
Opening Extract from...

Cool Maths

50 Fantastic Facts for Kids of All Ages

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Great Moments in Maths

About 30000BC
Palaeolithic peoples in central Europe and France record numbers on bones.

About 3000BC The abacus is developed in the Middle East and around the Mediterranean.

1950–1750BC
The Babylonians (from part of present-day Iraq) know linear and quadratic equations, multiplication tables, square and cube roots.

575BC Greek mathematician Thales brings Babylonian mathematical knowledge, including geometry, to Greece.

500BC Pythagoras and his school, the Pythagoreans, study irrational numbers, the Golden Ratio, properties of triangles and Pythagorean theorem.

About 450BC
Greeks begin to use written numerals.

About 300BC Euclid gives a systematic development of geometry in his *Elements*.

About 240BC Archimedes produces his inventions, including the Archimedes screw, and his writings on mathematics.

200BC Eratosthenes develops his sieve to isolate prime numbers.

About 1AD Chinese mathematician Liu Hsin uses decimal fractions.

263 By using a regular polygon with 192 sides Liu Hui calculates the value of π as 3.14159, correct to five decimal places.

594 Decimal notation, the system on which our current notation is based, is used for numbers in India.

About 980 French scholar Gerbert of Aurillac (later Pope Sylvester II) reintroduces the abacus into Europe. Uses Indian/Arabic numerals without a zero.

1150 Arabic numerals are introduced into Europe with Italian mathematician Gherard of Cremona's translation of Ptolemy's *Almagest*.

1202 Italian mathematician Fibonacci writes *Liber abaci* and calculates the Fibonacci sequence.

1494 Italian mathematician Luca Pacioli publishes *Summa de arithmetica, geometria, proportioni et proportionalita*, a summary of all the mathematics known at the time.

1514 Dutch mathematician Giel Vander Hoecke uses the '+' and '-' signs.

1557 Welsh doctor and mathematician Robert Recorde publishes *The Whetstone of Witte* that introduces '=' (the equals sign) into mathematics.

1591
Frenchman François Viète uses letters as symbols for known and unknown quantities. Descartes later uses the letters 'x' and 'y' for unknowns.

1615 German mathematician Johannes Kepler publishes work that shows early use of calculus.

1626 French mathematician Albert Girard publishes a work on trigonometry containing the first use of the abbreviations sin, cos and tan.

1665 English mathematician Isaac Newton discovers binomial theorem and begins work on differential calculus.

1687 Newton publishes *The Principia or Philosophiae naturalis principia mathematica (The Mathematical Principles of Natural Philosophy)*.

1794 Frenchman Adrien-Marie Legendre publishes *Eléments de Géométrie*, an account of geometry that is a leading text for 100 years.

1799 Metric system introduced in France.

1823 Englishman Charles Babbage starts to build his 'difference engine', capable of calculating logarithms and trigonometric functions.

1879 English mathematician Alfred Bray Kempe publishes his false proof of the Four Colour Theorem.

1976 Americans Kenneth Appel and Wolfgang Haken show that Kempe's Four Colour conjecture is true.

1994 English mathematician Andrew John Wiles proves Fermat's Last Theorem.

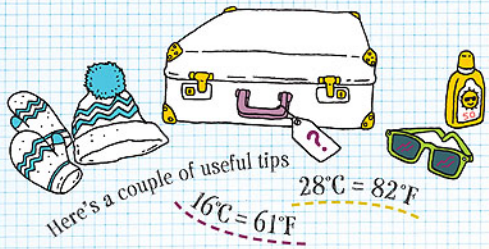
2003 Russian Grigori Perelman proves the Poincaré conjecture relating to 3-D spaces, first proposed in 1904, by Henri Poincaré.

Baby, It's Cold Outside – or Is It?

Going on a family holiday to an exotic destination? But are those temperatures in Celsius or Fahrenheit? Deciding what to pack is tricky enough already as the two units do not coincide (except when it's minus 40!). But relax, that bag will get packed, here's how to do a quick conversion.

'It doesn't make a difference what temperature a room is, it's always room temperature.'

Stephen Wright, American comedian



Let's Work It Out!

So, how do I convert a temperature in Celsius to Fahrenheit? For example, what is 24°C in Fahrenheit?

Step 1
Multiply the °C by 1.8:
24 × 1.8 = 43.2
OR
Divide by 5 and multiply by 9:
24 ÷ 5 = 4.8
4.8 × 9 = 43.2

Step 2 Add 32 to the answer from Step 1.

Did You Know?

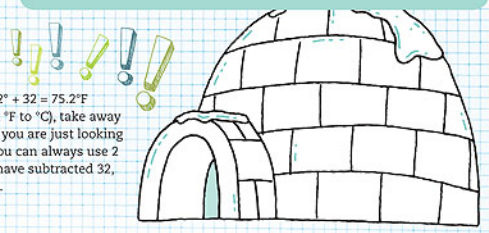
The hottest temperature ever recorded on Earth is 56.7°C (134°F), recorded in Death Valley, California, USA, on 10 July 1913. It was previously thought to have been 58°C (136.4°F) recorded in El Azizia, Libya, in 1922, but this has since been disputed following a review by the World Meteorological Organization.

The Answer → 43.2° + 32 = 75.2°F

To do this in reverse (convert °F to °C), take away 32, and then divide by 1.8. (If you are just looking for a quick approximation, you can always use 2 instead of 1.8.) Or, once you have subtracted 32, divide by 9 and multiply by 5.

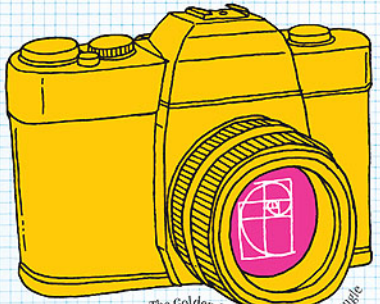
The Maths

The Fahrenheit scale was proposed in 1724 by German physicist Daniel Gabriel Fahrenheit (who also invented the mercury thermometer), and is based on a zero value representing the freezing point of brine. Between 1743 and 1954, the Celsius (or Centigrade) scale used the freezing and boiling point of water as its basis. Although scientists have since altered this definition, it has remained the temperature scale of the metric system, and coincides at intervals with the Kelvin scale, the measure for temperature in the International System of Units. As they were unrelated on their formations, there is little correlation between Celsius and Fahrenheit – apart from the fact they are equal at -40° – hence the need for a handy conversion method.



A Golden Photograph

The Golden Ratio created by Fibonacci's sequence of numbers (see pages 82–83), gives us a neat way to take better photographs by helping us with composition. So whether your camera is disposable, long lens or simply on your phone, get clicking – but make sure you remember the golden rule.



The Golden Ratio applied to a rectangle

The Maths

The Golden Ratio is a relationship found in both mathematics and the arts where for two numbers the ratio of the sum of the numbers to the larger number is equal to the ratio of the larger number to the smaller one.

$a + b$ is to a as a is to b

It is represented by the Greek letter φ (phi) and its value is 1.618033 ... The ratio's application in the world outside mathematics, in design, art, architecture, music and nature, has ensured its popularity.

THE GOLDEN RULE

Let's Work It Out!

Ancient Greek mathematicians first studied what we now know as the Golden Ratio because of its appearance in geometry relating to pentagons and pentagrams. In 1202, Fibonacci published his sequence of numbers (see pages 82–83), and it became apparent that the further up the sequence you move, the ratio between the numbers becomes closer and closer to the Golden Ratio.

But what does this have to do with taking photographs? If you apply the idea of the Golden Ratio to a rectangle, then the most aesthetically pleasing shape is one where the ratio of the shorter to the longer sides is somewhere around 1.6 – the value of φ. And, if you divide this rectangle again by creating a square and another rectangle, the smaller rectangle will be another golden rectangle. If you carry on, this will create a spiral shape that relates to shells seen in nature that exhibit the properties of the Fibonacci sequence.

The Answer

So when you are taking a picture, imagine placing a Fibonacci spiral on top of the image. Then, position the most important element of your shot, e.g. someone's eyes, an important building, not at the exact centre of the image, but at the eye of the Fibonacci spiral, which is slightly off-centre. Try it – it really works!

Did You Know?

Almost 2,500 years ago, a Greek sculptor and architect called Phidias is thought to have used the Golden Ratio to design the statues he sculpted for the Parthenon, and the word 'phi' in his name actually inspired the naming of this number in the 20th century.