Mathematical Representations of the Last Day of the Year 23 Written American Style: 12.31.23 (123123), **Zenodo**, December 19, 2023, pp. 1-13, https://doi.org/10.5281/zenodo.10405771

Mathematical Representations of the Last Day of the Year 23 Written American Style: 12.31.23 (123123)

Inder J. Taneja[1]

Abstract

If write last day of this year, i.e., December 31, 23 in american style, it stands as 12.31.23, i.e., 123123. In this work we shall write represenions of the number 123123 in different ways. These repreentations are ***crazy-type, single digit, single letter, base and power permutable, selfie representations, upside down and mirror looking****, etc.* ***Magic squares*** *of orders 3 to 7 are also written having the number 123123 as well as having magic sum as 123123.*

$$\mathbf{123123 = (1 + (2 + 3!)! + (1 + 2)!!) \times 3 = 3 \times ((2 + 1)!! + (3! + 2)! + 1)}$$

	pan	1021020	1021020	1021020	1021020	1021020
1021020	123123	132132	213213	231231	321321	1021020
1021020	231213	321231	123321	132123	213132	1021020
1021020	132321	213123	231132	321213	123231	1021020
1021020	321132	123213	132231	213321	231123	1021020
	213231	231321	321123	123132	132213	1021020
	1021020	1021020	1021020	1021020	1021020	1021020

11x(11+1+1)x(1+1+1)x(5+2)x(11+8+8+5+2+5+2)

[1]*Formerly, Professor of Mathematics, Federal University of Santa Catarina, Florianópolis, SC, Brazil (1978-2012).*
E-mail: *ijtaneja@gmail.com;*
Web-sites: *https://inderjtaneja.com; https://numbers-magic.com;*
Twitter: *@IJTANEJA;* ***Instagram:*** *@crazynumbers.*

Contents

1 123123 in Numbers and Magic Squares **3**
1.1 Crazy Representations . . . 3
1.2 Selfie Representations . . . 3
1.3 Single Digit Representations . . . 3
1.3.1 Pattern with Digit 2 . . . 4
1.4 Single Letter Representations . . . 4
1.4.1 Patterns in Single Letter . . . 4
1.5 Fixed Digit Repetitions Prime Pattern . . . 5
1.6 Prime Factors . . . 5
1.7 Permutable Bases and Powers . . . 5
1.8 Embedded Palindromic Prime Patterns With 123123 . . . 6
1.9 Pythagorean Triples with 123123 . . . 8
1.9.1 Pythagorean Triples Patterns . . . 8
1.10 Upside Down and Mirror Looking for 123123 . . . 9
1.10.1 Upside Down and Mirror Looking . . . 9
1.10.2 Upside Down . . . 9
1.11 Colored Patterns . . . 9
1.12 Magic Squares with 123123 . . . 10
1.12.1 Semi-Magic Square of Order 3 . . . 10
1.12.2 Magic Square of Order 4 . . . 10
1.12.3 Pandiagonal Magic Square of Order 5 . . . 10
1.12.4 Magic Square of Order 6 . . . 11
1.13 Magic Squares with Magic Sum 123123 . . . 11
1.13.1 Semi-Magic Square of Order 3 . . . 11
1.13.2 Pandiagonal Magic Square of Order 4 . . . 11
1.13.3 Pandiagonal Magic Square of Order 5 . . . 12
1.13.4 Magic Square of Order 6 . . . 12
1.13.5 Pandiagonal Magic Square of Order 7 . . . 12

1 123123 in Numbers and Magic Squares

1.1 Crazy Representations

Below are representations of 123123 in terms of 1 to 9 and 9 to 1.

$$\begin{aligned}\mathbf{123123} &:= 1\times 2+3^{4+5}\times 6+7!-8-9\\ &:= 9\times(8-7-6!\times(5-4!))-3-2-1\end{aligned}$$

1.2 Selfie Representations

$$\begin{aligned}\mathbf{123123} &:= (1+(2+3!)!+(1+2)!!)\times 3\\ &:= 3\times((2+1)!!+(3!+2)!+1)\\ &:= 3\times\left(1+(2^3)!+(1+2)!!\right)\end{aligned}$$

1.3 Single Digit Representations

$$\begin{aligned}\mathbf{123123} &:= \left(1+1+11^{1+1}\right)\times\left(1+(11-1)^{1+1+1}\right)\\ &:= 2+22+222\times(2222/2-2)/2\\ &:= 3+(3+3)^3\times\left(3+3\times\left((3+3)^3-3^3\right)\right)\\ &:= 4+(4\times 4+44)\times\left(4+4^4\times(4+4)\right)-4/4\\ &:= 5^5+(5+5)^5+\left((5+5)^5-(5+5)\right)/5\\ &:= 6\times 6/(6+6)+6\times\left(6^6-6\times 66\times 66\right)\\ &:= 7^7/7+7\times(7+777)-7-7\\ &:= 88/8+88\times(88\times(8+8)-8-8/8)\\ &:= 99/9\times(9\times 9+(9+99999)/9)\end{aligned}$$

1.3.1 Pattern with Digit 2

$$\mathbf{123123} := 2+22+\frac{222\times\left(\frac{2222}{2}-2\right)}{2}$$
$$\mathbf{1233123} := 2+22+\frac{222\times\left(\frac{22222}{2}-2\right)}{2}$$
$$\mathbf{12333123} := 2+22+\frac{222\times\left(\frac{222222}{2}-2\right)}{2}$$
$$\mathbf{123333123} := 2+22+\frac{222\times\left(\frac{2222222}{2}-2\right)}{2}$$

1.4 Single Letter Representations

$$\mathbf{123123} := \frac{(aaaa-a-a)\times aaa+(aa+aa+a+a)\times a}{a\times a}$$

where, $aaaaa = a10^4+a10^3+a10^2+a10+a,$
$aaaa = a10^3+a10^2+a10+a,$
$aaa = a10^2+a10+a,$
$aa = a10+a,$ etc.
$a\in\{1,2,3,4,5,6,7,8,9\}.$

1.4.1 Patterns in Single Letter

$$\mathbf{123123} := \frac{(aaaa-a-a)\times aaa+(aa+aa+a+a)\times a}{a\times a}$$
$$\mathbf{1233123} := \frac{(aaaaa-a-a)\times aaa+(aa+aa+a+a)\times a}{a\times a}$$
$$\mathbf{12333123} := \frac{(aaaaaa-a-a)\times aaa+(aa+aa+a+a)\times a}{a\times a}$$
$$\mathbf{123333123} := \frac{(aaaaaaa-a-a)\times aaa+(aa+aa+a+a)\times a}{a\times a}$$

1.5 Fixed Digit Repetitions Prime Pattern

1879
187 2 123123 4 **9**
187 2 123123 4 2 123123 4 **9**
187 2 123123 4 2 123123 4 2 123123 4 **9**
187 2 123123 4 2 123123 4 2 123123 4 2 123123 4 **9**
187 2 123123 4 2 123123 4 2 123123 4 2 123123 4 2 123123 4 **9**
187 2 123123 4 2 123123 4 2 123123 4 2 123123 4 2 123123 4 2 123123 4 **9**

Below is a real prime numbers pattern without spaces:

1879
187212312349
18721231234212312349
1872123123421231234212312349
187212312342123123421231234212312349
18721231234212312342123123421231234212312349
1872123123421231234212312342123123421231234212312349

The last number writing without space is prime number, i.e.,

1872123123421231234212312342123123421231234212312349

The next numbers in a sequence is not a prime number, i.e.,

$$187212312342123123421231234212312342123123421231234212312349$$
$$:= 19 \times 23 \times 431 \times 993975546953883647848021121718489501415596857031087367$$

1.6 Prime Factors

$$\mathbf{123123} := 3 \times 7 \times 11 \times 13 \times 41$$

1.7 Permutable Bases and Powers

$$\mathbf{123123} := 0^7 - 1^9 + 2^8 + 3^0 + 4^1 + 5^5 + 6^4 + 7^6 + 8^2 + 9^3$$

1.8 Embedded Palindromic Prime Patterns With 123123

1221 **123123** 1 **321321** 1221
12211221 **123123** 1 **321321** 12211221
1212212211221 **123123** 1 **321321** 1221122122121
111211212212211221 **123123** 1 **321321** 122112212212112111
12111211212212211221 **123123** 1 **321321** 12211221221211211121
1112211112111211212212211221 **123123** 1 **321321** 1221122122121121112111122111
1112211112211112111211212212211221 **123123** 1 **321321** 1221122122121121112111122111122111
1212121112211112211112111211212212211221 **123123** 1 **321321** 1221122122121121112111122111122111212121
... ...

1212111 **123123** 2 **321321** 1112121
11212111 **123123** 2 **321321** 11121211
1112111212111 **123123** 2 **321321** 1112121112111
11221112111212111 **123123** 2 **321321** 11121211121112211
1211221112111212111 **123123** 2 **321321** 1112121112111221121
11212111211221112111212111 **123123** 2 **321321** 11121211121112211211121211
1112212111212111211221112111212111 **123123** 2 **321321** 1112121112111221121112121112122111
... ...

112 **123123** 3 **321321** 211
112112 **123123** 3 **321321** 211211
1211112112 **123123** 3 **321321** 2112111121
122111211112112 **123123** 3 **321321** 211211112111221
11122111211112112 **123123** 3 **321321** 21121111211122111
1112211122111211112112 **123123** 3 **321321** 2112111121112211122111
11221111112211122111211112112 **123123** 3 **321321** 21121111211122111221111112211
1121111221111112211122111211112112 **123123** 3 **321321** 2112111121112211122111111221111211
121121111221111112211122111211112112 **123123** 3 **321321** 211211112111221112211111122111121121
... ...

311 **123123** 1 **321321** 113
133311 **123123** 1 **321321** 113331
33133311 **123123** 1 **321321** 11333133
322133133311 **123123** 1 **321321** 113331331223
12331322133133311 **123123** 1 **321321** 11333133122313321
1212331322133133311 **123123** 1 **321321** 1133313312231332121
33211212331322133133311 **123123** 1 **321321** 11333133122313321211233
331233211212331322133133311 **123123** 1 **321321** 113331331223133212112332133
11331233211212331322133133311 **123123** 1 **321321** 11333133122313321211233213311
1311331233211212331322133133311 **123123** 1 **321321** 1133313312231332121123321331131
1221311331233211212331322133133311 **123123** 1 **321321** 1133313312231332121123321331131221
… … … … … … …

1323 **123123** 2 **321321** 3231
1321323 **123123** 2 **321321** 3231231
11321321323 **123123** 2 **321321** 32312312311
12311321321323 **123123** 2 **321321** 32312312311321
3322212311321321323 **123123** 2 **321321** 3231231231132122233
32123322212311321321323 **123123** 2 **321321** 32312312311321222332123
333132123322212311321321323 **123123** 2 **321321** 323123123113212223321231333
31131333132123322212311321321323 **123123** 2 **321321** 32312312311321222332123133313113
3331131333132123322212311321321323 **123123** 2 **321321** 3231231231132122233212313331311333
123331131333132123322212311321321323 **123123** 2 **321321** 323123123113212223321231333131133321
… … … … … … …

112 **123123** 3 **321321** 211
112112 **123123** 3 **321321** 211211
311112112 **123123** 3 **321321** 211211113
33231311112112 **123123** 3 **321321** 21121111313233
33133231311112112 **123123** 3 **321321** 21121111313233133
331133133231311112112 **123123** 3 **321321** 211211113132331331133
33121331133133231311112112 **123123** 3 **321321** 21121111313233133113312133
31233121331133133231311112112 **123123** 3 **321321** 21121111313233133113312133213
1133331233121331133133231311112112 **123123** 3 **321321** 2112111131323313311331213321333311
31133331233121331133133231311112112 **123123** 3 **321321** 21121111313233133113312133213333113
3322331133331233121331133133231311112112 **123123** 3 **321321** 2112111131323313311331213321333311332233
… … … … … … …

1.9 Pythagorean Triples with 123123

$$6160^2+\mathbf{123123^2} := 123277^2$$
$$18620^2+\mathbf{123123^2} := 124523^2$$
$$20664^2+\mathbf{123123^2} := 124845^2$$
$$26936^2+\mathbf{123123^2} := 126035^2$$
$$37664^2+\mathbf{123123^2} := 128755^2$$
$$50836^2+\mathbf{123123^2} := 133205^2$$
$$57564^2+\mathbf{123123^2} := 135915^2$$
$$59800^2+\mathbf{123123^2} := 136877^2$$
$$61336^2+\mathbf{123123^2} := 137555^2$$
$$64436^2+\mathbf{123123^2} := 138965^2$$
$$81180^2+\mathbf{123123^2} := 147477^2$$
$$82836^2+\mathbf{123123^2} := 148395^2$$
$$85280^2+\mathbf{123123^2} := 149773^2$$
$$88660^2+\mathbf{123123^2} := 151723^2$$
$$90364^2+\mathbf{123123^2} := 152725^2$$
$$92880^2+\mathbf{123123^2} := 154227^2$$
$$21252^2+121275^2 := \mathbf{123123^2}$$
$$27027^2+120120^2 := \mathbf{123123^2}$$
$$47355^2+113652^2 := \mathbf{123123^2}$$
$$71148^2+100485^2 := \mathbf{123123^2}$$

1.9.1 Pythagorean Triples Patterns

$$27027^2+120120^2 := \mathbf{123123^2}$$
$$270027^2+1200120^2 := 1230123^2$$
$$2700027^2+12000120^2 := 12300123^2$$
$$27000027^2+120000120^2 := 123000123^2$$

1.10 Upside Down and Mirror Looking for 123123

1.10.1 Upside Down and Mirror Looking

1001+111111+11011

11x(88+88+88+8+1)x(8+8+8+8+8+1)

88888+8888+8888+8888+8x888+88+88+88+88+88+8+8+11

88888+8888+8008+8008+8008+888+88+88+88+81+18+8x(8+1)

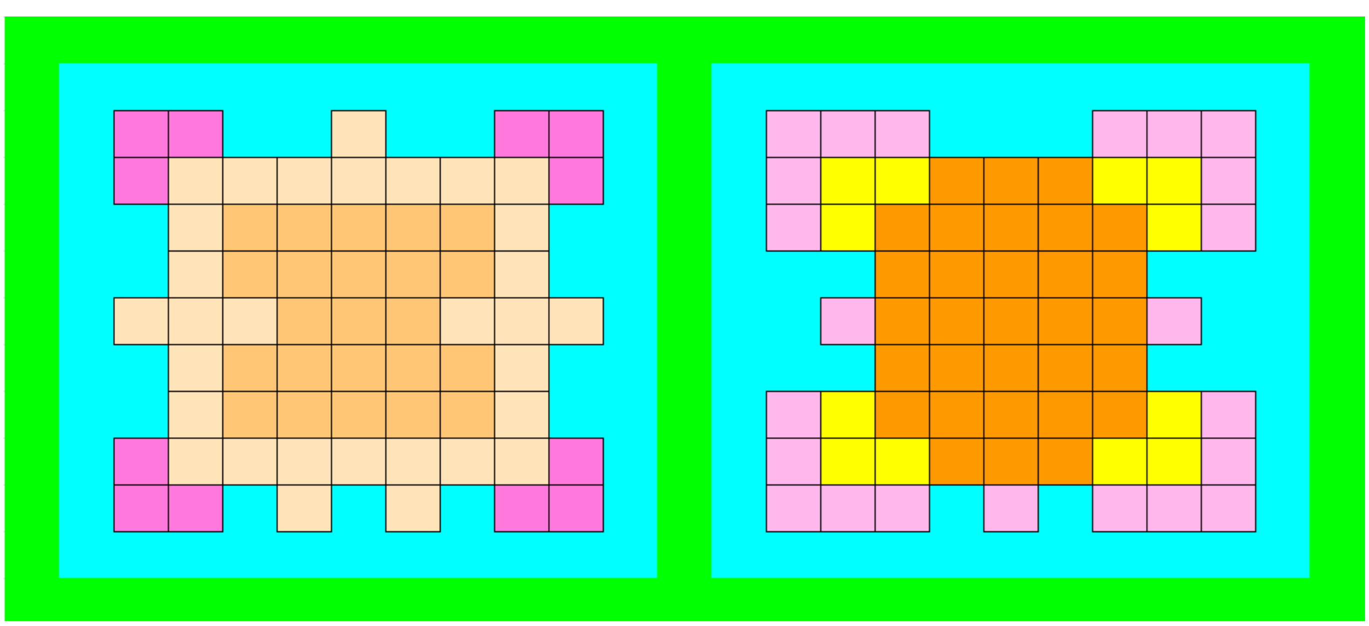
11x(11+1+1)x(1+1+1)x(5+2)x(11+8+8+5+2+5+2)

1.10.2 Upside Down

11x[(1+1+1)x(96+69)+9+6+9+6+8]x(1+1+1)x(5+2)

1.11 Colored Patterns

3-Colors patterns for 12-31-23:



1.12 Magic Squares with 123123

1.12.1 Semi-Magic Square of Order 3

			666693
231123	312312	123231	666666
123312	231231	312123	666666
312231	123123	231312	666666
666666	666666	666666	693666

1.12.2 Magic Square of Order 4

				699699
132213	213231	123123	231132	699699
123132	231123	132231	213213	699699
231231	123213	213132	132123	699699
213123	132132	231213	123231	699699
699699	699699	699699	699699	699699

1.12.3 Pandiagonal Magic Square of Order 5

	pan	1021020	1021020	1021020	1021020	1021020
1021020	123123	132132	213213	231231	321321	1021020
1021020	231213	321231	123321	132123	213132	1021020
1021020	132321	213123	231132	321213	123231	1021020
1021020	321132	123213	132231	213321	231123	1021020
	213231	231321	321123	123132	132213	1021020
	1021020	1021020	1021020	1021020	1021020	1021020

1.12.4 Magic Square of Order 6

						1333332
123123	321312	321231	321213	123132	123321	1333332
312321	132132	312231	132213	132312	312123	1333332
231321	231312	213213	213231	231132	213123	1333332
213321	213132	231213	231231	213312	231123	1333332
132123	312132	132231	312213	312312	132321	1333332
321123	123312	123213	123231	321132	321321	1333332
1E+06	1333332	1333332	1333332	1333332	1333332	1333332

1.13 Magic Squares with Magic Sum 123123

1.13.1 Semi-Magic Square of Order 3

mgc	123120	123126	123123
41040	41045	41038	123123
41039	41041	41043	123123
41044	41037	41042	123123
123123	123123	123123	123123

1.13.2 Pandiagonal Magic Square of Order 4

	pan	123123	123123	123123	123123
123123	30779.25	30784.25	30773.25	30786.25	123123
123123	30774.25	30785.25	30780.25	30783.25	123123
123123	30788.25	30775.25	30782.25	30777.25	123123
	30781.25	30778.25	30787.25	30776.25	123123
	123123	123123	123123	123123	123123

1.13.3 Pandiagonal Magic Square of Order 5

	pan	123123	123123	123123	123123	123123
123123	24612.6	24618.6	24624.6	24630.6	24636.6	123123
123123	24629.6	24635.6	24616.6	24617.6	24623.6	123123
123123	24621.6	24622.6	24628.6	24634.6	24615.6	123123
123123	24633.6	24614.6	24620.6	24626.6	24627.6	123123
	24625.6	24631.6	24632.6	24613.6	24619.6	123123
	123123	123123	123123	123123	123123	123123

1.13.4 Magic Square of Order 6

mgc	123110	123119	123123	123136	123127	123123
20503	20525	20530	20536	20519	20510	123123
20531	20509	20537	20516	20523	20507	123123
20514	20508	20515	20529	20533	20524	123123
20534	20518	20506	20526	20512	20527	123123
20521	20535	20513	20505	20532	20517	123123
20520	20528	20522	20511	20504	20538	123123
123123	123123	123123	123123	123123	123123	123123

1.13.5 Pandiagonal Magic Square of Order 7

	pan	123123	123123	123123	123123	123123	123123	123123
123123	17565	17573	17581	17589	17597	17605	17613	123123
123123	17604	17612	17571	17572	17580	17588	17596	123123
123123	17587	17595	17603	17611	17570	17578	17579	123123
123123	17577	17585	17586	17594	17602	17610	17569	123123
123123	17609	17568	17576	17584	17592	17593	17601	123123
123123	17599	17600	17608	17567	17575	17583	17591	123123
	17582	17590	17598	17606	17607	17566	17574	123123
	123123	123123	123123	123123	123123	123123	123123	123123

References

[1] Inder J. Taneja, 2019 In Numbers, **Zenodo**, December 31, 2019, pp. 1-27, *http://doi.org/10.5281/zenodo.2529103*.

[2] Inder J. Taneja, 2020 In Numbers: Mathematical Style, **Zenodo**, December 31, 2019, pp. 1-37, *http://doi.org/10.5281/zenodo.3596193*.

[3] Inder J. Taneja, 21 Mathematical Highlights for 2021, **Zenodo**, December 26, 2020, pp. 1-75, *http://doi.org/10.5281/zenodo.4394408*.

[4] Inder J. Taneja, Geometrical, Numerical, and Symmetrical Representations for the Days of 2020, **Zenodo**, October 04, 2020, pp. 1-201, *http://doi.org/10.5281/zenodo.4065069*.
Also see the link: Inder J. Taneja, Geometrical, Numerical, and Symmetrical Representations for the Days of 2020 *https://inderjtaneja.wordpress.com/2020/10/07/geometrical-numerical-and-symmetrical-representations-for-the-days-of-2020/*

[5] Inder J. Taneja, Hardy-Ramanujan Number – 1729, **Zenodo**, December 22, 2021, pp. 1-106, *https://doi.org/10.5281/zenodo.5799640*.

[6] Inder J. Taneja, Mathematical Beauty of 2022, **Zenodo**, December 26, 2021, pp. 1-78, *https://doi.org/10.5281/zenodo.5805264*.

[7] Inder J. Taneja, 23 and 2023 in Numbers and Patterns, **Zenodo**, December 22, 2022, pp. 1-51, *https://doi.org/10.5281/zenodo.7473340*.

[8] Inder J. Taneja, Fractional and Decimal Type Bordered Magic Squares with Magic Sum 2020, **Zenodo**, January 20, 2020, pp.1-25. http://doi.org/10.5281/zenodo.3613698

[9] Inder J. Taneja, Block-Wise and Block-Bordered Magic and Bimagic Squares with Magic Sums 21, 21^2 and 2021, **Zenodo**, December 16, 2020, pp. 1-118, http://doi.org/10.5281/zenodo.4380343.

[10] Inder J. Taneja, Fractional and Decimal Type Bordered Magic Squares With Magic Sum 2021, **Zenodo**, December 16, 2020, pp. 1-33, *http://doi.org/10.5281/zenodo.4327333*.

[11] Inder J. Taneja, Block-Wise and Block-Bordered Magic Squares With Magic Sum 2022, **Zenodo**, December 28, 2021, pp. 1-38, *https://doi.org/10.5281/zenodo.5807789*.

[12] Inder J. Taneja, Mathematical Representations of the Last Day of the Year 23 Written American Style: 12.31.23 (123123), **Zenodo**,
December 19, 2023, pp. 1-13 , *https://doi.org/10.5281/zenodo.10405771*

———————————————-