

## AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES SCHOOLS ENRICHMENT CENTRE (AIMSSEC)

## AIMING HIGH

## **ELEPHANT DREAMING**

Copy the picture to draw this spiral. Then create your own elephant.



The numbers in the centres of the squares give the radii of the quarter circles that you need to draw.

For the elephant's trunk start from the quarter circle of radius 3 and don't draw quarter circles with radii 1, 1, and 2.



For the elephant's ear, replace the quarter circle of radius 21 with a semicircle of radius 10.5.

What do you notice about this sequence of numbers 1, 1, 2, 3, 5, 8, 13, 21 ... ?

Continue this sequence for the next 5 terms.

If you calculate the ratios of pairs of successive terms you get (to 3 decimal places) the sequence: 1, 2, 1.5, 1.667, 1.6, 1.625, 1.615, 1.619 ...

Calculate the next 3 terms in this sequence. What do you notice?

Thank you to Jain for allowing us to use his Elephant Dreaming picture. See http://jain108.com

## HELP

The use of squared paper makes the construction easier. Draw the squares 21 by 21 and 13 by 13 first, then draw the smaller squares, and finally draw the arcs.

NEXT								
6		AutoSave	<u>ہ</u> ھ		• ت -	🖻 Fib	onacci.xls	- Com
Н	ome Inse	ert Draw	Page L	ayout 🖂	🖓 Tell	me		e sh
С	lipboard	Font Alignm	nent	∕∕	E Conc Form	litional For at as Table Styles 🗸	matting v e v	Cell
В	8 _₩	$\times \checkmark f_x$	=A8/A7					
	A	В	С	D	E	F	G	н
1	Fibonacci	Fibonacci						
2	sequence	ratio						
3	1			Change	the first two	terms of	the sequence	ce.
4	1	1						
5	2	2		What hap	opens?			
6	3	1.5						
7	5	1.666666667						
8	8	1.6						
9	13	1.625						
10	21	1.615384615						
11	34	1.619047619			_			
12	55	1.617647059						
13	89	1.618181818						
14	144	1.61/9//528		_				
15	233	1.010000000			_			
10	5//	1.010020701						
17	010	1.618032787						
10	1597	1 618034448						
20	2584	1 618033813			-			
21	4181	1.618034056						
22	6765	1.618033963						
23	10946	1.618033999						
24	17711	1.618033985						
25	28657	1 61803399						

Г

If you have access to a computer, set up a spreadsheet like the one in the picture and investigate how the ratio of the successive terms of the Fibonacci sequence tends to a limit.

You could do the calculations to many decimal places to see how fast the sequence converges.