

July 19 1988 JHC's visit to Bell.

Guests: Gene Helfand, John Hopfield, JHC,
MRG, JSS, MJA, Gary Miller,
Frank Stillman, Veit Elser, Bela Julesz.

Dinner at Charis Garden. Lousy food
Manfred Schroeder, JHC, G.H.,
Alan Gelperin (IB-302, 5696,
car shuttle Princeton to Bell)

JHC's talk Some crazy sequences

#1	n	1	2	3	4	5	6	7	8	9
	a_n	1	1	2	2	3	4	4	4	5

$$a_{n+1} = \text{the } a_n^{\text{th}} \text{ term from L} + a_n^{\text{th}} \text{ term from R}$$

$$a_3 = 1+1 = 2$$

$$a_4 = 1+1 \binom{2 \text{ in}}{=} = 2$$

$$a_5 = 1+2 \binom{2 \text{ in}}{=} = 3$$

$$a_6 = 2+2 \binom{2 \text{ in}}{=} = 4$$

A4001

$$a_7 = 2$$

$$a_8 = 2$$

$$a_9 =$$

Theorem

Q: For

For
cl

#2

a_n

of

Q: For

#3

Take

#4

1
2

Get

$$\begin{aligned} a_7 &= 2+2 \quad \left(\begin{array}{l} 4 \text{ in} \\ \end{array} \right) = 4 \\ a_8 &= 2+2 \quad \left(\begin{array}{l} \text{"} \\ \end{array} \right) = 4 \\ a_9 &= 2+3 \quad \left(\begin{array}{l} \text{"} \\ \end{array} \right) = 5 \\ &\dots \end{aligned}$$

Theorem $\frac{a_n}{n} \rightarrow \frac{1}{2}$

Q: Find an n_0 st. $n \geq n_0 \Rightarrow \left| \frac{a_n}{n} - \frac{1}{2} \right| < 0.05$.
\$100.00

Find least such n_0 : \$10,000.

Claimed by CLM (with some computing help from me), see AMM Jan '91.

#2 $a_n = \frac{a_{n-1} + a_{n-2}}{\text{largest perfect square in num}}$ \$1000

If $a_1 = a_2 = 1$ get $1, 1, 2, 3, 5, 27, 1, 2, \dots$
periodic now periodic

Q: Find any r_1, r_2 , (how) periodic. \$100.

#3 6174 = Kaprekar's constant

Take $a b c d$ not all equal

$$\begin{array}{r} d c b a \\ \hline \end{array}$$

subtract, repeat, \rightarrow 6174 in ≤ 7 steps.

#4 RATS: reverse, add, then sort.

1	2	4	8	61	77	145	
1	2	4	8	16	77	541	...
$\frac{1}{2}$	$\frac{2}{4}$	$\frac{4}{8}$	$\frac{8}{16}$	$\frac{16}{77}$	$\frac{77}{145}$	$\frac{541}{669}$	

$\rightarrow \infty$

Get $5^m 6^n 7^m \rightarrow * \rightarrow 5^m 6^{n+1} 7^m \rightarrow \dots$

Q: is this the only way to get to ∞ ? $\$100$.

NB: 117

NB: In bases < 10 , every no appears to be periodic!

- prove this ($\$100$)
So that's why we have 10 fingers.

Words
you
move
Don't
The f
You o
What

Typewriter
bought