+2+16= 34

Babylonian Clay Tablets





In ancient times writing was done on papyrus, parchment and clay tablets. The Babylonians were a Semitic people who invaded Mesopotamia defeating the Sumerians and by about 1900 B.C. establishing their capital at Babylon. While still wet, the clay had wedge-shaped letters called cuneiform imprinted on it with a stylus and then was kiln fired or sun dried.

The first clay tablets consisted of quadratic formulas. To solve a quadratic formula they essentially used the standard formula. They considered two types of equations; $x^2 + bx = c$ and $x^2 - bx = c$. In this formula b, c were positive but not necessarily integers. The form that their solutions took was, $x = [(b/2)^2 + c] - (b/2)$ *and* $x = [(b/2)^2 + c] + (b/2)$. In each case, there is the positive root from the two roots of the quadratic and the one that will make sense in solving "real" problems. For instance, problems led the Babylonians to equations of this type often concerned the area of a rectangle.

Babylonian Clay Tablets

The Babylonians were the first people to record quadratic formulas on clay tablets. An example for the importance of this mathematical concept is for finding the windchill measures and how cold the temperature feels at different wind speeds.

The windchill, *c*, at a given temperature in Farenheit is a reasonably good quadratic function of the wind speed in miles per hour, s. For example, at 0 degrees Fahrenheit, the function $c = 0.028s^2 - 2.52s + 2.7$ models the chill factor with wind speeds from 0 to 45 miles per hour. Use the quadratic formula to find the wind speed for a windchill of -10 degrees.

1. Windchill = -10 = *c* -10 = 0.028 *s* 2 - 2.52 *s* + 2.7

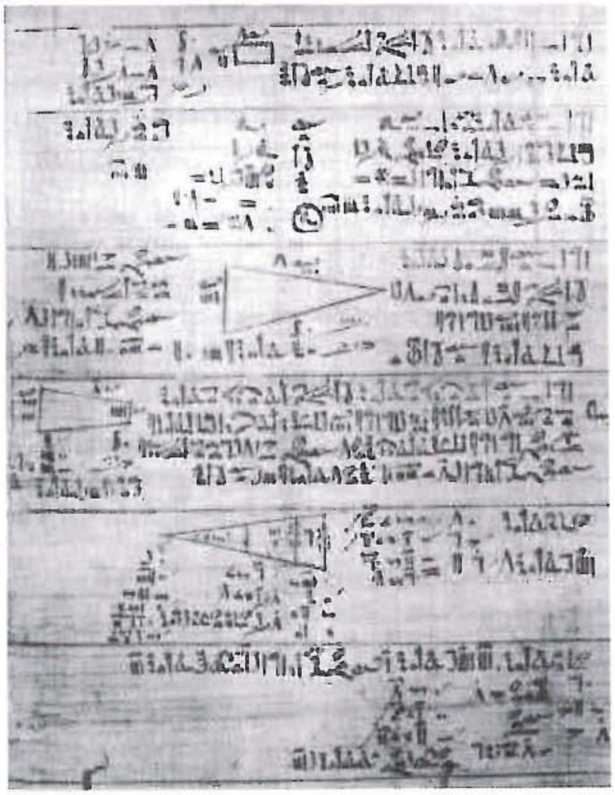
2. Add 10 to each side of the equation to put it in standard form. 0 = 0.028*s* - 2.52*s* + 12.7

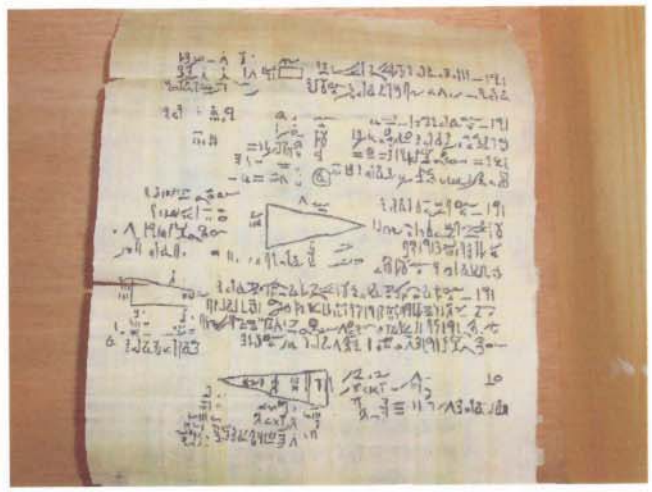
3. Use the quadratic formula to solve, *a* = 0.028; *b* = -2.52; *c* = 12.7. Round to the nearest tenth.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Only a wind speed of 5.4 miles per hour makes sense for this situation because the value of s must be between 0 and 45 miles per hour.

Rhind Payrus





The Rhind Papyrus is named after Henry Rhind. The papyrus is about 6 meters long and 1/3 wide. It was written in about 1850 B.C.

The papyrus contained mathematical and goemetric problems accompanied by their solutions. The problems mainly dealt with bussiness or administrative problems of that time. The papyrus, also referred to as the Ahmes Papyrus, was used more as a handbook. The Rhind Papyrus contained approximately 85 problems.

RHIND PAPYRUS

IN THE RHIND PAPYRUS, PROBLEM #10 SAID A CIRCULAR FIELD HAD A DIAMETER OF 9 KHET. WHAT IS THE AREA OF THE FIELD? THIS CAN BE RELATED TO THE REAL WORLD BECAUSE SUPPOSED YOU HAVE TO WATER A GRASS FIELD OF 9 METER IN DIAMETER. YOU HAVE A SPRINKLE THAT WILL COVER AN AREA OF 64-METER SQUARE. WILL THAT BE ENOUGH TO WATER THE GRASS FIELD?

IN THIS PROBLEM YOU USED THE FORMULA $A = 3.14(R)^2$.

$A = 3.14(R)^2$

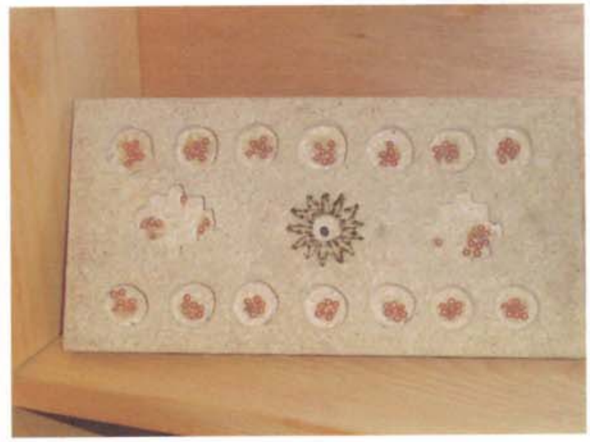
$A = 3.14(4.5)^2$

$A = 3.14(20.25)$

$A = 63.585$ METERS SQUARE

THE ANSWER IS YOUR SPRINKLE WILL COVER THE GRASS FIELD.

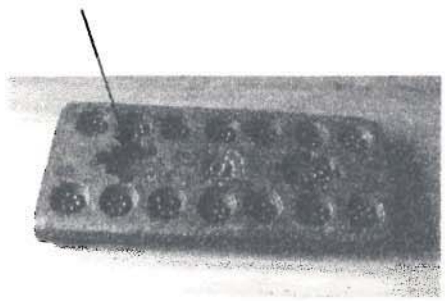
MANCALA

MANCALA IS POSSIBLY THE OLDEST GAME IN THE WORLD. IT IS KNOWN TO HAVE ORGINATED IN ANCIENT EGYPT. IT MAY EASILY BE PLAYED WITH ANY MATERIAL. FOR INSTANCE, AFRICANS PLAYED IT USING HOLLOWS SCOOPED INTO THE EARTH AND PEBBLES. MANCALA IS SIMILAR TO CHESS YET IT IS MORE COMPLEX. IT IS A MATHEMATICAL GAME THAT INCORPARATES STRATEGY AND LOGIC TO BE VICTORIOUS.

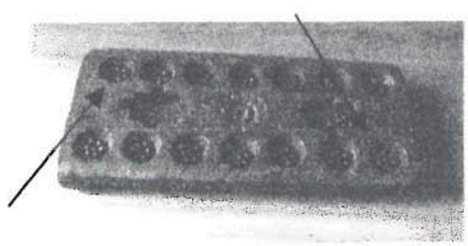
Mancala

Mancala is a simple strategy game in which your goal is to obtain more beads than your opponent. During each turn you take all the beads from one of your bowls and move counterclockwise, dropping one bead each time in each bowl except for your opponent's score bowl.



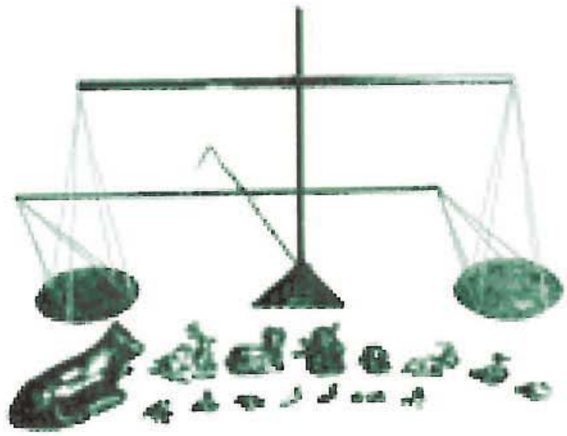
If your last bead drops in your own score bowl, you get to move again. However, if your last bead drops in your empty bowl, you are allowed to pick up all the beads in your opponent's bowl opposite.

This game is highly based on mental math and counting. For instance, in the modern game of mancala, each bowl begins with containing four beads. You will want to begin with a bowl that will help you to gather the most beads in your scoring bowl as possible. Therefore, you would probably choose the last bowl right next to your score bowl.



You begin with four marbles in the first hole. This means you will have to count four consecutive holes before you reach the one in which your last marble will be dropped. From there, you will pick up the five marbles in that hole and continue counting till you find the next hole where your last marble will be placed. It is obvious that Mancala is a game for thinkers who can quickly add and subtract mentally. Only these people will be able to triumph over their opponent.

Early Weights and Balances



Weighing played an important part in the ancient Egyptian's life. The balances employed were originally of simple patterns and existed before 3200 B.C. They consisted of two copper and silver pans suspended by cords at the ends of a centrally supported horizontal beam. It main purpose was to weigh metal.

By Egyptian belief, when someone died his heart must have weighed in the presence of Osiris, the great god of the dead. The weight of which exactly balance that of a feather, the man's soul was assumed to be represented by his heart. If it did so, the soul of the deceased was taken into the company of the gods. Heiroglyphics show this ceremony, together with detailed drawings of the balances incorporated.

Egyptian weights were of hard stone that were carefully polished and marked. Yet, in some remote times cast bronze weights were also in use. Sets were designed in animal forms, together with the actual balance.

Early Weights and Balances

Weights and balances were and are still used today to measure the quantity and mass of an object or objects. Weighing items can determine a price value for that item or items of equal measure. Weights are used to measure the mass of an object or person.

EGYPTIAN CALENDAR

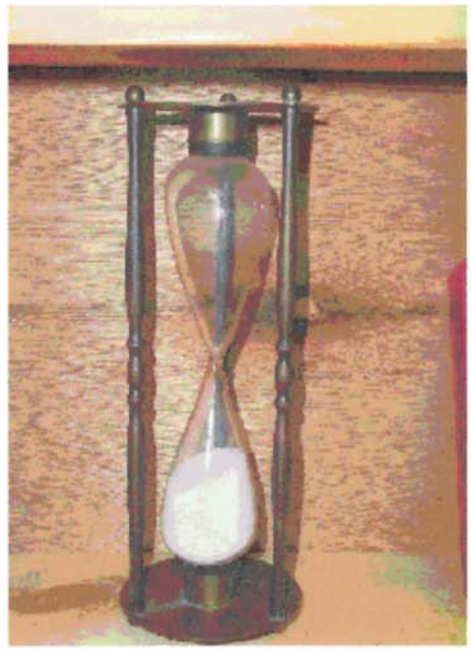
THE ANCIENT EGYPTIAN CALENDAR WAS BASED UPON THE MOON. HOWEVER, CERTAIN DIFFICULTIES AROSE. TO SOLVE THIS PROBLEM, THE EYPTIANS INVENTED A SCHEMATIZED CIVIL YEAR CONTAINING 365 DAYS. EACH YEAR WAS DIVIDED INTO THREE SEASONS, CONSISITING OF FOUR MONTHS OF THIRTY DAYS EACH. TO COMPLETE THE YEAR, 5 EXTRA DAYS WERE ADDED TO THE END OF THE YEAR. THE LUNAR CALENDAR CONTINUED TO REGULATE RELIGIOUS AFFAIRS AND EVERYDAY LIFE WHILE THE CIVIL CALENDAR SERVED THE GOVERNMENT AND ADMINISTRATION.

AS A GREAT CONTRIBUTUION TO MATHEMATICS, THE EGYTIAN CALENDAR, AS WELL AS OTHERS, SERVED AS A BASIS FOR LATER CALENDARS, INCLUDING OURS. THIS IS AN EXAMPLE OF THE MATHEMATICAL SOPHISTICATION OF ANCIENT CULTURES.

Egyptian Zodiac Calendar

Egyptians of the time divided their calendar into three seasons. They were Inundation, Emergence, and Harvest. Today however, our calendar is broken up into four seasons: summer, winter, spring, and fall. The ancient Egyptians used division to divide their seasons into 3 parts. Today, we use a similar system to divide our calendar.

HOURGLASS



MANY PEOPLE REFERRED THE HOURGLASS AS THE FIRST MECHANICAL CLOCK. ITS EARLIEST RECORD WAS 14TH CENTURY. BACK THEN, THEY WERE A COMMON SIGHT IN EARLY FACTORIES. TODAY, IT IS USED TO TIME A PHONE CALL, COOKING, MEDIATION, AND MORE.

Hourglass

An hourglass measured an hour worth of time. In daily life, it can be used to time many things. In school, it can be used to time a test such as GEPA.

CHESS

THIS ANCIENT GAME, WHICH TANTALIZED THE GREATEST MINDS FOR APPROXIMATELY 14 CENTURIES, ORIGINATED IN THE INDUS VALLEY IN THE 6TH CENTURY A.D. ORIGINALLY, IT WAS KNOWN AS CHATURANGA, MEANING "ARMY GAME." THIS GAME SPREAD LIKE WILDFIRE THROUGH VARIOUS COUNTRIES FROM THE BYZANTINE TO THE MUSLIM WORLD . THE ARABS EXTENSIVELY STUDIED, ANNAYLYZED, AND WROTE TREATIES ON THE GAME. DURING THIS PROCESS THEY DEVELOPED THE ALGEBRAIC NOTATION SYSTEM.

AT FIRST THE GAME WAS CONSIDERED ARISTOCRATIC. HOWEVER, AS THE PUBLIC BEGAN TO PLAY CHESS, THE LEVEL OF EXPERTISE IMPROVED. THEREFORE, TORNAMENTS AND MATCHES WERE HELD. PROMINENT PLAYERS WOULD EVEN ESTABLISH SCHOOLS FOR THE TEACHING OF THIS CLASSIC GAME.

Chess

As chess became a more popular game, chess notation evolved. Simple chess notation was being used as early as the nineteenth century. Players would write down all their moves. For example, “Then the black king for his second draught brings forth his queen, and places her in the third house, in front of his bishop's pawn." Imagine writing out a forty-move game in this way!

Therefore, Philip Stamma introduced the shorthand notation that we now call "algebraic" in his book of composed problems. Stamma’s system was practically identical to the algebraic notation system used today with the files of the board designated " a-h" and the ranks numbered "1-8."

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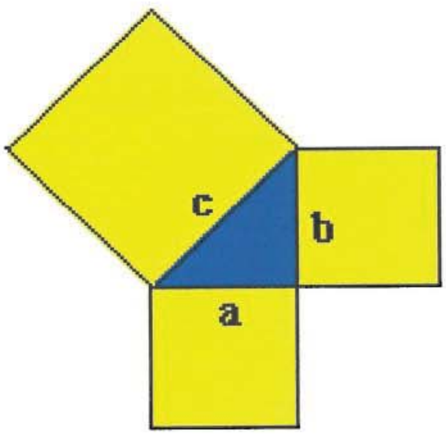
The Pythagoren Theorem

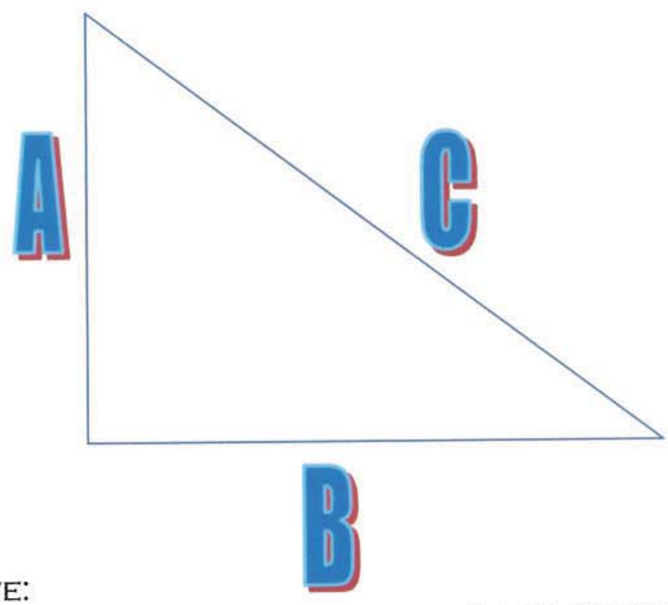


The Pythagorean Theorem was developed by Pythagoras. Pythagoras was a mathematician, a teacher, a philosopher, a mystic, but to his followers, he was a god. The theorem showed the basic truth about the way our world fit together.

Many mathmaticians think the Pythagorean Theorem was the most important elementary mathematics that was developed. The Pythagorean Theorem said that in a right triangle, the sqaure of the hypotenuse is equal to the sum of the squares of the other two sides. The formula is $A^2 + B^2 = C^2$.

The Pythagorean Theorem

The Pythagorean Theorem is used very frequently by home builders, and can be used in everyday life's. The Pythagorean can be used to determine the length of the hypotenuse side of a triangle.



How To Solve:

In any right triangle the square of the length of the hypotenuse, which is Side C, should be equal to the sum of the squares of the length of the legs.

If Side A was 3^2 inches and side B was 4^2 inches, then side C would have to be 5^2 inches to be a square right triangle.

We used the Pythagorean theorem in our project. The shelves height was 4 ft or 48 inches, and the length was 71 3/4 inches. After using the Pythagorean Theorem we determined the hypotenuse should be about 86 inches, which it was.

Height: 4 feet = 48 inches
Length: 71 3/4 inches

$A^2+B^2=C^2$

$48^2 + 71\ 3/4^2 = C^2$

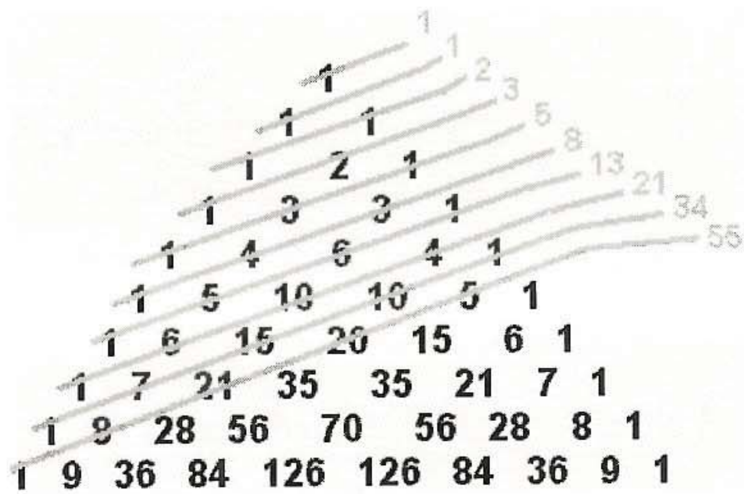
$2304+5148.0625=86.32532942$

$C=86.32532942$

Fibonacci

Leonardo Pisano is better known for his nickname Fibonacci. He was born in Italy and educated in North Africa. He is remembered today for the two preceding *numbersa*.?? This sequence appeared in many different areas of mathematics and science.

FIBONACCI

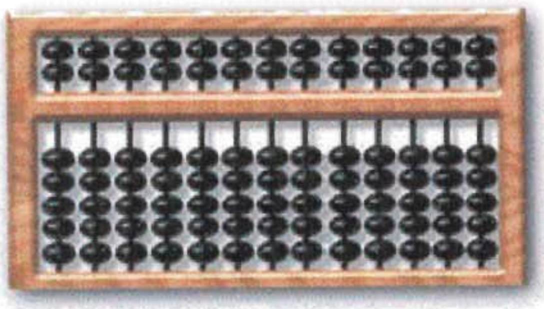


The Fibonacci sequence is still used in the world of mathematics. As shown above you must add these numbers in order to find the resulting numbers.

The growth of this nautilus shell, like the growth of populations and many other kinds of natural "growing," are somehow governed by mathematical properties exhibited in the Fibonacci sequence. And not just the *rate* of growth, but the *pattern* of growth. Examine the crisscrossing spiral seed pattern in the head of a sunflower, for instance, and you will discover that the number of spirals in each direction are invariably two consecutive Fibonacci numbers.

The Fibonacci sequence makes its appearance in other ways within mathematics as well. For example, it appears as sums of oblique diagonals in Pascal's triangle.

Chinese Abacus



The first Abacus recorded was completed during the fourteenth century. Yet, until present-day the inventor of the abacus still remains unknown. The Abacus' Mandarin name is "suan Pan", which translated means calculating plate. This early invention enabled people such as shopkeepers to add, subtract, multiply, as well as divide. This instrument also was utilized to solve more difficult problems such as fractions and even square roots.

The early model is similar to today's version. It had eleven wooden poles with five beads per pole on the bottom half. In the upper level of the abacus there were also eleven wooden poles but only had two beads per pole. Today some of the elders in China prefer to use this early invention instead of various mechanical instruments. They believe it is a visual method to display Mathematics.

Chinese Abacus

The Chinese abacus is still quite useful today. Some people use this early instrument in place of a modern calculator. Still, the abacus like the calculator will give you the correct answer. The only advantage the calculator has is that it perhaps offers more possibilities rather than just fundamental math. Using an abacus could be as simple as 1+1. Of course that the calculator will give you an answer of two. Yet moving counting the beads such as one and then two will also give you a similar answer. Another example could occur as you are shopping. Suppose you originally brought $7.00 and you spent $3.00 on a sandwich, what would your final outcome be? Well on a calculator you would simply press 7.00 - 3.00 and you will arrive at an answer of four. However using the abacus you would first gather seven beads or marbles. From those seven marbles you would subtract three also arriving at the answer of $4.00.

●●●●●●● - ●●● = ●●●●

Subtraction and addition sign

+, -

The addition and subtraction sign first appeared in the Johann Widman's Leipzig in 1489. It seemed that it was the Germans who used the signs. However, it was not until Francis Vieta that these signs became popular.

These signs were used constantly in mathematical problems. In fact, math problems cannot be written without these two signs. These signs were very important in the history of mathematicis.

Subtraction and Addition Signs

Roma bought 6 apples and Carla bought 9. How many do they have all together?

$$6 + 9 = 15$$

Together, they will have 15 apples.

Roma have 20 apples. She ate 5 of them. How many does she have left for her to make some platter of fruit salads?

$$20 - 5 = 15$$

She will have 15 apples left.

Aztec Calendar

Despite the time period in which they originated, the Aztecs were capable of producing an extremely complex and accurate calendar. The Haaab was the civil calendar of the Aztecs. It consisted of 18 months with 20 days each followed by an additional 5 days. This creates a year that contains 365 days. The months were named as follows.

1. Pop	2. Uo	3. Zip	4.Zotz
5. Tzec	6. Xul	7. Yaxkin	8. Mol
9. Cchen	10. Yax	11. Zac	12. Ceh
13. Mae	14. Kankin	15. Muan	16. Pax
	17. Kayab	18.Cumku	

The days of the month were numbered from 0 to 19. This use of the 0th day is unique to the aztec calendar. It shows evidence that the aztecs probably discovered and utilized the number zero before it was discovered in either Europe or Asia.

This early calendar represents the sophistication of the Aztec culture and its intricacy in the world of mathematics. It was important because it highly resembled the contemporary calendar used today.

Aztec Calendar

The Aztec Calendar shows evidence that the culture was probably the first to discover 0. However, they use it to count the first day of every month. Today, zero is used as a placeholder.

Hundreds	Tens	Ones
2	0	1

The number above is read two hundred and one. If the zero were not there, the number would read two hundred one. Obviously this is unethical because you are excluding the tens column. Due to this evidence, there was probably much confusion in counting before the invention of zero.

Equality Sign

=

Before the equality sign was invented, equality was usually said in words such as aequales, aeqantur, esgale, faciunt, or gleich. The symbol = was first used by Robert Recorde in 1557 in the book The Whetstone of Witte. He wrote, "I will set as I do often in work use, a pair of parallel, or lines of one length. Thus, the = was invented, because no two things can be more equal." The equality sign did not appear in print again until 1618. It was printed in an anonymous Appendix. However, it reappeared in 1631 by Thomas Harriot, and William Oughtred.

The equality sign was important in the history of mathematicis because every equation in math, requires an equal sign. The invention made the process of writing an equation faster and easier.

EQUALITY SIGN

EVERY EQUATION IN MATH REQUIRES AN EQUAL SIGN.

A MOTHER ELEPHANT AND A BABY ELEPHANT WERE BOTH WEIGHED. THE MOTHER WAS WEIGHED SEPARATELY, BUT THE BABY ELEPHANT WAS NOT WEIGHED SEPARATELY. HOW MUCH DOES THE BABY ELEPHANT WEIGH?

TOTAL WEIGHT	=	MOTHER'S WEIGHT	=	BABY'S WEIGHT
5396	=	5033	=	W

$$W = 363$$

HOW TO SOLVE:

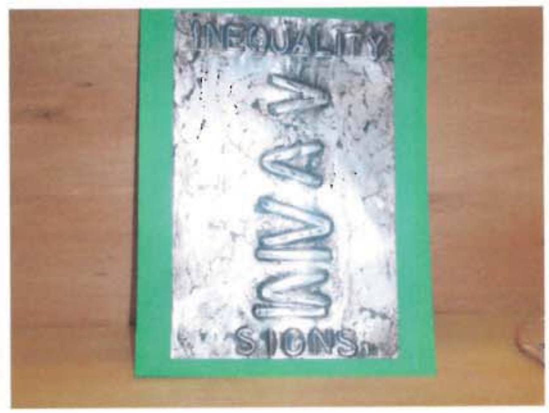
SUBTRACT THE MOTHER'S WEIGHT, FROM THE TOTAL WEIGHT.

$$5396 - 5033 = 363$$

WE USED THE EQUALITY SIGN IN OUR PROJECT WHEN WE WERE DETERMINING THE SPACE BETWEEN EACH SHELF. WE HAD A CERTAIN AMOUNT OF SPACE TO WORK WITH, AND WE HAD TO DETERMINE THE AMOUNT OF SPACE BETWEEN EACH SHELF INCLUDING THE AMOUNT THE SHELF TOOK UP.

GREATER THAN AND LESS THAN SIGN

>,<



IN 1631, THE SIGNS < AND > APPEARED IN ARTIS ANALYTICAE PRAXIS AD AEQUATIONS ALGEBRAICAS RESOLVENDAS BY THOMAS HARRIOT. WHILE HARRIOT WAS IN NORTH AMERICA, HE SAW A NATIVE AMERICAN WITH A SYMBOL THAT LOOKED LIKE TWO X'S ON TOP OF EACH OTHER. IT WAS VERY LIKELY THAT HE THOUGHT OF THE GREATER THAN AND LESS THAN FROM THIS SYMBOL.

THESE SIGNS WERE IMPORTANT IN MATHEMATICS, BECAUSE IN AN INEQUALITY EQUATION, WE NEED THESE SIGNS TO REPRESENT GREATER THAN OR LESS THAN TO AVOID CONFUSION.

Inequality Sign

Solve the equations using the signs <, >, ≤, ≥

1. 7______9

2. 8/4___2

3. 18____3

4. 32+11_____42

Answers

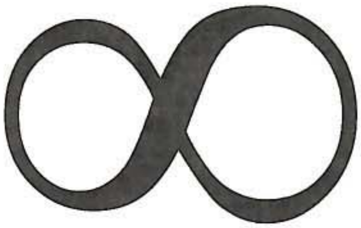
1. <

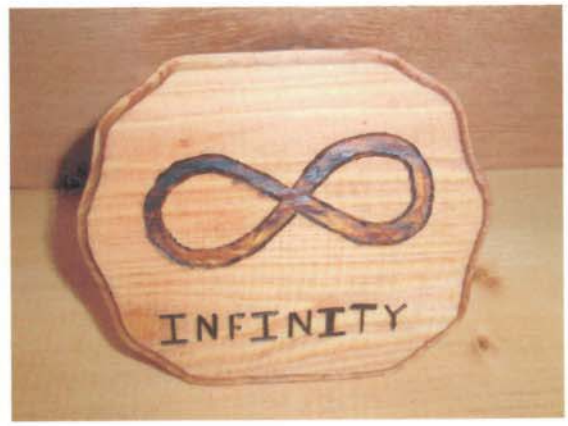
2. ≤

3. >

4. ≥

Infinity Sign





John Wallis's greatest work was the invention of the infinity sign. It was first published in 1655 in the Arithemetica Infinitorum. This invention said that numbers are infinte, meaning It can go on forever.

This invention greatly contributed to mathematics. Yet, the infinity sign had given mathematicians problems since the time of ancient Greek. For example, Zeno of Elea asked whether numbers are infinitely divisible or is it made up of small indivisible parts, in the 5th century B.C. This symbol had given the answer to this question.

Infinity Sign

An everyday example of an infinity problem that we used is the pi sign. The pi sign can go on forever. It cannot be terminated.

Division Sign

In the 17th century, the Anglo-American used the division sign to do the subtraction. It was used by Johann Heinrich Rahn who was a Swiss mathematician in 1659. There was a strong possiblity that the sign was used by Italian algebrists as a subtraction sign in 1684. However, it was Dr. John Pell of England that made the sign known throughtout the world in 1688.

The division sign is important to mathematics , because without it we can not divide. Furthermore, it helps avoid confusion when dividing with larger numbers.

Division Sign

John, Tony, and Rui had 300 marbles. They wanted to split up the marbles into 3 equal parts. After they divided they each were able to keep 100 marbles. In order to find out the amount of marbles the three of them kept, was just dividing 300 by 3. They divide by 3 because there are 3 boys.

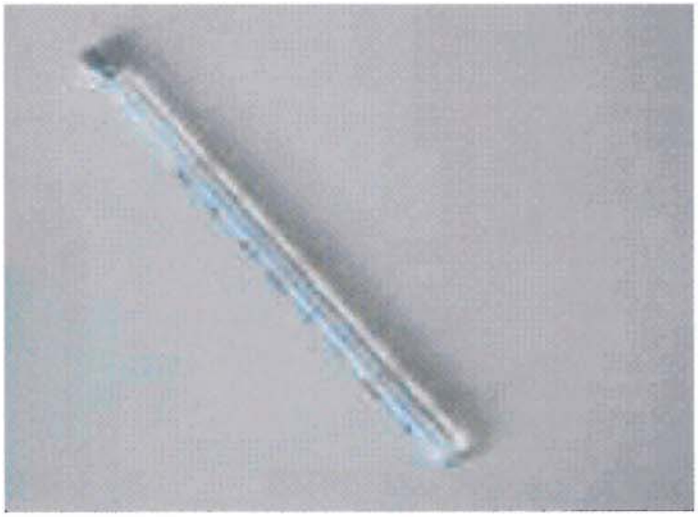
$$3 \overline{)300} = 100$$

This is found out by dividing 300 by 3, which equals 100.

There is another way to solve this. It uses the same concept except the division symbol is different.

$$300 \div 3 = 100$$

Mercury Thermometer



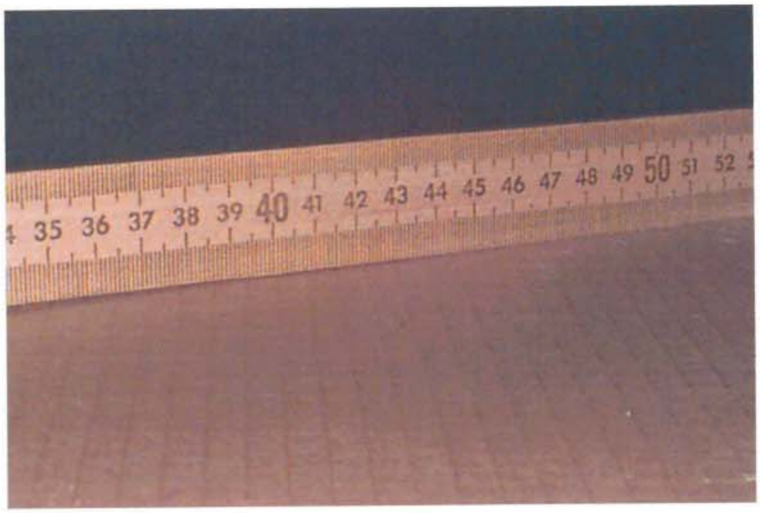
The first Mercury thermometer was invented in 1714 A.D. in Danzig by Gabriel Farenheit. it initiated the use of mercury as a heat-measuring medium. The thermometer is a small tubular instrument of thick glass. When heat is applied, the mercury expands and rises from the chamber past a narrowed point and up the cylindrical tube. Temperature is either measured in a Fahrenheit or Celsius scale.

Mercury Thermometer

Daniel Gabriel Fahrenheit invented the mercury thermometer and introduced the Fahrenheit scale that bears his name. The mercury thermometer involves mathematics because it is measured in the Celsius and Fahrenheit scale. The Celsius scale is also referred to as the centigrade scale. Centigrade means consisting of or divided into 100 degrees. Swedish Astronomer, Anders Celsius, invented the Celsius scale. There are 100 degrees between the freezing point (0 C) and the boiling point.

The formula to convert Celsius to Fahrenheit is $F = {}^{9/5}C + 32$.

Metric System



The metric system originated in France and was adopted in 1799 A. D. It is based on a unit of length called the meter and a unit of mass called the, kilogram.

Fractions and multiples of the metric units are related to each other by powers of 10. This allows conversion from one unit to a multiple of it simply by shifting a decimal point. Thus, avoiding the lengthy arithmetical operations required by the English units of measurement. Standard prefixes have been accepted for designating multiples and fractions of the meter, gram, are, and other units. Thus, 1,000 grams are a kilogram and 1/100 of a meter is a centimeter.

Metric System

The metric system is a mathematical concept that we use today in mostly every country in the world. We use the metric system for measurements. We use the system for length, width, height, et cetera, mass or weight, volume, and area. The meter is the base unit for length. The liter is the base unit for volume. The gram is the base unit for mass.

Length:

- 1,000 millimeters = 1 meter
- 100 centimeters = 1 meter
- 1,000 meters = 1 kilometer

Mass (or weight):

- 1,000 milligrams = 1 gram
- 1,000 grams = 1 kilogram
- 1,000 kilograms = 1 metric ton

Volume:

- 1,000 milliliters = 1 liter
- 1,000 liters = 1 cubic meter

Area:

- 10,000 square meters = 1 hectare
- 100 hectares = 1 square kilometer

Prefixes:

- micro- means 1/1,000,000
- milli- means 1/1000
- centi- means 1/100
- kilo- means 1,000
- mega- means 1,000,000

Symbols:

- m for meter
- mm for millimeter
- cm for centimeter
- km for kilometer
- g for gram
- mg for milligram
- kg for kilogram
- L for liter
- mL for milliliter
- m^2 for square meter
- m^3 for cubic meter
- km^2 for square kilometer
- t for metric ton
- ha for hectare

Some special relationships:

- 1 milliliter = 1 cubic centimeter
- 1 milliliter of water has a mass of approximately 1 gram
- 1 liter of water has a mass of approximately 1 kilogram
- 1 cubic meter of water has a mass of approximately 1 metric ton

Alexander Graham Bell
Telephone

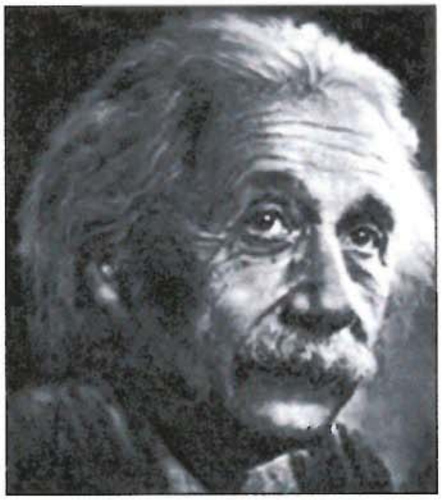
Sunday, June 25, 1876, was the day when Bell demonstrated his new invention at the Centennial Exhibition in Philadelphia. Alexander Graham Bell initially did not set out to invent the telephone. At first, he wanted to develop a multiple telegraph. In telegraphy, a current is interrupted in the pattern known as Morse Code. Bell hoped to convey several messages simultaneously, each at a different pitch. Yet, he could not see a way to make-and-break the current at the precise pitch required.

The breakthrough came one day in June 1875. Bell asked Thomas Watson to pluck a steel receiver reed with his finger to make sure it was not stuck. When Watson vibrated the reed, the receiver in Bell's room also vibrated, even though the current was turned off. Bell realized that the vibration had generated an undulating current, solely on the strength of a slight magnetic field. The telephone was born.

Alexander Graham Bell
Telephone

One of the most useful inventions was the telephone. Today, we use Bell's invention to communicate with others from vast distances. This is important to mathematics because it uses vibrations to transmit sounds.

ALBERT EINSTEIN

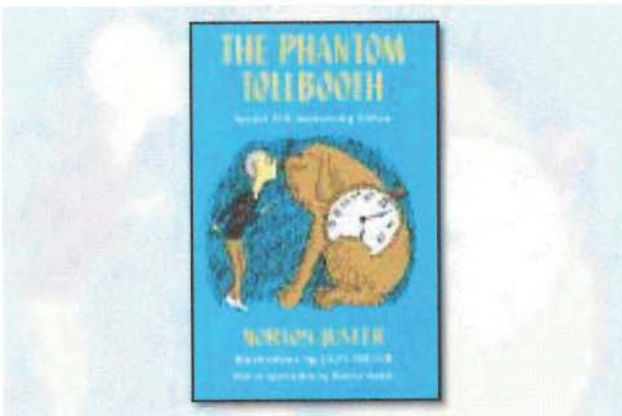
 

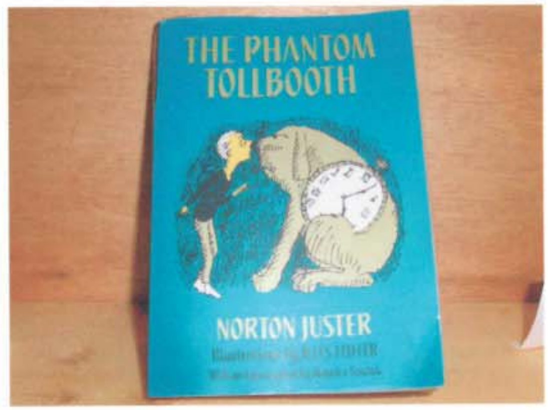
ALBERT EINSTEIN WAS BORN ON MARCH 14, 1879, AT ULM, WURTTEMBERG IN GERMANY. HE WAS EDUCATED IN THE SWISS FEDERAL POLYTECHNIC SCHOOL IN ZURICH TO BE A TEACHER IN PHYSICS AND MATHEMATICS. ALBERT WAS FAMOUS FOR HIS GENERAL THEORY OF RELATIVITY IN 1915. ALBERT EINSTEIN LECTURED ALL OVER THE WORLD AND WAS AWARED FELLOWSHIPS OR MEMBERSHIPS OF SCIENTIFIC ACADEMIES. HE ALSO RECEIVED A NUMBER OF AWARDS FOR THE RECOGNITION OFHIS CONTRIBUTES TO MATHEMATICS AND SCIENCE. HIS AWARDS INCLUDED THE COPLEY MEDAL OF THE ROYAL SOCIETY OF LONDON IN 1925, AND THE FRANKLIN MEDAL OF THE FRANKLIN INSTITUTE IN 1935. HE DIED ON APRIL 18, 1955 IN PRINCETON, NEW JERSEY.

Albert Einstein

Einstein's theory of relativity proposed that distance and time are not absolute. The key idea of General Relativity called the Equivalence Principle, is that gravity pulling in one direction is completely equivalent to an acceleration in the opposite direction. For example, a car accelerating forwards feels like sideways gravity pushing you back against your seat. An elevator accelerating upwards feels just like gravity pushing you into the floor.

THE PHANTOM TOLLBOOTH





THE BOOK THE PHANTOM TOLLBOOTH WAS WRITTEN BY NORTON JUSTER IN 1961 A.D. IT IS ABOUT A BOY NAMED MILO AND HIS ADVENTURES IN THE "LANDS BEYOND." THIS IS AN UNORDINARY PLACE WHERE WORDS, NAMES, AND EXPRESSIONS MEAN EXACTLY WHAT THEY SAY. FOR INSTANCE, MILO MEETS A DOG NAMED, TOCK, WHO IS A WATCH DOG – PART WATCH AND PART DOG. AS THE STORY GOES ON, MILO, TOCK, AND A LARGE INSECT CALLED THE HUMBUG, DRIVE ALONG A ROAD TO THE KINGDOM OF DIGITOPOLIS, WHICH IS RULED BY A PERSON KNOWN AS THE MATHEMATICIAN. THIS BOOK TAKES READERS TO A WHOLE NEW CURRICULUM OF CRITICAL THINKING INCORPORATING MATHEMATICS AND LITERATURE.

The Phantom Tollbooth

In the kingdom of Digitopolis, Milo finds himself face to face with the mathematician. This grand person shows Milo a complex problem using simple mathematics.

4+9 – 2x16+1/3x6-67+8x2-3+26-1/34+3/7+2-5

Milo quickly solves this problem mentally. Later in the story, Milo is shown two large numbers in size when he asked what is the largest number in the world. This story encourages young children to attempt more complex mathematics and see math in a whole new perspective.

Canon Pocketronic

The Canon Pocketronic was the first hand held calculator. It was manufactured in Japan in the mid-1971. When it became available, it costed about $395. It weighed about 1.8 pounds, and was 4 inches wide, 8 inches long, and 2 inches high. It was a four functioned calculator with a capacity of 12 decimal digits.

Today, we have hand held calculators everywhere. They are extremely convenient and allow students to save large amounts of space in bookbags and desks.

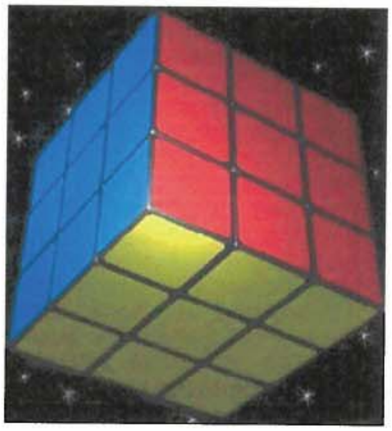
Canon Pocketronic

As the world today becomes more complex, simple machines such as the calculator are needed to make life a bit easier. The Canon Pocketronic was capable of performing simple calculations: multiplication, division, addition, and subtraction. In addition, calculators today can graph equations solve complex algebraic expressions, and you can even type on them.

1	+	1	=	2
2	x	2	=	4
3	/	3	=	1
4	-	2	=	2

As shown above, simple number sentences can be answered in a few seconds. On modernized calculators, graphing of complex equations can be done in the same amount of time.

Rubik's Cube



In 1974, Erno Rubik was granted a paten application for his highly addictive prototype. The model was of a 3x3x3 cube, each face a different color. This small wonder was later named the Rubik's Cube. Erno was a lecturer in the Department of Interior Design at the Academy of Applied arts and Crafts in Budapest. After several mind racking discoveries and a few minor incidents, Erno presented a prototype to his students. Instantaneously, they became devoured by the intense complexity of the cube. The creator was caught completely by surprise due to the effect his small game had on his students. Even more so when the toy hit Budapest toyshop's shelves towards the end of 1977. The toy made its international debut in January of 1980. The first Rubik's Cubes were exported from Hungary in May of 1980.

Although diminutive in size, this cube is of great importance to the world of three – dimensional geometry. It is a toy that challenges the eager minds of all people. it is a game of strategy, logic, and just a bit of luck.

Rubik's Cube

The Rubik's cube has always been a rather difficult puzzle to solve. However, through the years expert players have developed ways in which to solve the puzzle at any stage.

Experts advise that to begin to solve the cube, you should first pick a color, preferably white because it tends to stand out from the others. The first step is to from a cross on the top face of the cube. After you unscrambled the pieces, a white cross should be formed on top of the cube. Next, you must correctly position three of the "U" face pieces. Afterward, you must correctly place three of the four edge pieces on the "middle" layer of the cube. For these moves you will need to hold your cube so that the white face is on the bottom. Then, simply solve the remaining edge pieces. To learn how to solve the cube quickly, go to http://jeays.net/rubiks.htm#sol2step1.

Apple 2 Computer

The Apple 2 computer was finally completed in 1984. This new computer featured several charachteristics that distinguished this model from previous inventions. For one this model allowed for people to either capitalize their letters or keep them lowercase. Moreover, unlike previous models this new computer contained a built-in monitor. As well as a monitor this invention also featured a keyboard with numbers.

In the Math world this creation became a success. It was the first computer ever produced that had numbers. Besides the calculations put into the final product were all involving Math. As a matter of fact, the inventors used old formulas to calculate the dimensions and the memory this computer could store.

Apple 2 Computer

The Apple 2 Computer used binary digits to operate its programs. Based on the number ten, computers use a form of binary called hexadecimal.

1
10
11
100
101
110
111
1000

Above is a sequence of binary digits often used to operate modern computers. They work on a command basis just like our body. Today new computers are trying to improve by not using binary digits. however, most find it more useful to operate their computers with binary digits.

Earth loses Weight

In the early days of March in the year 2000 physicists at the University of Washington discovered that the weight of the Earth had been changed.The new weight calculated by theses scientists is 5.972 sextillion metric tons. This is approximately one trillion metric tons for each person on Earth. According to Jens Gundlach and Stephen Merkowitz , the formula to calculate the weight of the Earth is approximately $6.673 \times 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$. This discovery is of great importance to the world of mathematics. This formula enabled scientists to accurately measure the weight of the Earth.

Earth Looses Weight

Daily thousands of people worldwide loose weight. Like them recently the Earth has also lost weight. This discovery was made by physicists at The University of Washington. According to them the formula to calculate the current weight of the earth is $6.673*10^{-11}M^3Kg^{-1}S^{-2}$. Although this formula doesn't apply to our everyday mathematics it reminds us of growth and decrease. Also we could have subtracted the previous weight of the earth from the current one provided and have found the decrease. In mother words, imagine you weighed 140 lbs. After Thanksgiving you once again weighed yourself and now your scale indicates you weigh 143 lbs. Now what was the change in your weight?. Well to solve this problem you would simply subtract 140 lbs. from 143 lbs. and arrive at the conclusion that you gained a total of 3 lbs. Therefore, the weight of the earth shifting is quite the same as our weight changing over periods of time.

MATH FAIR 2003

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