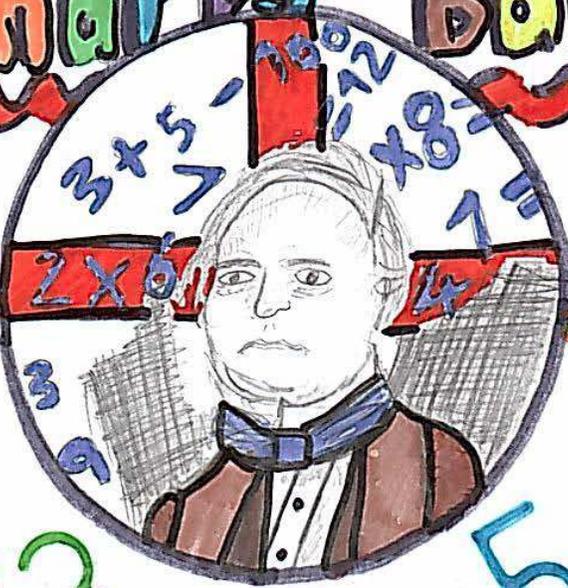


# Charles Babbage



Born  
26 December  
1791  
London  
England

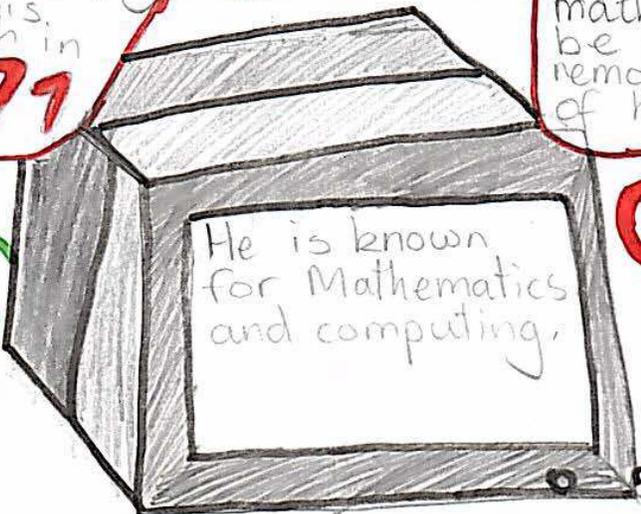
Died  
18 October  
1871 (aged 79)  
London  
England

# Mathematician

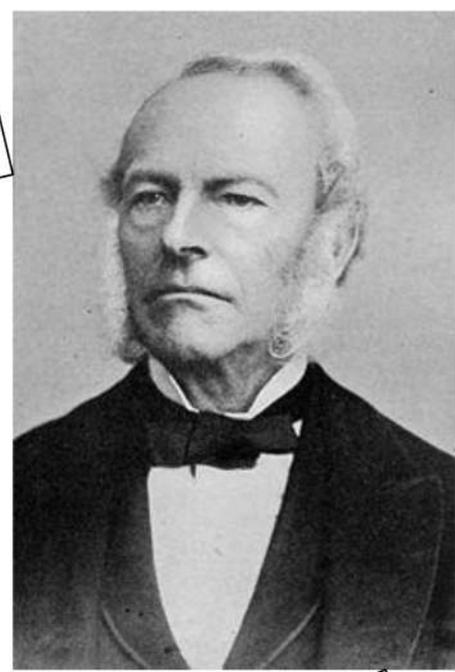
In 1824, Charles won the gold medal of the Royal Astronomical Society "for his invention of an engine for calculating mathematical and astronomical tables". He was a founding member of the society and one of its oldest living members on his death in 1877.

Charles married Georgiana Whitmore and had eight children. Charles engineered the central heating system.

Charles sought a method by which mathematical tables could be calculated mechanically, removing the high rate of human error.



# Sir George Gabriel Stokes



In content his work is distinguished by a certain definiteness and finality, and even of problems which, when he attacked them, were scarcely thought amenable to mathematical analysis, he has in many cases given solutions which once and for all settle the main principles.

This fact must be ascribed to his extraordinary combination of mathematical power with experimental skill. From the time when in about 1840 he fitted up some simple physical apparatus in his rooms in Pembroke College, mathematics and experiment ever went hand in hand, aiding and checking each other. In scope his work covered a wide range of physical inquiry, but, as Marie Alfred Cornu remarked in his Rede lecture of 1899, the greater part of it was concerned with waves and the transformations imposed on them during their passage through various media.

**Fluid dynamics**

**Light**

Perhaps his best-known researches are those which deal with the wave theory of light. His optical work began at an early period in his scientific career. His first papers on the aberration of light appeared in 1845 and 1846, and were followed in 1848 by one on the theory of certain bands seen in the spectrum.

In 1849 he published a long paper on the dynamical theory of diffraction, in which he showed that the plane of polarization must be perpendicular to the direction of propagation. Two years later he discussed the colours of thick plates.

**Chemical analysis**

The identification of organic bodies by their optical properties was treated in 1864; and later, in conjunction with the Rev. William Vernon Harcourt, he investigated the relation between the chemical composition and the optical properties of various glasses, with reference to the conditions of transparency and the improvement of achromatic telescopes. A still later paper connected with the construction of optical instruments discussed the theoretical limits to the aperture of microscope objectives.

His first published papers, which appeared in 1842 and 1843, were on the steady motion of incompressible fluids and some cases of fluid motion. To the theory of sound he made several contributions, including a discussion of the effect of wind on the intensity of sound and an explanation of how the intensity is influenced by the nature of the gas in which the sound is produced. These provided a key not only to the explanation of many natural phenomena, such as the suspension of clouds in air, and the subsidence of ripples and waves in water, but also to the solution of practical problems, such as the flow of water in rivers and channels, and the skin resistance of ships.

**Fluorescence**

In 1852, in his famous paper on the change of wavelength of light, he described the phenomenon of fluorescence, as exhibited by fluorspar and uranium glass, materials which he viewed as having the power to convert invisible ultra-violet radiation into radiation of longer wavelengths that are visible. The Stokes shift, which describes this conversion, is named in Stokes' honor. A mechanical model, illustrating the dynamical principle of Stokes's explanation was shown. The offshoot of this, Stokes line, is the basis of Raman scattering.

**Polarization**

In the same year, 1852, there appeared the paper on the composition and resolution of streams of polarized light from different sources, and in 1853 an investigation of the metallic reflection exhibited by certain non-metallic substances. The research was to highlight the phenomenon of light polarization. About 1860 he was engaged in an inquiry on the intensity of light reflected from, or transmitted through, a pile of plates; and in 1862 he prepared for the British Association a valuable report on double refraction, a phenomenon where certain crystals show different refractive indices along different axes. Perhaps the best known crystal is Iceland spar, transparent calcite crystals.

# Fibonacci



## Key Facts:

Born in 1170 in Italy

He published a book inventing the digits 0-9, and also invented place value.

His main discovery was the sequence which he named after himself—the Fibonacci Sequence.

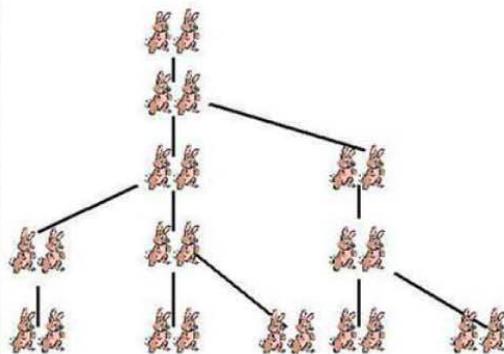
The reason his sequence was so special was because it occurs huge amount in nature.

His full name was Leonardo Pisano Bigollo.

He died in 1250.

## The Fibonacci Sequence:

It worked by adding the previous two numbers together. So if there are the two numbers 3 and 5, then the next will be 8. It occurs an incredible amount in nature. For example, in your hands, the length of each finger bone increases in the same way as the Fibonacci Sequence, or maybe the number of diamonds on the side of a pinecone or pineapple. It was discovered when he thought about breeding rabbits, and found the pattern in the number of babies produced.



BORN IN  
1889

DIED IN 1971



I LOVE  
CODES!

Agnes Meyer Driscoll!!

The Cryptanalyst!!!

LIVED  
THROUGH  
BOTH WORLD  
WARS!!



She got a degree in  
Mathematics, Physics, Foreign  
Languages and Music!!



Her  
nicknames  
were: Miss  
Aggie, or  
Madame X



She was an  
American  
cryptanalyst  
World War I  
and World  
War II.



Betty  
Meyer  
Agnes'  
sister:



In 2000 she was inducted into  
the National Security Agency's  
Hall of Honour.



Some of  
the codes  
she  
decoded:



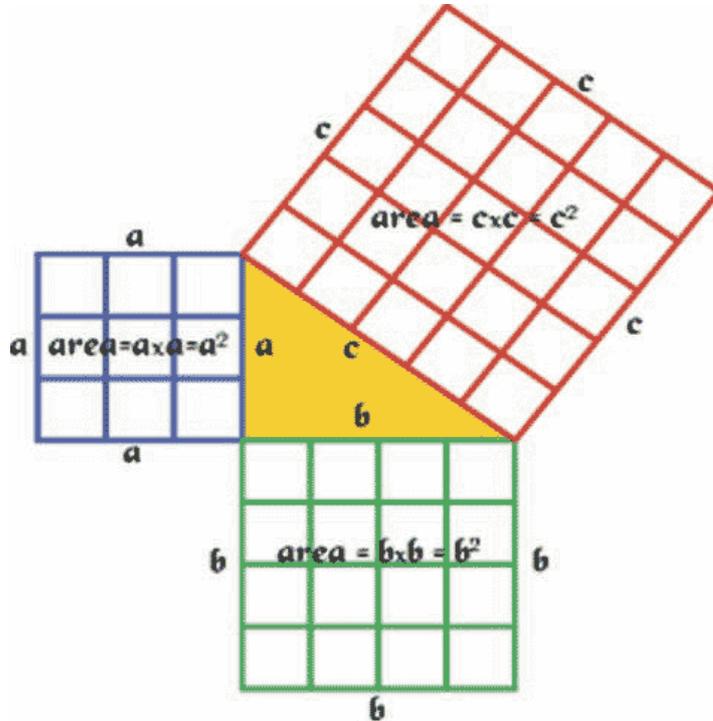
By Aisling Strachan!!



# Pythagoras' Theorem

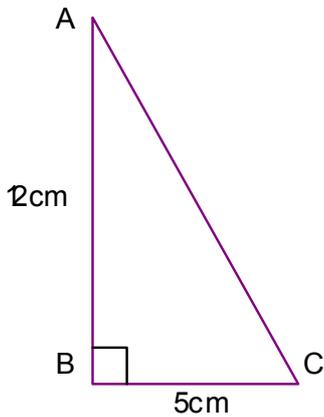
Pythagoras' theorem states that in a right-angled triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Did you know, Pythagoras was a Greek philosopher and mathematician who lived around 2500 years ago?



Pythagorean Theorem:  $c^2 = a^2 + b^2$

For example:



$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 12^2 + 5^2$$

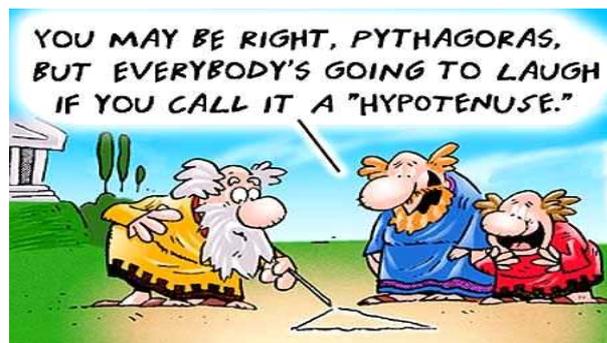
$$AC^2 = 144 + 25$$

$$AC^2 = 169$$

$$AC = 13\text{cm}$$

Did you know that Pythagoras' Theorem was first used thousands of years ago by the ancient Egyptians?

The hypotenuse is the longest side on a right-angled triangle.



By Tamah  
Gayle-  
Morris

# Leonhard Euler

**Born: 15 April 1707 in Basel, Switzerland**

**Died: 18 Sept 1783 in St Petersburg, Russia**

At the age of 13 he matriculated from the University of Basel, and in 1723, at the age of 17, he received the degree of Masters of Arts with a dissertation that compared the philosophies of Descartes and Newton

#### Interesting Facts:

1735 he lost much of his vision in the right eye because he had looked into the sun for too long.

In 1720 Euler began his studies at the University of Basel. There Euler met Daniel and Nikolaus Bernoulli, who noticed Euler's skills in mathematics. In 1727 Euler was called to St. Petersburg by Catherine I. and became professor of physics in 1730. Finally in 1733 he became professor of mathematics. His work was both in physics and mathematics. Euler was the first to publish a systematic introduction to mechanics in 1736.

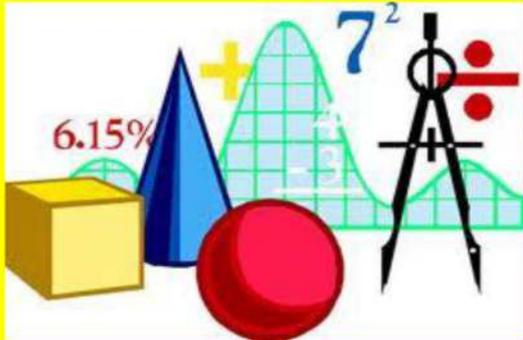


In 1733, (Aged 26), he marries Katharina Gsell, the daughter of the director of the academy of arts. They had 13 children together but unfortunately only three sons and two daughters survived. The descendants of these children, however, were in high positions in Russia in the 19<sup>th</sup> century.

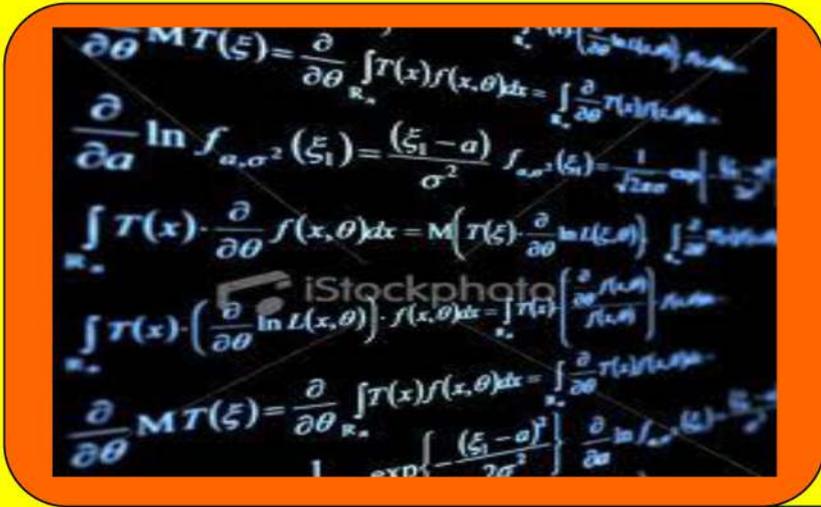
When Euler died on 18th of September 1783 the mathematician and philosopher Marquis de Condorcet said ``...et il cessa de calculer et de vivre" (and he stopped calculating and living).

*'Mathematicians have tried in vain to this day to discover some order in the sequence of prime numbers, and we have reason to believe that it is a mystery into which the human mind will never penetrate.'*

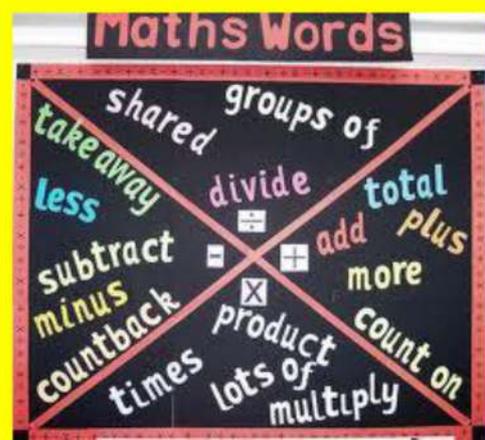
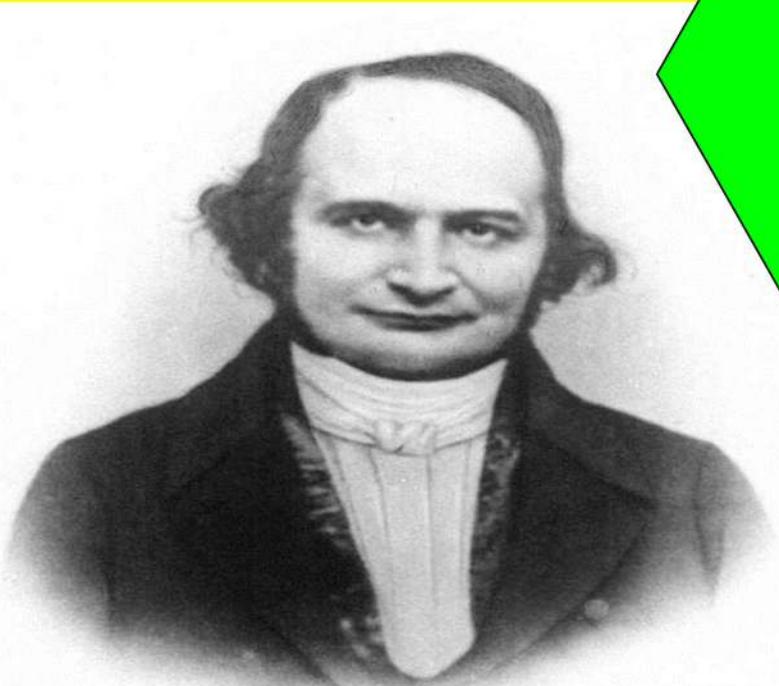
# Carl Gustav Jacob Jacobi



German Mathematician. Born December 10, 1804 at Potsdam, Kingdom of Prussia. He is known for Jacobi's elliptic functions, Jacobian, Jacobi symbol and Jacobi Identity. He invented the Determinant.



Jacobi's most important contributions to mathematics were in the field of elliptic functions. Niels Hendrik Abel had partially anticipated some of Jacobi's work, but the two were equally important in the creation of this subject. Jacobi also worked on Abelian functions and discovered the hyperelliptic functions. He applied his work in elliptic functions to number theory.



# Hypatia of Alexandria



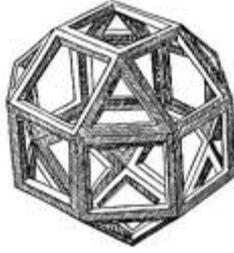
Hypatia of Alexandria was born about 370 In Alexandria, Egypt.

Hypatia was the first woman to make a substantial contribution to the development of mathematics.

- Hypatia was the daughter of the mathematician and philosopher Theon of Alexandria and it is fairly certain that she studied mathematics under the guidance and instruction of her father.
- Hypatia came to symbolise learning and science which the early Christians identified with paganism. However, among the pupils who she taught in Alexandria there were many prominent Christians.
- Most historians believe that Hypatia surpassed her father's knowledge at a young age. However, while Hypatia was still under her father's discipline, he also developed for her a physical routine to ensure for her a healthy body as well as a highly functional mind.
- She edited the work *On the Conics of Apollonius* which divided cones into different parts by a plane.
- Hypatia lived in Alexandria when Christianity started to dominate over the other religions. In the early 390's, riots broke out frequently between the different religions.
- Hypatia's life ended tragically, however her life's work remained. Later, Descartes, Newton, and Leibniz expanded on her work. Hypatia made extraordinary accomplishments for a woman in her time. Philosophers considered her a woman of great knowledge and an excellent teacher.

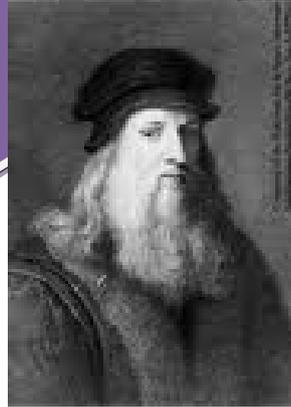
# Leonardo Da Vinci

If you like Maths, then this is the poster for you!



Leonardo Da Vinci was always a lover of maths, yet he did not know how to express his feelings for the higher equalities. So for the first time in maths history, he made maths but with geographical shapes. His expressions were a wonderful piece of maths.

Leonardo loved wrapping his mind through, what seemed like impossible puzzles and problems. Leonardo also had never had a proper education and his maths was nothing to do in the Italian schools. His speciality was his shapes.



He picked up the writings and calculations of the ancient civilisations as they used shapes to.

It was an unexpected discovery that his maths was actually included in his music and his paintings!

He used his mathematical proportions in his other work like his inventions he planned out. One of his most famous inventions was a machine gun. It's strange but true. This was made on cogs of rotation. With proportions of the cogs was able to spin faster.

In the music his maths created rhythmic patterns or beats. Only recently, the maths found in his painting, The Last Supper; if you measure by equal units the painting measures 6 by 12 units, the back wall 4 units and the windows 3 units.

The Mona Lisa; another masterpiece of art is all around the golden rectangle. If you look at the face then you can see a rectangle that he drew the base of the face around and the same with the eyes if you draw a line in-between them.

# Hertha Marks Ayrton

1854-1923

made with sparklee.com



This is a picture from Hertha Ayrton 1926 biography, institution: Hertha Ayrton 1854-1923: A Memoir, by Evelyn Sharp (London: 1926)

She was also active in devising and solving mathematical problems, many of which were published in "Mathematical Questions and Their Solutions" from the *Educational Times*.

Ayrton invented a draftsman's device that could be used for dividing a line into equal parts as well as for enlarging and reducing figures.



Hertha was born with the name Phoebe Sarah Marks, but when a teenager changed it to Hertha Marks Ayrton. This was after completing the Cambridge University Examination for Women with honours in English and mathematics.

by Daniella Grosso



# Sir Isaac Newton

Born in 1643  
Lincolnshire, England

Isaac thought the universe worked like a machine and that a few simple

Isaac was born just a short time after the death of **Galileo**, one of the

## THE 3 LAWS

1. **The First Law** states that an object that is not being pushed or pulled by some force will stay still, or will keep moving in a straight line at a steady speed.
- 2.

### **The Second Law**

explains how a force acts on an object. An object accelerates in the direction the force is moving it.

- 3.

**The Third Law** states

Galileo had proved that the planets revolve around the sun, not the earth as people thought

He formulated laws of *motion* and *gravitation*. These laws are math formulas that explain how objects move

Newton understood that **GRAVITY** was the force of attraction between two objects.

by Kate Hughes

# Sir Isaac Newton

...was one of the **best scientists in the world** because he took his ideas and the ideas of earlier scientists like Galileo and combined them into a unified picture of how

# Blaise Pascal



Blaise Pascal was a French philosopher, physicist, and of course mathematician. Pascal demonstrated his abilities at a very early age, under the guidance of his father, but lived a short life (he died at age 39).

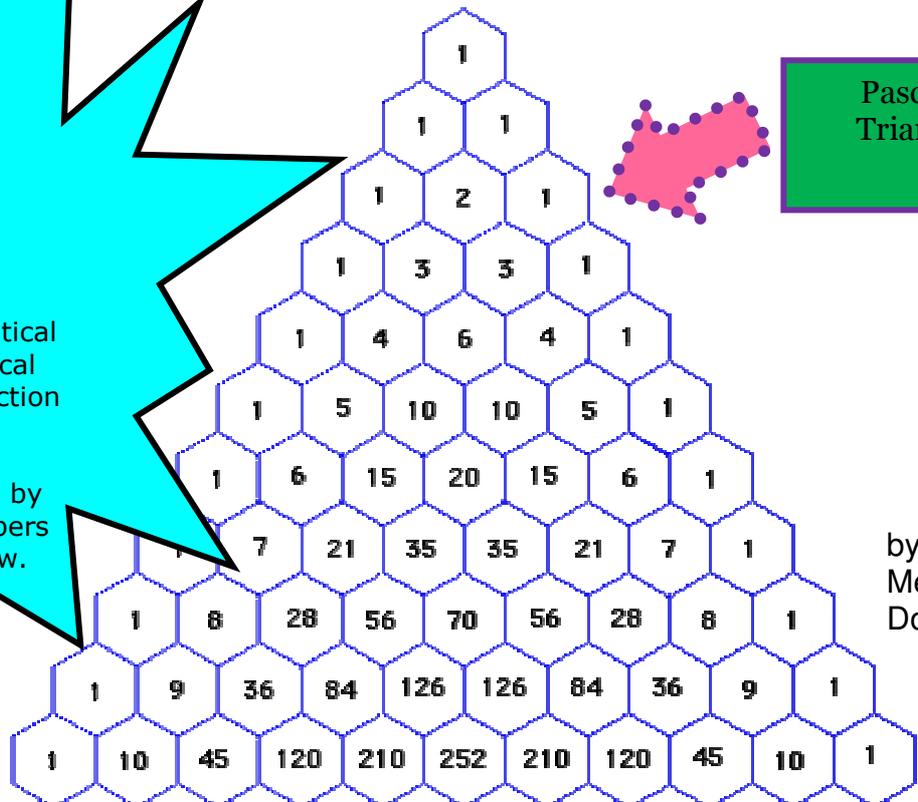


Pascal is famous for his contributions to probability. In fact, he is considered to have been at the forefront of field.

In addition to professional gamblers, many economists gained valuable information from Pascal, particularly actuarial scientists.

If you have heard of Pascal it is probably because of **Pascal's Triangle**. Pascal's triangle has many interesting mathematical connections, but Pascal discovered its connection to the binomial coefficients. Each number is generated by adding the two numbers above it... Look below.

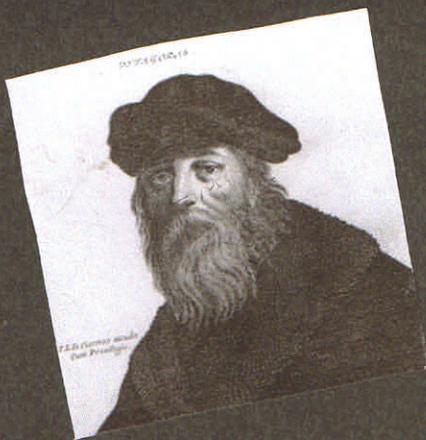
Pascal's Triangle



by  
Meg Isabella  
Dowthwaite

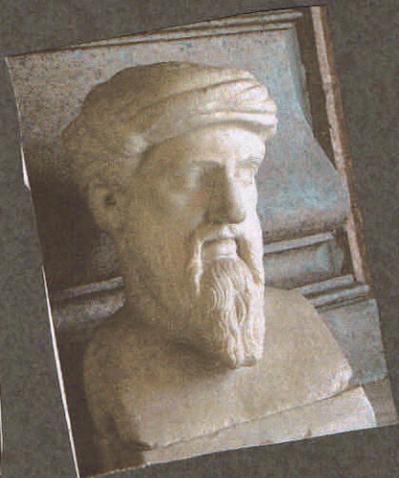
# PYTHAGORAS

This is what Pythagoras was supposed to have looked like.



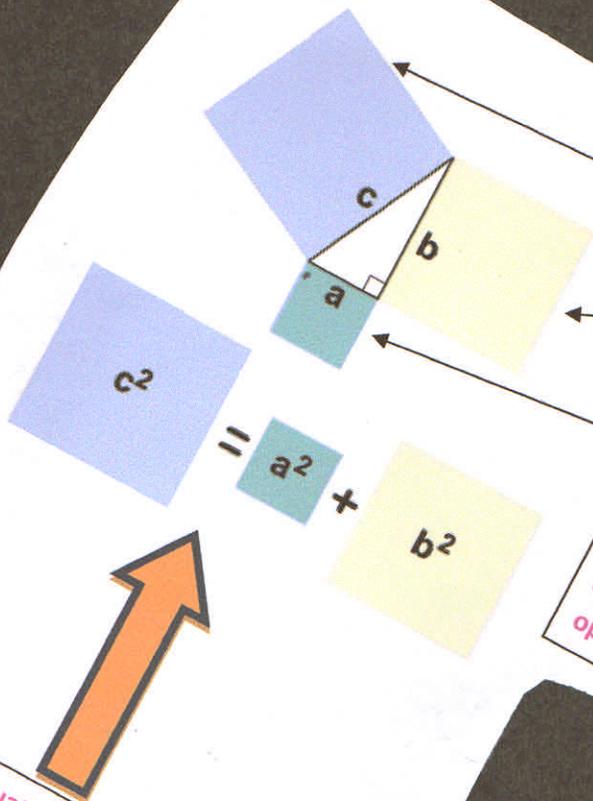
Pythagoras was a Greek philosopher and mathematician. He was born on the Greek island of Samos over 2000 years ago.

Nowadays there are a series of statues of Pythagoras many of which look like this:



As a child Pythagoras was well educated, and in 530 B.C. he moved to Croton and started a religious group. Here he developed many rites and rituals, he gained some followers too.

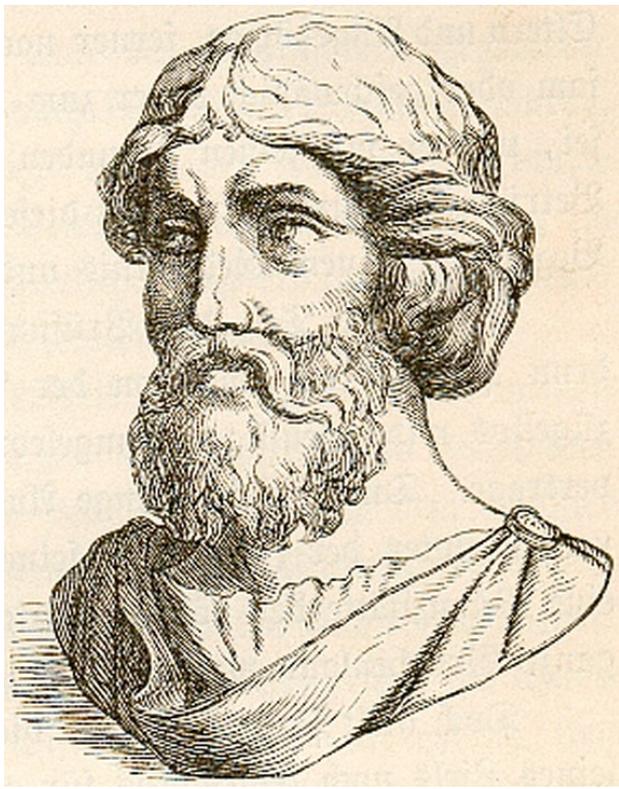
Pythagoras is most well known for his mathematics. He had a theory shown below. This was called Pythagoras's Theorem.



Pythagoras's Theorem was this: If you had a right angled tri-angle and added squares on each side of the tri-angle it would look like this. Plus, he found that the area of the squares of the shorter sides would fit into the square of the bigger side on the bigger side. The big square on the bigger side is called the Hypotenuse and is easy to spot because it is always opposite the right angle.

He made an Equation out of this and this is what it looks like. If you have the length of two sides of the Tri-angle you can find the other side's length by following this

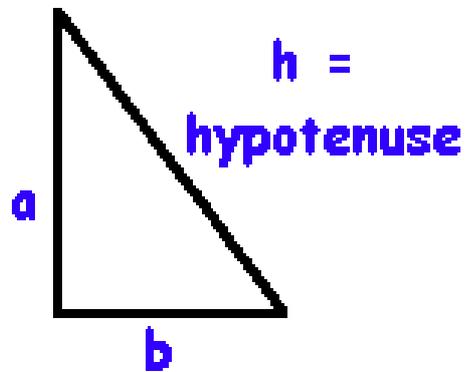
There is not much reliable information about Pythagoras because all the information was written about him many years after his death.



## Pythagoras

Pythagoras is a famous mathematician who lived from 570 BC – 495 BC. He is known for “Pythagoras’ Theorem”. This Theorem helps us with triangles and their right angles. Pythagoras found out that:

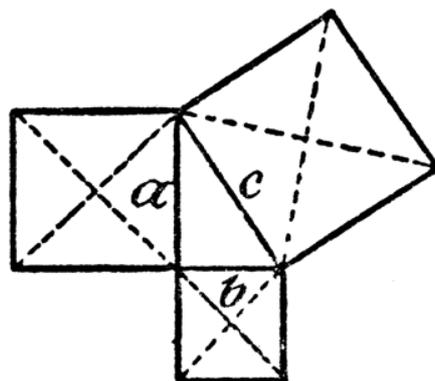
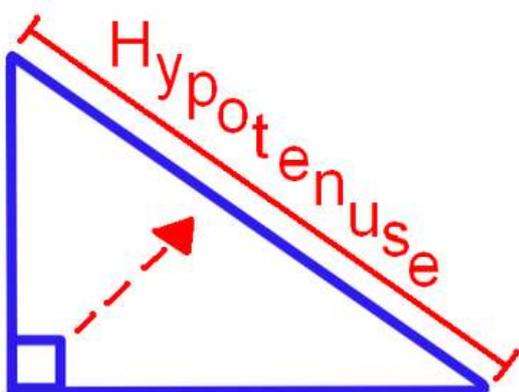
$$a^2 + b^2 = h^2$$



This helps us to find the shorter sides of a right angled triangle and helps us find the longer side (the hypotenuse).

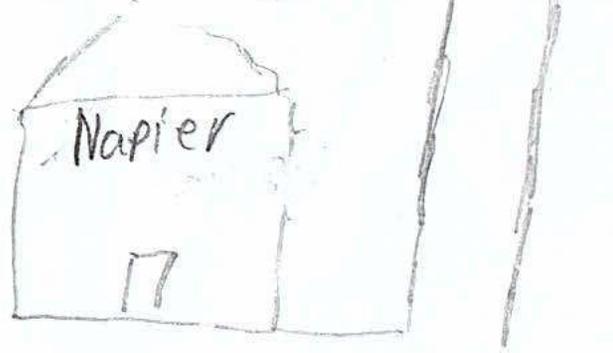
At the moment we haven't found any of Pythagoras' writings and findings as they rotted away but there were some written about him and that's how we know about him and his findings.

Pythagoras was born on Samos which is a eastern Greek island with his dad, his mother and a brother. On that island Pythagoras found discoveries. He didn't just found out about triangles, he also found out about music, astronomy and more.



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

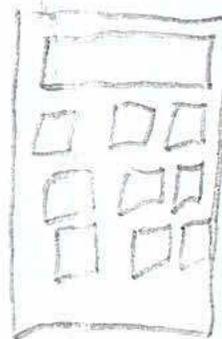
John Napier  
University



he was  
born in  
1550



he invented  
the ~~battergrass~~  
calculator



he died in

# 1642-1727 NEWTON

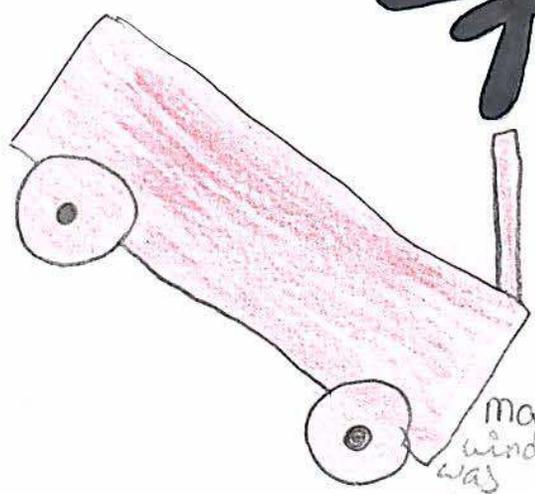
Invented  
the flap  
cat but  
didn't  
have a  
cat



didn't  
have  
a wife or  
children

Discovered Gravity  
Was sitting under an apple  
tree when an apple fell on  
his head so he decided to  
do some tests

Discovered  
the reflecting  
telescope in  
(1672)



Isaac Newton  
made carts and  
windmills when he  
was a small boy  
all the moving parts  
actually worked.



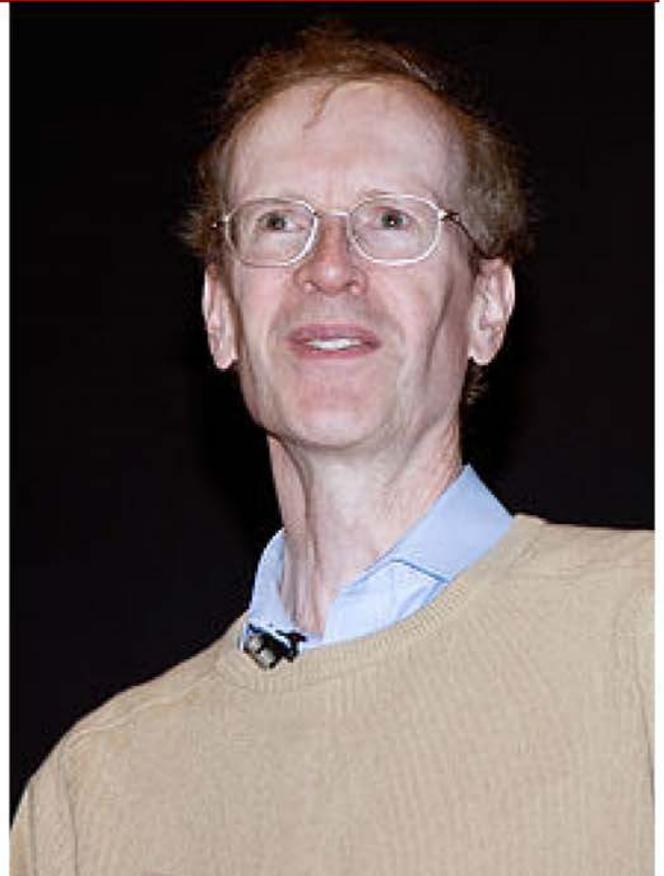
# Sir Andrew Wiles

Sir Andrew John Wiles was born 11 April 1953 and is age 57. He is most famous for proving Fermat's Last Theorem.

Andrew Wiles is married to Nada Canaan Wiles and they have three daughters: Clare, Kate and Olivia. He and his family currently live in Princeton, New Jersey.

## Interesting

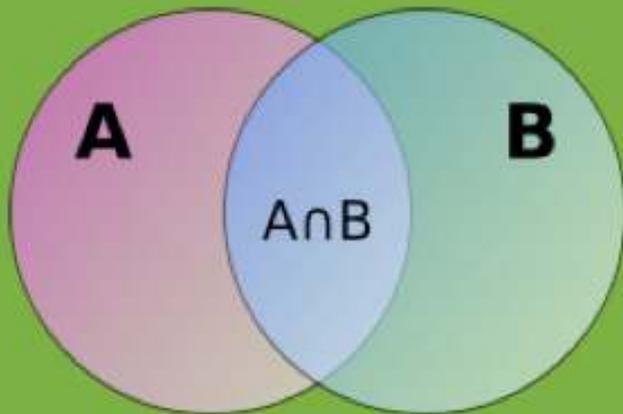
- Andrew Wiles was appointed to the rank of Knight Commander of the Order of the British Empire in the United Kingdom in 2000.
- The asteroid 9999 Wiles was named for Andrew Wiles in 1999.
- Andrew Wiles was mentioned in an episode of Star Trek for his proof of



Theorem- a theoretical proposition, statement, or formula embodying something to be proved from other propositions or formulas.

# GEORG CANTOR

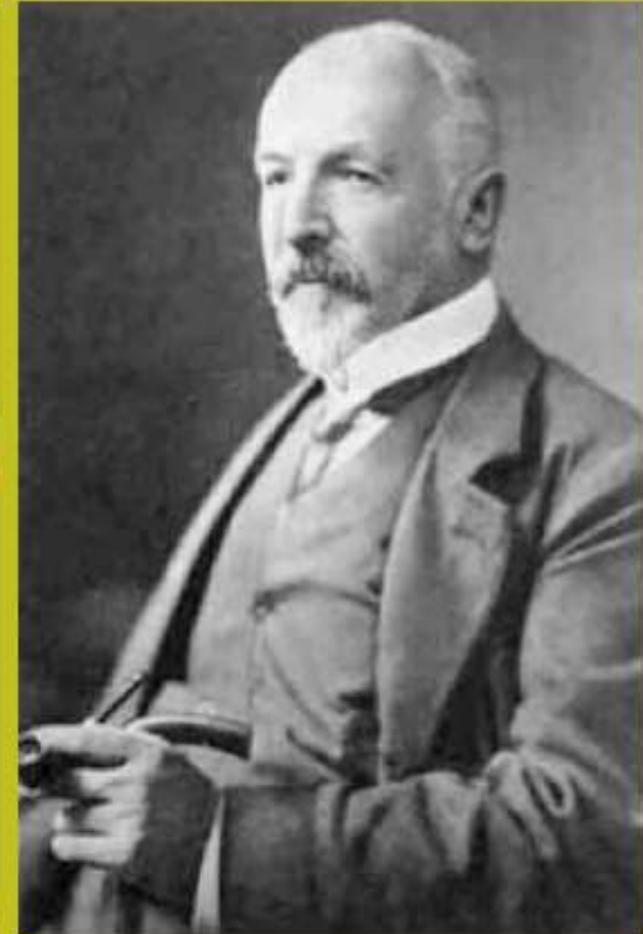
Georg Ferdinand Ludwig Cantor was best known for his invention of a whole branch of mathematics with his set theory. It is useful for analysing difficult concepts in maths and logic. It is important as it can help mathematicians with infinity. Set theory collects objects into sets, but they don't have to be mathematical objects! Venn Diagrams are a basic form of set theory.



**OTHER SKILLS:**  
Cantor was a skilled violinist and was thought to have inherited the skills from his mother and father who were both musical.

Cantor's continuum hypothesis remains unsolved to this day.

$$2^{\aleph_0} = \aleph_1$$
$$2^{\aleph_a} = \aleph_{a+1}$$



Cantor was born in the city of Saint Petersburg, Russia in 1845. He grew up there until he was eleven, when his family left the city to go to Germany, trying to find warmer summers. He went to several universities and taught later on in his life. He taught at the University of Halle, where he took a permanent position. He had many disputes with other mathematicians and had serious bouts of depression. In 1899 Rudolph, his son, died suddenly while he was giving a lecture. After that he said he had 'lost all passion for mathematics' but continued to work until 1913. He attended many talks and lectures but due to his illness he missed awards and they had to be sent to him. His public celebration of his seventieth birthday had to be cancelled in 1916 due to World War One. He died in 1918 in a sanatorium.

Juan-Philip  
Marx

# Leonardo Pisano Fibonacci

## Lead Story Headline

Leonardo Pisano Fibonacci was approximately born in the 13th century around 1170 and that he died around 1250.

Fibonacci was born in Italy but was educated in North Africa. Most of the information we are taught about was actually by his own autobiographical notes, we also did not have any pictures or drawings of him.

Fibonacci is considered to be one of the most talented mathematicians for the Middle Ages. Not many people realize that it was Fibonacci that gave us our decimal number system (0-9) which replaced the Roman Numeral system. When he was

studying mathematics, he used the Hindu-Arabic (0-9) symbols instead of Roman symbols. He shows how to use our current numbering system in his book Liber abaci.

Fibonacci wrote this problem in his book called Liber abaci:

*A certain man put a pair of rabbits in a place surrounded on all sides by a wall. How many pairs of rabbits can be produced from that pair in a year if it is supposed that every month each pair begets a new pair, which from the second month on becomes productive?*

This is how Fibonacci discovered the famous Fibonacci Numbers and Fibonacci Sequence. The sequence is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55... This sequence, shows that each

number is the sum of the two numbers before it.

The Fibonacci Sequence defines the curves of natural spirals. Examples can be snail shells and even the pattern of seeds in plants.

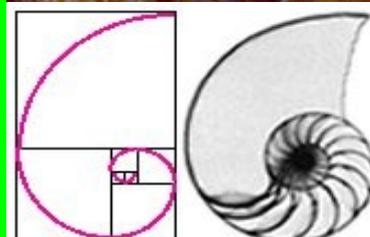
The name was given in by a French mathematician named Edouard Lucas in the 1870's.



A sketch of Fibonacci by Kristin Palm

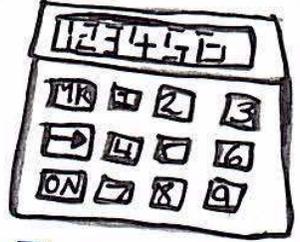
### Special points of interest:

- Fibonacci was born in Italy but educated in Northern Africa
- He gave us our decimal number system (0-9)
- He wrote 4 books
- It has been said that the Fibonacci numbers are Nature's numbering system and apply to the growth of living things, including cells, petals on a flower, wheat, honeycomb, pine cones and much more.



# Blaise Pascal

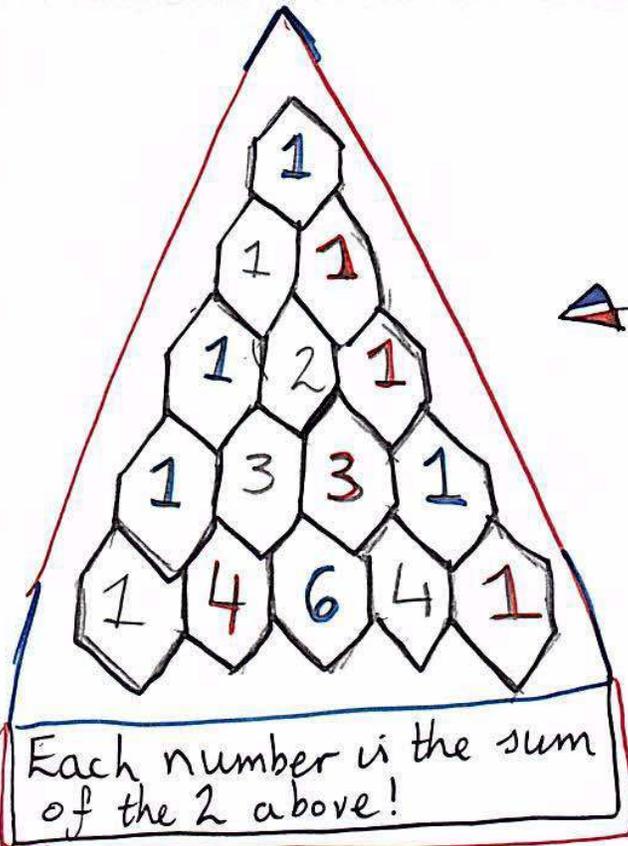
June 19<sup>th</sup> 1623



August 19<sup>th</sup> 1662

He was a French mathematician, physicist and writer. He was also Roman Catholic.

Pascal was born in Clermont, France and died 2 months after 39<sup>th</sup> Birthday because of a disease called Tuberculosis.



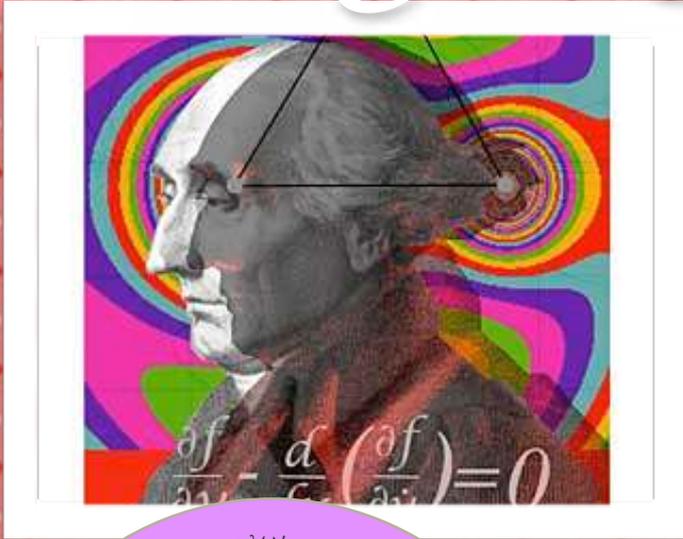
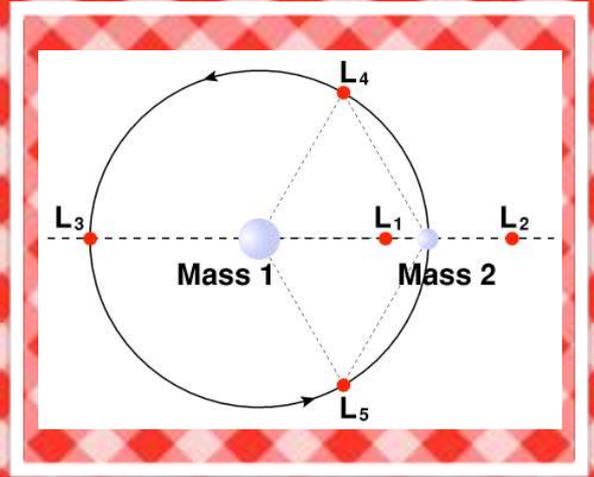
In 1654 he devoted himself to philosophy, which was when he invented a Probability theory, now called Pascal's Triangle.

In 1642 Pascal started work on calculating machines.

- 3 years later and after  prototype
- Blaise Pascal invented the machine calculator!!!

# Joseph Louis Lagrange

$$a^{p-1} - 1 \equiv 0 \pmod{p},$$

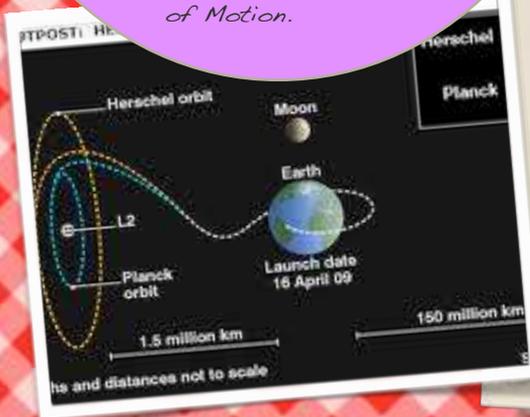


$$a^{p-1} - 1 \equiv 0 \pmod{p},$$

While in Prussia, he published the 'Mécanique Analytique' which is considered to be his monumental work in the pure maths. His most prominent influence was his contribution to the metric system and his addition of a decimal base. Some refer to Lagrange as the founder of the Metric System. Lagrange is also known for a great deal of work on planetary motion. He was responsible for developing the groundwork for an alternate method of writing Newton's Equations of Motion.

## FACTS...

Joseph Louis Lagrange, the greatest mathematician of the eighteenth century, was born at Turin on January 25, 1736, and died at Paris on April 10, 1813. Joseph-Louis Lagrange is usually considered to be a French mathematician, but he was born in Italy. He studied at the College of Turin, and his favorite subject was classical Latin. At first he had no great enthusiasm for mathematics, finding Greek geometry rather dull. Lagrange's interest in mathematics began when he read a copy of Halley's 1693 work on the use of algebra in optics.



*"Before we take to sea we walk on land, Before we create we must understand."*

# Leonhard Euler

Born 15th of April 1707

Died 18th December 1783



At the age of thirteen he enrolled at the University of Basel.



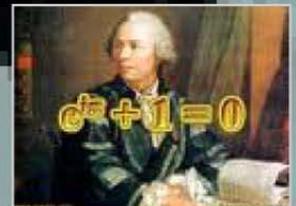
$$e^{i\pi} + 1 = 0$$

Leonhard's Equation

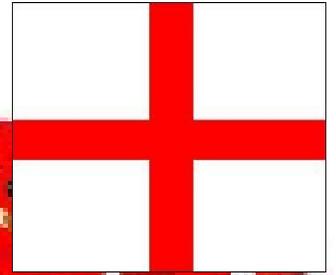
He lost sight in one of his eyes most likely due to observing the sun without taking proper precaution

He was a Swiss mathematician. Born and educated at Basel, where he knew the Bernoullis, he went to St. Petersburg (1727) at the invitation of Catherine I.

as a kind and generous man who enjoyed the simple pleasures of life. His simple pleasures included growing vegetables in his garden and telling stories of his 13 children and playing with his many grandchildren. (Dunham, 1990) He is possibly the most prolific writer in mathematics history.



# Isaac Newton



Isaac (Sir) Newton (1642-1727) England

I. Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it

II. The relationship between an object's mass  $m$ , its acceleration  $a$ , and the applied force  $F$  is  $F = ma$ . Acceleration and force are vectors (as indicated by their symbols being displayed in slant bold font); in this law the direction of the force vector is the same as the direction of the acceleration vector.

III. For every action there is an equal and opposite reaction.

Newton believed God was invisible but influenced every part of people's lives.

Newton at only age 26 became a professor of math.

Isaac's father could hardly write his name.

Newton's discoveries about light and movement of planets were used to make the first flights to the moon possible.

Newton oversaw the recoinage of the whole country.

Newton earned the title of Warden of the Royal Mint.

Isaac was born on Christmas day.

# David Hilbert

David Hilbert is recognized for one of the most influential and universal mathematicians of the 19th and early 20th century. Hilbert was the first of 2 children and only son of Otto and Maria. Hilbert, was born in the Province of Prussia.

Why is David Hilbert Famous?.....

The finiteness Theorem, Acclimatization of Geometry, The 23 problems, formalism, functional analysis, physics, and the number theory are his biggest accomplishments.



Born-January 23rd 1862

Died-14th February 1943

A SQUARED + B SQUARED = H SQUARED

# pythagorean theorem

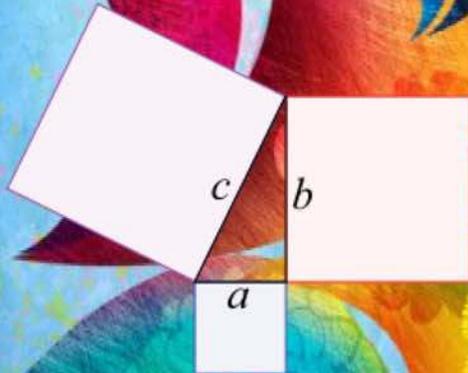


H

The sum of the squares of the lengths of the sides of a right triangle is equal to the square of the length of the hypotenuse

Pythagoras was a Greek philosopher who made important developments in mathematics, astronomy, and the theory of music. The theorem now known as Pythagoras's theorem was known to the Babylonians 1000 years earlier but he may have been the first to prove it.

Pythagoras of Samos was a famous Greek mathematician and philosopher, born between 580 and 572 BC, and died between 500 and 490 BC. He is known best for the Pythagorean Theorem, which is an important theorem about right triangles. He started a group of mathematicians, called the Pythagoreans, who worshiped numbers and lived like monks.



The Pythagorean Theorem says that the area of a square on the hypotenuse is equal to the sum of the areas of the squares on the legs. In this picture, the area of the blue square added to the area of the red square makes the area of the purple square. It was named after the Greek mathematician Pythagoras: If the lengths of the legs are  $a$  and  $b$ , and the length of the hypotenuse is  $c$ , then,  $a^2 + b^2 = c^2$ . Then you square root  $c$  to find the length of the hypotenuse.

Religion was important to the Pythagoreans. They swore their oaths by "1+2+3+4" (which equals 10). They also believed that the soul is immortal and goes through a cycle of rebirths until it can become pure. They believed that these souls were in both animal and plant life. Pythagoras himself claimed to remember having lived four different lives. He also told of hearing the voice of a dead friend in the howl of a dog being beaten, and was then attacked by an angry mob.

ADA  
LOVELACE  
DAY  
24<sup>th</sup> MARCH

ADA BYRON, LADY LOVELACE  
1815-1852

SHE HAD A GREAT IMPACT ON  
BERNOULLI NUMBER IN SOLVING  
SUMS AND POLYNOMIALS USED TO  
CALCULATE FUNCTIONS AND ALSO  
TO FIND THE RADIUS  
CONVERGENCE AND POWER SERIES



IN 1980, THE COMPUTER LANGUAGE  
ADA, CREATED BY THE U.S. DEFENCE  
DEPARTMENT WAS NAMED IN HER  
HONOUR

THE LOVELACE MEDAL WAS  
ESTABLISHED BY THE BRITISH  
COMPUTER SOCIETY IN 1998,  
FOR HER CONTRIBUTION TO  
COMPUTER SCIENCE

BCS

The  
Chartered  
Institute  
for IT

DESPITE BEING A WOMAN, ADA DEFIED VICTORIAN SOCIETY IN HER  
PURSUIT FOR KNOWLEDGE AND BECAME RECOGNISED AS THE FIRST  
COMPUTER PROGRAMMER AS WELL AS BEING A HIGHLY REPUTABLE  
MATHEMATICIAN

BABBAGE'S ANALYTICAL ENGINE IDEAS  
1834

+

MENABREA'S NOTES ON BABBAGE'S  
LECTURES  
1842

+

ADA'S TRANSLATIONS OF THESE NOTES  
AND HER OWN "NOTES A-G", OUTLINED  
THE FIRST COMPUTER PROGRAM

+

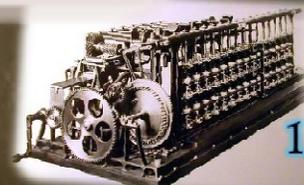
BERNOULLI  
NUMBERS

$$\frac{z}{e^z - 1} = \sum_{n=0}^{\infty} B_n \frac{z^n}{n!}, \quad |z| < 2\pi$$

=

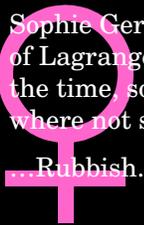
SCHULTZ'S  
DIFFERENCE  
ENGINE

1853



Sophie Germain used the alias “M. LeBlanc,” one of Lagrange’s students, when submitting work. At the time, social prejudice meant that women were not supposed to be smart.

...Rubbish.



April 1<sup>st</sup>, 1779 – June 27<sup>th</sup>, 1831



Sophie Germain used to study at night when her parents were asleep as they didn't see it as fit for her to be studying; not only was she a woman but she was also middle-class. They went to extreme measures such as taking her clothes in the winter to make her stay in bed due to the cold. Still, she persevered, using candles and quilts for light and warmth until eventually, her parents gave up – Must have decided she was a lost cause!

Sophie Germain actually became a 'pen friend' of Carl Friedrich Gauss. At first, he did not know she was female; it wasn't till 1807 that he found out. Surprisingly (or not?) he was thrilled by the knowledge that his friend was actually a very gifted woman!

Germain proved that if  $x$ ,  $y$  and  $z$  are integers and if  $x^5+y^5=z^5$ , then either  $x$ ,  $y$ , or  $z$  must be divisible by 5. Germain's theorem is a major step toward proving Fermat's last theorem for the case where  $n$  equals 5."

Surprisingly, Sophie Germain was actually inspired to take up mathematics from reading the story of Archimedes in her father's library... Archimedes was so engrossed in a geometrical problem that he ignored the Roman soldier questioning him, and was subsequently speared to death. Sophie figured that it must be worth studying if you would ignore an armed soldier in favour of it!

Sophie won an award from the French Academy of Sciences for her "Memoir on the Vibrations of Elastic Plates," after entering 3 times (due to extended deadlines) and not being awarded due to lack of formal education (1<sup>st</sup> entry.) This helped her become one of the most prominent mathematicians of her time. She was also due to receive an honorary degree from the University of Göttingen, thanks to Gauss, another famous mathematician at the time. Unfortunately, she died of breast cancer before she could receive it.

And the moral of the story, kids, is...

Don't do maths, or you'll get speared to death by Roman soldiers.

# B A B Y L O N I A N S

462-538

## And Algebra?

### Who invented algebra?

Many people think that inventions have a single inventor like Thomas Edison for the light bulb, but there wasn't a single inventor of Algebra. It was a group of people called The Babylonians who invented algebraic methods of solving equations.

### how did they solve equations?

The Babylonians used the standard quadratic formula to solve a quadratic equation. They considered quadratic equations in the form of:

$$x^2 + bx = c$$

here  $b$  and  $c$  were not necessarily integers, but  $c$  was always positive. They knew that a solution to this form of equation is

$$x = -\frac{b}{2} + \sqrt{\left(\frac{b}{2}\right)^2 + c}$$

and they would use their tables of squares in reverse to find square roots.

### examples of their work

E.g.  $ax^3 + bx^2 = c$ .

Step 1) they would multiply the equation by  $a^2$  and dividing by  $b^3$  which gives:

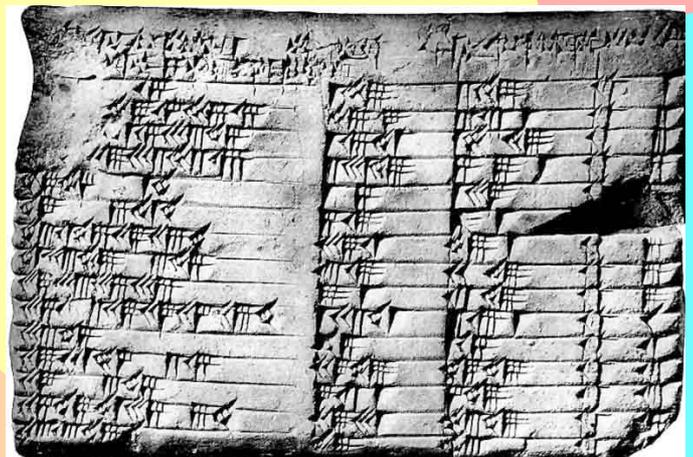
$$\left(\frac{ax}{b}\right)^3 + \left(\frac{ax}{b}\right)^2 = \frac{ca^2}{b^3}$$

Step 2) then they would substitute

$y = \frac{ax}{b}$  which gives

$$y^3 + y^2 = \frac{ca^2}{b^3}$$

which could now be solved by looking up the  $n^3 + n^2$  table to find the value closest to the right hand side.



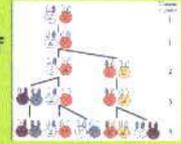
A clay tablet used to work out equations, fractions, etc

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144,

Leonardo Fibonacci is famous for having described and promoted the sequence which borders this poster. This sequence is formed by adding the 2 previous numbers. It starts with 0 and 1, the Fibonacci numbers are found in many places in the pattern of rabbit breeding, the spirals in a cauliflower floret, In the bones your hand and in the petals on many flowers.



Leonardo was born in Italy, in Pisa around the year 1200. His dad Guglielmo Fibonacci, was a merchant, who directed a trading post and some people think he was the consultant for Pisa. As a young boy Leonardo travelled around with his father it was with him he first learnt about the Hindu-Arabic numeral system Leonardo quickly realised that this was a much faster and simpler way of expressing long numbers and doing Maths...



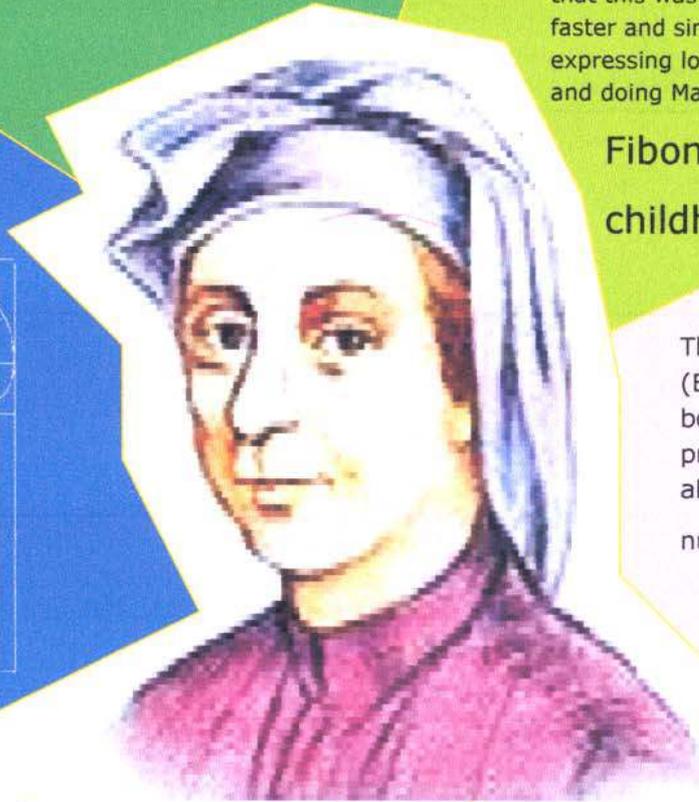
### Fibonacci's childhood

The liber abaci (Book of calculation) is a book Leonardo wrote to promote and educate about the Hindu-Arabic numeral system.



### The liber abaci

First draw a rectangle 13x8 then draw a square inside it at the 8th square so you have an 8 by 8 square and then in the rectangle you put a smaller 5x5 square then continue working down the Fibonacci sequence then with a compass join the squares!



# Leonardo Fibonacci

Leonardo Fibonacci was so popular that some things

were named after him in the past 50 years:

- The fibonacciis are a rock band from the 1980's
- In *the da vinci code* The fibonacci sequence is used as a code which confuses the characters!



Leonardo Fibonacci was Roman Catholic!

He is best known for spreading the Hindu-Arabic numeral system!

Also Known As: Leonardo of Pisa, Leonardo Pisano Bigollo, Leonardo Pisano, Leonardo Bonacci

Things Named after him!

### Fun Facts

196418, 317811, 514229, 832040, 1346269, 2178309,

233, 377, 610, 987, 1597, 2584, 4181,

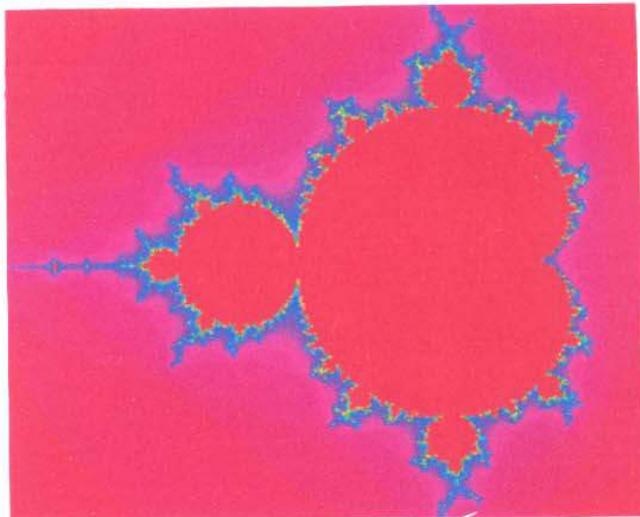
6765, 10946, 17711, 28657, 46368, 75025, 121393,

# ALMONDBREAD PIONEERS THEORY OF CAULIFLOWER

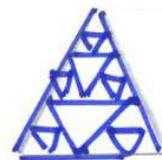
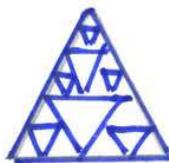


With a Germanic name meaning “Almondbread”, Benoit Mandelbrot was a Polish-born French mathematician, who spent most of his working life in the U.S.A. , where he pioneered a new field of mathematics called fractals.

Fractals are easily explained if you look closely at a head of cauliflower. The vegetable is made up of lumps, which are smaller copies of the whole. These self-similar shapes are called fractals.



The Mandelbrot set is a shape which Mandelbrot came across when he repeatedly applied an algebraic formula and programmed a computer to draw it. The result was a blob surrounded by a few specks. When you zoom in on the specks, they turn out to be miniature copies of the whole image - baby Mandelbrot sets nestling inside their parents, just like these Russian dolls.



“Mountains are not cones, coastlines are not circles.” Mandelbrot proved that a mountain peak is not just a triangle or a pyramid, but a jagged landscape composed of smaller peaks, which are themselves made of even smaller peaks. Benoit Mandelbrot died in October 2010, aged 85. Mathematics is impoverished by his loss.

By Ian Keir

He was an English natural philosopher!

Newton made many contributions to analytic geometry, algebra and calculus. He discovered the binomial theory!

In 1666 Newton discovered the famous apple falling out of an apple tree in his garden!

- He studied at Cambridge with a bachelor degree and no honours or distinction

- He died in London on March 20<sup>th</sup>, 1727

- He was knighted in 1705!

- Was born on 25<sup>th</sup> December!

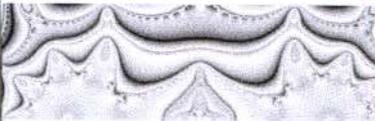
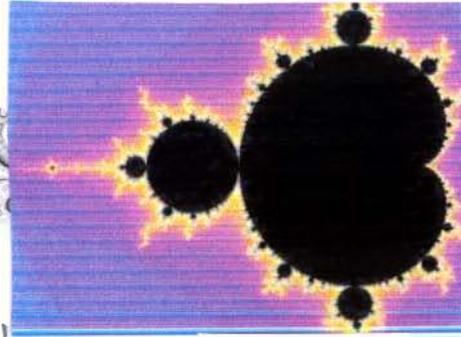
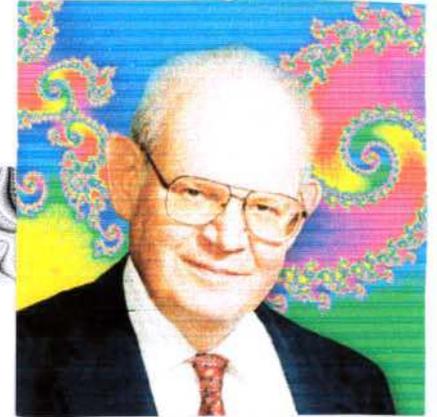
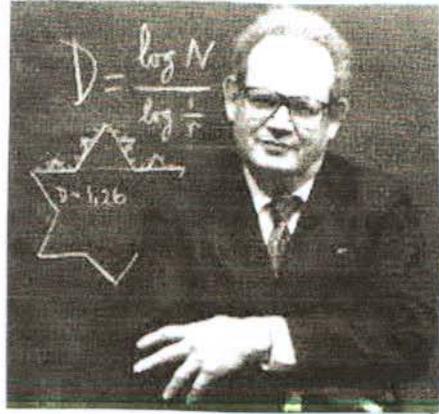
- He was born in Woolsthorpe

- His childhood was horrible and throughout his life he had emotional breakdowns.

- He was taken out of school to be a farmer

(1642 - 1727)

# BENOIT MANDELBROT



20 November 1924  
Warsaw, Poland.



Married Aillette Kagan  
France 1955



Two sons  
Laurent and Didier



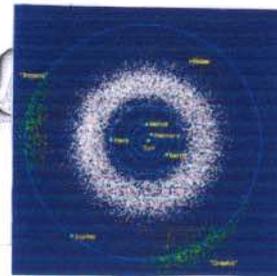
IBM - Thomas J. Watson Research Center  
Yorktown Heights, New York.



Retired  
2005



Poland 1924 – 1936, France 1936 – 1955,  
Switzerland 1955 – 1958, USA 1958 – 2010.



2750 Mandelbrot  
is a main-belt asteroid



14 October 2010

# EUCCLID



Euclid of Megara and Alexandria was a Greek mathematician. He was renowned as the 'Father of Geometry'. It is believed that he was born around 322 Bc and he died around 275 Bc. He was the first to prove there infinitively many prime numbers; he stated and proved the factorisation theorem; he devised Euclid's algorithm for computing. He proved that there are only five "Platonic Solids" (Tetrahedron, Cube/Regular Hexahedron, Octahedron, Dodecahedron, Icosahedron), as well as theorems of Geometry far too numerous to summarise; among many with special historical interest is proof that rigid-compass constructions can be implemented with collapsing-compass construction.

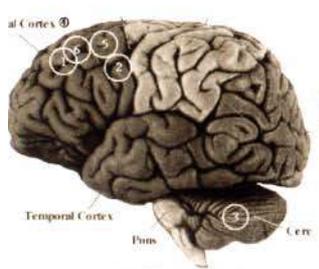
# A World of Fractals

Fractals are continuous patterns and are the same shape at different scales.

Examples of natural Fractals



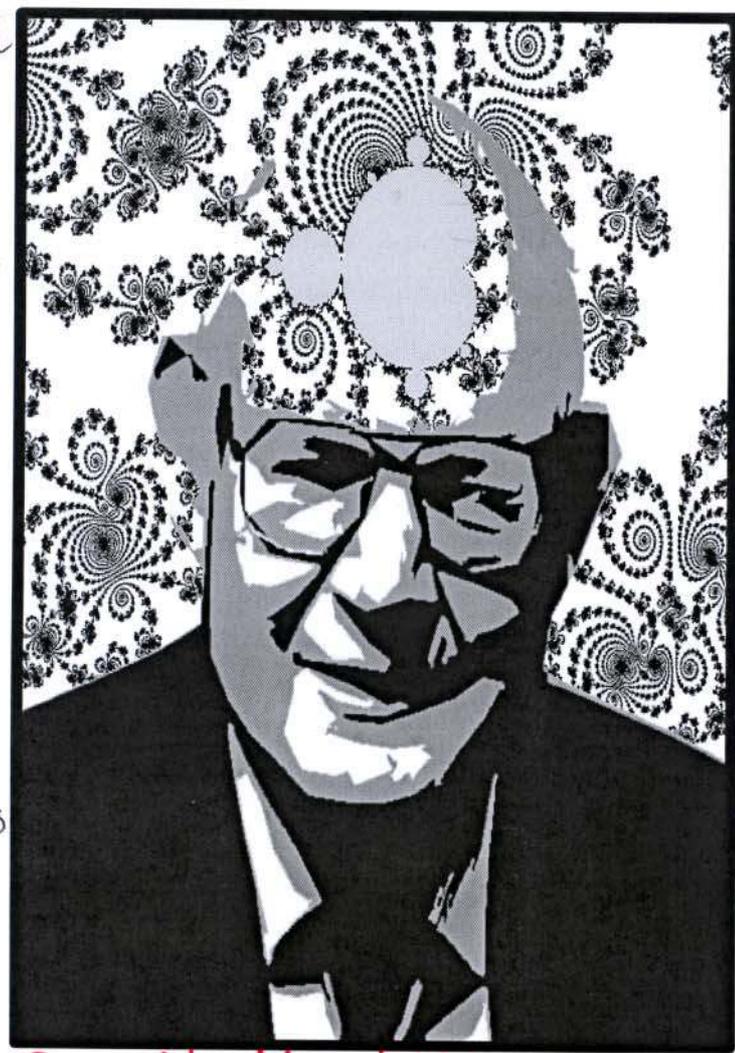
a tree



a brain

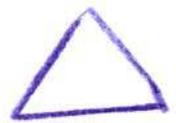


Rocks

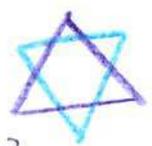


Make your own Fractals

step 1



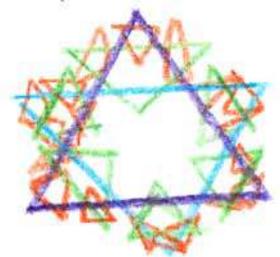
step 2



step 3



step 4

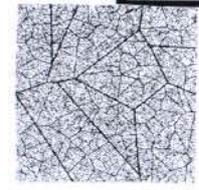


## Benoit Mandelbrot

More Examples of Natural Fractals



Benoit B. Mandelbrot lived from the 20<sup>th</sup> November 1924 to the 14<sup>th</sup> October 2010. Benoit was a Franco-American Mathematician that worked on his man-made Fractal (the Mandelbrot set, it's on his forehead). people thought he was crazy, but when he created his set he wrote many books to publicise fractals. Before he died, he won 30 awards, 25 awards he won because fractals. He was a visionary. His fractals theory change many fields of science & the way we view the world.



←leaves→



Music→



by Marius Saunders

# BLAISE PASCAL

He also looked at the points problem which asks how do you divide the stakes if a game of dice is incomplete. He solved it for a 2 player game but never got any further.



This is BLAISE PASCAL. He was born on the 19th of June 1623. He died on the 19th August 1662.

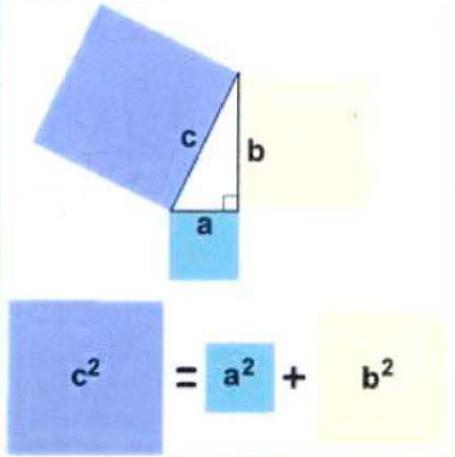
• At the age of 16, he presented a piece of paper to a Mersennes meeting. It contained a number of projective geometry theorems including his mystic hexagon.

Pascal's last work was on the cycloid, the curve traced by the point on the circumference of a rolling circle. He also solved the problem of the volumes and surface area of the revolution formed by a rotating cycloid about the x-axis.

He laid the foundation for the theory of probability. He considered the Dice Problem. This asks how many times you have to throw a dice before getting a double 6. He found the answer with the help of Fermat.

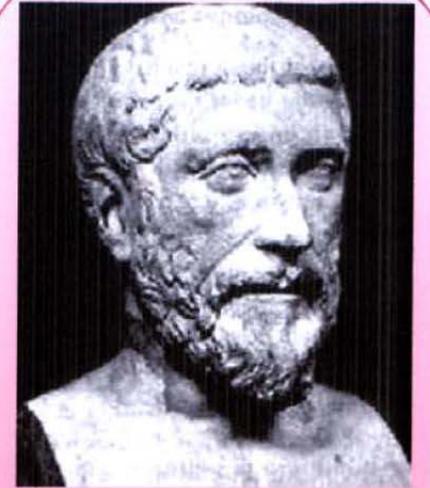
This is a Pascaline calculator which Pascal invented himself in 3 years, making him the 2nd person to invent a mechanical calculator, the 1st being Schickard.





He had a group of followers (like the disciples of Jesus) who followed him around and taught other people what he had taught them. Both men and women were Pythagoreans.

Pythagoreans were interested in philosophy, but especially in music and mathematics, two ways of making order out of chaos. Music is noise that makes sense, and mathematics is rules for how the world works.



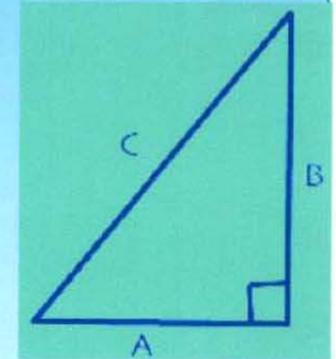
He lived in the 500's BC and he was one of the first Greek mathematical thinkers.

He spent most of his life in the Greek colonies in Sicily and southern Italy!

# PYTHAGORAS

Here is how to do the theory!

The Pythagorean Theorem says that in a right angle, the sum of the square of the two right-angle sides will always be the same as the square of the hypotenuse (the long side).  $A^2 + B^2 = C^2$ . Try it yourself: if Side A is 4 inches long, and Side B is 3 inches long, then  $4 \times 4 = 16$ , and  $3 \times 3 = 9$ , and  $9 + 16 = 25$ , and so Side C will be 5 inches long. Try it with other size triangles and see if this is still true (you can use a calculator, or your computer, to figure out the square roots).



# möbius Strip

August Ferdinand created the Möbius strip. Which is a strip of paper twisted in the middle and then stuck together with tape.

Born - November 17th 1790  
Died - September 26th 1868

Möbius entered the University of Leipzig in 1809 and soon decided to concentrate on mathematics, astronomy and physics.



Many mathematical concepts are named after him, including the Möbius transformations. The asteroid 28516 Möbius is also named after him.

## August Ferdinand Möbius

# GRIGORI PERELMAN



Grigori Perelman is one of the most famous Russian mathematicians. He was born on the 13th June 1966, Leningrad (now St. Petersburg) during the Soviet Union.

Grigori has a sister called Elena who grew up to be a maths teacher. When he was younger his father, who worked as an engineer, and his mum, who was also a maths teacher, used to give him brainteasers, which he worked out quickly by himself and from then on his family (who were Jewish) noticed that they had a gifted child!

Later on in his life, everybody seemed to know Grigori more as a mathematician than a friend! A couple of years ago, Grigori was offered a top award which was a field's medal that could potentially be worth \$15,000 for his achievement of solving puzzles, but refused to accept this offer.

In 2010 Grigori was again under pressure to accept the first clay millennium prize problems award of \$1,000,000 for solving the Poincaré conjecture, however he rejected this prize as he felt that U.S mathematician Richard Hamilton who starting the program that led to the solution was equally deserving.



**STEPHEN**



**HAWKING**

# PROUD TO BE BRITISH

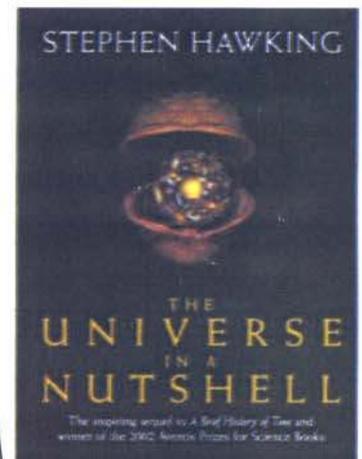
## 1942 TO PRESENT



**Whilst trying to prove the Singularities and the Geometry of Space-Time he realised that the mathematical techniques needed to do his calculations didn't exist so he devised some new ones.**

**Before he was diagnosed with amyotrophic lateral sclerosis he enjoyed horse riding and rowing. He gradually lost the use of his arms, legs and voice**

**In 2009 he won the Presidential Medal of Freedom, the highest civilian honour in the United States.**



**"My goal is simple. It is a complete understanding of the universe, why it is as it is and why it exists at all."**

by Izzy Greenook

# Archimedes

He was sent to Alexandria, Egypt to study mathematics and also to get away from the war that was going on at the time.

He made the formula for the area and volume of 3D shapes.

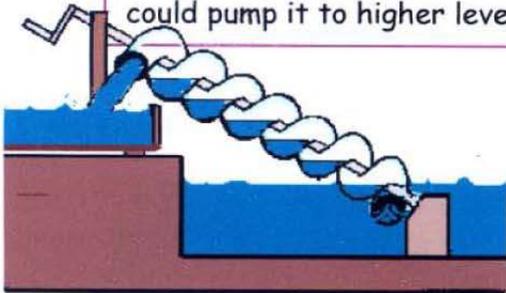


Syracuse, Sicily. Where Archimedes was born, in 287BC



He devised a new number system that was capable of showing larger numbers than the Greek number system.

Archimedes was an inventor as well as a mathematician. He created the Archimedes' screw. It was used to pump water out of ships because it could pump it to higher levels.



Archimedes is somewhat known for shouting, "Eureka!" whilst running down a street, naked. He did this after he found out how to tell the difference between a crown made out of pure gold and a crown mixed with other materials. "Eureka!" means, "I've found it!"

It is said that a Roman soldier killed Archimedes in war. They say that the soldier's shadow began to shade Archimedes' drawings in the soil. He supposedly said, "ΜΗΝ ΜΟΥ ΤΟΥΣ ΚΥΚΛΟΥΣ ΤΑΠΑΤΤΕ," which means, "Don't disturb the circles drawn by me. I am in deep thinking right now," before the Roman soldier murdered him.



Archimedes once said, "Give me a place to stand on and I will move the earth." He said this after he found out the laws of the lever.

# Augustin Louis Cauchy

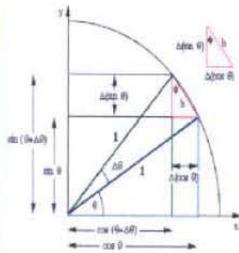
August 21 1789-23 May 1857

## Background

Cauchy was born on 21 August 1789 in Paris and died on 23 May 1857. He was educated by his father. His first occupation was an Engineer in Cherbourg in 1810. He stopped being an Engineer because of health and devoted himself to mathematics.

## Best known for

Cauchy was best known for a lot of things like the Theory of Functions, integral and differential calculus and Algebraic analysis just to name a few.



## Mathematician

He was one of the most famous mathematicians of the 19<sup>th</sup> century. He was a professor at École Polytechnique. One of his great successes at that time was the proof of Fermat's polygonal number theorem.



## Writing

Cauchy was a prolific writer, he wrote approximately eight hundred research articles and five complete textbooks.

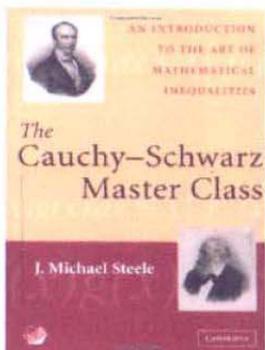
## The Polygonal Number Theorem

That states that every positive integer is a sum of at most  $n$   $n$ -gonal numbers. Every positive number can be written as the sum of three or fewer triangular numbers and so on.

## Famous Sayings

Men Pass way,  
But their deeds abide

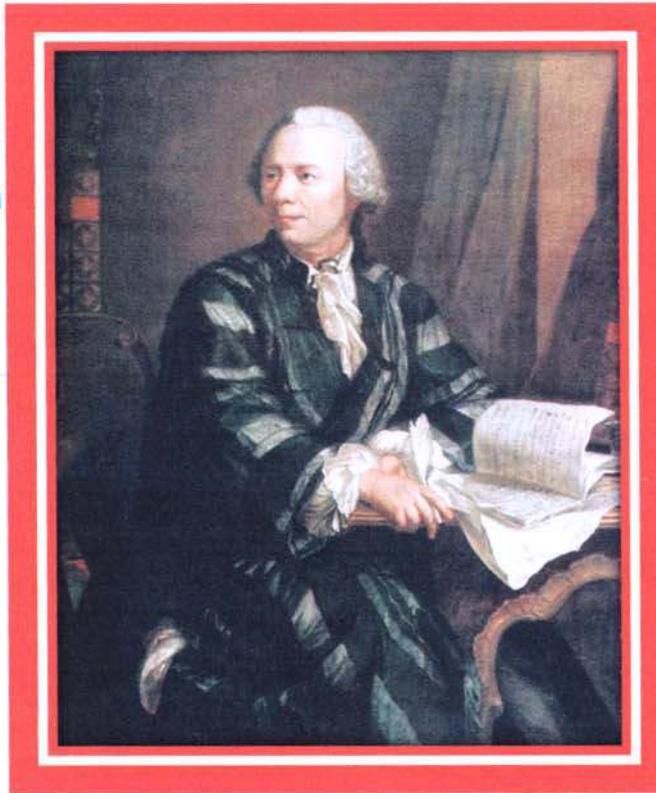
$17 = 10 + 6 + 1$   
(triangular numbers)  
 $17 = 16 + 1$   
(square numbers)  
 $17 = 12 + 5$   
(pentagonal numbers).



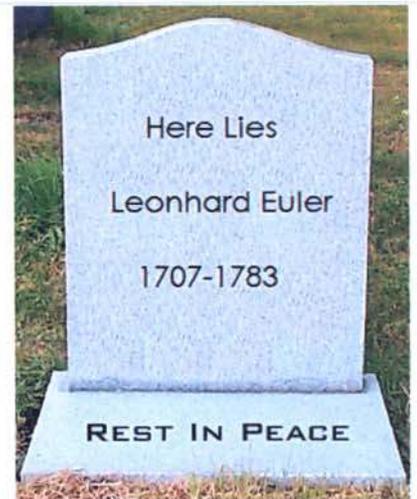
# Leonhard Euler

1707-1783

Leonhard Euler was born in Basel, Switzerland in April 15 1707



September 18, 1783 in St. Petersburg



Leonhard Euler was responsible for the following:-

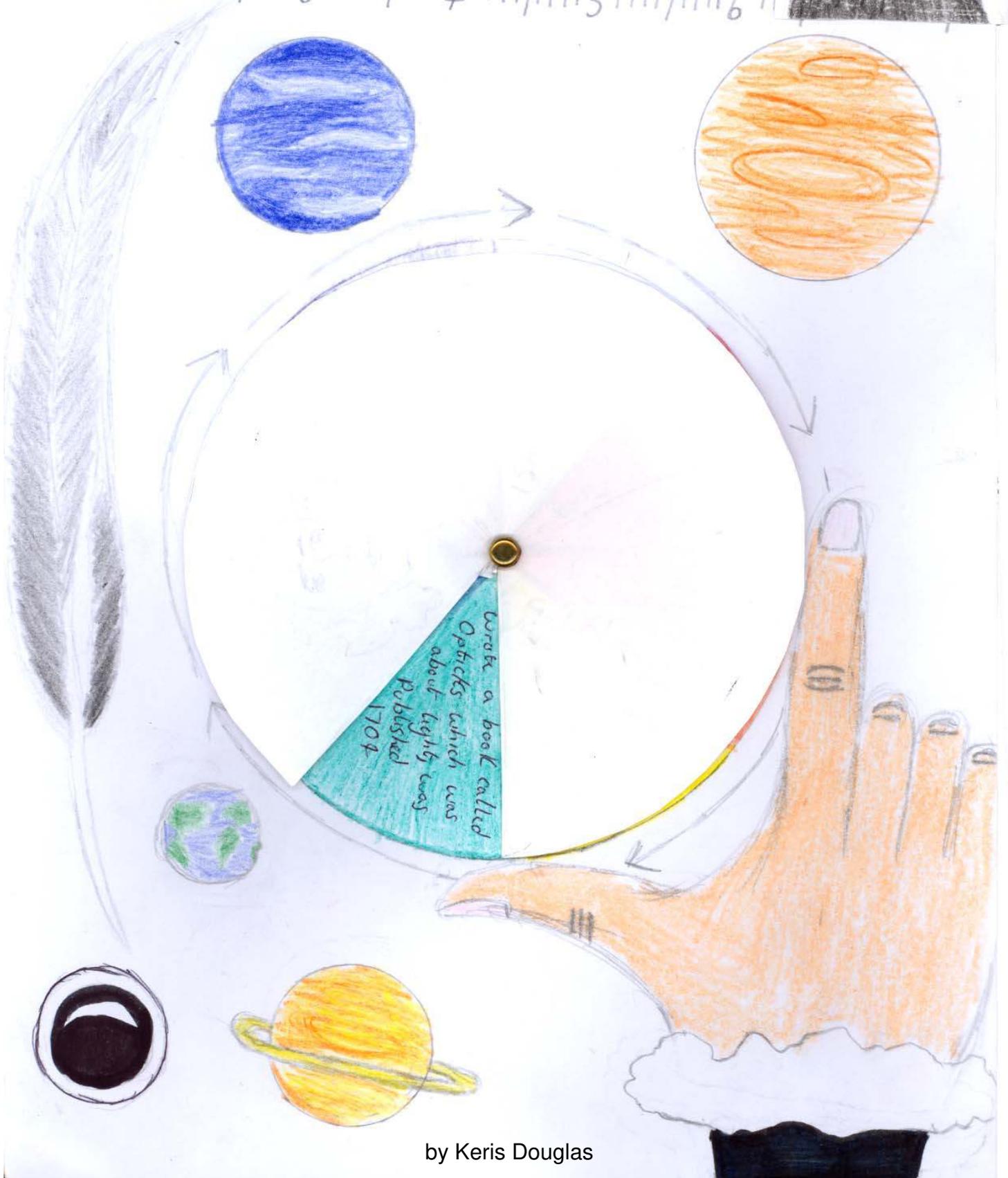
- + (x) for function notation
- + a, b, c for the sides of triangle ABC
- + i for the imaginary unit  $\sqrt{-1}$
- +  $\Sigma$  for the summation sign
- + e for the base of natural logarithms

His father was an amateur mathematician and he influenced Leonhard into becoming one. In 1727, on the invitation of Catherine I, Euler took up his residence in St. Petersburg.

He was married twice, his second wife being a half-sister of his first. He had 13 children; though all but five of them died young, he did a lot of his work with his children playing at his feet.

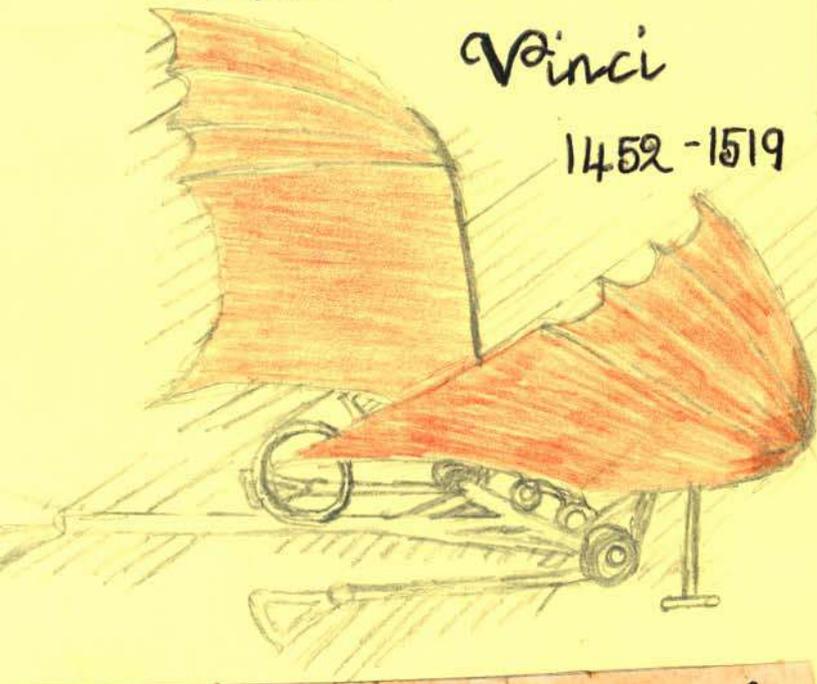
By Millie Collins

# ISAAC NEWTON



# Leonardo Da Vinci

1452 - 1519

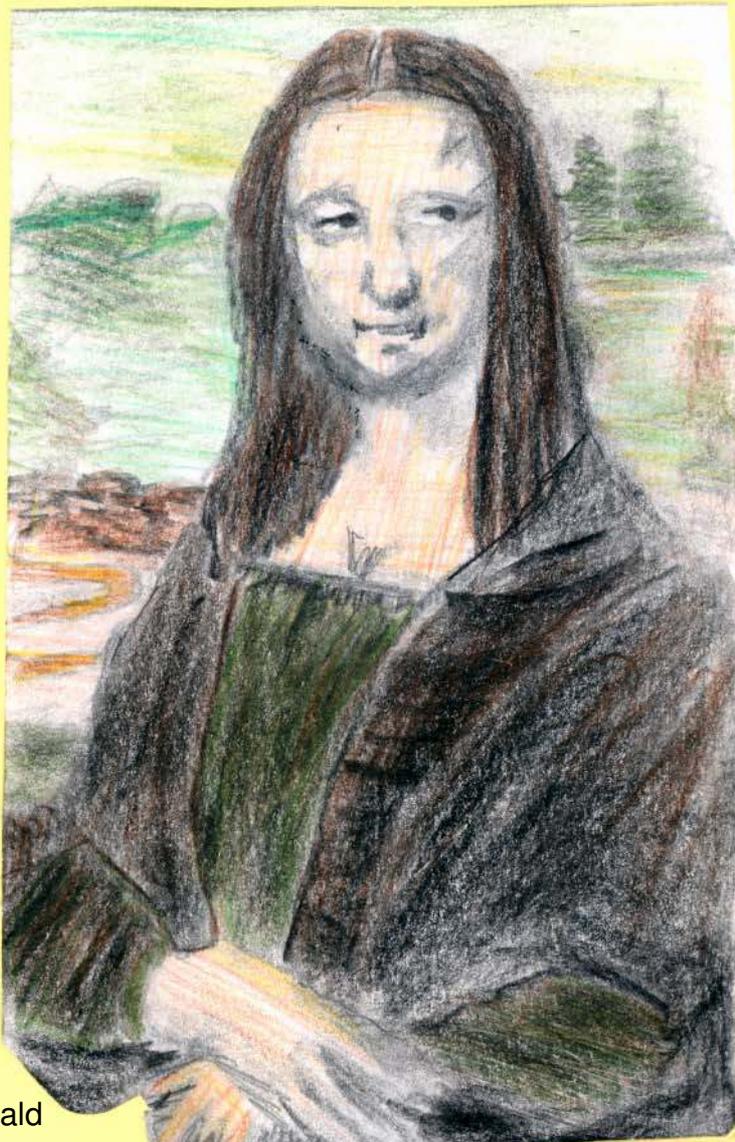


Leonardo wrote a series of scientific notebooks. The subjects covered were: maths, art, invention and the human body. He looked at the science of painting, architecture, mechanics, human anatomy, botany, geology, aerology, and hydrology. Leonardo's books are distinctive because of the relation of illustration to text and his use of mirror writing. Leonardo never published his writings. He was left handed and wrote from right to left so that his notes can only be read in a mirror. He may have been afraid that his opinions were against the church and beliefs at the time.

Leonardo spent years observing and analysing the flight of insects and birds which helped him devise this flying machine above.



The Mona Lisa was painted about 1502. This demonstrates Leonardo's famous invention called sfumato (blurred outline and mellow colours which leave something to our imagination).



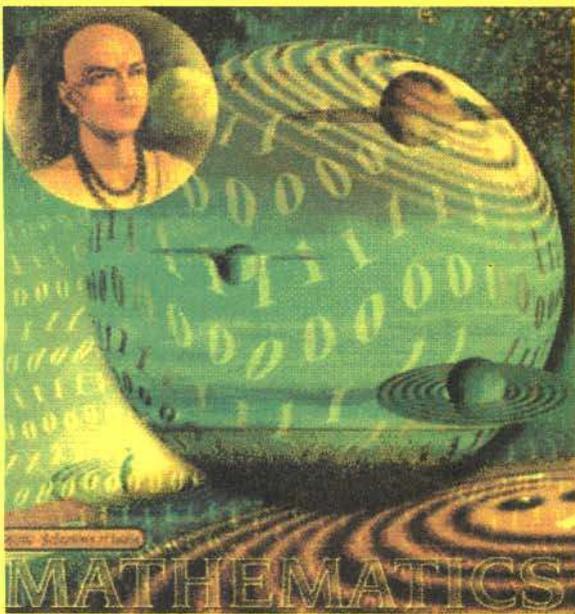
Leonardo was a genius. He believed that true knowledge came from "knowing how to see". Whenever he came across a problem he tried an experiment to solve it and would never accept what he read without checking with his own eyes.



# Aryabhata

**(476-550 A.D.)**

- **Aryabhata wrote mathematical and astronomical theories which are used in modern mathematics.**
- **He discovered Pi to four decimal places (3.1416) which was very close to the actual value of Pi (3.14159).**



- **He calculated the circumference of the earth as 24835 miles which is close to modern day calculation of 24900 miles.**
- **He contributed to arithmetic, algebra and trigonometry.**
- **History suggests that he made a huge contribution to the discovery of zero, without which there would not be, much maths to teach today!**

**Not much is known about Aryabhata's life although it is speculated that Aryabhata might have been the head of the Nalanda University as well. It is also thought that he set up an observatory at the Sun temple in Taregana, Bihar.**

# PYTHAGORAS

Pythagoras was born in Greece in 500BC, the son of a Gem Merchant. He played the lyre and was very well educated and interested in mathematics, philosophy, astronomy and music.

I don't like to boast but I was the very first pure mathematician and discovered Pythagorean Theorem!

I don't like the look of that mob!

(Pythagoras was believed to have been killed by an angry mob)

## LIFETIME DIARY

535BC: I moved to Egypt to study with the Priests but was taken prisoner and sent to Babylon ... a fine welcome I must say!

520BC: Finally I was freed and went back home to Greece. Opened a school ... called it The Semicircle ... Feeling better already.

518BC: Settled in Crotona in Italy and founded the school of Philosophy and Religion.

His followers were called 'Pythagoreans'.  
They lived by strict rules and held mystical views of numbers

# Pythagoras

Born: 570 BC

Died: 495 BC

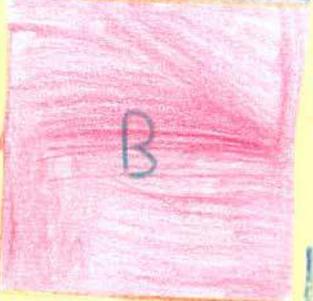
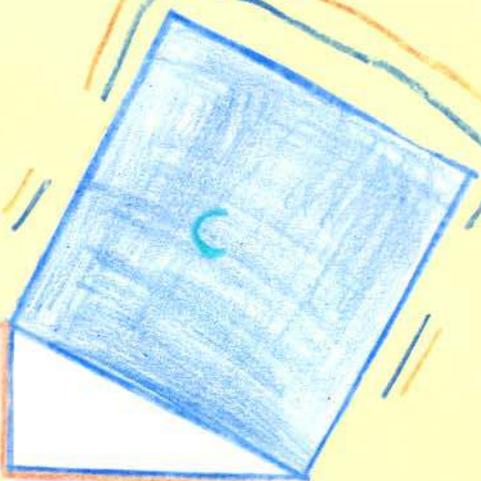
He had a group of followers who followed him around and taught other people what he had taught them.



Pythagoras was a Greek philosopher who made developments in mathematics, astronomy and the theory of music.

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

The theorem can be written as an equation relating the lengths of the sides  $a$ ,  $b$ , and  $c$ . Often called the Pythagorean equation,  $c$  represents the length of the hypotenuse and  $a$  and  $b$  represent the lengths of the other two sides.



# Leonardo Pisano Fibonacci

"The greatest mathematician of the middle ages!"

He was born in Pisa in Italy. Therefore he got the name Pisano!



He died in the 1240's but there is a statue commemorating him in Pisa.

He studied and wrote about the 'nine Indian figures' for a long time.

His famous book was 'Liber Abaci' which means 'The Book of Calculations'.

He took an interest in the Hindu-Arabic system and was one of the first people to introduce this system into Europe.

## Fibonacci Numbers

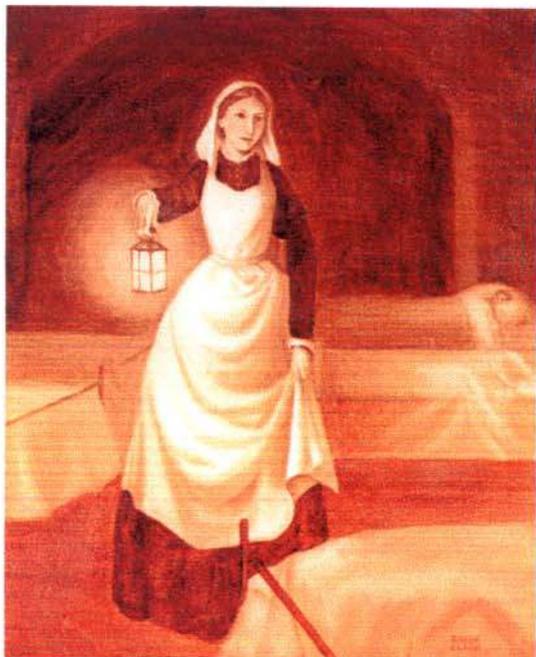
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987...

This is the pattern Fibonacci invented where each number is the sum of the two previous numbers. For example:

$1+1=2 \rightarrow 1+2=3 \rightarrow 3+2=5 \rightarrow 5+3=8 \rightarrow 8+13=21$  ect...

# Florence Nightingale

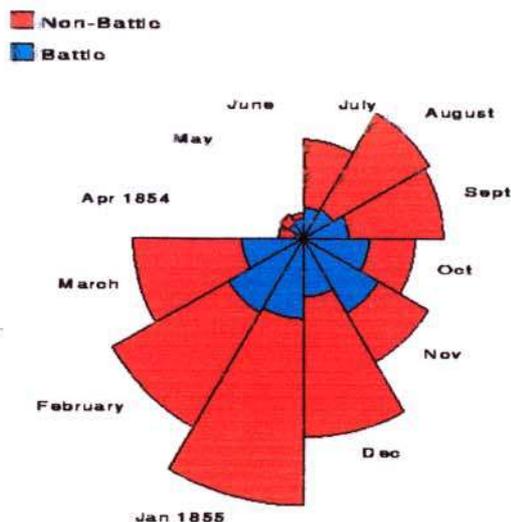
Born 1820 Died 1910



Florence Nightingale was born in Italy on 12th May 1820. She was taught at home by her Father, who believed that girls were just as worthy of a good education as boys. Florence Nightingale is most famously known as the 'Lady with the Lamp'. She led the nurses caring for thousands of soldiers during the Crimean War and helped save the British army from medical disaster.

She used graphs and tables to record the incidence of preventable deaths in the military. She was innovative in her collection, recording, interpretation, and graphical display of information she collected from patients. She developed the "[polar-area diagram](#)" to highlight the needless deaths of soldiers caused by unsanitary conditions and the need for healthcare reform and an improvement of sanitary methods. With her analysis, Florence Nightingale showed that social conditions could be measured and analysed mathematically.

Causes of Mortality in the Army in the East  
April, 1854 to March 1855



From: F. Nightingale, "Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army", 1858

It was her work during the Crimean War that created the legend of the Lady with the Lamp and it was her experience here that drove her to continue researching, writing and campaigning for better healthcare conditions for hospital patients.

Her writings continue to be a resource for nurses, health managers and planners to this day.