Date problems

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The rules of the date game are the following: using each number in the day's date exactly once, create an expression which precisely equals 100, with each term involving at least one number. When I played this in elementary school the goal was to create the most abstruse expression possible; here the spirit is similar. The following entries are my log of solutions to the date game for a period of 30 days in the summer of 2020.

Notation:

$\phi(n) =$ Euler's toitent function

$\zeta(s) =$ Riemann zeta function,

$\Pi(x) =$ number of primes $\leq x$

$\sigma_k(n) = \sum_{d|n} d^k$ the divisor function

$D(n) =$ the arithmetic derivative, defined by $D(nm) = D(n)m + D(m)n, \qquad n, m \in \mathbb{N}$

$F_n = n$th Fibonacci number

$L_n = n$th Lucas number

$\chi(M) =$ Euler characteristic of M

$T(R) =$ index of representation R

$C_2(R) =$ quadratic Casimir of representation R

$A_G =$ adjoint representation of G,

$F_G =$ fundamental representation of G

$\mathrm{rk}(G)$ = dimension of maximal torus of Lie group G

$\uparrow$ = used for Graham's up-arrow notation and to make unweidly exponents look nicer

$|G| =$ order of group G

$\sigma^a =$ Pauli matrices

$\Sigma_g =$ genus g Riemann surface

$||\mathcal{O}|| =$ operator norm of $\mathcal{O}$

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7/17/2020

$$D(20) - \zeta(0)\left(\lfloor 7/2 \rfloor^{\Pi(7)} - 1\right) \tag{1}$$

7/18/2020

$$\zeta(-1)^{-2} - \chi(S^{80})\left(\Pi(70) + \lceil \ln 20 \rceil\right) \tag{2}$$

7/19/2020

$$\phi(\phi(19^2)) - \lfloor \ln(700) + 2 \rfloor \tag{3}$$

7/20/2020

$$\phi\left((\lceil \sqrt{\phi(20)} \rceil !)!! + 2\right) \times \left(\phi(7) - \lfloor \cos(20) + 0! \rfloor\right) \tag{4}$$

7/21/2020

$$\frac{1}{7}\left(\left\lceil \frac{\left(\int_{\mathbb{R}} dx\, \frac{\sin(\pi x)}{x+0!}\right)^2}{\zeta(2)} \right\rceil ! - 20\right) \tag{5}$$

7/22/2020

$$\left(\sum_{0<i<20} i + \Pi(22) + \lceil \sum_{n\in\mathbb{N}} 7^{-n} \rceil\right)/2 \tag{6}$$

7/23/2020

$$\phi(\sigma_2(7!! \bmod 23)) + \left[\left(\left(\frac{1}{\sqrt{\pi}}\int_{\mathbb{R}+} dx\, \sqrt{x} e^{-x}\right)^{-0!} + \cos(0)\right)!\right]^2 \tag{7}$$

7/24/2020

$$7 \times \Pi\left(\gcd\left(D(D(22)), 42\right)!!\right) - \lfloor \pi \Gamma(\zeta(0))\zeta(0) \rfloor \tag{8}$$

7/25/2020

$$-\dim[Sp(7)] + \dim[SU(2)] + \dim[U(5)] + \dim[SO(20)] - \dim[Sp(2)] - \dim[Sp(0!)] \tag{9}$$

7/26/2020

$$(200 + 6/\Pi(\Pi(22)))_{\mathrm{Base}\,7} \tag{10}$$

7/27/2020

$$\left(((2 \uparrow\uparrow \Pi(7)) \bmod 70) - (2 + \cos(0))!\right)^2 \tag{11}$$

7/28/2020

$$2\left(C_2(F_{SU(7)})(\sigma_{0!}(8)-\cos(0))+2\right) \tag{12}$$

7/29/2020

$$|20\cdot\zeta(0)|\uparrow\left(\int_{-\pi}^{\pi}\frac{dx/\pi}{2+\sqrt[\Pi(7)]{\Pi(9)}\cos(x)}\right)^2 \tag{13}$$

7/30/2020

$$|\mathrm{Tor}[\pi_{\phi(30)+7}(S^{\Pi(20)})]|-20 \tag{14}$$

7/31/2020

$$\frac{\sqrt[3]{.02\times\left(\int_{\mathbb{R}^+}dx\,x\,e^{-20x}\right)^{-1}}}{\int_{\mathbb{R}^+}dx\,e^{-x}\,\cos(7x)} \tag{15}$$

8/1/2020

$$\frac{\dim[G_2]^2-\dim[E_8]-1/\zeta(0)}{\zeta(0)} \tag{16}$$

8/2/2020

$$\phi(22)\uparrow(\dim[\pi_8(SO(100))]) \tag{17}$$

8/3/2020

$$\phi(\phi(\phi(\phi(\phi(\phi(F_{20}))))))+\dim[SO(8)]+|\mathrm{Out}[SU(20)]|^3 \tag{18}$$

8/4/2020

$$\left(||(-\mathbf{1}/\zeta(0)+\sigma^x)^{\oplus\phi(4)}||!\right)^2+(\Pi(D(8))-0!)^2 \tag{19}$$

8/5/2020

$$\frac{0!}{\zeta(-\dim[SU(2)])}-\dim[SO(5)]\times\dim[\pi_{\phi(8)}(Sp(20))] \tag{20}$$

8/6/2020

$$\left(\frac{\sigma_{0!}\left(\dim[\pi_6(\mathbb{CP}^{0!})]\right)-8}{2}\right)^2 \tag{21}$$

8/7/2020

$$\exp\left(-7\lim_{x\to\infty}(\ln\cosh x - x\tanh x)\right) - \Pi(8)! - \chi(S^{200})^2 \tag{22}$$

8/8/2020

$$\frac{\exp\left(-\lim_{x\to\infty}\left[x(\Gamma(2)-\sqrt[x]{200})\right]\right)}{\left|\pi_8(S^{\chi(S^8)})\right|} \tag{23}$$

8/9/2020

$$(\mathrm{rk}\,[SO(\mathrm{rk}[SO(20)])])! - D(9) - \phi(\phi(8)) \tag{24}$$

8/10/2020

$$\Gamma\left[\frac{\pi^{\Pi(\Pi(10))}}{\zeta\left(\sqrt{2}^{\sqrt{2}^{\cdot^{\cdot^{\cdot}}}}\right)}\right] - L_0 \times \Pi\left[L_{L_{8/L_0}}\right] \tag{25}$$

8/11/2020

$$\left(\frac{8! + \zeta(\ln(1))^{-\lfloor\pi\rfloor\lfloor e\rfloor} - \Pi(20)!!}{\Pi(\dim[SU(\dim[SU(2)])])}\right)^{T(F_{SU(10)})} \tag{26}$$

8/12/2020

$$2\left[\left\lceil\left(\frac{1}{0! + \frac{\cos(0)}{\Gamma(2)+\ddots}}\right)^8\right\rceil + \dim[SU(2)]\right] \tag{27}$$

8/13/2020

$$\left(\sqrt{\int \mathcal{D}a\,\exp\left(\frac{3\zeta(0)}{2\pi}\int_{\Sigma_{\phi(8)\times\mathbb{R}}} a\wedge da\right)} + \Gamma(2)\right)\times 10 \tag{28}$$

8/14/2020

$$\frac{12 - \left(\int_{\mathbb{R}+} dx\, J_0(x)\, e^{-x}\right)^{\chi(\Sigma_{20})}}{\Pi(\Pi(4)) + \chi(\Sigma_8)} \tag{29}$$

8/15/2020

$$(\dim[\mathbb{Z}_{50}\otimes_{\mathbb{Z}}\mathbb{Z}_{20}])^{\lceil \sqrt[12]{\dim[SU(8)]}\rceil} \tag{30}$$