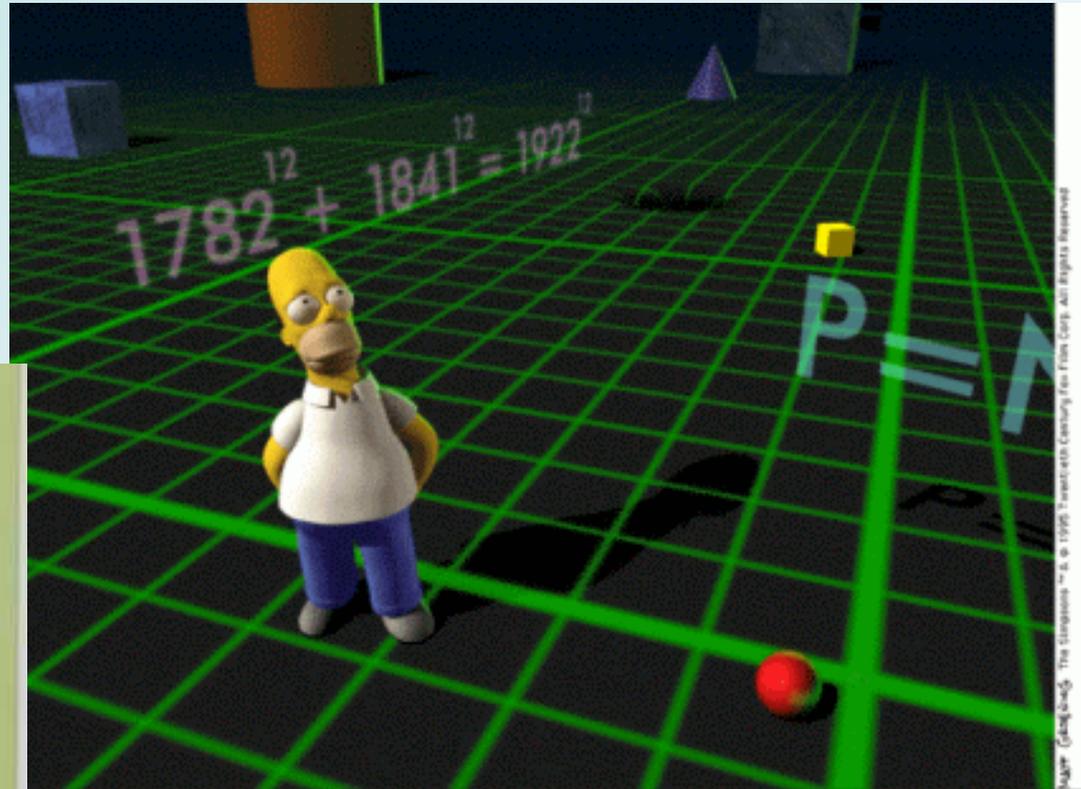
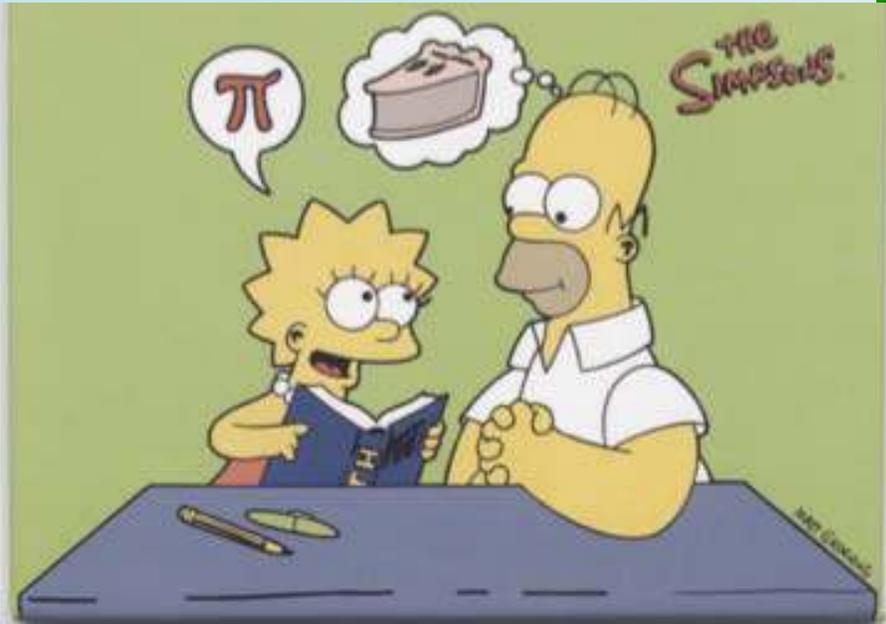


The Golden Curve

Maths, art and nature

It's surprising who uses maths

Many of the writers for The Simpsons have maths degrees.



Maths helps us...



Design



Maths helps us...



Design
Plan



Maths helps us...



Design
Plan
Understand



Where's the maths?

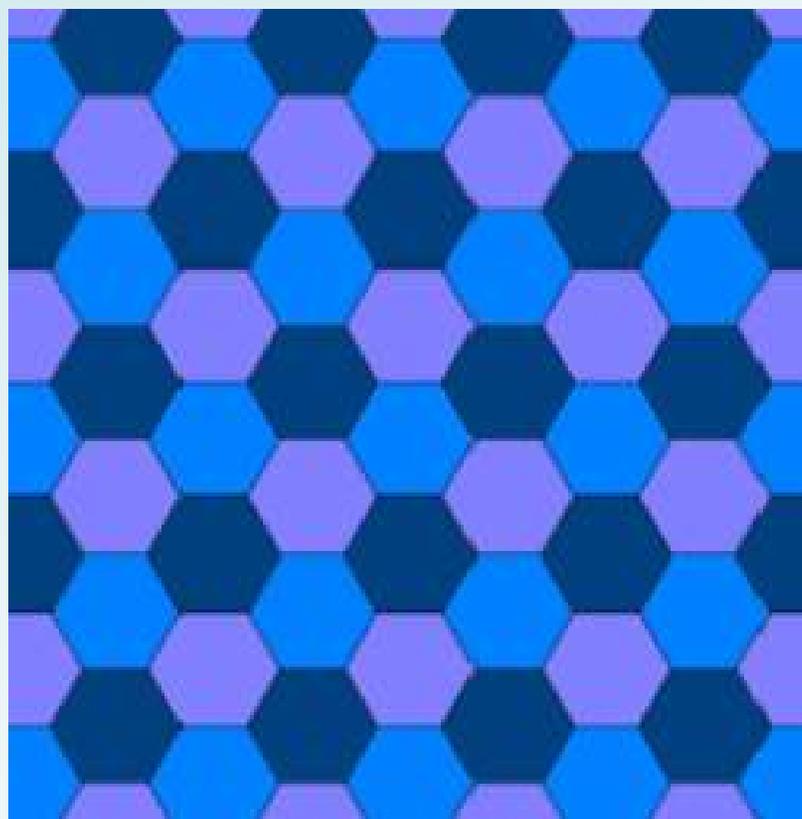
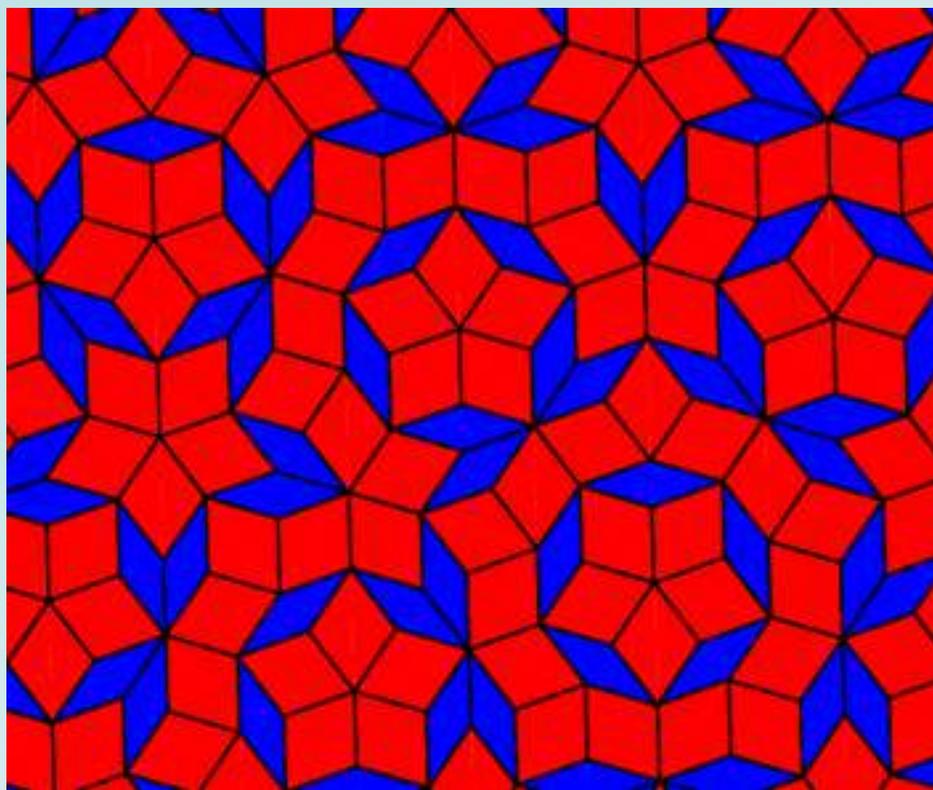
Where's the maths? (1)



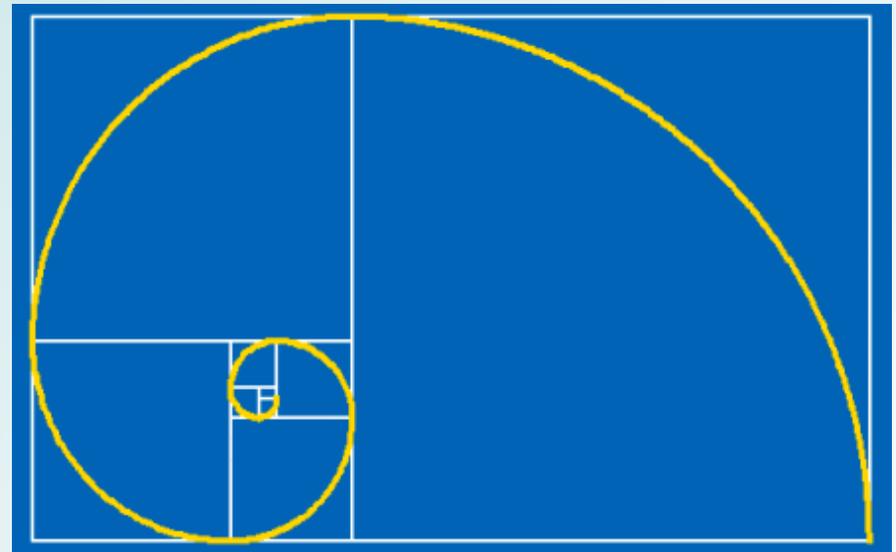
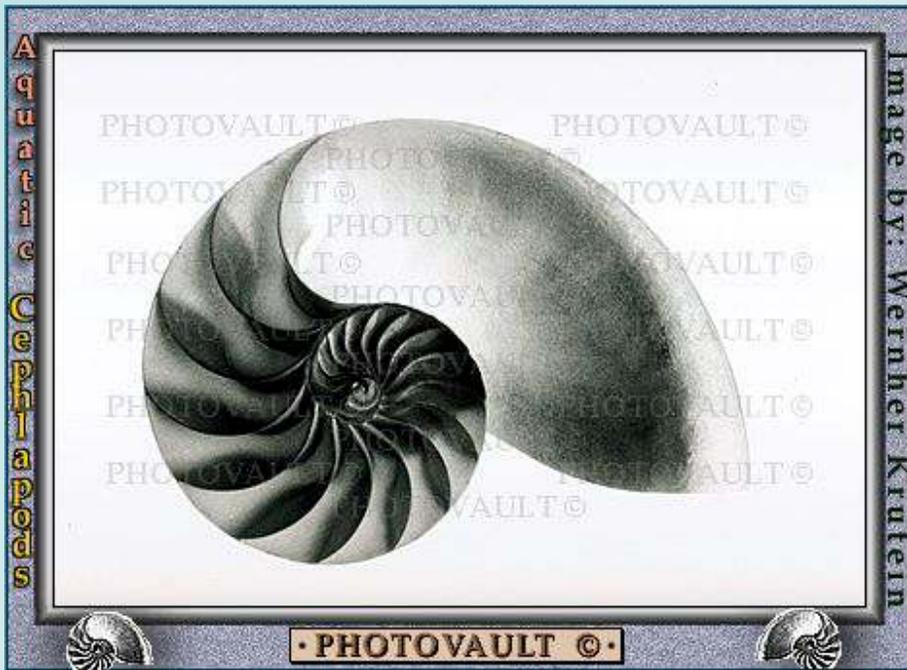
Where's the maths? (2)



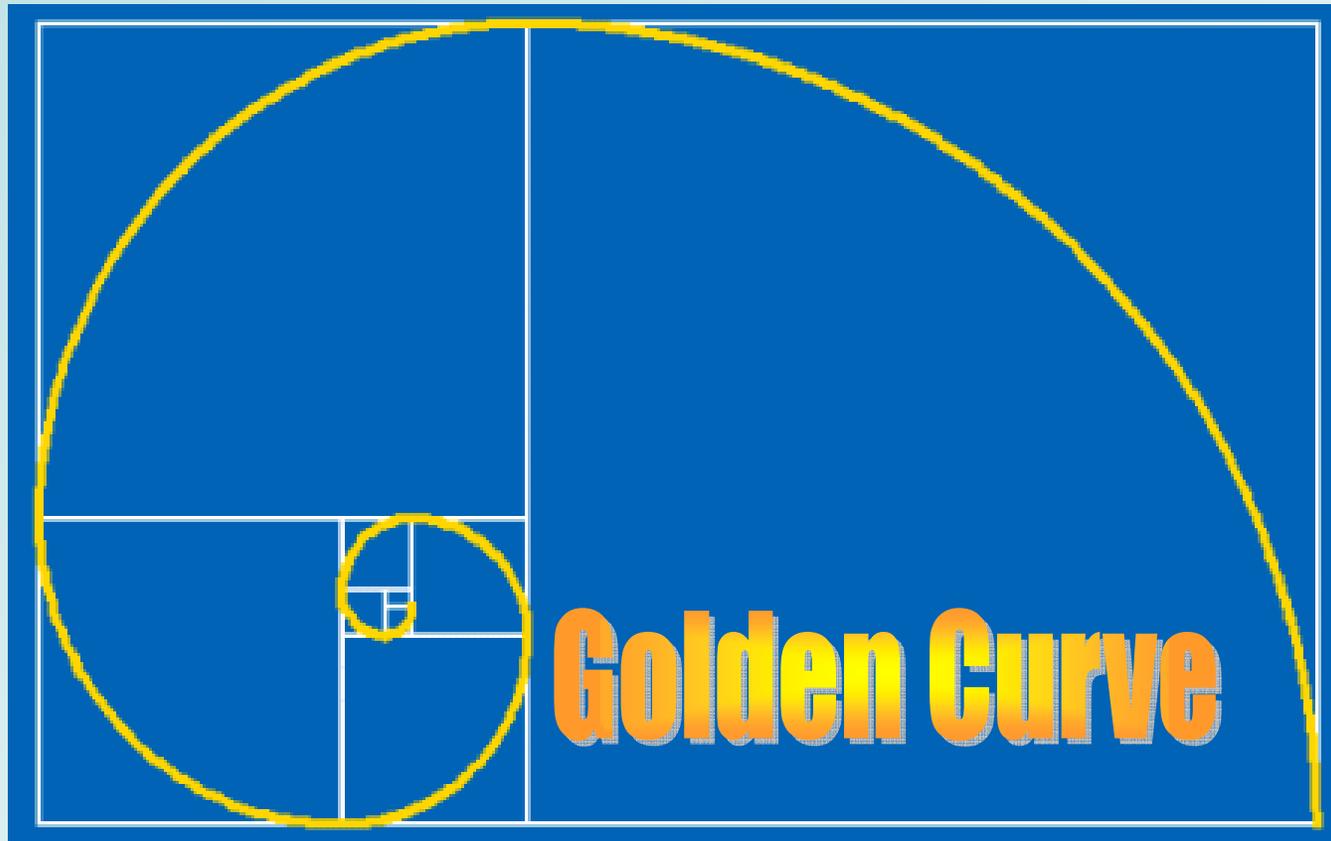
Where's the maths? (3)



Where's the maths? (4)



The “Golden Curve”



The Fibonacci sequence

- 1, 1, 2, 3, 5, 8, 13, 21, 34,
- What comes next?

$$21 + 34 = 55$$

$$34 + 55 = 89$$

$$55 + 89 = 144$$

$$89 + 144 = 233$$

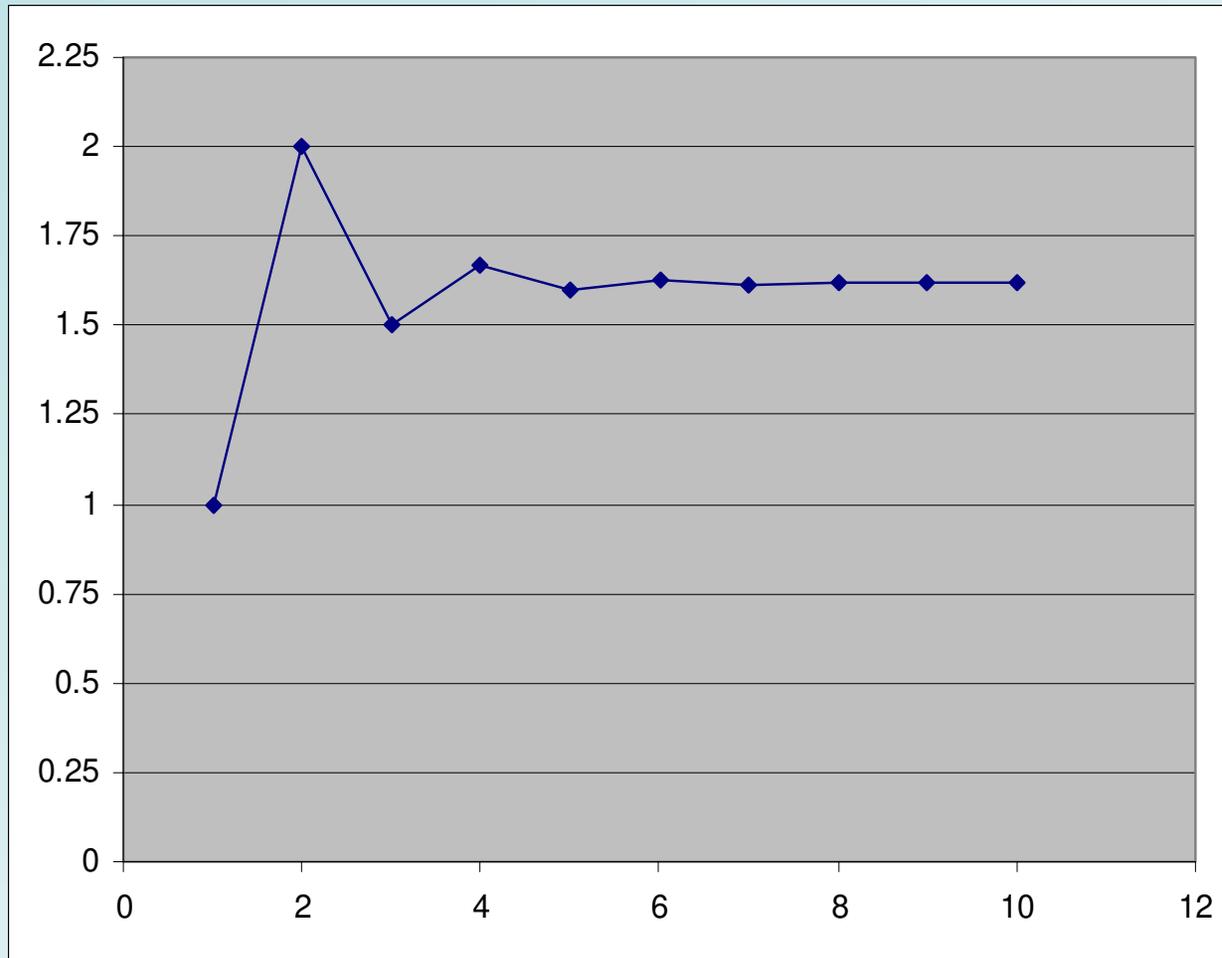
The ratios of the sequence

- $1 \div 1 = 1$
- $2 \div 1 = 2$
- $3 \div 2 = 1.5$
- $5 \div 3 = 1.6666666666\dots$
- $8 \div 5 = 1.6$
- $13 \div 8 = 1.625$
- $21 \div 13 = 1.615384615384615384615\dots$

The ratios of the sequence...

- $8 \div 5 = 1.6$
- $13 \div 8 = 1.625$
- $21 \div 13 = 1.615384615384615384615...$
- $34 \div 21 = 1.619047619047619047619...$
- $55 \div 34 = 1.6176470588235294117647...$
- $89 \div 55 = 1.618181818181818181818...$

The ratios tend to a number!



The golden ratio

- The number that these ratios tend towards is called the **golden ratio**:

1.618033988749...

Why golden?

- It has lots of special properties
- People have studied it for over 2000 years
- It occurs in art, architecture and nature

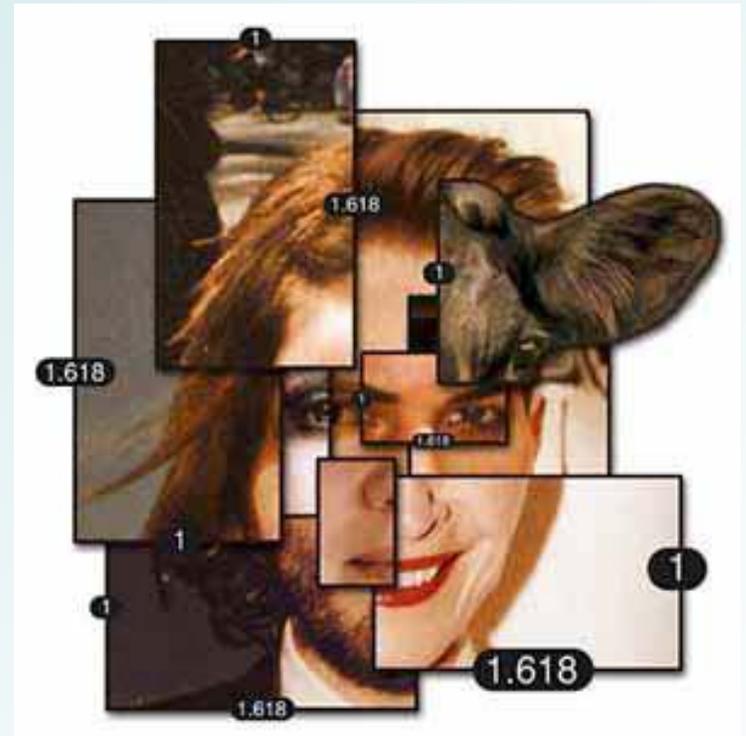
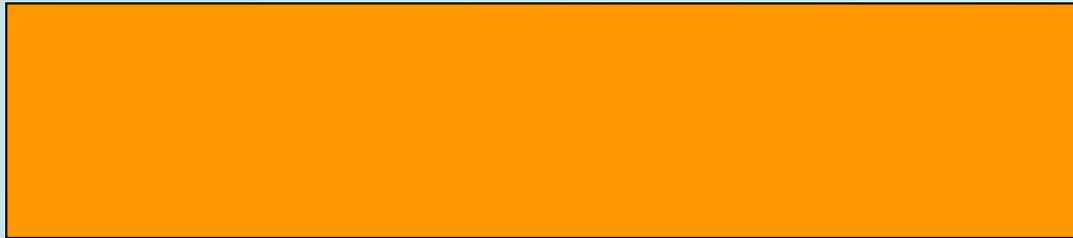
Golden rectangles



- A golden rectangle has one side which is 1.618033... times the length of the other
- The United Nations building in New York has this shape

People like golden rectangles

- Too long? Too short? Just right!



Nature and the golden ratio

- Sunflowers use the Fibonacci sequence

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
Can you spot the pattern?

maths counts

WORLD MATHEMATICAL YEAR 2000
Posters in the London Underground
Supported by EPSRC

Mathematics of Nature

The sequence of numbers on the left is attributed to Leonardo Fibonacci, who used it in the 12th century as a model for the growth of a population of rabbits. It has since been the key to understanding an astonishing array of natural phenomena, including the spiral patterns of sunflower seeds and pine cones.

The sequence of fractions $\frac{1}{1}, \frac{2}{3}, \frac{3}{5}, \frac{5}{8}, \frac{8}{13}, \frac{13}{21}, \frac{21}{34}, \dots$ approaches the Golden Ratio, a special number in mathematics, which also plays an important role in art and architecture.

Nature of Mathematics

Isaac Newton Institute
for Mathematical Sciences
<http://www.newton.ac.uk/>
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Shells and the golden curve

- The shell of a nautilus (sea creature)

