

Crazy Sequential Representations: Base 16 (-FFFFFF up to FFFFF)

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Historic Overview

Decimal Crazy Sequential Representations

Inder Taneja published five papers on arXiv (for 1 up to 11111):

ARXIV Version	Evaluated Range	Allowed Operations	Missing Increasing	Missing Decreasing	Valid Representations
1 (06-02-2013) ¹	44 to 1000	+ * ^	2	10	1902 (of 1914)
2 (19-03-2013) ²	44 to 4444	+ * ^	50	53	8699 (of 8802)
3 (05-06-2013) ³	44 to 11111	+ * ^ ()	590	605	20941 (of 22136)
4 (05-08-2013) ⁴	0 to 11111	+ * ^ () -	449	315	21460 (of 22224)
5 (08-01-2014) ⁵	0 to 11111	+ * ^ () - /	9	10	22205 (of 22224)

Authors published three papers on Figshare/Zenodo (for -2147483647 up to 2147483647):

Date	Title
12-06-2018	Crazy Sequential Representations: Exhaustive Search ⁶
14-06-2018	Crazy Sequential Representations: Negative Integers ⁷
18-06-2018	Crazy Sequential Representations: Without Subtraction and/or Division ⁸

Inder Taneja published three papers on RGMIA (for 11112 up to 30000):

Date	Title
12-09-2018	Crazy Representations of Natural Numbers From 11112 to 20000 ⁹
10-11-2018	Crazy Representations of Natural Numbers From 20001 to 25000 ¹⁰
10-11-2018	Crazy Representations of Natural Numbers From 25001 to 30000 ¹¹

Authors published one paper on Figshare/Zenodo (comparing results for 11112 up to 30000):

Date	Title
06-12-2018	Crazy Sequential Representations: 11112 up to 30000 ¹²

Authors published three papers on Figshare/Zenodo (improving our previous work):

Date	Title
14-12-2018	Crazy Sequential Representations: Simplifications (01) ¹³
24-12-2018	Crazy Sequential Representations: Fill the Gaps (01) ¹⁴
02-01-2019	Crazy Sequential Representations: Fill the Gaps (02) ¹⁵

Historic Overview

Non-Decimal Crazy Sequential Representations

Tim Wylie published one paper on arXiv (focusing on bases 3 through 10):

Date	Title
11-10-2018	Crazy Sequential Representations of Numbers for Small Bases ¹⁶

Authors published six paper on Figshare/Zenodo (focusing on bases 11 through 16):

Date	Title
04-01-2018	Crazy Sequential Representations: Base 11 (0000 up to AAAA) ¹⁷
04-01-2018	Crazy Sequential Representations: Base 12 (0000 up to BBBB) ¹⁸
04-01-2018	Crazy Sequential Representations: Base 13 (0000 up to CCCC) ¹⁹
04-01-2018	Crazy Sequential Representations: Base 14 (0000 up to DDDD) ²⁰
04-01-2018	Crazy Sequential Representations: Base 15 (0000 up to EEEE) ²¹
04-01-2018	Crazy Sequential Representations: Base 16 (0000 up to FFFF) ²²

Base 16 Crazy Sequential Representation

For example, two valid base 16 crazy sequential representations:

$$\begin{array}{c} \mathbf{16148}_{10} \quad \mathbf{3F14}_{16} \\ \hline -1_{16}/2_{16} * (3_{16} - 4_{16} + 5_{16}) ^ 6_{16} + 7_{16} * 89A_{16} + BCD_{16} - EF_{16} \end{array} \qquad \begin{array}{c} \mathbf{4402}_{10} \quad \mathbf{1132}_{16} \\ \hline FED_{16} - CB_{16} + A9_{16} ^ (8_{16} - 7_{16}) * 6_{16} / (-5_{16} + 4_{16} + 3_{16}) + 21_{16} \end{array}$$

For clarity, the corresponding base 10 representations:

$$\begin{array}{c} -1_{10}/2_{10} * (3_{10} - 4_{10} + 5_{10}) ^ 6_{10} + 7_{10} * 2202_{10} + 3021_{10} - 239_{10} \\ \hline \end{array} \qquad \begin{array}{c} 4077_{10} - 203_{10} + 169_{10} ^ (8_{10} - 7_{10}) * 6_{10} / (-5_{10} + 4_{10} + 3_{10}) + 21_{10} \\ \hline \end{array}$$

Definition

Valid mathematical expression, thus well-formed interpretable syntactic construct.
Evaluation results is an integer value, thus a number without a fractional component.
Notation as used by most programming languages, thus restricted to following characters:

1 2 3 4 5 6 7 8 9 A B C D E F + - * / ^ ()

Digits 1 up to F occur in **increasing** or **decreasing** order:

$$\begin{array}{c} -1/2*(3-4+5)^6+7*89A+BCD-EF \\ \hline \end{array} \qquad \begin{array}{c} FED-CB+A9^(8-7)*6/(-5+4+3)+21 \\ \hline \end{array}$$

Digits represent **single-digit** or **multi-digit** numbers (concatenation of digits is allowed):

$$\begin{array}{c} -1/2*(3-4+5)^6+7*89A+BCD-EF \\ \hline \end{array} \qquad \begin{array}{c} FED-CB+A9^(8-7)*6/(-5+4+3)+21 \\ \hline \end{array}$$

Numbers occur in **positive form** or **negative form** (negation of numbers by “-” is allowed).

$$\begin{array}{c} -1/2*(3-4+5)^6+7*89A+BCD-EF \\ \hline \end{array} \qquad \begin{array}{c} FED-CB+A9^(8-7)*6/(-5+4+3)+21 \\ \hline \end{array}$$

Allowed operations; **addition**, **subtraction**, **multiplication**, **division** and/or **exponentiation**.

$$\begin{array}{c} -1/2*(3-4+5)^6+7*89A+BCD-EF \\ \hline \end{array} \qquad \begin{array}{c} FED-CB+A9^(8-7)*6/(-5+4+3)+21 \\ \hline \end{array}$$

Order of evaluation may be influenced by **parentheses** (also nested parentheses).

$$\begin{array}{c} -1/2*(3-4+5)^6+7*89A+BCD-EF \\ \hline \end{array} \qquad \begin{array}{c} FED-CB+A9^(8-7)*6/(-5+4+3)+21 \\ \hline \end{array}$$

Representations with **negation** of **segments in brackets** are referred to as “pseudo”.

$$\begin{array}{c} (1+2-3)*(45*-(6^7)+8-9ABCDEF) \\ \hline (1+2-3)*(45/-(6^7)+8-9ABCDEF) \\ \hline (1+2-3)*(45^-(6^7)+8-9ABCDEF) \\ \hline (-(1+2)+3)*(45^(6^7)+8-9ABCDEF) \\ \hline -(1-2+234*(6-(7+8-9))*ABCDEF) \end{array} \qquad \begin{array}{c} (FEDCBA98+7*-(6^5)+4)*(3-2-1) \\ \hline (FEDCBA98+7/-(6^5)+4)*(3-2-1) \\ \hline (FEDCBA98+7^-(6^5)+4)*(3-2-1) \\ \hline (FEDCBA98+7^(6^5)+4)*(-(3-2)+1) \\ \hline -(FEDCBA*(9-(8+7-6))*543-2+1) \end{array}$$

Representations without negation of segments in brackets are referred to as “genuine”.

Aim

Identify genuine base 16 crazy sequential representations for $-FFFFF_{16}$ up to $FFFFF_{16}$

Target is $2_{16} + FFFFF_{16} + FFFFF_{16} + FFFFF_{16} + FFFFF_{16} = 3FFFE_{16} = 4194302_{10}$ representations.

Results

4194302_{10} out of 4194302_{10} were identified, see supplements.

Missing

Increasing	None
Decreasing	None

Notes

Authors consider base 16 crazy sequential representations to be proof-of-work, as identification is computationally expensive, while verification is trivial. Authors did not simplify and/or optimize the crazy sequential representations.

For the majority of crazy sequential representations, only digits in the A up to F range were concatenated, while digits in the 1 up to 9 range were not concatenated.

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