# Im Debattierclub n°37

## Zahlenspiele / numbers games

### 37.1

3 and 7

$3 * 7 * 37 = 777 = 7^{\underline{3}}$ (1)

(c.f. Deb 33 und 35)

** Ist die Zahlenkonstellation Gl. (1) im Zehnersystem unikal oder existieren mehrere dieser oder ähnlicher Art?

Is the number constellation equ. (1) unique in the decimal system or do exist more of this or of similar type?

** Ist in Gl. (1) irgendeine (zahlentheoretische, numerologische, magische, etc.) “Message codiert”?

Is in equ. (1) any (number-theoretic, numerological, magic, etc.) “message encoded”?

## 37.2 = 12.C.3.2

# Remarkable infinite nested expressions with continued fractions

$$\Phi = \frac{1}{2}\left(\sqrt{5}+1\right) = 1+\frac{1}{2}\left(1+\frac{1}{5}\left(1+\frac{1}{7-\frac{1}{2}}\left(1+\frac{1}{7-\frac{1}{5}}\left(1+\frac{1}{7-\frac{1}{7-\frac{1}{2}}}\left(1+\frac{1}{7-\frac{1}{7-\frac{1}{5}}}\left(1+\right.\right.\right.\right.\right.\right.\right.$$

$$\left.\left.\frac{1}{7-\frac{1}{7-\frac{1}{7-\frac{1}{2}}}}\left(1+\frac{1}{7-\frac{1}{7-\frac{1}{7-\frac{1}{5}}}}\left(1+\frac{1}{7-\frac{1}{7-\frac{1}{7-\frac{1}{2}}}}\left(1+\frac{1}{7-\frac{1}{7-\frac{1}{7-\frac{1}{5}}}}\left(1+\ldots\right.\right.\right.\right.\right.\right.$$

$$\sqrt{3} = 1+\frac{1}{3}\left(1+\frac{1}{3\left(1-\frac{1}{3}\right)}\left(1+\frac{1}{3\left(1-\frac{1}{3-\frac{1}{2}}\right)}\left(1+\frac{1}{3\left(1-\frac{1}{3-\frac{1}{2-\frac{1}{2}}}\right)}\left(1+\frac{1}{3\left(1-\frac{1}{3-\frac{1}{2-\frac{1}{2-\frac{1}{2}}}}\right)}\left(1+\ldots\right.\right.\right.\right.\right.$$

$$\frac{\pi}{2} = 1+\frac{1}{3}\left(1+\frac{1}{3-\frac{1}{2}}\left(1+\frac{1}{3-\frac{1}{2-\frac{1}{2}}}\left(1+\frac{1}{3-\frac{1}{2-\frac{1}{2-\frac{1}{2}}}}\left(1+\ldots\right.\right.\right.\right. = 1.57079\,6326\ldots.$$

$$\sqrt{2} = 1+\frac{1}{4}\left(1+\frac{1}{4\left(1-\frac{1}{3}\right)}\left(1+\frac{1}{4\left(1-\frac{1}{3-\frac{1}{2}}\right)}\left(1+\frac{1}{4\left(1-\frac{1}{3-\frac{1}{2-\frac{1}{2}}}\right)}\left(1+\frac{1}{4\left(1-\frac{1}{3-\frac{1}{2-\frac{1}{2-\frac{1}{2}}}}\right)}\left(1+\ldots\right.\right.\right.\right.\right.$$

$$\sqrt[3]{2} = 1+\frac{1}{6}\left(1+\frac{1}{6\left(1-\frac{1}{2}\right)}\left(1+\frac{1}{6\left(1-\frac{1}{2-\frac{1}{4}}\right)}\left(1+\frac{1}{6\left(1-\frac{1}{2-\frac{1}{4-\frac{1}{1}}}\right)}\left(1+\frac{1}{6\left(1-\frac{1}{2-\frac{1}{4-\frac{1}{1-\frac{1}{4}}}}\right)}\left(1+\frac{1}{6\left(1-\frac{1}{2-\frac{1}{4-\frac{1}{1-\frac{1}{4-\frac{1}{1}}}}}\right)}\left(1+\ldots\right.\right.\right.\right.\right.\right.$$

! Find a similar representation for $e$, and for $e^{\pi}$, for the Feigenbaum constant, and for other important mathematical constants [1].

## 37.3

5-Rasenmäher/5-lawnmower

$$\det\begin{bmatrix} 5100000000 \\ 1510000000 \\ 0151000000 \\ 0015100000 \\ 0001510000 \\ 0000151000 \\ 0000015100 \\ 0000001510 \\ 0000000151 \\ 0000000015 \end{bmatrix} = 6665999$$

$\text{Quersumme/digit sum}(6665999)=2*5^2$ |

$\text{alternierende Quersumme/alternating digit sum}(6665999) = 2*5$

$6665999=U_{2*5}\left(\frac{5}{2}\right)$ ; $U_n(x)$ - Chebyshev polynomial of the second kind

! Find other lawnmower expressions.

! Discuss
Number Theory versus Numerology [2,3,4].

## References


[1] https://en.wikipedia.org/wiki/Mathematical_constant
[2] https://en.wikipedia.org/wiki/Number_theory
[3] https://en.wikipedia.org/wiki/Numerology
[4] https://en.wikipedia.org/wiki/Pierre_Alamire