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HP-65 helped discovering the Feigenbaum number

*Message #1 Posted by **Juergen (CH)** on 25 June 2003, 8:00 a.m.*

28 years ago, an HP-65 helped Mitchell Jay Feigenbaum in discovering the Feigenbaum number 4.669..., a universal number in the theory of Chaos.

I've found this fact on several web pages (see below). Here is an interesting excerpt:

> Quote:
>
> You might wonder why he (Feigenbaum) would use a small calculator when he had access to some of the largest computers in the world, computers that could produce thousands, even tens of thousands, of numbers in a few minutes.
>
> The reason, he said, is that he liked to play with numbers. Even when he was young he liked to play with numbers, see how they came about, how they changed under various circumstances. It gave him a feel for what was going on. Having thousands of numbers handed to him on a sheet of paper that came from a computer wasn't the same; it didn't appeal to him. And indeed it was this "playing" that allowed him to make the breakthrough that he eventually made. It helped him understand what was going on. With large computers he probably would have missed it.

See also:

http://www-gap.dcs.st-and.ac.uk/~history/Mathematicians/Feigenbaum.html

http://www.upscale.utoronto.ca/PVB/Harrison/Chaos/Chaos.html

http://spanky.triumf.ca/www/fractint/bif_type.html

http://zebu.uoregon.edu/~js/21st_century_science/readings/Parker_Chap6.html

http://cnls.lanl.gov/~nbt/Book/node44.html

Regards, Juergen

Re: HP-65 helped discovering the Feigenbaum number

*Message #2 Posted by **Mike (Stgt)** on 25 June 2003, 11:48 a.m.,*
in response to message #1 by Juergen (CH)

Nice finding.

Thanx.....Mike

that's enough already

*Message #3 Posted by **Carly** on 25 June 2003, 3:18 p.m.,*
in response to message #2 by Mike (Stgt)

That's Enough Already with the mathematical hogwash and the mythical past of HP calculators!!

There was no HP-65. There is only Kinpo calculators !! Just buy one of our HP personal computers. Buy one of our HP cameras. And an HP vacuum cleaner.

Just give us all your money . Give it here, right now. I've got blow-molded trash in exchange. To heck with Floozenbam and HP-65. That's all baloney anyway. 4.99 yeah right. That's what my kinpo calculators cost the corporation wholesale. Have an HP-49G, see if you can come up with some other famous number instead.

Carly Fiorina

COOOL

*Message #4 Posted by **Norm** on 25 June 2003, 3:22 p.m.,*
in response to message #1 by Juergen (CH)

That is very, very interesting. I don't quite understand it yet. It's gonna take a couple of extra reads. Something about the population of rabbits or the orbit of the earth around 2 suns, is a chaotic system.

And that there is some constant kind of like PI that kind of tells U what will happen next.

I'm gonna have to read it twice before I understand the chaos theory number.

Can't somebody kick that Carly Fiorina woman off the chat board? I sure am tired of her.

:o)

- Norm

Prejudiced PIG!!!

*Message #5 Posted by **Carly** on 25 June 2003, 3:58 p.m.,*
in response to message #4 by Norm

Why are YOU BAD MOUTHING a Brilliant CEO such as myself.

I have implemented sooo many new ideas and products. I have increased the synergy of HP greatly. I have brought Hp into the 21st century. Hp made great strides with the millinium bug and other software issues on my watch.

I have merged Hp with Compaq!!! ME, ME, ME!!!

Soooo, I have done it ALL! I am why Hp is SO GREAT. That is why I got such a nice stock option package for this merger. However since times and the economy have been tough, I DID TAKE a 50% pay cut. And I am sure this helped pay for the second jet I had to acquire when I first became a CEO. I need two jets, so that I do not have to share my jet with some of the other jerks on my board. Also I had the forsight to realize that this might be a good perk for any other company that would merge with Hp, but would be to cheap to supply their CEO with a corporate Jet.

As you can readily discern, I am WAY OUT ahead of you, ALL of YOU!! Often, I laugh so hard at your pathetic pleas for better tools. You engineers have always made me SICK!!! BAH-HAA-HAA-HAA-HAAA!!!! Beg, plead, whine, it makes no difference. Oh, I'm sorry, it does. It makes me laugh harder!

Away with you!!

BWAAH-HAAA-HAAA-HAAA!!

Sincerely and Respectfully Yours,

Carly Fiorina

(this was posted in jest, I can't imagine Carly would even waste a moment in reading this post or any of our complaints, Ron Ross)

Re: Prejudiced PIG!!!

*Message #6 Posted by **Ernie Malaga** on 25 June 2003, 4:13 p.m.,*
in response to message #5 by Carly

Carly,

It's a bloody shame that your mother didn't abort you.

'Nuff said. 8^)

-Ernie

Mama did !

*Message #7 Posted by **Mitchell Feigenbaum** on 26 June 2003, 1:26 a.m.,*
in response to message #6 by Ernie Malaga

Mama did abort her !

But then somebody heard a crying sound coming out
of the dumpster ...

now we are stuck with her

:o(

Re: Prejudiced PIG!!!

*Message #8 Posted by **Chris(FLA)** on 26 June 2003, 9:56 a.m.,*
in response to message #5 by Carly

I have merged Hp with Compaq!!! ME, ME, ME!!! Soooo, I have done it ALL! I am why Hp is SO GREAT. That is why I got such a nice stock option package for this merger.

Ask my father about his pre-merger HP stock and post HP merger stock.

Not a happy person :(

Chris

HP stock ripoff and your old man

*Message #9 Posted by **NH** on 26 June 2003, 10:29 a.m.,*

in response to message #8 by Chris(FLA)

one thing U can take 2 the bank ...
If your old man lost his butt on HP stock,
Carly planned it that way.

These MBA boardroom types, they balance
their books on Joe Truckdriver's back .

So Carly gets a scheme and a dream... she says, hey
I will make HP shares go to zero, and Compaq shares
to go infinity. So she transfers her bank balance
onto the new boat, which is the Compaq shares...
all the little hard-working decent people still hold HP shares.

So the lower HP goes, the harder the little people
cling to them, they won't sell, because they are
decent people. Carly cackles loudly, getting richer
and richer, at the expense of the little people.

That's why their is precious little reason for Joe
Truckdriver to invest in stocks anymore, its all a swindle
and unless his cousin is a Wall Street Tycoon, he doesn't know
whether it will go up or down.

The difference between Mr. Feigenbaum and Carly

*Message #10 Posted by **Juergen (CH)** on 25 June 2003, 5:04 p.m.,*
in response to message #1 by Juergen (CH)

I just wanted to point out that *clever* people (like Mr. Feigenbaum) using the *right* tools (HP-65) can do amazing things.

But I'm also aware that *Carly-minded* people using the *wrong* tools (HP-12C Platinum) can make big mistakes.

My advice: forget Carly, enjoy the story about the discovery of the Feigenbaum number. It's worth it!

ABSOLUTELY RIGHT, JUERGEN

*Message #11 Posted by **Norm** on 26 June 2003, 1:31 a.m.,*
in response to message #10 by Juergen (CH)

I really appreciate Juergen that you brought this to our attention. I am sure it needs to be placed into the HP Museum "articles" section.

Think you could do this ? Its little more than cut & paste, and the title you already used couldn't be better (citing the HP model number and the topic).

Your post was deep enough that U dont want it to fade away like my John Denver songwriting.

YES ISN'T AMAZING THAT THE SMALL, CLEAN NUMBER-CRUNCHING
RED-BRICK CALCULATOR ALLOWED THE MATHEMATICIAN TO FIGURE
SOMETHING OUT.

THATS EXACTLY HOW I FEEL ABOUT MY 34C. I NEED TO RUN
SOME FORMULA AND LEARN HOW IT GOES? THE 34C IS SUPERIOR TO ANY OTHER TOOL, (plus a mechanical pencil and some graph paper) AND HP HAS NO BUSINESS TRYING TO TAKE TOOLS LIKE THAT AWAY FROM THE COMMUNITY OF INTELLIGENT PEOPLE.

Even an HP-49G is too bloated and complex to just casually work with the numbers, IMHO.

Thanks again!

Museum Article

*Message #12 Posted by **Juergen (CH)** on 26 June 2003, 9:19 a.m.,*
in response to message #11 by Norm

Norm,

if time allows I will prepare an article. If you don't mind I will come back to you to review my "swiss cheese" writing.

In the mean time, keep your 34C's running and delve into Chaos Theory, it's really interesting.

Regards, Juergen

Re: ABSOLUTELY RIGHT, JUERGEN

*Message #13 Posted by **bill platt** on 26 June 2003, 10:55 a.m.,*
in response to message #11 by Norm

Norm,

Your songs don't fade away----they live on in the hearts and minds (and ears) of all of us :-}

Bill

I still need song links ..

*Message #14 Posted by **Norm** on 26 June 2003, 10:42 p.m.,*
in response to message #13 by bill platt

I still need song links ... where U click on the link and the song will play.

For Paul Simon "Kodachrome"

John Denver "Take me home country roads"

AC/DC "Highway to Hell"

AC/DC "Money Talks"

See the problem is, I can't write lyrics for AC/DC if people don't know how the melody goes. If you can see where I am headed, Carly's VP would be the lead singer for "Highway to Hell".

EVERYBODY knows the melody for John Denver, thats why that one worked pretty well.

Re: The difference between Mr. Feigenbaum and Carly

*Message #15 Posted by **Mike (Stgt)** on 26 June 2003, 5:10 a.m.,*
in response to message #10 by Juergen (CH)

That reminds me the Olympus ad: "If you won't become a top photographer with this camera - it's not our fault."

So it's _not_ the HP-65 (or HP-41) that I am not as well known as Feigenbaum <G>. But it's nice to see that others use those calculators in a similar way.

Ciao.....Mike

I'm still trying to figure out the Feigenbaum number ...

*Message #16 Posted by **Norm** on 27 June 2003, 3:11 a.m.,*
in response to message #10 by Juergen (CH)

I haven't forgotten about this Feigenbaum number.

So far, when I read up on it, its just kind of perplexing..... I can almos understand what the number IS, but its the logical conclusion that concerns me. I mean, how the heck can a single number constant ($4.66, the wholesale price of a Kinpo calculator) be the SAME constant for a bunch of bunnies in the forest, or for a planet in a multi-star orbit.

I haven't forgotten about this and am still reading it and still trying to figure it out.

Re: I'm still trying to figure out the Feigenbaum number ...

*Message #17 Posted by **Valentin Albillo** on 27 June 2003, 5:15 a.m.,*
in response to message #16 by Norm

Norm wrote:

"I mean, how the heck can a single number constant ($4.66, the wholesale price of a Kinpo calculator) be the SAME constant for a bunch of bunnies in the forest, or for a planet in a multi-star orbit."

That's why it's called a *universal constant*. The same happens with Pi, e, and all other universal constants out there, they keep appearing all the time, in all variety of situations, completely unrelated. For instance,

- what's the ratio of a circle's circumference to its diameter on a flat plane surface ? Pi
- if you drop a needle on a lined sheet of paper, what is the probability of the needle crossing one of the lines on the page ? 2/Pi
- what's the limit of the sum of the infinite series 1 -1/3 +1/5 -1/7 +1/9 -1/11 + ... ? Pi/4
- what is the probability of choosing two integer numbers that have no common prime factors? 6/Pi^2

and so on. The same applies to 'e' (=2.71828+), and many other famous constants.

Best regards.

Edited: 27 June 2003, 8:42 a.m.

yeah but what if nobody told the bunny rabbits

*Message #18 Posted by **Norm** on 27 June 2003, 12:12 p.m.,*
in response to message #17 by Valentin Albillo

yeah, although those are geometrical and mathematical problems. BTW I did not know about the mathematical series for finding PI. That is quite interesting.

When the feigenbaum number is applied to biological systems its kind of perplexing.

I mean, if nobody told the bunny rabbits that their number is 4.66 , then how would they know when its time to quit having more bunnies ?

Same with the high school dance, if the guys dont KNOW that their number is 4.66 then how will they know to quit asking the ladies for a dance ?

Hmmmmmmmmmm.....

Let's whisper 4.66 into Carly Fiorina's ear. Maybe she will not procreate, and we wont have a whole new generation of monstrous little rich lawyer weasels, figuring out how to wreck corporations of their very own ....

Imagine Carly outside the factory gates, with her kid, giving him wisdom of life ..... the great giant assembly buildings, all the cars in the parking lot, the trucks filled with boxed products .....

"someday, son, all of this will be yours to destroy ..."

Are there any mathematicians ... Feigenbaum number

*Message #19 Posted by **Norm** on 28 June 2003, 1:48 a.m.,*
in response to message #18 by Norm

Hello,

I am very intrigued by the topic of the Feigenbaum number (and to a lesser extent, that it was figured out on an HP-65, rather than 100 years earlier by some old ancient looking dude wearing a wig.

I am looking at all the links, but I get some very clear questions where I dont' understand and require clarification.

Does anybody want to chat at length about this topic? Obviously, only if you know exactly what the deal is, and you are willing to take time to explain it to me. My questions will be pointed and you'd have to answer them ...

Re: I'm still trying to figure out the Feigenbaum number ...

*Message #20 Posted by **Trent Moseley** on 28 June 2003, 6:08 p.m.,*
in response to message #17 by Valentin Albillo

Valentin-

Please give us a few examples for 'e'.

tm

[OT]: Examples for 'e'

*Message #21 Posted by **Valentin Albillo** on 28 June 2003, 10:46 p.m.,*
in response to message #20 by Trent Moseley

Trent Moseley posted:

"Valentin - Please give us a few examples for 'e'"

With pleasure. Let's see:

- what's the limit of the sum of the infinite series 1 + 1/1 + 1/2 + 1/2/3 + 1/2/3/4 + 1/2/3/4/5 + ... ? e
- you put $1 into a bank account at 100%, compound interest. If the interest is accrued at the end of the year, you'll have $2. If it's accrued every six months, at the end of the year you'll have $2.25. How many dollars will you get if it's accrued continuously ? $e
- each of two people is given a shuffled deck of playing cards. They then expose simultaneously their first cards. If they do not match, they go on with their second cards, and so forth. What's the probability of finishing both decks without a single match ? 1/e
- if numbers in the interval (0,1) are selected at random, what's the expected number of selections until the sum of all chosen numbers exceeds 1 ? e
- with each purchase, a certain shop gives away a badge with the picture of a playing card on it. You want to collect the entire set of 52 badges. If you make exactly 52 different purchases, what fraction of the set of 52 badges would you expect to have accumulated ? 1-1/e
- such natural entities as the inner structure of a Nautilus' shell, the arms of galaxies, the way a fern leaf curls, and many others are examples of logarithmic spirals. The logarithmic spiral's equation becomes in polar coordinates r = e^aT, where r is the distance of a point on the spiral

from its center, T is the angle through which the spiral has grown to that point, and a is a fixed quantity for a given spiral that describes how tightly that spiral winds itself at each turn.

- the shape of the curve described by a hanging chain is called a 'catenary'. The resulting equation for the catenary curve is y = (e^x + e^(–x))/2
- the familiar trigonometric functions sine and cosine are actually derived from e:

  sin(x)=(e^(ix)-e^(-ix))/2i, cos(x)=(e^(ix)+e^(-ix))/2
- are e and pi related in any way ? yes, e^(i*pi) = -1
- the number e is also to be seen in music (J.S. Bach's equally-tempered scale), art (Escher's drawings), biology, chemistry (anything related with continuous growth), radioactive decay, etc, etc.

Best regards.

Re: [OT]: Examples for 'e'

*Message #22 Posted by **Patrick** on 28 June 2003, 11:18 p.m.,*
in response to message #21 by Valentin Albillo

Very, very nice, Valentin. When you see all of these examples in one place, it really hits home how special is this strange number less than three.

I noticed you carefully omitted the one where you press [1][e^x] on your calculator, for in that case you don't actually get *e*, but a mere approximation to that magical number!

I will add one other from the even more magical realm of calculus...

What functions are the only ones to have *themselves* as derivatives (i.e., the value of the function is the same as the slope of the tangent line to the graph at that point)? *(any constant) * e^x*

Re: [OT]: Examples for 'e'

*Message #23 Posted by **Trent Moseley** on 29 June 2003, 4:00 p.m.,*
in response to message #21 by Valentin Albillo

Thank You!