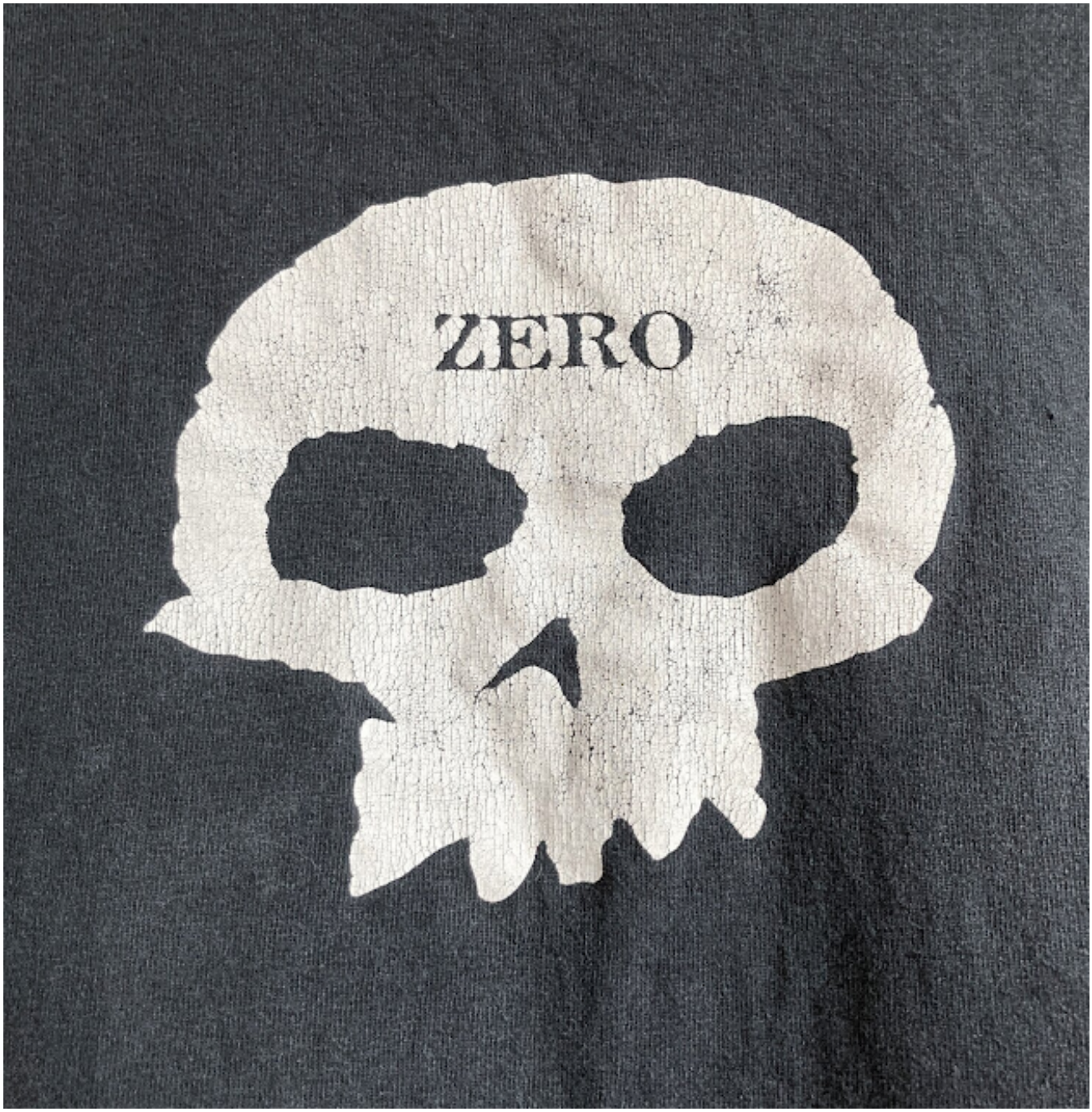
Cinquante signes

Multiply with zero

septembre 25, 2023



Seq #1

NAME

Trajectory of 34 under the “multiply with zero” rules explained in the *Comments section*.

DATA

34, 1034, 11094, 129086, 1590817, 21075277, 253919083, 15701617319, 199307878383, 2229089415827, 33269991281067.

OFFSET

1

COMMENTS

The “multiply with zero” rules:

– no term contains two or more zeros;

– a(n) is the product of the two numbers separated by a zero in a(n+1);

– a(n+1) is always the smallest possible integer;

– the sequence stops when two or more zeros cannot be avoided for a(n+1).

EXAMPLE

a(1) = 34

a(2) = 1034 as 1*34 = 34, which is a(1). We do not assign 1702, 2017 or 3401 to a(2) as they are larger than 1034 (though they all “produce” 34);

a(3) = 11094 as 11*94 = 1034, which is a(2). We do not assign 20517, 22047, 47022, 51702 or 94011 to a(3) as they are larger than 11094 (though they all “produce” 1034);

a(4) = 129086 as 129*86 = 11094, which is a(3). We do not assign 184906, 205547, 258043, 303698, 369803, 430258, 554702, 601849 or 860129 to a(3) as they are larger than 129086 (though they all “produce” 11094).

The last term of the trajectory is 33269991281067 as its divisors 1, 3, 17, 51, 652352770217, 1957058310651, 11089997093689 and 33269991281067 cannot produce a successor a(n+1) that contains less than two zeros.

CROSSREF

Cf. A365994.

KEYWORD

base, nonn, fini, full

Seq #2

NAME

The nth term of the sequence is the last term of n’s trajectory under the “multiply with zero”

rules explained in Axxxxxx.

DATA

The hereunder yellow terms

OFFSET

1

COMMENTS

It is conjectured that all trajectories will stop quite rapidly, mostly because the probability for 0 to appear in a divisor of a(n) increases with the size of a(n).

EXAMPLE

Trajectories of n for n = 1 to 40. A *stop* means that the next term will contain two or more zeros. Is there a trajectory after 40 that contains more than 15 terms?

n = 1 --> 1, 101, stop

n = 2 --> 2, 102, 1706, 20853, 210993, 3981053, stop

n = 3 --> 3, 103, stop

n = 4 --> 4, 104, 1308, 20654, 230898, 2654087, 35907393, 1196913103, stop

n = 5 --> 5, 105, 1507, 110137, 2410457, 34435107, 371092817, 4185108867, stop

n = 6 --> 6, 106, 2053, stop

n = 7 --> 7, 107, stop

n = 8 --> 8, 108, 1209, 13093, stop

n = 9 --> 9, 109, stop

n = 10 --> 10, 205, 4105, 50821, stop

n = 11 --> 11, 1011, 30337, 1319023, stop

n = 12 --> 12, 206, stop

n = 13 --> 13, 1013, stop

n = 14 --> 14, 207, 2309, stop

n = 15 --> 15, 305, 5061, 70723, 1970359, stop

n = 16 --> 16, 208, 2608, 32608, 408152, 6260652, 64410972, 1160555267, stop

n = 17 --> 17, 1017, 11309, 263043, 2657099, 43061793, 1435393103, stop

n = 18 --> 18, 209, 11019, 303673, 5147059, stop

n = 19 --> 19, 1019, stop

n = 20 --> 20, 405, 4509, 167027, 2230749, 24786109, stop

n = 21 --> 21, 307, stop

n = 22 --> 22, 1022, 14073, 304691, 17017923, 305672641, 3469610881, 43707939613, 1265393034541, stop

n = 23 --> 23, 1023, 11093, stop

n = 24 --> 24, 308, 4077, 45309, 1104119, stop

n = 25 --> 25, 505, stop

n = 26 --> 26, 1026, 11409, stop

n = 27 --> 27, 309, stop

n = 28 --> 28, 407, 11037, 283039, 3490811, stop

n = 29 --> 29, 1029, 14707, 191077, stop

n = 30 --> 30, 506, 11046, 140789, 11012799, 118290931, 1210977611, stop

n = 31 --> 31, 1031, stop

n = 32 --> 32, 408, 5108, 127704, 1360939, 18107519, stop

n = 33 --> 33, 1033, stop

n = 34 --> 34, 1034, 11094, 129086, 1590817, 21075277, 253919083, 15701617319, 199307878383, 2229089415827, 33269991281067, stop

n = 35 --> 35, 507, 13039, 170767, stop

n = 36 --> 36, 409, stop

n = 37 --> 37, 1037, 17061, 305687, stop

n = 38 --> 38, 1038, 17306, 208653, 3069551, stop

n = 39 --> 39, 1039, stop

n = 40 --> 40, 508, 12704, 158808, 1985108, 20992554, 306997518, 5116625306, 1303 2065196793281, stop

etc.

CROSSREF

Cf. A365993.

KEYWORD

base, nonn

Though we used the wonderful online Alpertron to find all divisors of a(n), we are afraid that many typos are still present on this page – please forgive the (shabby) author.

Two hours after posting this, I got the hereunder message from Giorgos **Kalogeropoulos**:

> Hi Eric!
> (...)
> Here are my results.
> {1,101}
> {2,102,1706,20853,210993,3981053}
> {3,103}
> {4,104,1308,20654,230898,2654087,35907393,1196913103}
> {5,105,1507,110137,2410457,34435107,371092817,4185108867}
> {6,106,2053}
> {7,107}
> {8,108,1209,13093}
> {9,109}
> {10,205,4105,50821}
> {11,1011,30337,1319023}
> {12,206}

{13,1013}
{14,207,2309}
{15,305,5061,70723,1970359}
{16,208,2608,32608,408152,6260652,64410972,1160555267}
{17,1017,11309,263043,2657099,43061793,1435393103}
{18,209,11019,303673,5147059}
{19,1019}
{20,405,4509,167027,2230749,24786109}
{21,307}
{22,1022,14073,304691,17017923,305672641,3469610881,43707939613,1265393034541}
{23,1023,11093}
{24,308,4077,45309,1104119}
{25,505}
{26,1026,11409}
{27,309}
{28,407,11037,130849,1707697,17770961,1301366997,14459633309,149743096563,30499
14365521,44661214906829}
{29,1029,14707,191077}
{30,506,11046,140789,11012799,118290931,1210977611}
{31,1031}
{32,408,5108,127704,1360939,18107519}
{33,1033}
{34,1034,11094,129086,1580817,21075277,253919083,15701617319,199307878383,22290
89415827,33269991281067}
{35,507,13039,170767}
{36,409}
{37,1037,17061,305687}
{38,1038,17306,208653,3069551}
{39,1039}
{40,508,12704,158808,1985108,20992554,306997518,5116625306,130393586562,206519
6793281}
{41,1041,30347}
{42,607}
{43,1043,14907,304969,4356707,199021893,2109477233,21751096983,227284190957,385
2274423059,39527097459317,426229709273661}

{44,1044,11609,130893,1610813}
{45,509}
{46,1046,20523,306841,3708293}
{47,1047,30349,310979}
{48,608,7608,80951,1306227,33493039}
{49,707}
{50,2025,22509,369061,4793077}
{51,1051}
{52,1052,20526,220933}
{53,1053,11709}
{54,609,7087,190373,12701499,138210919,1631770847,27383305959,309127768653}
{55,1055,21105,234509,11021319,122459109}
{56,708,11806}
{57,1057,15107}
{58,1058,20529,228109,3258707}
{59,1059,30353,1270239,30423413}
{60,1205,24105,482105,5096421,51479099,707354157,15124104677,191444363079,306381
4787693,35256786970869,435268974949081,4783175548891091,65836430726524137,73
1515896961379309,7786831093942695939}
{61,1061}
{62,1062,11809,168707,2191077,24345309,477359051,13036719927,153916410847,331304
6458319,34155118127097,417831810817437,4642575675749309}
{63,709}
{64,808}
{65,1065,15071,215307,2392309,28823083,1148330251,27104237381,516705245643,6937
107448433}
{66,1066,13082,206541,2294909,35470647,394118309}
{67,1067,11097,123309,2704567}
{68,1068,12089,157077,1689093,18767709,222630843}
{69,1069}
{70,1405,28105,365077}
{71,1071,11909}
{72,809}
{73,1073,29037,309679,5305843}
{74,1074,17906,208953,2130981}

{75,1075,21505,230935,4618705,50923741,1104629431,15558161071,181085956691,2747065921353,130211312763181}
{76,1076,20538,210978,2344209,33488707,490683443,6721691073,121521055313,1685451530721,26971062491251,484454987055673,5688467085164419,21102695959645329,2390882957989789311,26565366199886547909}
{77,1077,30359,433707,14456903,230628561,2479877093}
{78,1078,11098,179062,1846097,19097163,306365721,3533630867,37930931619,511074228829}
{79,1079,13083,147089}
{80,1605,30535,310985,4107585,50821517,1758530289,23910735479}
{81,909}
{82,1082,20541,306847}
{83,1083,19057,323059,4307513,56307651,1137049523}
{84,1084,20542}
{85,1085,15507,172309,3704657,110336787,1114513099,15921615707,338757781047,3515799096353}
{86,1086,18106,220823}
{87,1087}
{88,1088,13608,140972,2605422,30868474,339214091,18101874111,399599870453,4319092521387,45316257709531}
{89,1089,11099}
{90,1506,20753}
{91,1091}
{92,1092,12091}
{93,1093}
{94,1094,20547,228309}
{95,1095,15073}
{96,1096,13708,149092,2074546}
{97,1097}
{98,1098,12209,290421,3226909}
{99,1099,15707,1130139,12557109}
{100,2504,31308,407827,4109947,190216313,2717375907}

Here are also the number of steps for n (300 terms) :
2, 6, 2, 8, 8, 3, 2, 4, 2, 4, 4, 2, 2, 3, 5, 8, 7, 5, 2, 6, 2, 9, 3, 5, 2, 3, 2, 11, 4, 7, 2, 6, 2, 11, 4, 2, 4,

5, 2, 10, 3, 2, 12, 5, 2, 5, 4, 6, 2, 5, 2, 4, 3, 9, 6, 3, 3, 5, 5, 16, 2, 13, 2, 2, 10, 7, 5, 7, 2, 4, 3, 2, 5, 5, 11, 16, 7, 10, 4, 8, 2, 4, 7, 3, 10, 4, 2, 11, 3, 3, 2, 3, 2, 4, 3, 5, 2, 5, 5, 7, 1, 5, 1, 7, 7, 2, 1, 3, 1, 6, 2, 3, 3, 5, 4, 8, 3, 10, 8, 12, 5, 6, 2, 2, 4, 2, 13, 4, 3, 5, 3, 2, 2, 3, 2, 3, 3, 2, 2, 5, 4, 2, 6, 2, 3, 4, 3, 3, 5, 6, 2, 3, 2, 5, 3, 2, 4, 6, 9, 6, 3, 3, 2, 10, 4, 2, 3, 4, 2, 8, 5, 8, 6, 2, 2, 3, 9, 2, 3, 10, 2, 3, 2, 9, 5, 6, 5, 7, 3, 8, 6, 12, 2, 5, 6, 2, 3, 2, 4, 5, 2, 1, 5, 5, 3, 1, 2, 7, 4, 7, 2, 6, 5, 2, 5, 3, 7, 5, 5, 6, 2, 4, 2, 13, 8, 5, 8, 7, 5, 6, 9, 6, 6, 2, 4, 8, 2, 2, 11, 4, 6, 3, 3, 6, 3, 9, 2, 4, 2, 5, 3, 4, 2, 6, 7, 2, 4, 4, 4, 4, 2, 5, 3, 9, 6, 7, 2, 16, 5, 4, 2, 4, 3, 4, 5, 5, 11, 3, 2, 8, 3, 6, 11, 3, 6, 5, 3, 6, 2, 3, 3, 2, 3, 4, 2, 3, 2, 4, 10, 3, …

… A marvel, **Giorgos** – many thanks! The number of steps will be here soon, I guess (OEIS).

Best,

É.

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Posts les plus consultés de ce blog

A square for three (chess)

juin 22, 2024

(English translation after the French text) Voici cinq problèmes d'échecs disjoints : a) combien faut-il de coups au minimum pour que trois pions soient capturés sur la même case ? b) trois tours c) trois c ...

LIRE LA SUITE

Le tripalin se présente

avril 11, 2024

Un tripalin est constitué de trois images. Chaque image illustre un substantif. Accolés, ces trois substantifs forment une chaîne palindromique. Laquelle nous vous invitons à trouver. Exem ...

LIRE LA SUITE

Some strings au cinéma Galeries

juillet 19, 2024

Lettre ouverte au cinéma Galeries Bonsoir à tous, Je viens de voir pour la seconde fois chez vous le beau film de Léos Carax (la première fois c'était le 26 juin en présence du réalisateur, au BRIFF). Apparut à l'écran aujourd'hui, avant la projection propre ...

LIRE LA SUITE