Lesson on Fibonacci

Name _____

PART I

In this lesson you will learn about one of the greatest mathematicians of the middle ages, Leonardo of Pisa, the famous Fibonacci. You will learn about an important pattern of numbers, the Fibonacci series, which shows up in nature and you will also learn about the golden mean.

GO TO
http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibBio.html#who

1) When and where was Fibonacci born? _____

Read the next section and **SCROLL** down to Mathematical Contributions.

2) Fibonacci was one of the first to introduce the Hindu Arabic system which replaced Roman numerals. What is the Hindu Arabic system and why was this such an important contribution? _____

3) What is a positional number system? _____
_____

4) What book did Fibonacci write and what does its title mean? _____
_____

Scroll down and look at the Roman numerals.

5) We still use Roman numerals. Can you think of some examples where we still see Roman numerals? _____
_____
_____
_____

6) Write the numbers these numerals represent without looking at the screen and then scroll down to check your answers:
I= ____ V= ____ X = ____ L = ____ C= ____ D= _____ M = _____

Name _____

Name _____

PART II The Fibonacci Series

7) NOW, LOOK AT THIS PATTERN AND TRY TO FIGURE OUT THE NEXT FOUR NUMBERS:

1, 1, 2, 3, 5, 8, 13, _____, _____, _____, _____

(If you cannot figure it out, **GO TO**
http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibseries.html
and it will show you how the pattern works.)

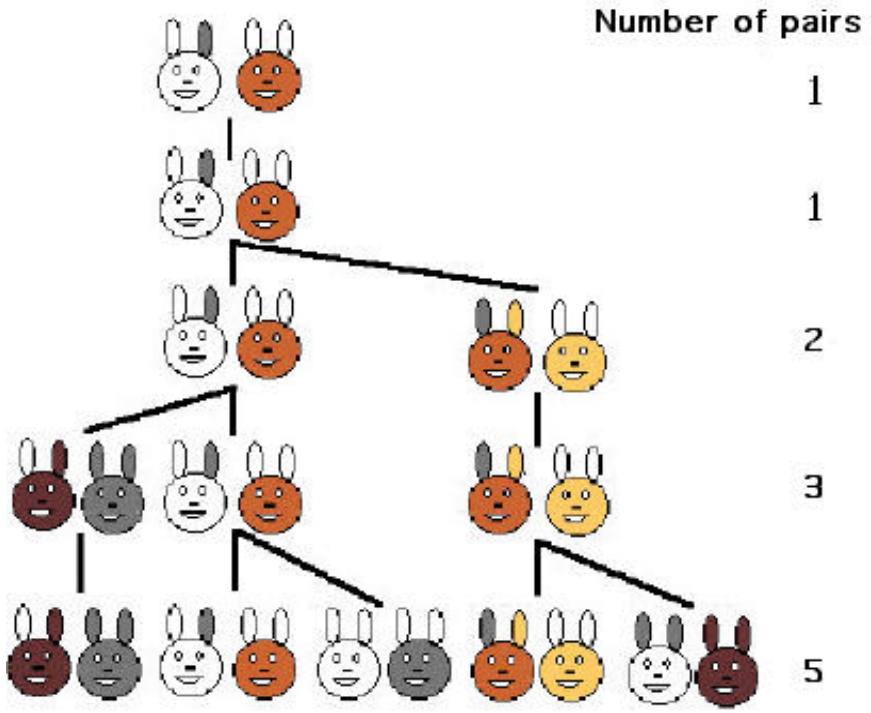
NOW!

If you got it, then let's look at a famous example how the pattern works (this example of the rabbits is not quite real, but it shows how the pattern works).

The Fibonacci Numbers in Nature

GO TO http://www.indoorooss.qld.edu.au/05studgl/fibonacci/webs/nature.html

Read the explanation and see if you can figure it out. I have duplicated the drawing here in case you need to think about it more at home.



(graphic from http://www.ee.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html)

Scroll Down and READ Petals on Flowers

8) Write one sentence to summarize what you learned about the petals of most flowers?

_____

Read The Family Tree of a Drone and Spirals on Pinecones.

9) Write one sentence to summarize what you learned about the spirals of pine cones.

_____

Part III The Golden Mean and the Golden Rectangle Name _____

GO TO

http://www.shout.net/~mathman/html/prob7.html

Read the section and then go to the table that looks like the one below.

Look at the Fibonacci series and **divide each number by the previous one with your calculator** (you can use the calculator in your computer) and see if what you get:

Here's the series to help you:

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

10) Start at the top left and work down:

$\frac{1}{1} = 1$	$\frac{13}{8} =$	
$\frac{2}{1} = 2$		
$\frac{3}{2} = 1\frac{1}{2} = 1.5$		
$\frac{5}{3} = 1\frac{2}{3} = 1.6666...$		$\frac{610}{377} =$
$\frac{8}{5} =$		

11) What did you find about the ratio of each number in the Fibonacci series when it's divided by the previous one?_____

_____

This number approaches 1.618034... or what is called the Golden Mean or the Divine Proportion. The Greek letter PHI or is used to represent this number. It is an irrational number (which means a decimal that never stops and never repeats). When you get to 9th grade you will learn that Phi is an irrational number like π but unlike π it's not a transcendental number, meaning that Phi can be obtained from a formula by solving $x^2 - x - 1 = 0$ and it's actually the number $\frac{1 + \sqrt{5}}{2}$).

Now click **GO BACK** and scroll down to the Chambered Nautilus Shell and read about Proportions in the Human Bodies. Make sure you **scroll down** and **sideways** so you can see the ratios on the right of the page. The Golden Mean was used in architecture and in paintings. It is a ratio that is pleasing to our eyes. See Lesson 2 for more onThe Golden Mean and the Golden Rectangle.

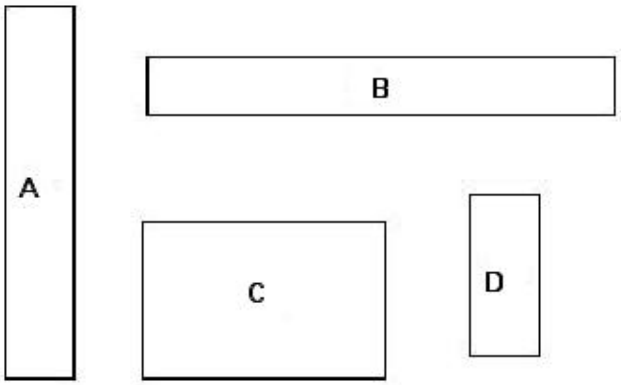
12) What can you say about the proportions of the human body after reading this section?_____

More on the Golden Mean - The Golden Rectangle Name _____

GO TO

http://www.indoorooss.qld.edu.au/05studgl/fibonacci/webs/goldrect.html

Look at the pictures of the rectangles and follow the directions on the screen:



13) Which rectangle did you pick and why? _____

_____

14) What is the Golden Rectangle? Explain using a sentence_____

_____

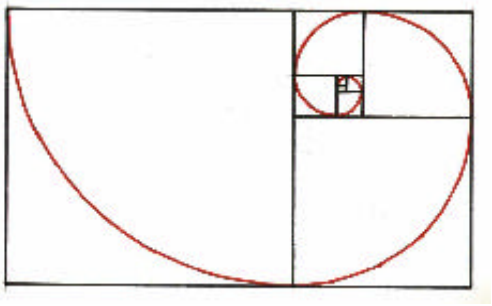
Click where it says The Golden Ratio in Art.

15) What does the Golden Mean have to do with the Parthenon in Athens, Greece?

_____

Click **GO BACK**

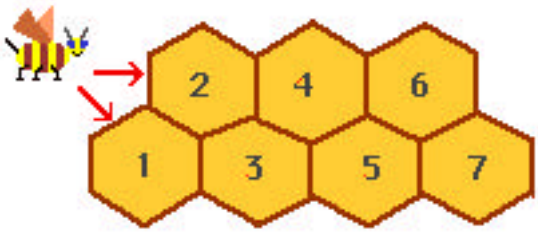
Scroll down and read what happens to the Golden rectangle as you keep dividing it.



16) What does the above picture look like? _____

Extra Credit Name _____

Find the number of paths that a bee can travel in this bee hive!



(from http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibpuzzles.html#bricks)

A bee can that starts on the left can move only to the right (or to a bigger number). Determine the number of paths it can take.
Fill out the following:

	List the paths:
How many ways to reach cell 1? ____	_____
How many ways to reach cell 2? ____	_____
How many ways to reach cell 3? ____	_____
How many ways to reach cell 4? ____	_____
How many ways to reach cell 5? ____	_____
How many ways to reach cell 6? ____	_____
How many ways to reach cell 7? ____	_____

What do you find about the pattern? _____

For more examples of Fibonacci numbers in every day life and other fun things to try, **GO TO**
http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibpuzzles.html#bricks