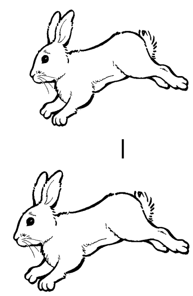
Lwr. 2ndry Maths Made Easy
NUMBER THEORY :
THE FIBONACCI NUMBERS

Name: ……………………………………………… No : ………………

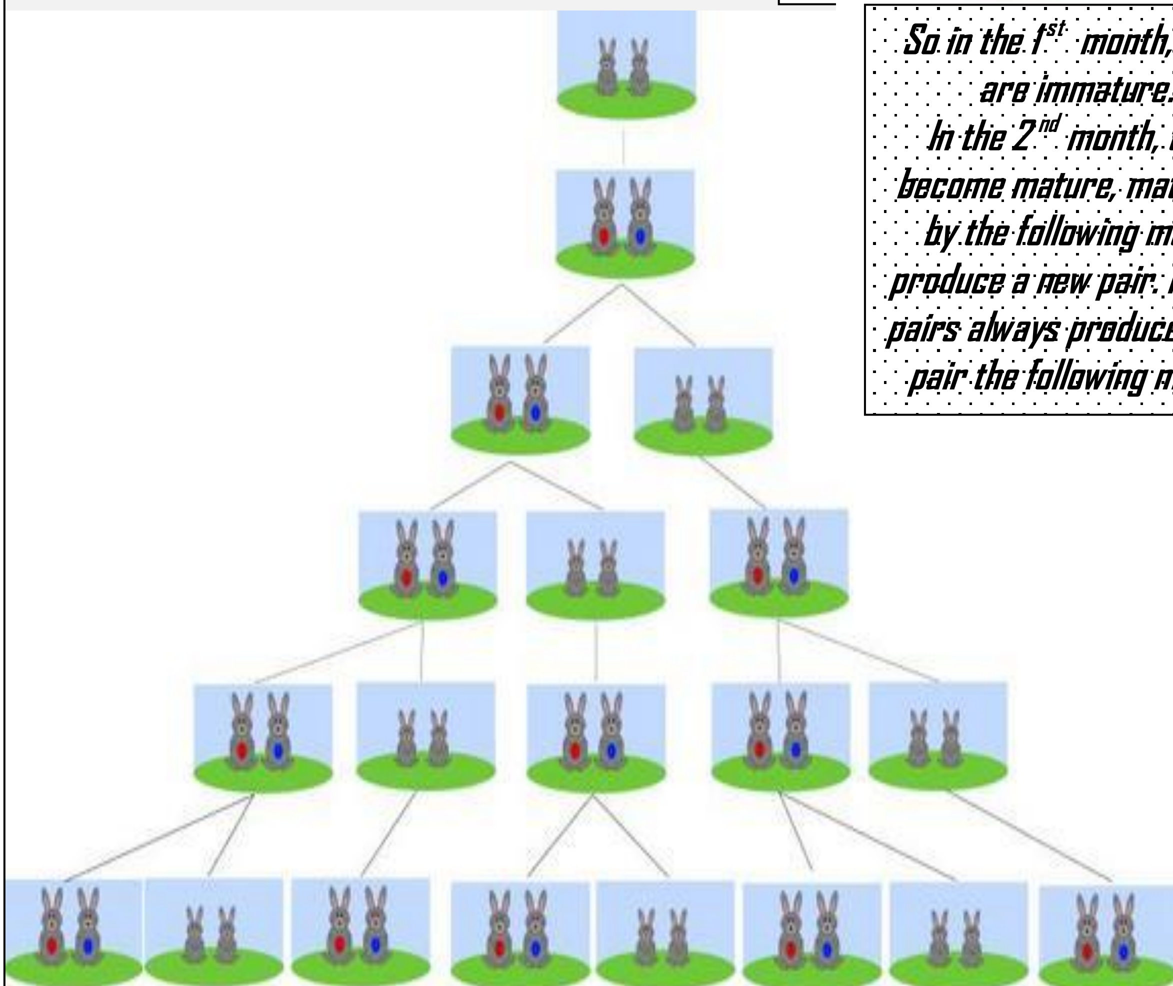
Class : ……………… Date :……………………………………………………

In A.D. **1202**, **Fibonacci** posed a problem with rabbits.
He asked this : if a pair of rabbits takes one month to mature,
then mates, and produces a new pair the following month
(**1** male and **1** female) and for every month after that,
AND their offspring do the same,
how many pairs will there be after one year ?



***Q.1 :** To work this out, can you complete the situation at End 7^{th} i.e. T_7*

Month	Total Pair
End 1st T1	
End 2nd T2	
End 3rd T3	
End 4th T4	
End 5th T5	
End 6th T6	
End 7th T7	



So in the 1^{st} month, pairs are immature. In the 2^{nd} month, they become mature, mate, and by the following month produce a new pair. Mature pairs always produce a new pair the following month.

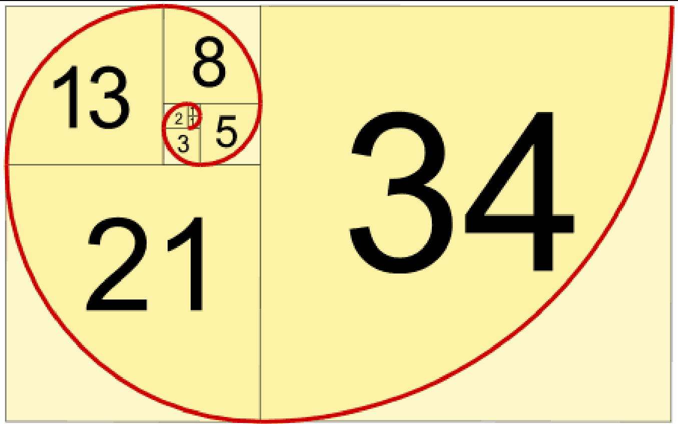
***Q.2 :** If you can see the pattern, you can complete the table below, and answer Fibonacci's question : how many pairs of rabbits will there be after one year (at the end of the 12^{th} Month) ? : i.e. T_{12} = …………*

The Fibonacci Sequence *(it is infinite)*

Term	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	$F_n =$
number	1	1	2	3	5	8	?	?	?	?	?	?	$F_{n\ ……} + F_{n\ ……}$

Q.4 : Divide each Fibonacci number by the previous number in the sequence, and complete the table below. You can use a calculator.

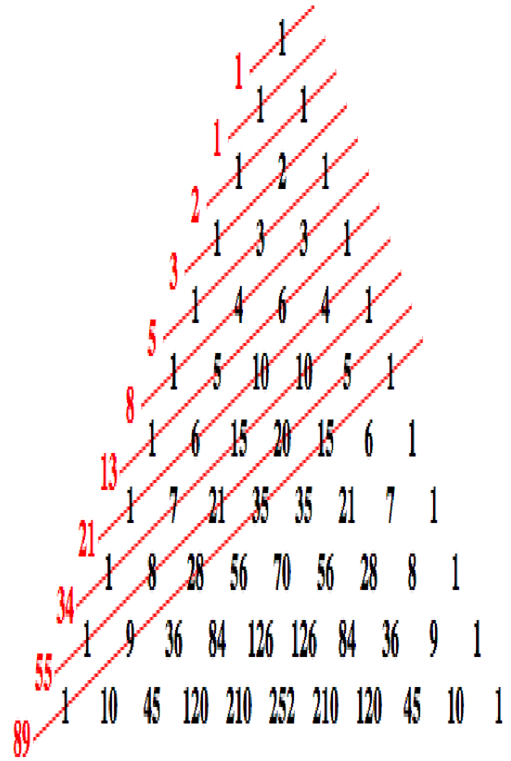
$\frac{T.5}{T.4} = \frac{5}{3} = 1.66...$
$\frac{T.6}{T.5} = \frac{8}{5} = 1.6$
$\frac{T.7}{T.6} = \frac{13}{8} =$
$\frac{T.8}{T.7} = \frac{21}{13} =$
$\frac{T.9}{T.8} = \frac{34}{21} =$
$\frac{T.10}{T.9} =$ --- $=$
$\frac{T.11}{T.10} =$ --- $=$
$\frac{T.12}{T.11} =$ --- $=$
$\Phi = \frac{\sqrt{5}+1}{2}$



The quotients on the left get closer to a number known as Φ **"Phi"** = **1.618033 ... the "golden ratio"**

Q5 : Take a credit card, measure it, and divide the length by the width .... what is your answer ? It should give you Φ.

(A credit card should also fit neatly over the "golden rectangle" above.)



Above is **Pascal's triangle.**

The total of the diagonal lines are the Fibonacci numbers.

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Also the sum of the squares of two consecutive Fibonacci numbers is a Fibonacci number, ***e.g.***

$(T_4)^2 + (T_5)^2 = 3^2 + 5^2 = 34(T_9)$

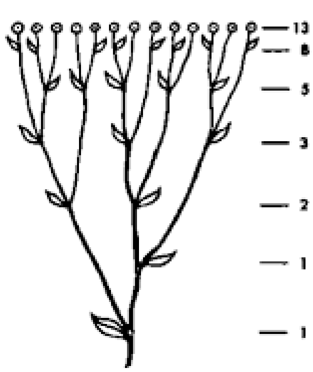
Q6 : $(T_5)^2 + (T_6)^2 =$ ....

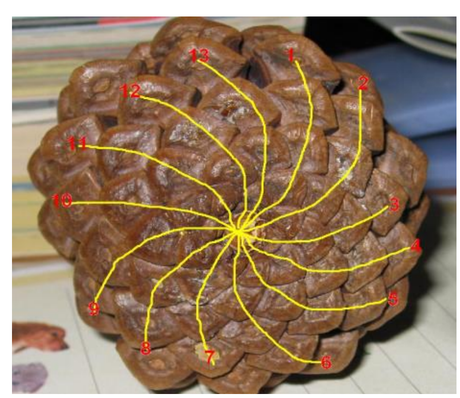
Fibonacci numbers often occur in nature, and sometimes form spirals

(though there are other types of spiral in nature)

Occurring in nature, it is an optimal pattern for survival and growth.

Q7 : Can you find a flower or cone yourself in nature which displays the Fibonacci sequence ?





For some examples see : http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fibnat.html