

The logo for the Santa Fe Alliance for Science is centered in a white rectangular box. It features the words "SANTA FE" in a large, blue, sans-serif font at the top. Below that, the words "ALLIANCE FOR" are in a smaller, grey, sans-serif font. At the bottom, the word "SCIENCE" is in the same large, blue, sans-serif font as "SANTA FE".

SANTA FE ALLIANCE FOR SCIENCE

This video was created by volunteers from the Santa Fe Alliance for Science, a 501(c)(3) organization.

Our Mission

We inspire the inner scientist in Santa Fe students by creating STEM learning and discovery opportunities through our network of volunteer scientists, engineers, and other STEM professionals.

Learn more: www.sfafs.org

Fibonacci and his numbers

Hubert van Hecke
January 2021



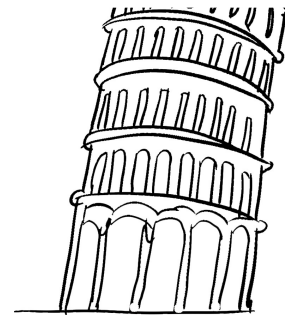
1170-1250



Leonardo of Pisa
Fibonacci



Son of Bonacci



1172-1372

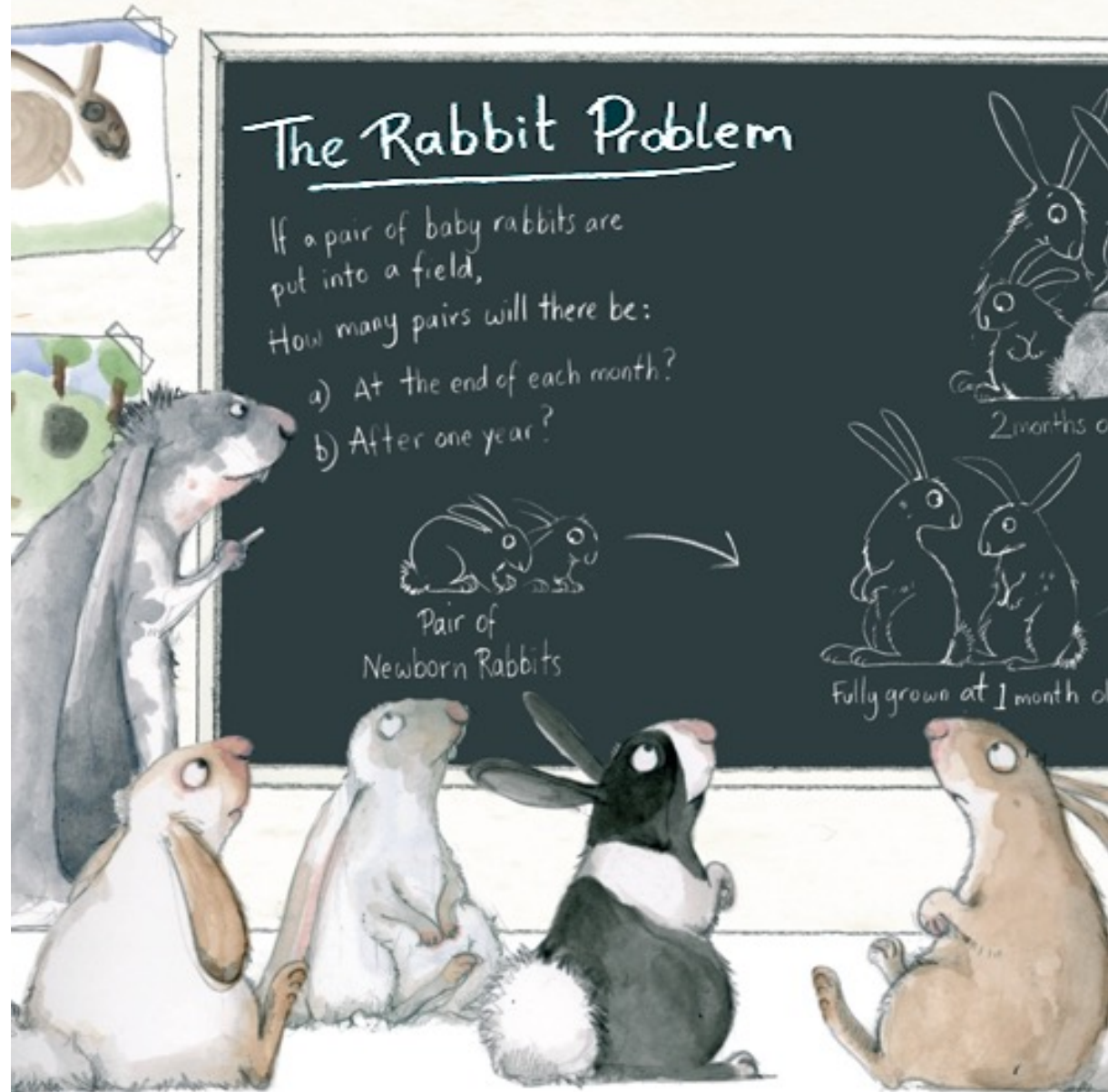
Leaning tower of Pisa



If I put a pair of baby rabbits
in a field,
How many rabbits will there
be in a year?

Rules:

- It takes one month to grow into an adult rabbit
- An adult pair will produce a pair of baby rabbits every month



■ Month

■ # of Pairs

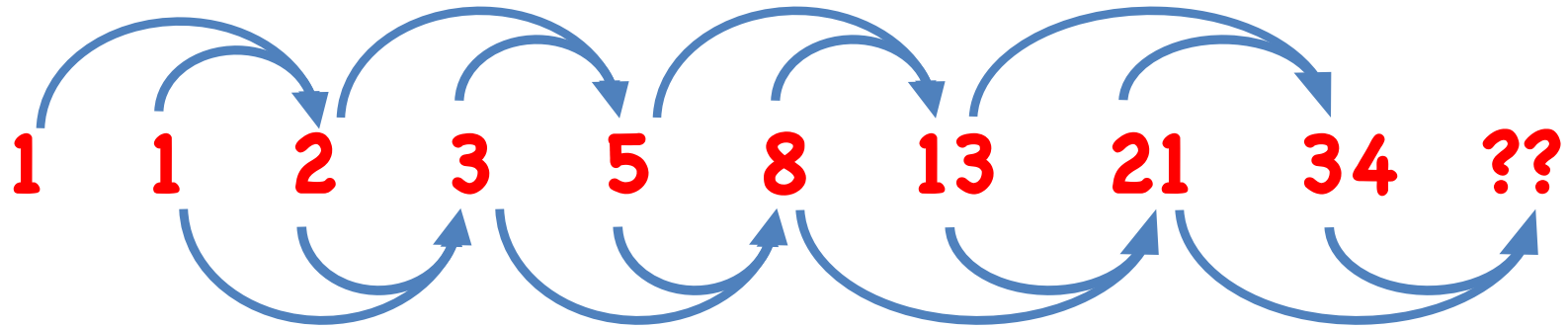
 Mature

 Immature

1  1



Fibonacci number series



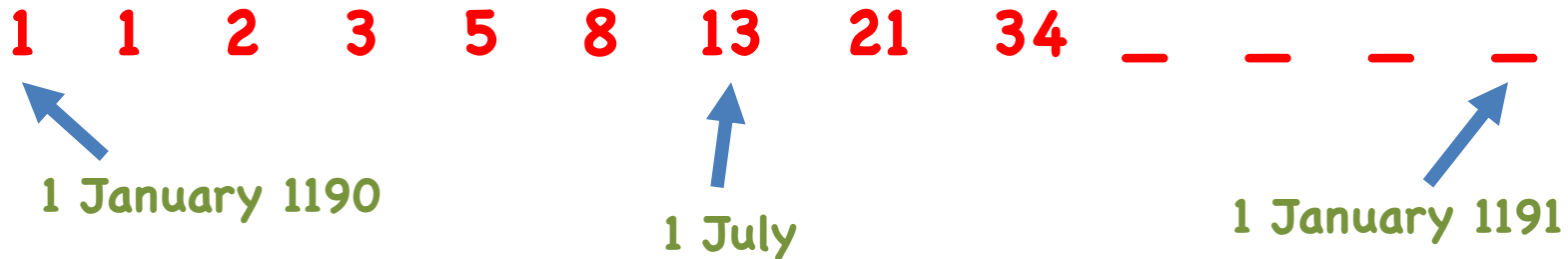
$$\begin{array}{r} 21 \\ 34 \\ \hline 55 \end{array} +$$

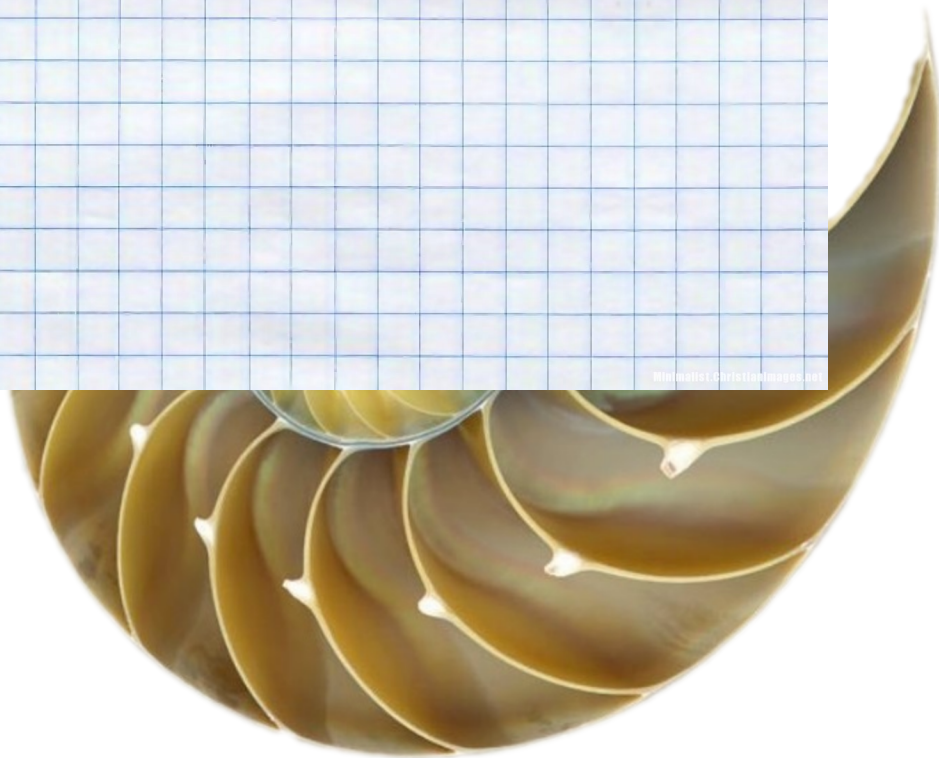
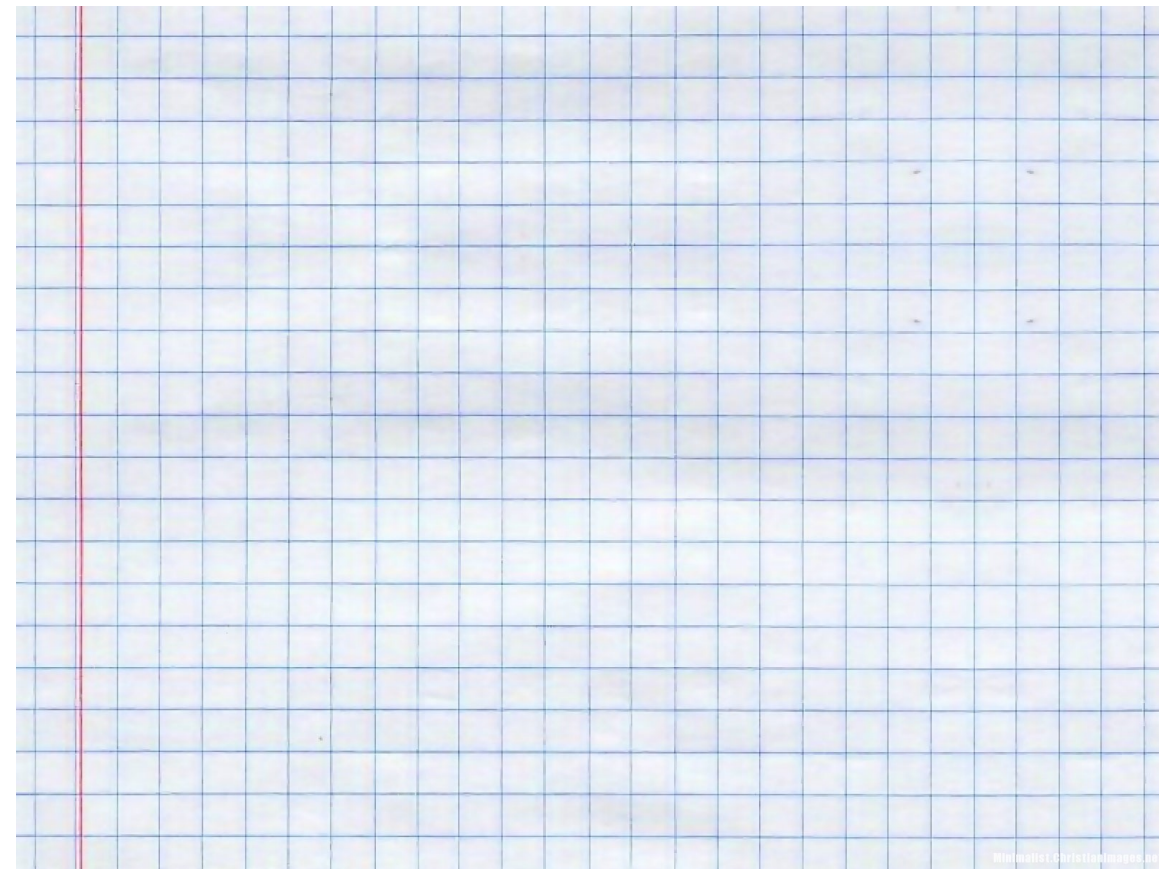
Every number is the sum of the previous two numbers

Fibonacci number series



Every number is the sum of the previous two numbers





Let's find Fibonacci numbers in Nature

First: the
grocery
store



1 1 2 3 5 8 13 21 34 55 ...

Fibonacci numbers in Nature



pineapple

1 1 2 3 5 8 13 21 34 55 ...



Pineapple

1 1 2 3 5 8 13 21 34 55 ...



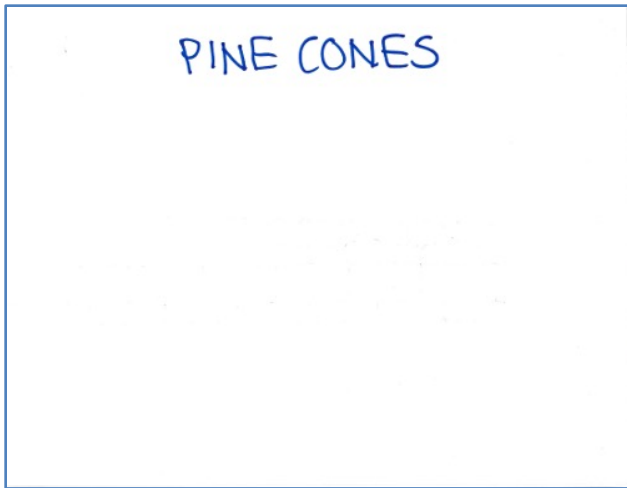
Fibonacci numbers in Nature

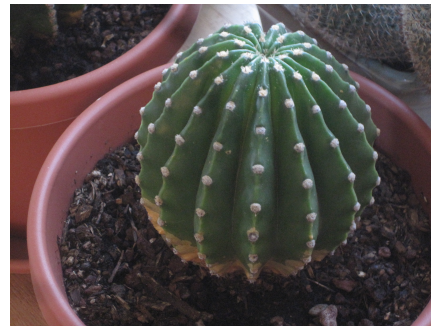
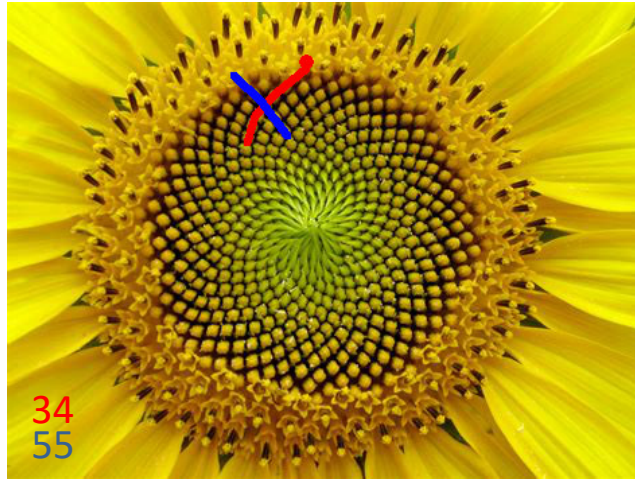
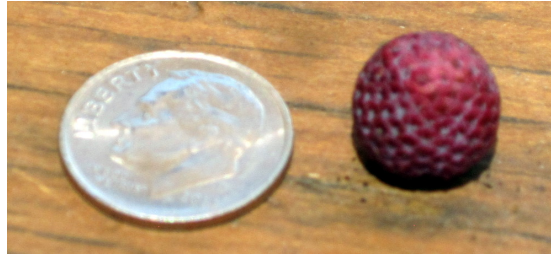


pinecones

1 1 2 3 5 8 13 21 34 55 ...

(switch to overhead camera)





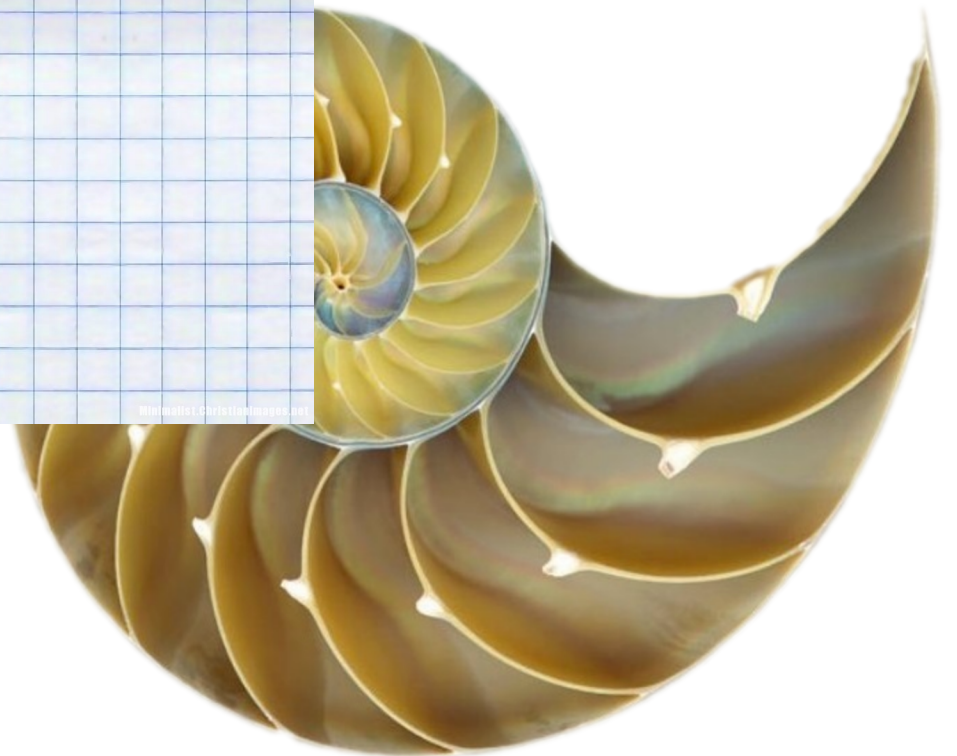
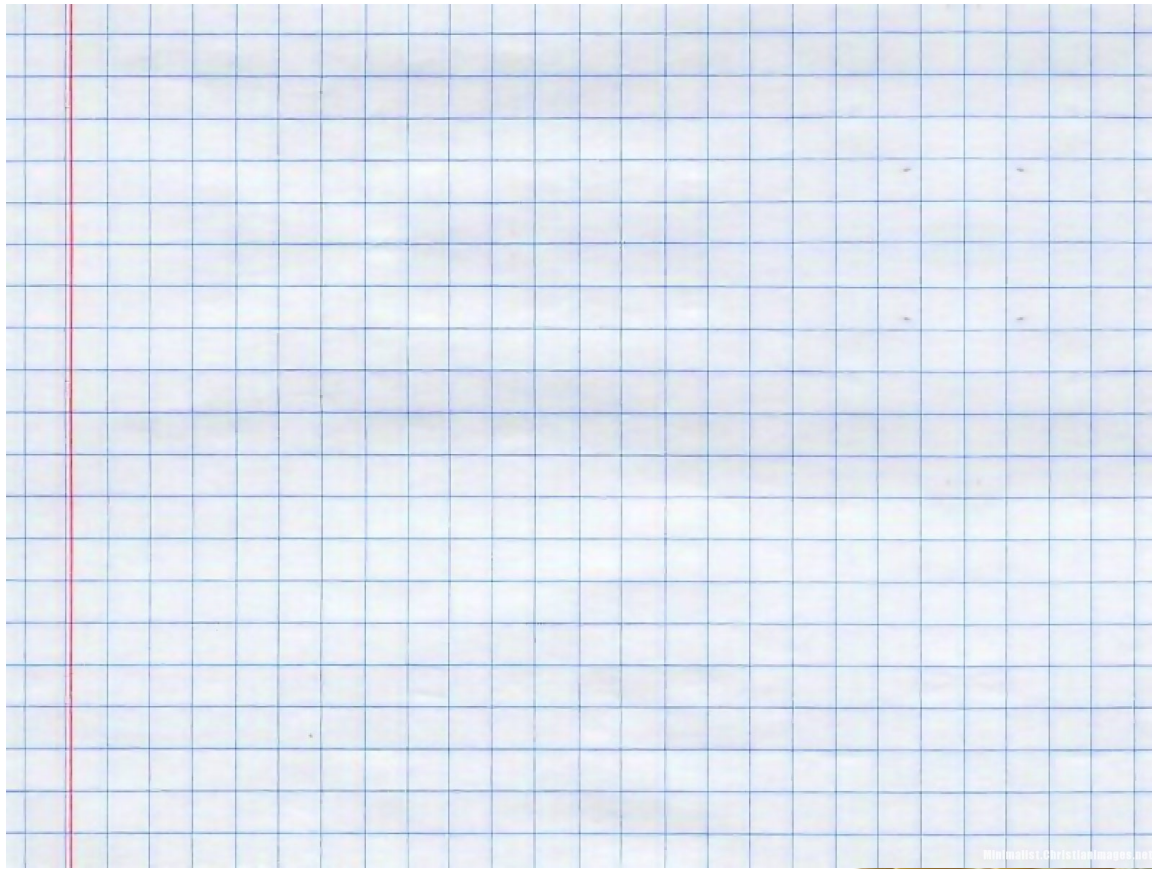
**Part 2:
Ratios
Golden Ratio**

1 1 2 3 5 8 13 21 34 55 89

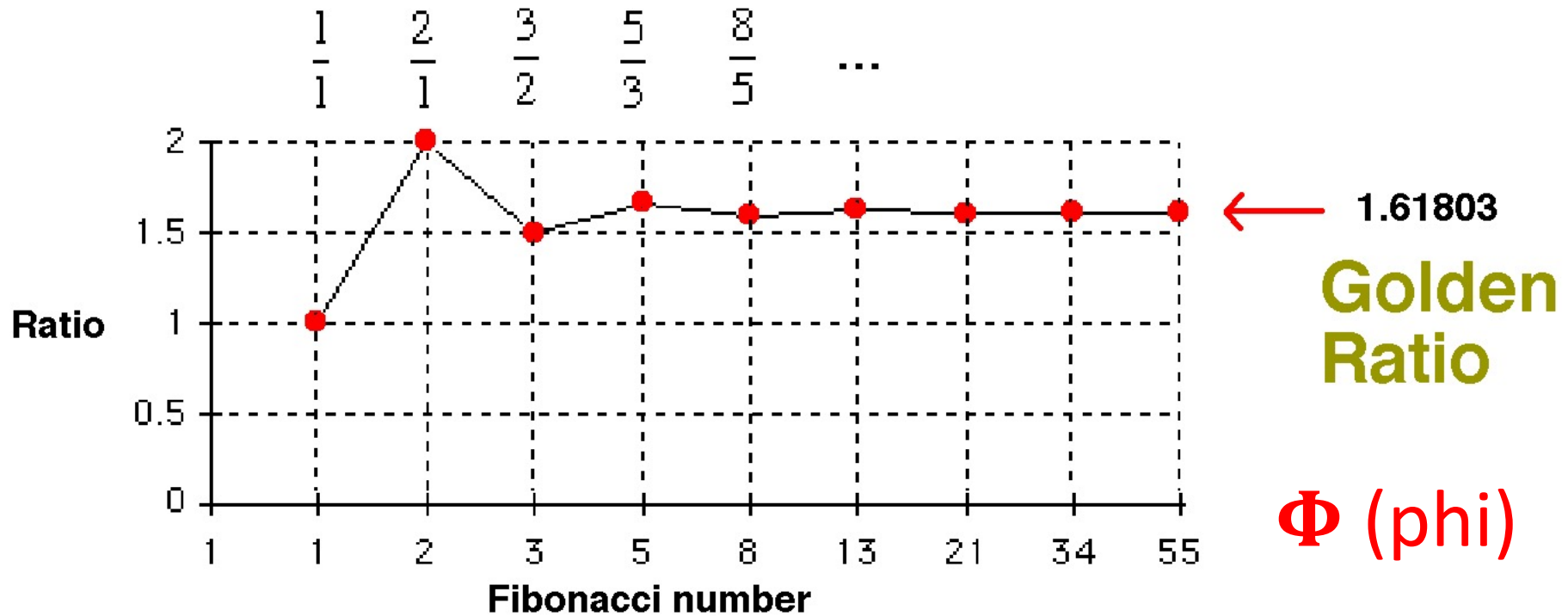
Let's take the **ratio** between *adjacent* pairs of Fibonacci numbers

↙ *next to each other*





www.mattchristian.org

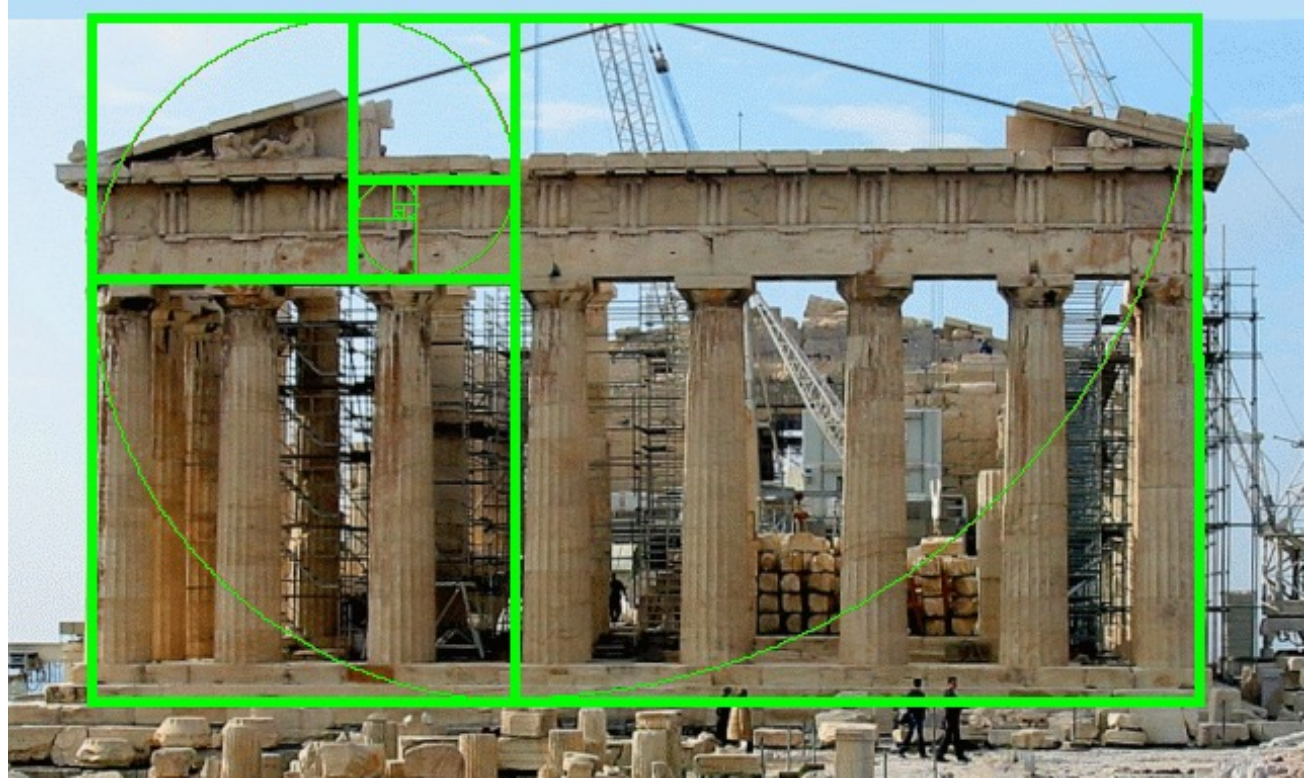


So why is this ratio interesting?

2000 years ago,
The Greeks and
the Romans

used this ratio
to design some
of their
buildings.

They believed
that this ratio
led to **the most
pleasing shapes**

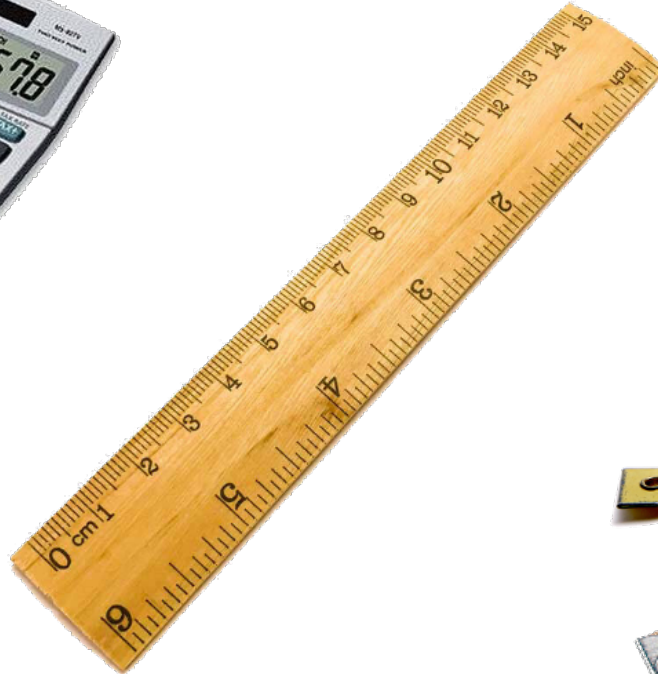


The width of this temple
divided by
the height of this temple

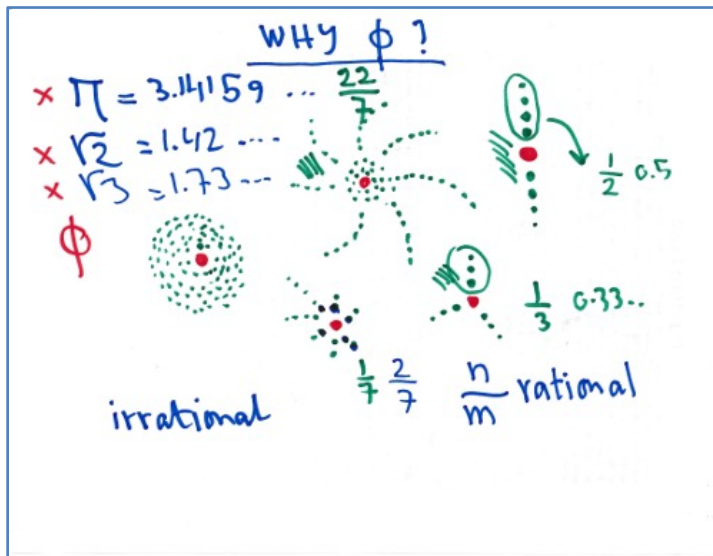
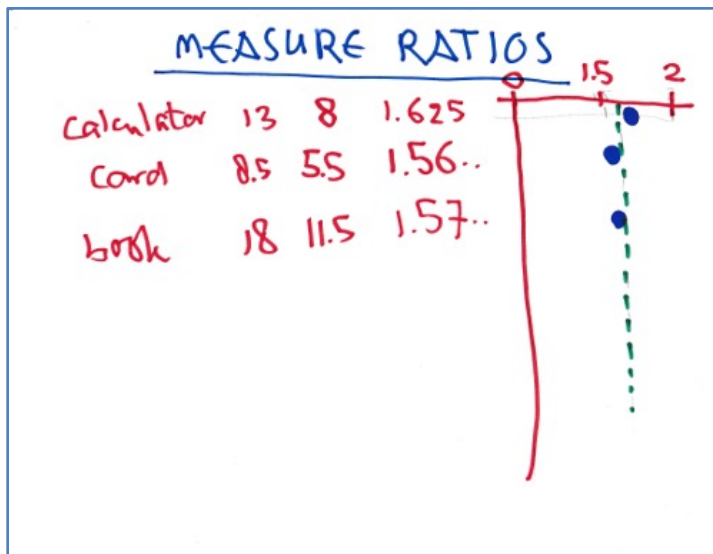
is equal to the **Golden Ratio**, 1.618

ACTIVITY!

Get out a ruler, a meter stick or a tape measure









(switch to overhead camera)



Part 3: Number systems

(switch to overhead camera)

BILL	How Many	price per	Total
			
			
			

BILL	How Many	price per	Total
	III	VI	XVIII
			
			

ROMAN NUMERALS		
1	I	
2	II	50
3	III	60
4	IV	
5	V	
6	VI	100
7	VII	500
8	VIII	1000
9	IX	
10	X	

ROMAN NUMERALS		
1	I	
2	II	XI 50 L
3	III	XII 60 LX
4	IV	
5	V	
6	VI	100 C
7	VII	500 D
8	VIII	1000 M
9	IX	
10	X	

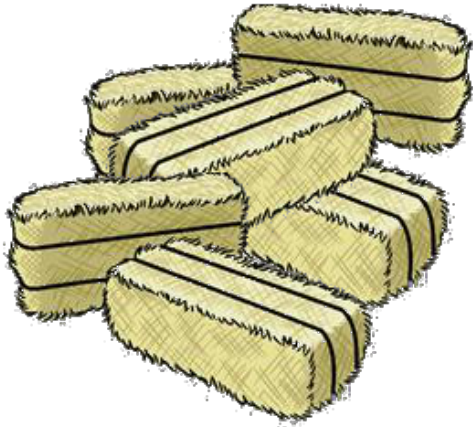
bottles of olive oil



sacks of grain



bales of hay



(switch to overhead camera)

1 I 123
5 V ↖ ↗
10 X 1 2 3
50 L 10 10 1
100 C

place-value system
base-10

IV
XL

1 I 123 ✕
5 V ↖ ↗
10 X 1 2 3
50 L 100 10 1
100 C

place-value system
base-10

1 0 0

100 10 1

1 2 3 4 5 6 7 8 9

0

✕

1 0 0

100 10 1

1 2 3 4 5 6 7 8 9

0

Where can you find Roman numerals?



1000

1000

-100

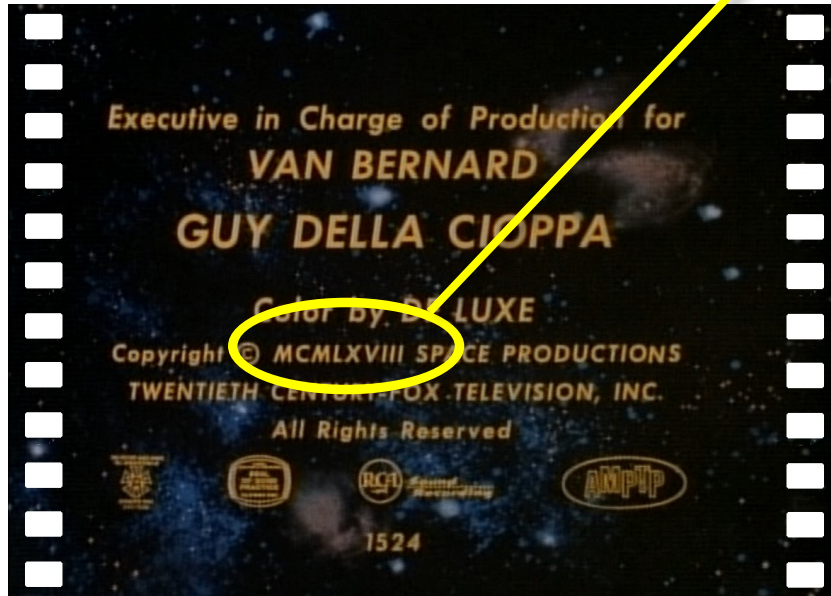
50

10

5

3

1968



JOE ROBBIE STADIUM
MIAMI, FLORIDA

MCMLXVIII

Roman

1968

Arabic

11110110000

Binary



$$\Phi \text{ (phi)} = 1.61803\dots$$



1 1 2 3 5 8 13 21 34 55 ...