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RESOURCES FOR SCHOOL TEACHERS

MATHEMATICS

"To see a world in a grain of sand
And a heaven in a wild flower,
Hold infinity in the palm of your hand
And eternity in an hour."

William Blake, 1803

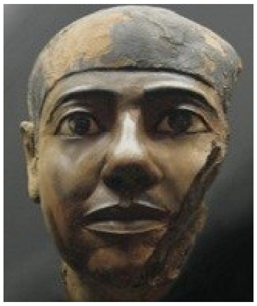
William Blake's opening lines, from his 1803 poem *Auguries of Innocence,* capture a central human intuition that has quietly guided mathematics across centuries: **that the infinite can be discovered within the finite.**

Perhaps when Blake imagined a world of atoms inside a tiny crystal of quartz or eternity folded into a mere hour, he anticipated a mathematical way of seeing and perceiving the world, in which scale dissolves and structure matters more than size.

From the geometric ratios of the Ancient Egyptians and Greeks and the random infinity of π, to the limits of Newton's calculus and the infinite beauty of Mandelbrot's self-similar fractals, mathematics repeatedly reveals that vast complexity can reside in the smallest forms. Mathematical beauty emerges at this threshold, where the boundless is made intimate and the eternal briefly fits within the grasp of the mind.

This document guides us through some of the main mathematical concepts of 28 pioneers from the *Atlas of Human Imagination*. In the following pages, we will trace the chronology of mathematical thought – one insight at a time.

1. Imhotep (2600 BCE)



Maths Discovery

Geometric methods (angles, areas, volume) applied to step-pyramid construction

Imhotep was an ancient Egyptian polymath who served as chancellor to Pharaoh Djoser and is widely regarded as the first named architect, engineer and *applied mathematician* in history. He used practical mathematics and geometry to plan and construct the Step Pyramid at Saqqara, introducing systematic measurement, proportional design and modular stone construction on an unprecedented scale. His work transformed buildings from mudbrick into precise, multi-tiered stone architecture (see image, right) governed by geometry and numerical order.

Key breakthroughs related to:

- Geometry, measurement, architectural mathematics and proportional design

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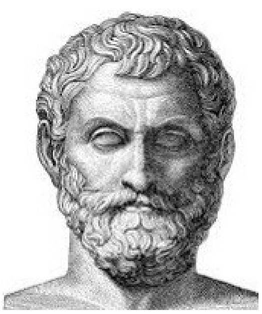
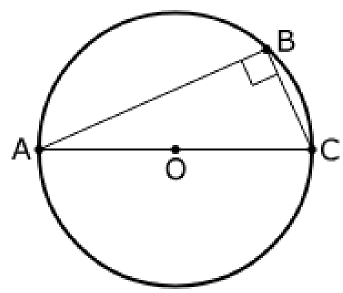
2. Thales (600 BCE)



Maths Discovery

Deductive geometry, including several circle theorems, like the one shown right

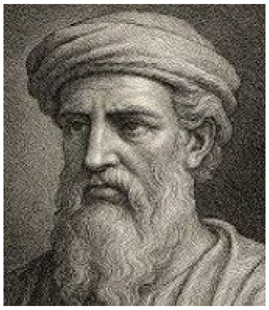


Thales of Miletus was a Greek philosopher-mathematician traditionally credited with introducing deductive reasoning into mathematics. He is associated with several early geometric results, including the theorem that an angle inscribed in a semicircle is a 90° right angle (see image, right), and principles relating to congruent and proportional triangles. His *circle theorems* helped shift geometry from practical rule-of-thumb methods to reasoned proof.

Key breakthroughs related to:

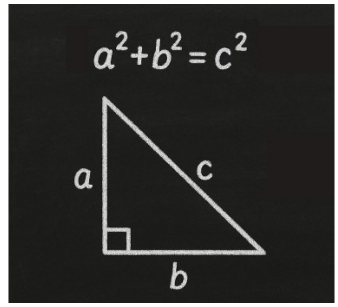
- Deductive geometry, circle theorems, proportional reasoning and mathematical proof

3. Pythagoras (500 BCE)



Maths Discovery

Pythagoras' theorem of right-angled triangles and their length relationships



Pythagoras of Samos was a Greek philosopher-mathematician who founded a school that treated mathematics as the underlying structure of reality. He is credited with formalising the relationship between the sides of a right-angled triangle, now known as the *Pythagorean theorem* (see image, right), and exploring numerical ratios in geometry and music. The Pythagoreans advanced the idea that numbers, proportions and geometric forms obey universal laws.

Key breakthroughs related to:

- The Pythagorean theorem, number-geometry relationships, mathematical harmony in music and proof-based mathematics

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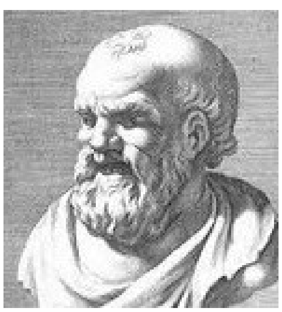
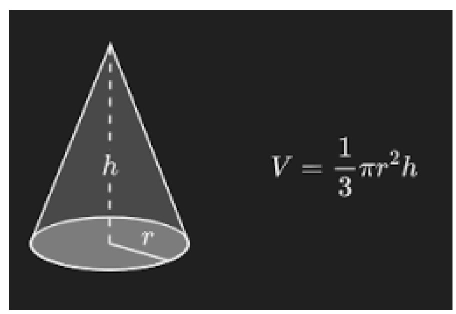
4. Democritus (400 BCE)



Maths Discovery

Volumes of 3D shapes like cones and pyramids

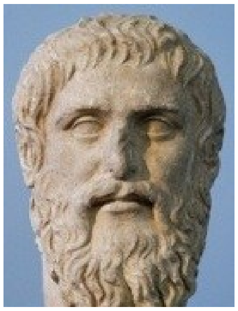


The Greek philosopher Democritus made early contributions to geometry alongside his better-known atomic theory. He investigated the *geometry of volumes*, proposing that cones and pyramids have one-third the volume of cylinders and prisms with the same base and height, anticipating later rigorous proofs (see image, right). Although his results were largely qualitative, they showed an emerging interest in infinitesimal reasoning and spatial decomposition (similar to calculus).

Key breakthroughs related to:

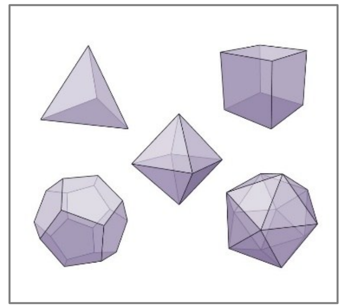
- Geometric volumes, early infinitesimal ideas and spatial reasoning

5. Plato (360 BCE)



Maths Discovery

3D Platonic solids with regular faces of triangles, squares and pentagons



Plato was a Greek philosopher whose influence on mathematics came largely through his elevation of geometry as a path to abstract truth. In his dialogue *Timaeus*, he associated the five regular convex polyhedra with the elements, helping to systematise and popularise what are now called the *Platonic solids* (see image, right). Through his Academy, Plato promoted rigorous geometric study and the belief that mathematical forms underlie physical reality.

Key breakthroughs related to:

- Platonic solids, solid geometry, mathematical idealism and geometric abstraction

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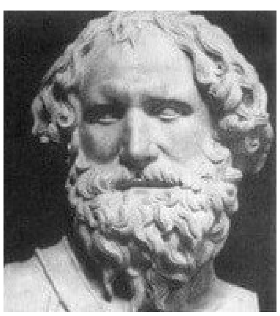
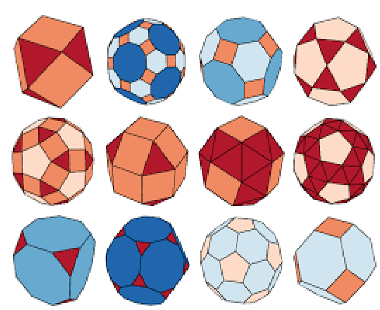
6. Archimedes (270 BCE)



Maths Discovery

Space-filling 3D geometries that pack together without any air gaps



Archimedes was a Greek mathematician, physicist and engineer who made groundbreaking contributions to geometry, mechanics and calculus-like methods. He studied the properties of spheres, cylinders and other solids, calculating volumes and surface areas with remarkable precision, and discovered 3D shapes that could fill space efficiently, called the *Archimedean solids* (see image, right). His work combined rigorous proof with practical ingenuity, influencing both mathematics and engineering for centuries.

Key breakthroughs related to:

- Solid geometry, volume and surface area calculation, Archimedean solids, space-filling and packing

7. Brahmagupta (665)

<u>Maths Discovery</u>

Concept of zero, as well as positive and negative numbers either side of zero on the number line

Brahmagupta was an Indian mathematician and astronomer who made pioneering contributions to arithmetic, algebra and number theory. He is famous for formalising rules for *zero and negative numbers* (see image, right), and for solving quadratic equations and certain types of indeterminate equations. In geometry, he provided advanced methods for calculating areas, connecting algebraic reasoning with spatial problems.

Key breakthroughs related to:

- Zero and negative numbers, algebra, quadratic equations and geometric calculation

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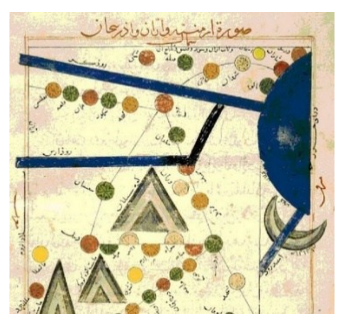
8. Al-Khwarizmi (820)

<u>Maths Discovery</u>

Algebra; and he gave his name to the word *"algorithm"*



Al-Khwarizmi was a Persian mathematician whose work laid the foundations for *algebra* as a systematic discipline. He wrote *Kitāb al-Mukhtaṣar fī Ḥisāb al-Jabr wal-Muqābala*, introducing methods for solving linear and quadratic equations using both verbal and symbolic reasoning (see image, right). He also contributed to Hindu–Arabic numerals and *arithmetic algorithms*, linking number theory with practical computation.

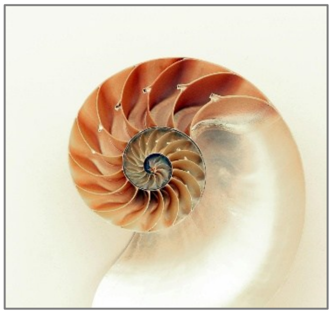
Key breakthroughs related to:

- Algebra, equation solving, algorithmic arithmetic and decimal numeration

9. Fibonacci (1202)

Maths Discovery

Fibonacci sequence, where each new number is the sum of the previous two



Fibonacci was an Italian mathematician who popularised the Hindu-Arabic numeral system in Europe through his book *Liber Abaci*. He introduced the famous *Fibonacci sequence* (1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144…) and explored patterns in number theory and in nature (see image, right). He also applied mathematics to real-world problems such as commerce, interest calculations and geometry. His work helped bridge medieval arithmetic with emerging European algebra and combinatorial thinking.

Key breakthroughs related to:

- Fibonacci sequence, number theory, practical arithmetic, mathematical modelling and the first introduction of Hindu-Arabic numerals to Europe

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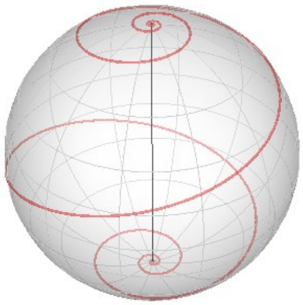
10. Pedro Nunes (1537)

Maths Discovery

Navigational mathematics on planet Earth, allowing accurate maritime shipping



Pedro Nunes was a Portuguese mathematician who applied advanced mathematics to navigation and cartography. He studied the geometry of the rhumb line or *loxodrome*, showing that straight courses on a compass are actually curved on the globe (see image, right), and developed methods to calculate distances and angles for oceanic navigation. His work helped sailors account for the Earth's curvature, greatly improving the accuracy of maps and long-distance sea travel.

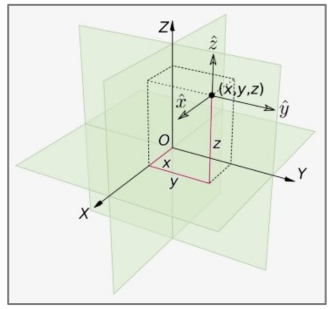
Key breakthroughs related to:

- Spherical geometry, navigation mathematics, loxodromes, cartography and surveying

11. René Descartes (1637)

Maths Discovery

Cartesian coordinate system in 3D, involving plotting points on X-Y-Z axes



René Descartes was a French philosopher and mathematician who transformed geometry by introducing analytic methods. He developed the *Cartesian coordinate system* (see 3D image, right), linking algebra and geometry so that curves could be represented by equations and geometric problems solved algebraically. This approach laid the foundation for modern algebraic geometry and calculus.

Key breakthroughs related to:

- Cartesian coordinates, analytic geometry, algebra-geometry unification and geometric representation of equations

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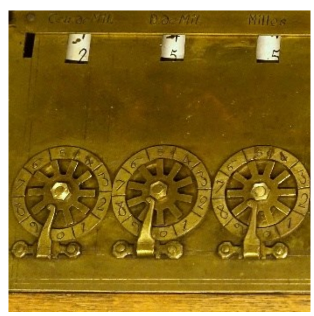
12. Blaise Pascal (1642)

Maths Discovery

First commercial calculator; and Pascal's Triangle in combinatorics



Blaise Pascal was a French mathematician, physicist and philosopher who made major contributions to probability, geometry and the theory of fluids. He made the first commercial mechanical calculators (see image, right), developed *Pascal's Triangle,* explored combinatorial numbers and laid the groundwork for probability theory. His work linked abstract mathematics with practical applications in finance, engineering and science.

Key breakthroughs related to:

- Combinatorics, probability theory, Pascal's Triangle and mathematical modelling

13. Christiaan Huygens (1656)

Maths Discovery

Circular motions and centrifugal forces (see equation)

$$F_c = \frac{mv^2}{r}$$

The Dutch mathematician, physicist and astronomer Christiaan Huygens applied mathematics to mechanics, optics and timekeeping. He formulated the laws of *centrifugal force for circular motion* (see equation, right), developed the wave theory of light and designed precise pendulum clocks using geometric and calculus-based reasoning. Huygens' work exemplified the use of mathematics to model physical phenomena with predictive accuracy.

Key breakthroughs related to:

- Mechanics, circular motion, pendulum clocks, waves and applied mathematics

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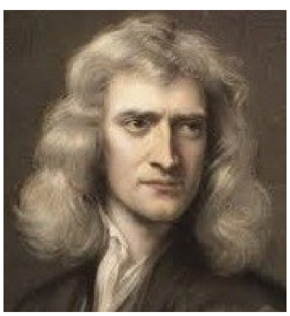
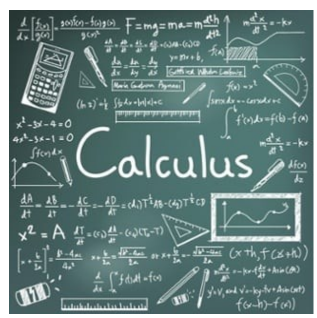
14. Sir Isaac Newton (1686)



Maths Discovery

Calculus (co-discovered with Leibniz), as well as the mathematics of gravity and motion



Sir Isaac Newton was an English mathematician, physicist and astronomer who developed the foundations of *classical mechanics* and *calculus* (see image, right). He also formulated the laws of motion and universal gravitation, invented fluxional calculus to handle changing quantities, and applied mathematics to explain planetary motion, optics and tides.

Key breakthroughs related to:

- Calculus, classical mechanics, universal gravitation, mathematical physics and mathematical modelling of nature

15. Leonhard Euler (1745)

Maths Discovery

Euler's identity, as well as many other equations in geometry and solid mechanics

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

The Swiss mathematician Leonhard Euler made extraordinary breakthroughs across nearly every branch of mathematics, from number theory to mechanics. He introduced much of modern mathematical notation, explored functions and is most famous for *Euler's identity* (see image, right), which beautifully links the fundamental constants *e, i, π, 1 and 0*. Euler's work connected algebra, geometry and analysis, creating tools still central to modern mathematics today.

Key breakthroughs related to:

- Complex analysis, number theory, mathematical notation, Euler's identity, bridging algebra and geometry

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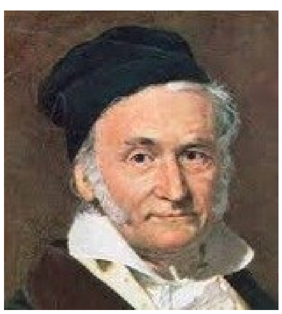
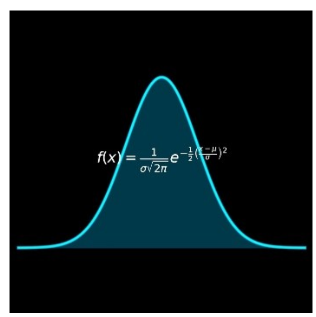
16. Carl Friedrich Gauss (1800)



Maths Discovery

The equation for a bell curve, widely used in statistical analysis

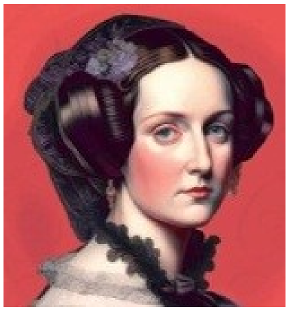


Carl Friedrich Gauss was a German mathematician who made foundational contributions across number theory, statistics, geometry and astronomy. He developed the method of least squares, the *equation for a bell curve* (see image, right), explored modular arithmetic, proved the fundamental theorem of algebra, and studied the curvature of surfaces. Gauss' work established rigorous methods and precision in both pure, applied and statistical mathematics.

Key breakthroughs related to:

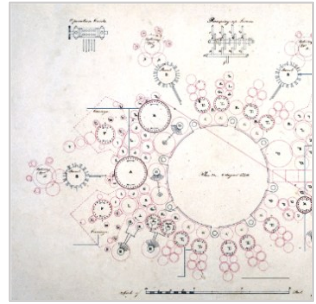
- Number theory, statistics, algebra, differential geometry and mathematical rigour

17. Ada Lovelace (1843)



Maths Discovery

Algorithms in early mechanical computer systems



Ada Lovelace was an English mathematician and writer who is considered the world's first computer programmer. She analysed Charles Babbage's Analytical Engine, creating *algorithms* intended for machine computation and recognising that such machines could manipulate symbols beyond numbers (see image, right). Lovelace's work anticipated modern computing and the abstract application of mathematics to automation.

Key breakthroughs related to:

- Algorithms, early computing, symbolic computation and mathematical abstraction in machines

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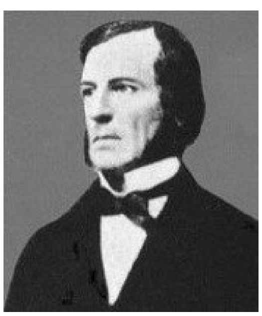
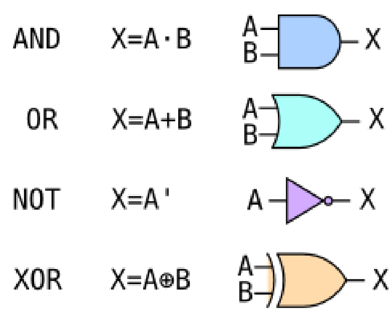
18. George Boole (1847)



Maths Discovery

Boolean algebra as a way to analyse true/false patterns, essential to computers today

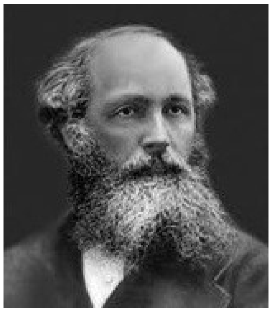


George Boole was an English-Irish mathematician and logician who founded *Boolean algebra*, providing a formal system for reasoning with truth values. He showed how logical statements could be expressed algebraically (see image, right), laying the groundwork for digital logic, computer science and information theory. Boole's work transformed logic from philosophical argument into a rigorous mathematical discipline.

Key breakthroughs related to:

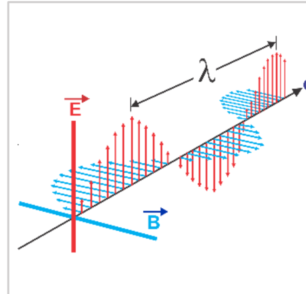
- Boolean algebra, mathematical logic and the foundations of computer science

19. James Clerk Maxwell (1905)



Maths Discovery

Maxwell equations that explain light, magnetism and electricity in a unified way



James Clerk Maxwell was a Scottish mathematician and physicist who unified electricity, magnetism and optics through mathematics. He formulated four *Maxwell equations*, which describe how electric and magnetic fields interact and propagate as electromagnetic waves (see image, right). His work applied advanced mathematical analysis to physical phenomena, laying the foundation for modern physics and engineering, as we know it today.

Key breakthroughs related to:

- Electromagnetic theory, vector calculus, mathematical physics, field theory, and the unification of physical laws

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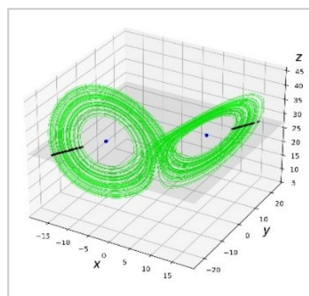
20. Henri Poincaré (1905)

Maths Discovery

Topology, chaotic systems and the father of chaos theory

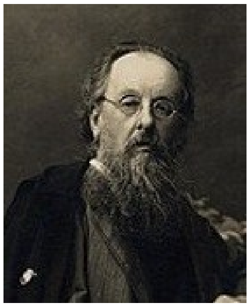


Henri Poincaré was a French mathematician, physicist and philosopher who made profound contributions to topology, dynamical systems and the theory of chaos. He introduced qualitative methods for studying differential equations, explored the three-body problem, and laid the foundations of algebraic topology and *modern chaos theory* (see image, right). Poincaré's work emphasised the deep connection between geometry, analysis and physical systems.

Key breakthroughs related to:

- Topology, dynamical systems, qualitative analysis of differential equations, celestial mechanics and chaos theory

21. Konstantin Tsiolkovsky (1910)



Maths Discovery

The rocket equation

$\Delta v = v_e \ln(m_o/m_f)$

Konstantin Tsiolkovsky was a visionary Russian scientist and mathematician who pioneered the theoretical foundations of astronautics. He formulated the *rocket equation*, describing the motion of vehicles in space, and used mathematical reasoning to explore orbital mechanics and space travel. His work established the principles of modern multi-stage rocketry (see image, right) and spaceflight engineering – crucial to all modern space programmes.

Key breakthroughs related to:

- Rocket mathematics, orbital mechanics, astronautics and spaceflight theory

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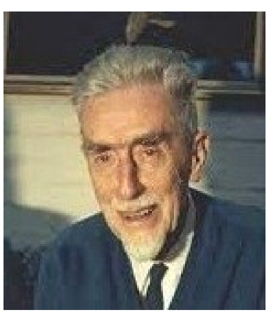
22. Maurits Cornelis Escher (1922)



Maths Discovery

Mathematical art based on tessellating patterns and 'impossible' shapes

M. C. Escher was a Dutch graphic artist whose artwork explored impossible constructions, *symmetry* and *tessellations*. Using principles of geometry, group theory and perspective, he created visually paradoxical structures and infinite patterns (see image, right) that challenged conventional notions of space. Escher's art made abstract mathematical concepts tangible, inspiring both mathematicians and artists.

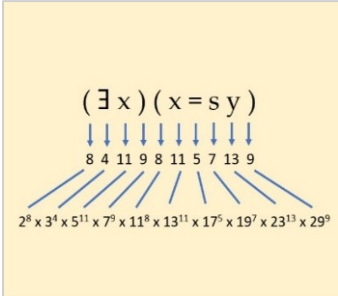
Key breakthroughs related to:

- Tessellations, symmetry groups, perspective geometry, mathematics in art

23. Kurt Gödel (1931)

Maths Discovery

Incompleteness theorem, showing that there are limits to logic



Kurt Gödel was an Austrian-American mathematician and logician who revolutionised the foundations of mathematics. He is famous for his *incompleteness theorems*, showing that any sufficiently powerful axiomatic system cannot be both complete and consistent. Gödel's work revealed fundamental limits to formal mathematical reasoning and influenced logic, computer science and philosophy. Famously, he analysed and saw a logical flaw in the US Constitution.

Key breakthroughs related to:

- Mathematical logic, incompleteness theorems and limits of computation

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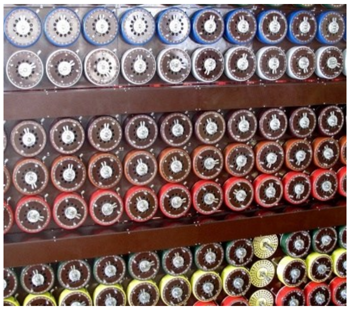
24. Alan Turing (1936)

Maths Discovery

The concept of the *Turing machine* that can calculate anything algorithmically

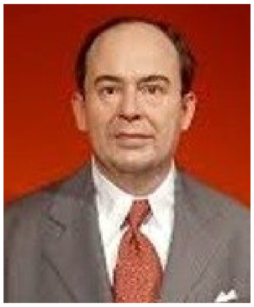


Alan Turing was a British mathematician, logician and computer scientist who laid the foundations of theoretical computing. He introduced the *Turing machine*, a mathematical model of computation that formalised the concept of algorithms and computability. He also applied mathematics to code-breaking during World War II, famously cracking the *Enigma code*. Turing's work established the theoretical underpinnings of modern computers and artificial intelligence.

Key breakthroughs related to:

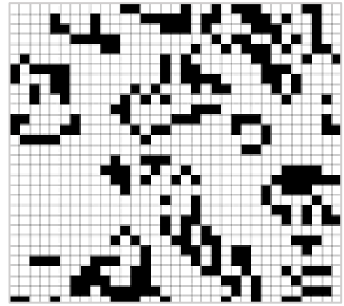
- Computability, algorithms, Turing machines, AI and foundations of computer science

25. John von Neumann (1945)



Maths Discovery

Computer-aided mathematics, game theory and cellular automata



John von Neumann was a Hungarian-American mathematician whose work spanned set theory, quantum mechanics, game theory, computing and *cellular automata* (see image, right). He developed the *von Neumann architecture* in modern computers, and applied mathematics to a wide range of activities like economics, statistics, life science and nuclear physics.

Key breakthroughs related to:

- Game theory, functional analysis, computing architecture, mathematical modelling, cellular automata, self-replication and quantum mechanics

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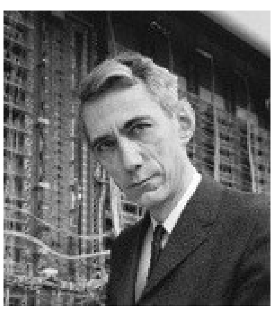
26. Claude Shannon (1948)



Maths Discovery

Entropy of information, the bit, and computational maths

$$H = -\sum p(x) \cdot log_2 p(x)$$

Claude Shannon was an American mathematician and electrical engineer who founded information theory. He quantified information using *entropy* (see equation, right), introduced the concept of the *bit*, and developed mathematical methods for encoding, transmitting and compressing data. Shannon's work provided the theoretical foundation for digital communication, data storage and modern computing.

Key breakthroughs related to:

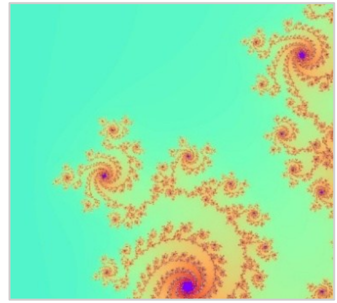
- Information theory, entropy, coding, digital communication, data compression, and the mathematical foundations of computing

27. Benoit Mandelbrot (1975)

Maths Discovery

Fractals using the iterative equation:

$f(z)=z^2+c$



Benoit Mandelbrot was a French-American mathematician who pioneered the study of fractals and self-similar structures in mathematics and nature. He developed the *Mandelbrot set* (see image, right), showing how very simple iterative formulas (above) can produce infinitely complex patterns, and he applied fractal geometry to phenomena in physics, biology and finance. His work revealed the mathematics underlying irregular, fragmented and naturally occurring shapes like clouds, coastlines, snowflakes and plants.

Key breakthroughs related to:

- Fractal geometry, self-similarity, mathematical modelling of natural complexity, chaos and fractal patterns in nature

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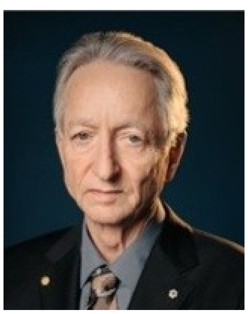
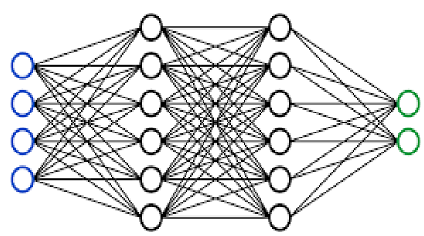
28. Geoffrey Hinton (2004)



Maths Discovery

Neural networks applied to deep learning and AI



Geoffrey Hinton is a British-Canadian computer scientist and mathematician whose work laid the mathematical foundations of deep learning. He helped develop modern neural networks (see image, right), backpropagation and probabilistic models that use high-dimensional optimisation, enabling computers to learn complex patterns from data. Hinton's research transformed artificial intelligence (AI) by applying mathematical ideas to machine learning.

Key breakthroughs related to:

- Neural networks, backpropagation, optimisation, high-dimensional statistics and the mathematical foundations of deep learning

Conclusion:

Mathematics has evolved through a remarkable interplay of practical problem-solving, abstract reasoning and visionary insight. From Imhotep's early use of geometry in Egyptian architecture to Hinton's pioneering work in deep learning and AI, each pioneer in the *Atlas of Human Imagination* demonstrates how mathematical ideas emerge from both curiosity and necessity. Some, like Pythagoras and Euler, sought universal truths and elegant patterns, while others, such as Tsiolkovsky and Shannon, applied mathematics to transform technology, navigation, computers and communication. Across centuries, these pioneers reveal a common thread: mathematics is not only a tool for understanding the world, but also a language for shaping it.

The legacy of these 28 amazing thinkers in the *Atlas* shows that mathematical discovery is cumulative, building on earlier insights while opening new horizons. Together, they illustrate how imagination and rigour can combine to expand human understanding, and in the words of Blake, mathematics is our way of holding the infinite in the palm of our hand.

David Jarvis

Some Honourable Mentions in the World of Mathematics:

These additional 44 figures further highlight how mathematics has been shaped by contributions from philosophy, logic, geometry, physics, space, computing and AI:

- Ahmes (1550 BCE) – Egyptian mathematician and scribe, associated with the *Rhind Papyrus*
- Euclid (c. 325 BCE) – established the axiomatic method and defined geometry as a deductive system
- Zhang Heng (78 CE) – Chinese mathematician and astronomer who produced early approximations of π
- Hypatia of Alexandria (415) – known as the first recorded female mathematician
- Gerolamo Cardano (1501) – first conceiver of imaginary numbers based on √-1
- Simon Stevin (1548) – introduced decimal fractions, like 0.25, 0.1 or 0.85
- John Napier (1550) – best known for discovering logarithms, and developing *Napier's Bones*
- Pierre de Fermat (1607) – transformed number theory with revolutionary ideas in analytic geometry
- Gottfried Wilhelm Leibniz (1646) – co-invented calculus, independently of Isaac Newton
- Jakob Bernoulli (1654) – founded probability theory and formalised recursive and asymptotic thinking
- Abraham de Moivre (1667) – developed a formula linking complex numbers and trigonometry
- Brook Taylor (1685) – devised a way to calculate a function as an infinite sum of terms, or Taylor series
- Thomas Bayes (1701) – created Bayes theorem and the foundation of Bayesian statistics
- Jean le Rond d'Alembert (1717) – developed the wave equation in mathematical physics
- Caspar Wessel (1745) – represented complex numbers geometrically on the plane
- Pierre-Simon Laplace (1749) – developed calculus methods, as well as partial differential equations
- Joseph Fourier (1768) – revealed that complex phenomena can be decomposed into simple waves
- Claude-Louis Navier (1785) & Sir George Gabriel Stokes (1819) – key equations of viscous fluid flow
- Augustin-Louis Cauchy (1789) – rigorous analysis in calculus, as well as continuum mechanics
- August Ferdinand Möbius (1790) – worked mainly on geometry and developed the *Möbius strip*
- Niels Henrik Abel (1802) – proved fundamental limits of algebra and the theory of elliptic functions
- William Rowan Hamilton (1805) – invented quaternions and reimagined algebra as a geometric language
- Évariste Galois (1811) – discovered that symmetry governs the solvability of equations
- Bernhard Riemann (1826) – redefined geometry by allowing space itself to curve and vary
- John Venn (1834) – invented Venn diagrams to visualise logical relationships and set theory
- Sophus Lie (1842) – created the theory of continuous symmetry through *Lie groups* and algebras
- Georg Cantor (1845) – founded set theory and gave mathematics a rigorous theory of infinity
- Karl Pearson (1847) – developed statistical methods like chi-square and correlation coefficients
- David Hilbert (1862) – reframed mathematics as a formal axiomatic activity
- Emmy Noether (1882) – revealed deep connections between symmetry, algebra, and physical laws
- Srinivasa Ramanujan (1887) – produced astonishing formulas through intuition
- Alexander Friedmann (1888) – derived mathematical models of an expanding universe
- Norbert Wiener (1894) – developer of cybernetics and the mathematics of feedback loops
- Andrey Kolmogorov (1903) – axiomatised probability and reshaped modern analysis
- Stanisław Ulam (1909) – developer of *Monte Carlo* methods, with John von Neumann
- Paul Erdős (1913) – turned problem-solving into a global, collaborative mathematical culture
- Edward Lorenz (1917) – founded modern chaos theory and developed Lorenz attractors
- Katherine Johnson (1918) – her orbital calculations were critical to the *Apollo 11* mission to the moon
- Alexander Grothendieck (1928) – reimagined algebraic geometry by drawing equations in 3D space
- Roger Penrose (1931) – used visual and geometric imagination to connect mathematics and physics
- John Conway (1937) – active in number theory, game theory and the cellular automata, *Game of Life*
- Grigori Perelman (1966) – solved the *Poincaré Conjecture* using deep geometric flow techniques
- Maryam Mirzakhani (1977) – known for her work on the dynamics and geometry of Riemann surfaces

FOR TEACHERS

Using the *Atlas of Human Imagination* in Lessons

Some Classroom Ideas about Mathematics (14-18 Yrs):

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1. Imhotep – Geometry and Architecture
Activity: Calculate the volume and slope of a stepped pyramid using scale drawings
Learning outcome: Understand early practical geometry, ratios and measurement

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2. Thales – Circle Theorems
Activity: Measure angles in semicircles and verify Thales' theorem experimentally
Learning outcome: Develop deductive reasoning from geometric observation

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3. Pythagoras – Right-Angled Triangles
Activity: Prove the Pythagorean theorem using a geometric dissection
Learning outcome: Understand proof and numerical relationships in geometry

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4. Democritus – Volumes of Solids
Activity: Compare the volumes of cones, pyramids and cylinders using models
Learning outcome: Develop spatial reasoning and early ideas of limits

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5. Plato – Platonic Solids
Activity: Build paper models of the five Platonic solids
Learning outcome: Explore symmetry, regularity and 3D geometry

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6. Archimedes – Surface Area and Volume
Activity: Calculate the volume of spheres and cylinders using formulas
Learning outcome: Apply rigorous geometric reasoning to physical shapes

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7. Brahmagupta – Zero and Negatives
Activity: Solve equations involving zero and negative numbers
Learning outcome: Understand number systems and algebraic rules

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8. Al-Khwarizmi – Algebraic Methods
Activity: Solve word problems using linear and quadratic equations
Learning outcome: Learn systematic algebraic problem-solving

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9. Fibonacci – Sequences
Activity: Generate the Fibonacci sequence and plot it visually
Learning outcome: Recognise patterns and recurrence in mathematics

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10. Pedro Nunes – Navigation Geometry
Activity: Plot a rhumb line (or loxodrome) on a globe or map
Learning outcome: Apply spherical geometry to real-world navigation

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11. René Descartes – Coordinates
Activity: Plot curves in 2D and 3D using Cartesian coordinates
Learning outcome: Connect algebra and geometry

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12. Blaise Pascal – Probability
Activity: Use Pascal's Triangle to calculate probabilities
Learning outcome: Understand combinatorics and chance

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13. Christiaan Huygens – Motion and Time
Activity: Model pendulum motion using simple equations
Learning outcome: Apply mathematics to physical systems

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14. Isaac Newton – Change and Motion
Activity: Interpret motion graphs using basic calculus ideas
Learning outcome: Understand rates of change and mathematical modelling

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15. Leonhard Euler – Mathematical Beauty
Activity: Explore Euler's identity and its components
Learning outcome: Appreciate connections between different areas of maths

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16. Carl Friedrich Gauss – Data and Curves
Activity: Plot data and fit a bell curve
Learning outcome: Understand statistics and normal distribution

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17. Ada Lovelace – Algorithms
Activity: Write a step-by-step algorithm to solve a problem
Learning outcome: Understand algorithmic thinking

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18. George Boole – Logic
Activity: Create truth tables for logical statements
Learning outcome: Learn binary logic and symbolic reasoning

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19. James Clerk Maxwell – Fields
Activity: Visualise electric and magnetic fields using diagrams
Learning outcome: Understand mathematical models of invisible forces

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20. Henri Poincaré – Chaos
Activity: Explore sensitive dependence using simple iterative functions
Learning outcome: Understand nonlinear systems and unpredictability

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21. Konstantin Tsiolkovsky – Rockets
Activity: Use the rocket equation to model velocity change
Learning outcome: Apply mathematics to space travel

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22. M. C. Escher – Symmetry in Art
Activity: Design a tessellated pattern in the style of Escher
Learning outcome: Understand symmetry and geometry visually

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23. Kurt Gödel – Limits of Proof
Activity: Discuss statements that cannot be proven within a system
Learning outcome: Understand the limits of formal mathematics

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24. Alan Turing – Computation
Activity: Simulate a simple Turing machine with instructions
Learning outcome: Understand computability and algorithms

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25. John von Neumann – Systems Thinking
Activity: Model a system using simple rules (e.g. cellular automata, *Game of Life*)
Learning outcome: Understand emergent behaviour from mathematical rules

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26. Claude Shannon – Information
Activity: Encode messages in binary and measure information content (or entropy)
Learning outcome: Understand data, bits and information theory

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27. Benoit Mandelbrot – Fractals
Activity: Generate a fractal pattern using iteration using an online generator
Learning outcome: Recognise self-similarity and mathematical complexity

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28. Geoffrey Hinton – Neural Networks
Activity: Train a simple neural network using an online simulator
Learning outcome: Understand how mathematics underpins machine learning