

lower limit

michael winter (1a, 2011; rev 2014)

the piece consists of four parts to be played on 1, 2, or 4 like-sounding instruments or different instruments; e.g., 1 guitar, 2 pianos, 4 cellos, 4 flutes, string quartet, or combinations of these without duplication.

the performers are preferably spread about the performance space to the extent possible (or at least the amps are if played on electric guitars for example). the sustain of the first (top) part should be very short; approximately equivalent to a single note at the tempo of the piece, which should be as fast as is comfortably possible. the sustain for each successive part is longer such that there are generally four distinct tiers of tone duration. digital reverb may be added to achieve this effect (and to help overcome when a tone is rearticulated and stopped short of the general length of the given tier).

each part consists of three tones (preferably derived from harmonic partials of an arbitrary fundamental and whenever possible played as natural harmonics) notated by the numerals 1, 2, or 3 over a notehead. there are several options provided below as how the numbers are mapped to sounds. however, the players should feel free to consider other mappings of the numbers to sounds.*

option 1)

the ensemble chooses a set of 12 adjacent harmonic partials (higher in number preferably) of an arbitrary fundamental. the number to partial mapping may be decided arbitrarily. e.g. the first part plays the top 3 partials, the second then next lower 3, etc.

option 2)

each performer plays 3 pitches that are very close in different tuning system limits (see partch's "genesis of a music") such that different tuples of the instruments result in different qualities of a chord. for example, the first performer can play three pitches in a 3-limit (pythagorean) tuning; the second performer can play the three closest pitches to the first performer in a 5-limit tuning; the third performer can play the three closes pitches to the first performer in a 7-limit tuning; etc.

option 3)

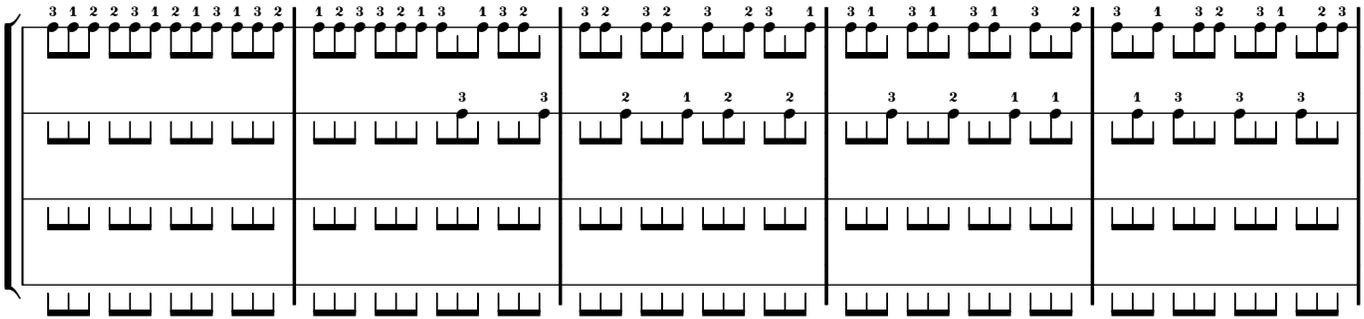
each performer plays the same 3 partials of an arbitrary fundamental (not necessarily adjacent).

clear; not loud.

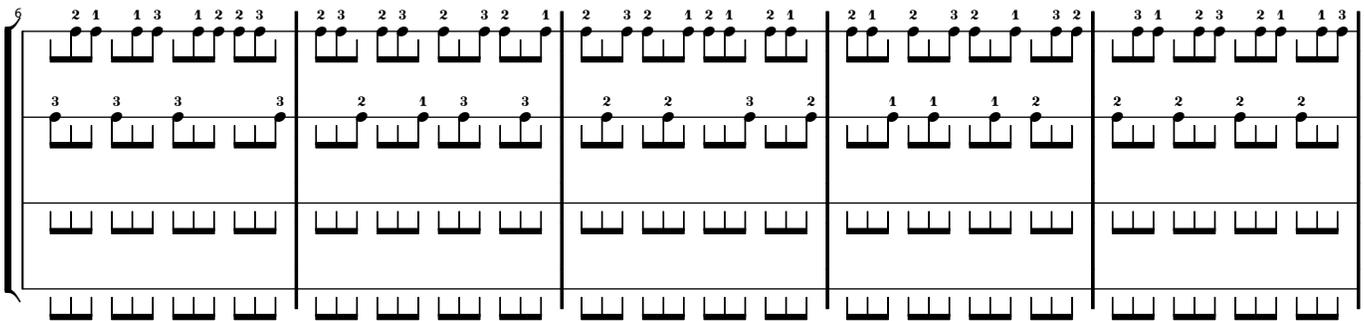
*as of this revision, this piece has been performed 2 times. the first, organized by chaz underriner for guitar quartet, used option 1 above. in preparation for the second performance, organized by cristian alvear for guitar duo, another option was considered but ultimately not performed. still, the option was completely viable and is included here as an example of a mapping alternative to the ones originally provided: the performers chose 12 natural harmonics and ordered them by the length of the natural decay such that the mapping is itself based on the tiering of tone durations outlined in the instructions above. the performers also requested scores where the four parts are collapsed into two (merging parts 1 and 3 as well as 2 and 4 and using numbers 1 through 6 above the noteheads to distinguish between the parts in the original quartet version; e.g. when merging parts 1 and 3, the numbers 4, 5, and 6 correspond to the numbers 1, 2, and 3 of part 1 in the quartet version). these versions are now provided in this edition of the score and others can be made upon request and will subsequently also be added.

lower limit
for stephen wolfram

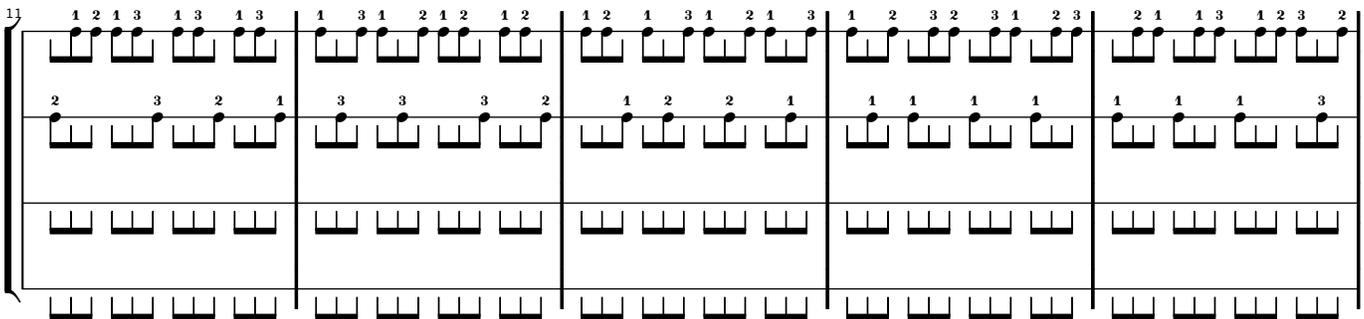
michael winter (1a, 2011)



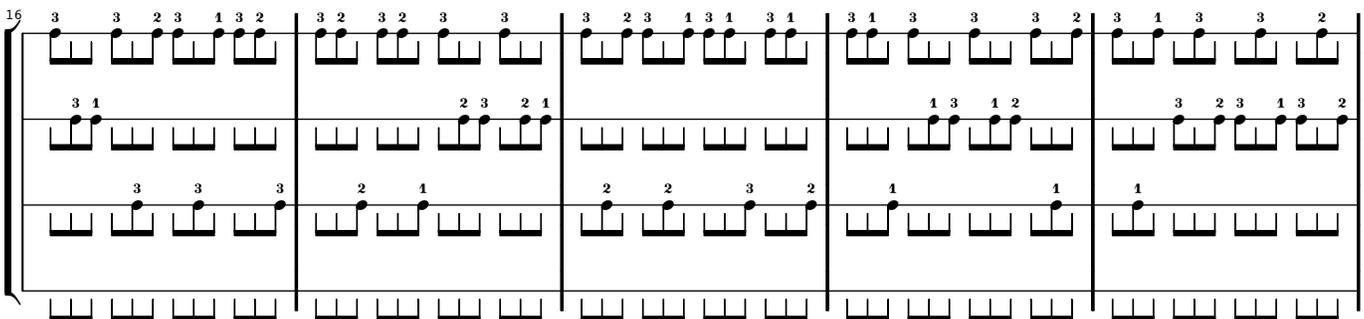
Musical notation system 1, measures 1-5. The system consists of four staves. The top staff contains a sequence of notes with fingerings: 3 1 2 2 3 1 2 1 3 1 3 2 | 1 2 3 3 2 1 3 1 3 2 | 3 2 3 2 3 2 3 1 | 3 1 3 1 3 1 3 2 | 3 1 3 2 3 1 2 3. The second staff contains notes with fingerings: 3 3 | 2 1 2 2 | 3 2 1 1 | 1 3 3 3. The third and fourth staves contain rhythmic patterns represented by vertical stems.



Musical notation system 2, measures 6-10. The system consists of four staves. The top staff contains a sequence of notes with fingerings: 2 1 1 3 1 2 2 3 | 2 3 2 3 2 3 2 1 | 2 3 2 1 2 1 2 1 | 2 1 2 3 2 1 3 2 | 3 1 2 3 2 1 1 3. The second staff contains notes with fingerings: 3 3 3 3 | 2 1 3 3 | 2 2 3 2 | 1 1 1 2 | 2 2 2 2. The third and fourth staves contain rhythmic patterns represented by vertical stems.



Musical notation system 3, measures 11-15. The system consists of four staves. The top staff contains a sequence of notes with fingerings: 1 2 1 3 1 3 1 3 | 1 3 1 2 1 2 1 2 | 1 2 1 3 1 2 1 3 | 1 2 3 2 3 1 2 3 | 2 1 1 3 1 2 3 2. The second staff contains notes with fingerings: 2 3 2 1 | 3 3 3 2 | 1 2 2 1 | 1 1 1 1 | 1 1 1 3. The third and fourth staves contain rhythmic patterns represented by vertical stems.



Musical notation system 4, measures 16-20. The system consists of four staves. The top staff contains a sequence of notes with fingerings: 3 3 2 3 1 3 2 | 3 2 3 2 3 3 | 3 2 3 1 3 1 3 1 | 3 1 3 3 3 2 | 3 1 3 3 2. The second staff contains notes with fingerings: 3 1 | 2 3 2 1 | 1 3 1 2 | 3 2 3 1 3 2. The third staff contains notes with fingerings: 3 3 3 | 2 1 | 2 2 3 2 | 1 1 | 1. The fourth staff contains rhythmic patterns represented by vertical stems.

21

Musical notation for measures 21-25. The notation includes notes on a staff with fingerings (1-3) above and below the notes. The measures are separated by vertical bar lines.

26

Musical notation for measures 26-30. The notation includes notes on a staff with fingerings (1-3) above and below the notes. The measures are separated by vertical bar lines.

31

Musical notation for measures 31-35. The notation includes notes on a staff with fingerings (1-3) above and below the notes. The measures are separated by vertical bar lines.

36

Musical notation for measures 36-40. The notation includes notes on a staff with fingerings (1-3) above and below the notes. The measures are separated by vertical bar lines.

41

Musical notation for measures 41-45. It consists of five measures, each with four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the first three staves. The fourth staff contains a series of vertical lines representing a specific rhythmic or melodic sequence.

46

Musical notation for measures 46-50. It consists of five measures, each with four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the first three staves. The fourth staff contains a series of vertical lines representing a specific rhythmic or melodic sequence.

51

Musical notation for measures 51-55. It consists of five measures, each with four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the first three staves. The fourth staff contains a series of vertical lines representing a specific rhythmic or melodic sequence.

56

Musical notation for measures 56-60. It consists of five measures, each with four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the first three staves. The fourth staff contains a series of vertical lines representing a specific rhythmic or melodic sequence.

61

Musical notation for measures 61-65. Each measure contains four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the notes. Measure 61 starts with a treble clef and a key signature of one flat. The notes are primarily eighth and sixteenth notes.

66

Musical notation for measures 66-70. Each measure contains four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the notes. Measure 66 starts with a treble clef and a key signature of one flat. The notes are primarily eighth and sixteenth notes.

71

Musical notation for measures 71-75. Each measure contains four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the notes. Measure 71 starts with a treble clef and a key signature of one flat. The notes are primarily eighth and sixteenth notes.

76

Musical notation for measures 76-80. Each measure contains four staves. The notation includes various rhythmic patterns and fingerings (1, 2, 3) for the notes. Measure 76 starts with a treble clef and a key signature of one flat. The notes are primarily eighth and sixteenth notes.

81

Musical notation for measures 81-85, featuring four staves per measure with various rhythmic patterns and fingerings (1, 2, 3).

86

Musical notation for measures 86-90, featuring four staves per measure with various rhythmic patterns and fingerings (1, 2, 3).

91

Musical notation for measures 91-95, featuring four staves per measure with various rhythmic patterns and fingerings (1, 2, 3).

96

Musical notation for measures 96-100, featuring four staves per measure with various rhythmic patterns and fingerings (1, 2, 3).

101

Musical notation for measures 101-105. Each measure contains four staves. The notation includes various rhythmic patterns, primarily consisting of eighth and sixteenth notes, with frequent triplets. Fingering numbers (1, 2, 3) are placed above notes to indicate fingerings. The patterns are complex and repetitive across the measures.

106

Musical notation for measures 106-110. Each measure contains four staves. The notation includes various rhythmic patterns, primarily consisting of eighth and sixteenth notes, with frequent triplets. Fingering numbers (1, 2, 3) are placed above notes to indicate fingerings. The patterns are complex and repetitive across the measures.

111

Musical notation for measures 111-115. Each measure contains four staves. The notation includes various rhythmic patterns, primarily consisting of eighth and sixteenth notes, with frequent triplets. Fingering numbers (1, 2, 3) are placed above notes to indicate fingerings. The patterns are complex and repetitive across the measures.

116

Musical notation for measures 116-120. Each measure contains four staves. The notation includes various rhythmic patterns, primarily consisting of eighth and sixteenth notes, with frequent triplets. Fingering numbers (1, 2, 3) are placed above notes to indicate fingerings. The patterns are complex and repetitive across the measures.

141

146

151

156

181

Musical notation for measures 181-185. The system consists of four staves. Measure 181: Staff 1 has notes with fingerings 3 and 2; Staff 2 has notes with fingerings 2 and 1; Staff 3 has notes with fingerings 3, 1, 3, 1, 3, 3; Staff 4 has notes with fingerings 1, 1. Measure 182: Staff 1 has notes with fingerings 1, 3, 3, 3; Staff 2 has notes with fingerings 3, 2, 3, 1; Staff 3 has notes with fingerings 3, 3, 2, 1; Staff 4 has notes with fingerings 1, 3, 3, 3. Measure 183: Staff 1 has notes with fingerings 3, 2; Staff 2 has notes with fingerings 3, 3; Staff 3 has notes with fingerings 3, 3; Staff 4 has notes with fingerings 3, 3, 3, 3. Measure 184: Staff 1 has notes with fingerings 1, 2, 2, 2; Staff 2 has notes with fingerings 3, 3, 2, 1; Staff 3 has notes with fingerings 3, 3, 3, 3; Staff 4 has notes with fingerings 3, 3, 3, 3. Measure 185: Staff 1 has notes with fingerings 3, 2; Staff 2 has notes with fingerings 2, 3, 2, 1; Staff 3 has notes with fingerings 2, 2; Staff 4 has notes with fingerings 3, 3, 3, 3.

186

Musical notation for measures 186-190. The system consists of four staves. Measure 186: Staff 1 has notes with fingerings 1, 1, 1, 1; Staff 2 has notes with fingerings 1, 3, 1, 2; Staff 3 has notes with fingerings 2, 3, 2, 1; Staff 4 has notes with fingerings 3, 3, 3, 3. Measure 187: Staff 1 has notes with fingerings 3, 2; Staff 2 has notes with fingerings 1, 1; Staff 3 has notes with fingerings 1, 3, 3, 3; Staff 4 has notes with fingerings 3, 3, 3, 3. Measure 188: Staff 1 has notes with fingerings 1, 2, 2, 2; Staff 2 has notes with fingerings 1, 3, 3, 3; Staff 3 has notes with fingerings 3, 2, 1, 2; Staff 4 has notes with fingerings 3, 3, 3, 3. Measure 189: Staff 1 has notes with fingerings 2, 2, 2, 2; Staff 2 has notes with fingerings 2, 2, 3, 2; Staff 3 has notes with fingerings 2, 2, 3, 2; Staff 4 has notes with fingerings 2, 1, 2, 2. Measure 190: Staff 1 has notes with fingerings 2, 2, 2, 2; Staff 2 has notes with fingerings 2, 2, 2, 2; Staff 3 has notes with fingerings 2, 2, 3, 2; Staff 4 has notes with fingerings 2, 1, 2, 2.

191

Musical notation for measures 191-195. The system consists of four staves. Measure 191: Staff 1 has notes with fingerings 2, 2, 2, 2; Staff 2 has notes with fingerings 2, 3; Staff 3 has notes with fingerings 1, 1, 1, 1; Staff 4 has notes with fingerings 2, 3, 2, 1. Measure 192: Staff 1 has notes with fingerings 2, 2, 2; Staff 2 has notes with fingerings 2, 3, 2, 3, 2, 2; Staff 3 has notes with fingerings 3, 2, 1; Staff 4 has notes with fingerings 1, 1, 1, 3. Measure 193: Staff 1 has notes with fingerings 2, 3, 2, 3, 2, 2; Staff 2 has notes with fingerings 3, 2, 3, 1; Staff 3 has notes with fingerings 2, 1; Staff 4 has notes with fingerings 2, 1. Measure 194: Staff 1 has notes with fingerings 2, 3, 2, 1, 2, 2; Staff 2 has notes with fingerings 2, 3, 2, 1; Staff 3 has notes with fingerings 2, 3, 2, 1; Staff 4 has notes with fingerings 3, 3. Measure 195: Staff 1 has notes with fingerings 2, 3, 2, 1, 2, 1; Staff 2 has notes with fingerings 2, 3, 2, 1, 2, 1; Staff 3 has notes with fingerings 2, 3, 2, 1; Staff 4 has notes with fingerings 2, 2, 3, 2.

196

Musical notation for measures 196-200. The system consists of four staves. Measure 196: Staff 1 has notes with fingerings 3, 3, 3; Staff 2 has notes with fingerings 2, 1, 2, 2, 2, 3; Staff 3 has notes with fingerings 1, 3, 1, 2; Staff 4 has notes with fingerings 1, 1. Measure 197: Staff 1 has notes with fingerings 3, 3, 3, 2; Staff 2 has notes with fingerings 2, 1; Staff 3 has notes with fingerings 2, 2, 2; Staff 4 has notes with fingerings 1, 3, 2, 1. Measure 198: Staff 1 has notes with fingerings 3, 3, 3, 2; Staff 2 has notes with fingerings 2, 3, 2, 1, 2, 3, 2, 3; Staff 3 has notes with fingerings 2, 3, 2, 1, 2, 3; Staff 4 has notes with fingerings 3, 3, 3. Measure 199: Staff 1 has notes with fingerings 3, 2, 1; Staff 2 has notes with fingerings 2, 3, 2, 2, 2; Staff 3 has notes with fingerings 1; Staff 4 has notes with fingerings 3, 3, 3. Measure 200: Staff 1 has notes with fingerings 2, 2, 2; Staff 2 has notes with fingerings 2, 2, 2, 2, 3; Staff 3 has notes with fingerings 2, 2, 2, 2, 3; Staff 4 has notes with fingerings 3, 2, 1.

201

Musical score for measures 201-205. The score is written for four staves. Measure 201: Staff 1 (3 2 1), Staff 2 (2), Staff 3 (2 1 2 2 2), Staff 4 (2 2 2). Measure 202: Staff 1 (1 1 1), Staff 2 (1), Staff 3 (2 2 2 2 3), Staff 4 (3 2 1). Measure 203: Staff 1 (1 1 1 1), Staff 2 (1 3 2 1), Staff 3 (2 1 2 1 2 1 2 1), Staff 4 (2 2 2 3). Measure 204: Staff 1 (3 2 1 3), Staff 2 (3 3), Staff 3 (2 2 2 3), Staff 4 (1 1 1 2). Measure 205: Staff 1 (3 3), Staff 2 (3 2 3 1), Staff 3 (2 1), Staff 4 (2 2 2 2).

206

Musical score for measures 206-210. The score is written for four staves. Measure 206: Staff 1 (3 2 1 2), Staff 2 (2 2), Staff 3 (3 3 3 3), Staff 4 (2 2 2 2). Measure 207: Staff 1 (2 2), Staff 2 (2 3 2 1), Staff 3 (2 1), Staff 4 (2 2 2 2). Measure 208: Staff 1 (3 2 1 1), Staff 2 (3 2 1 1), Staff 3 (2 2 2 3), Staff 4 (2 2 2 2). Measure 209: Staff 1 (1 1), Staff 2 (1 3 1 2), Staff 3 (2 1), Staff 4 (2 2 2 2). Measure 210: Staff 1 (3 2 1 1), Staff 2 (3 2 1 1), Staff 3 (1 1 1 3), Staff 4 (2 2 2 3).

211

Musical score for measures 211-215. The score is written for four staves. Measure 211: Staff 1 (1 1 1 1), Staff 2 (1 1 1 1), Staff 3 (3 3 3 2), Staff 4 (2 1 3 3). Measure 212: Staff 1 (1 1 1 1), Staff 2 (1 1 1 1), Staff 3 (1 2 2 2), Staff 4 (3 3 2 1). Measure 213: Staff 1 (1 1 1 1), Staff 2 (1 1 1 1), Staff 3 (3 2 1 1), Staff 4 (2 2 2 3). Measure 214: Staff 1 (1 1 1 1), Staff 2 (1 1 1 1), Staff 3 (1 1 3 2), Staff 4 (2 1 1 1). Measure 215: Staff 1 (1), Staff 2 (1 3 1 3 1 3), Staff 3 (1), Staff 4 (1 3 2 1).

216

Musical score for measures 216-220. The score is written for four staves. Measure 216: Staff 1 (1 1 1 3 1 2), Staff 2 (1 2 1 2 1 2 1), Staff 3 (3 2 3 1), Staff 4 (3 3). Measure 217: Staff 1 (1 1 3 1 2 1), Staff 2 (1 2 1), Staff 3 (2 3), Staff 4 (3 2 1). Measure 218: Staff 1 (1 1 3 1 2), Staff 2 (1 1 3 1 2 1), Staff 3 (2 1), Staff 4 (2 2). Measure 219: Staff 1 (1 1 3 1 2), Staff 2 (1 1 3 1 2), Staff 3 (1 2), Staff 4 (1 1 3). Measure 220: Staff 1 (3 3), Staff 2 (1 1 1 3 1 2), Staff 3 (1 1 1 3 1 2), Staff 4 (2 1).

221

Musical score for measures 221-225. The score is written for four staves. The first staff contains a sequence of notes with a '3' above the first measure. The second staff contains notes with '3', '2', and '1' above the first three measures. The third staff contains notes with '1 3', '1 3', '1 3', and '1' above the first four measures. The fourth staff contains notes with '3', '3', '3', and '2' above the first four measures. The score is divided into five measures by vertical bar lines.

226

Musical score for measures 226-230. The score is written for four staves. The first staff contains notes with '3' and '2' above the first two measures. The second staff contains notes with '1' and '1' above the first two measures. The third staff contains notes with '1 3', '1 2', and '1' above the first three measures. The fourth staff contains notes with '1', '1', '1', and '1' above the first four measures. The score is divided into five measures by vertical bar lines.

231

Musical score for measures 231-235. The score is written for four staves. The first staff contains notes with '1', '1', '1', and '1' above the first four measures. The second staff contains notes with '1 3', '1 2', and '1' above the first three measures. The third staff contains notes with '2', '3', '2', and '1' above the first four measures. The fourth staff contains notes with '1', '1', '1', and '1' above the first four measures. The score is divided into five measures by vertical bar lines.

236

Musical score for measures 236-240. The score is written for four staves. The first staff contains notes with '3', '3', '3', and '3' above the first four measures. The second staff contains notes with '1', '2', '2', and '2' above the first four measures. The third staff contains notes with '3', '3', '3', and '3' above the first four measures. The fourth staff contains notes with '3', '3', '2', and '1' above the first four measures. The score is divided into five measures by vertical bar lines.

241

246

251

256

261

266

271

276

281

286

291

296

301

Musical notation for measures 301-305. It consists of five systems, each with three staves. The top staff contains rhythmic patterns. The middle staff contains notes with fingerings (1, 2, 3) and slurs. The bottom staff contains notes with fingerings (1, 2, 3) and slurs.

306

Musical notation for measures 306-310. It consists of five systems, each with three staves. The top staff contains rhythmic patterns. The middle staff contains notes with fingerings (1, 2, 3) and slurs. The bottom staff contains notes with fingerings (1, 2, 3) and slurs.

311

Musical notation for measures 311-315. It consists of five systems, each with three staves. The top staff contains rhythmic patterns. The middle staff contains notes with fingerings (1, 2, 3) and slurs. The bottom staff contains notes with fingerings (1, 2, 3) and slurs.

316

Musical notation for measures 316-320. It consists of five systems, each with three staves. The top staff contains rhythmic patterns. The middle staff contains notes with fingerings (1, 2, 3) and slurs. The bottom staff contains notes with fingerings (1, 2, 3) and slurs.

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part 1

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3 1 2 2 3 1 2 1 3 1 3 2 | 1 2 3 3 2 1 3 1 3 2 | 3 2 3 2 3 2 3 1 | 3 1 3 1 3 1 3 2 | 3 1 3 2 3 1 2 3 |

6 2 1 1 3 1 2 2 3 | 2 3 2 3 2 3 2 1 | 2 3 2 1 2 1 2 1 | 2 1 2 3 2 1 3 2 | 3 1 2 3 2 1 1 3 |

11 1 2 1 3 1 3 1 3 | 1 3 1 2 1 2 1 2 | 1 2 1 3 1 2 1 3 | 1 2 3 2 3 1 2 3 | 2 1 1 3 1 2 3 2 |

16 3 3 2 3 1 3 2 | 3 2 3 2 3 3 | 3 2 3 1 3 1 3 1 | 3 1 3 3 3 2 | 3 1 3 3 2 |

21 2 3 2 1 | 1 1 3 2 | 1 3 2 3 1 2 3 | 2 1 1 3 1 2 2 3 | 2 3 2 3 2 2 |

26 2 3 2 1 2 2 | 2 3 2 1 2 1 2 1 | 2 1 2 2 2 3 | 2 1 3 3 3 | 2 1 2 2 |

31 1 1 3 2 | 1 3 2 3 1 2 3 | 2 1 1 3 1 2 1 3 | 1 3 1 3 1 1 | 1 3 1 2 1 2 1 2 |

36 1 2 1 1 1 3 | 1 2 1 1 1 3 | 1 2 3 3 3 | 2 1 2 2 | 3 2 1 1 |

41 1 3 2 3 1 2 3 | 2 1 1 3 1 2 3 | 3 3 3 3 | 3 3 2 3 1 3 2 | 3 2 3 2 3 3 |

46 3 3 3 3 | 3 2 3 1 3 1 3 1 | 3 1 3 3 3 | 3 3 3 3 2 | 3 1 3 3 3 |

51 3 2 1 2 | 2 2 3 | 2 1 1 1 | 1 3 2 | 1 3 3 3 |

56 3 2 1 2 | 2 2 3 2 | 1 1 1 1 | 3 2 1 3 2 | 3 1 2 3 2 1 1 3 |

61 1 2 2 3 2 3 2 3 | 2 2 2 2 | 2 2 2 3 2 1 | 2 2 2 2 | 2 2 2 3 2 1 |

66 2 1 2 1 2 1 2 | 2 2 2 2 | 2 2 3 2 1 3 | 3 3 3 | 2 1 2 2 |

71 2 3 2 1 | 1 1 1 | 3 2 1 3 | 3 3 3 2 | 1 2 2 2 |

76 3 2 1 1 | 1 1 3 2 | 1 3 2 3 1 2 3 | 2 1 1 3 1 2 1 3 | 1 3 1 3 1 1 |

81 1 1 1 1 | 1 3 1 2 1 2 1 2 | 1 2 1 1 1 | 1 1 1 1 3 | 1 2 1 1 1 |

86 1 1 1 1 3 | 1 2 3 3 3 | 3 2 1 | 2 2 2 | 3 2 1 1 |

91 1 1 3 2 | 1 3 3 3 | 3 2 1 2 | 2 2 3 2 | 1 1 1 1 |

96 3 2 1 3 2 | 3 1 2 3 2 1 1 3 | 1 2 3 3 3 | 3 3 3 3 | 3 3 3 3 |

101 3 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 2 |

106 1 2 2 2 | | 3 2 1 | 1 1 1 | |

111 3 2 1 3 | 3 2 | 2 3 | 2 1 1 1 | 3 2 |

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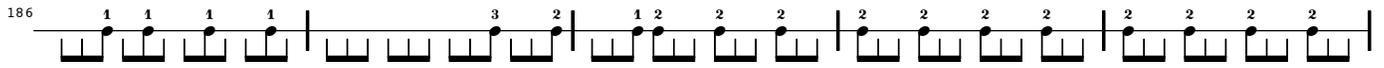
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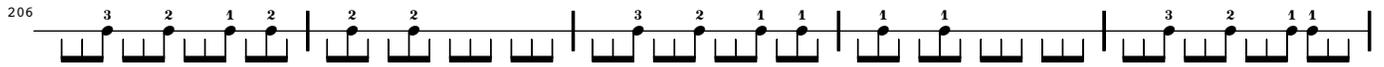
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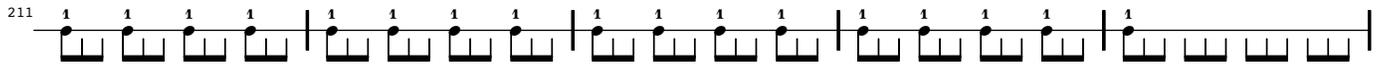
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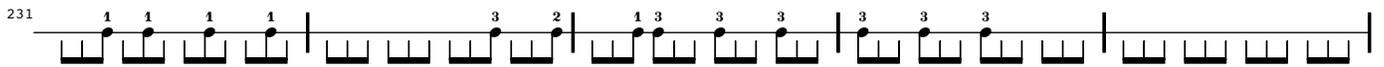
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part 2

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3 3 | 2 1 2 2 | 3 2 1 1 | 1 3 3 3 |

6 3 3 3 3 | 2 1 3 3 | 2 2 3 2 | 1 1 1 2 | 2 2 2 2 |

11 2 3 2 1 | 3 3 3 2 | 1 2 2 1 | 1 1 1 1 | 1 1 1 3 |

16 3 1 | 2 3 2 1 | | 1 3 1 2 | 3 2 3 1 3 2 |

21 3 1 3 2 3 2 3 2 | 3 2 3 1 3 1 3 1 | 3 1 | | 3 2 3 1 |

26 | 2 3 2 1 | | 1 3 1 2 | 2 3 2 1 2 3 | 2 3 2 3 2 3 2 1 |

31 2 3 2 1 2 1 2 1 | 2 1 | | | 3 2 3 1 |

36 | 2 3 2 1 | 1 3 1 2 | 1 3 1 2 1 3 | 1 3 1 3 1 3 1 2 | 1 2 1 2 1 2 1 3 |

41 1 2 | | 3 2 | 3 3 3 2 | 1 | | 2 2 |

46 2 3 2 1 | | 1 1 1 | 3 2 1 | 3 3 3 |

51 3 3 3 3 | 3 3 3 2 1 3 | 3 3 3 3 | 3 3 1 2 3 3 | 3 3 2 1 |

56 3 3 3 3 | 2 1 2 2 | 2 3 2 1 | 1 1 1 |

61 3 3 3 3 | 2 1 | 2 2 2 3 | 2 1 |

66 1 | 1 1 3 2 | 1 2 | 2 2 2 3 1 2 | 2 2 2 2 |

71 2 2 2 2 | 2 2 2 2 1 3 | 2 2 2 3 | 2 1 3 3 | 3 3 2 1 |

76 2 2 2 3 | 2 1 1 1 | 1 | 3 3 |

81 3 3 2 1 | 2 2 2 | 3 2 1 | 1 1 1 |

86 3 2 1 | 1 1 1 | 1 3 2 1 1 1 | 1 1 1 1 2 3 | 1 1 1 1 |

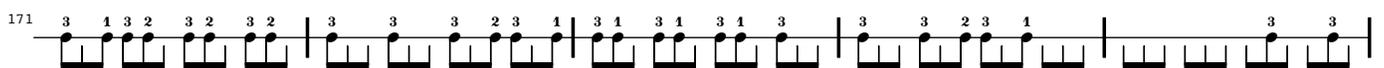
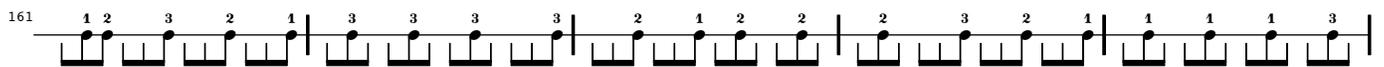
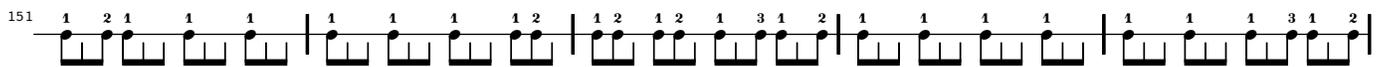
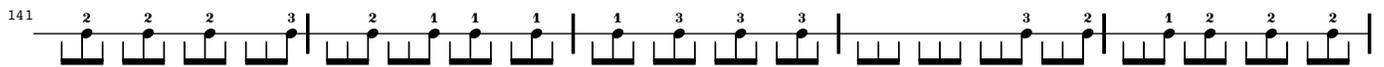
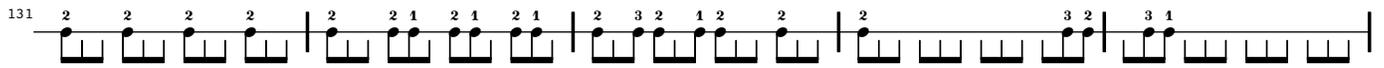
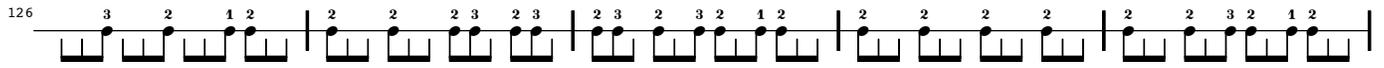
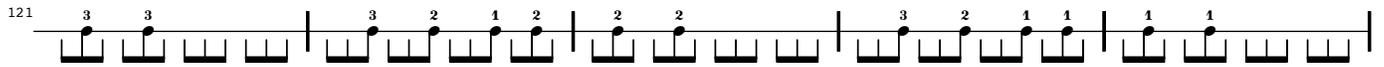
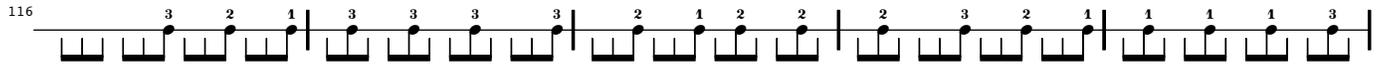
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96 1 1 1 | 3 3 3 | 3 2 | 1 2 2 2 |

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106 3 3 3 3 | 3 2 3 2 3 2 3 2 | 3 1 3 3 3 | 3 3 3 3 1 | 3 1 3 1 3 2 3 1 |

111 3 3 3 | 3 2 3 1 | 2 3 2 1 | 1 3 1 2 |



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236 3 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 2 1 2 |

241 2 2 3 | 2 1 1 1 | 1 3 2 | 1 3 | 3 3 3 2 |

246 1 2 | 2 2 3 2 | 1 | 1 1 | 1 3 2 1 |

251 2 2 2 2 | 2 2 2 2 | 2 2 2 2 |

256 2 2 2 2 | 2 2 2 3 | 3 3 3 | 2 1 2 2 | 2 3 2 1 |

261 1 1 1 | 3 2 1 | 3 3 3 | 3 2 1 |

266 2 2 2 3 | 2 1 | 1 1 1 3 | 2 1 |

271 1 | 1 1 1 1 | 1 1 1 1 | 1 1 1 1 | 1 1 1 1 | 1 1 1 1 |

276 1 3 3 3 | 3 2 1 | 2 2 2 | 3 2 1 1 | 1 1 3 2 |

281 1 3 | 3 3 3 2 | 1 | 2 2 | 2 3 2 1 |

286 1 1 1 | 3 2 1 | 3 3 3 3 | 3 |

291 3 3 | 2 2 | 3 2 1 |

296

Musical staff 296: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '1' and '1'. The next two measures have notes with fingerings '3', '2', '1', '2'. The following two measures have notes with fingerings '2', '2', '2', '2'. The final measure has a note with fingering '2'.

301

Musical staff 301: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '3'. The next two measures have notes with fingerings '3', '2', '1'. The following two measures have notes with fingerings '2', '2'. The final measure has notes with fingerings '1', '1'.

306

Musical staff 306: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '2', '1', '1'. The next two measures have notes with fingerings '1', '1', '1', '1'. The following two measures have notes with fingering '1'.

311

Musical staff 311: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '3'. The next two measures have notes with fingerings '3', '2', '1'. The following two measures have notes with fingerings '2', '2'. The next two measures have notes with fingerings '3', '2', '1', '1'. The final measure has notes with fingerings '1', '3'.

316

Musical staff 316: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '3'. The next two measures have notes with fingerings '3', '2', '1'. The following two measures have notes with fingerings '2', '2'. The next two measures have notes with fingerings '3', '2', '1', '1'. The final measure has notes with fingerings '1', '3'.

321

Musical staff 321: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '3'. The next two measures have notes with fingerings '3', '2', '1'. The following two measures have notes with fingerings '2', '2'. The next two measures have notes with fingerings '3', '2', '1', '1'. The final measure has notes with fingerings '1', '3'.

326

Musical staff 326: A five-line staff with rhythmic notation. The first two measures have notes with fingerings '3', '3'. The next two measures have notes with fingerings '3', '2', '1'. The following two measures have notes with fingerings '2', '2'. The next two measures have notes with fingerings '3', '2', '1', '1'. The final measure has notes with fingerings '1', '3'.

lower limit
for stephen wolfram

part 3

michael winter (1a, 2011)

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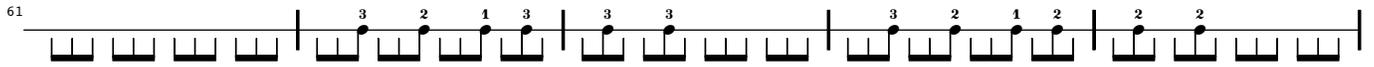
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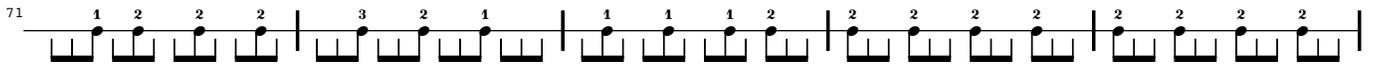
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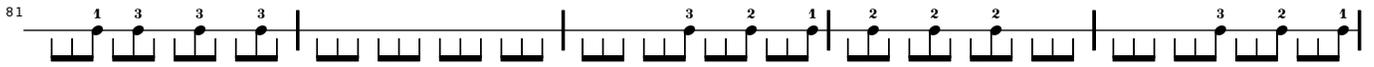
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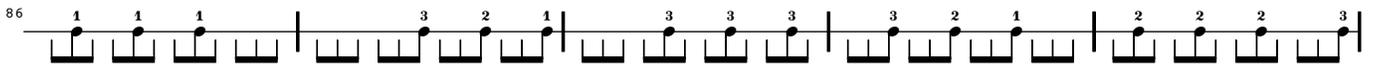
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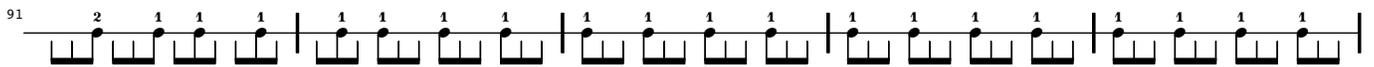
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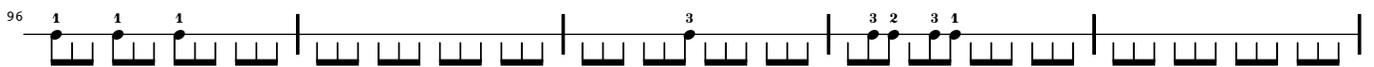
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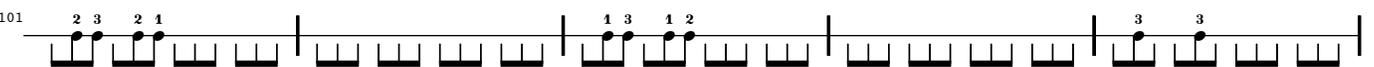
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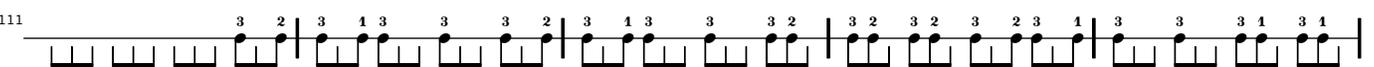
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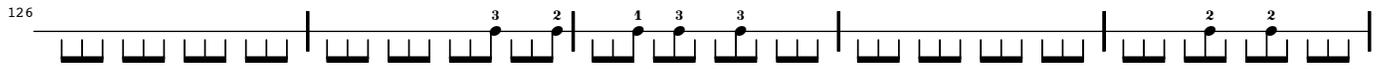
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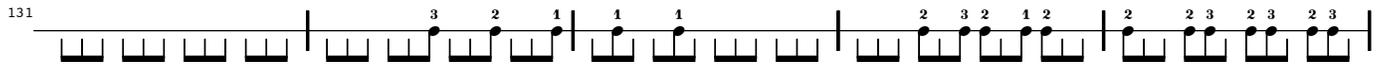
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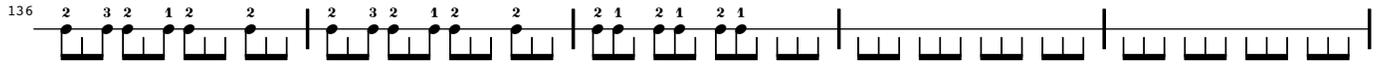
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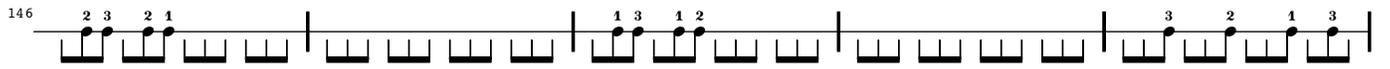
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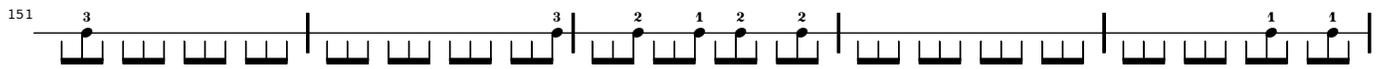
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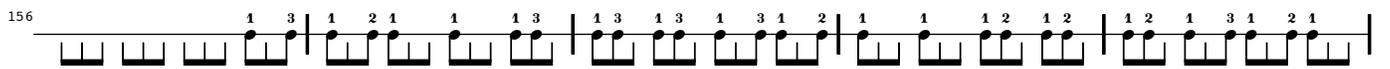
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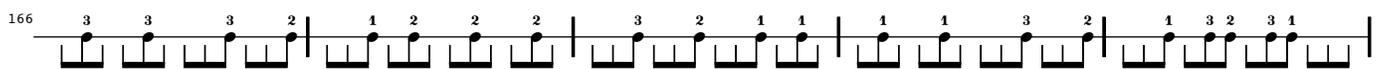
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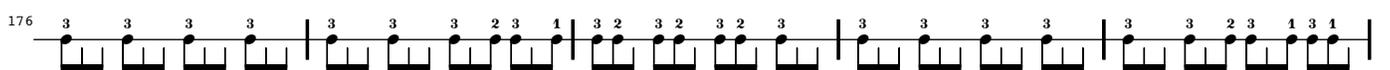
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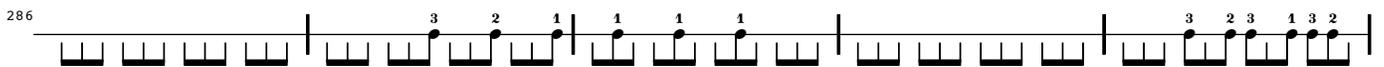
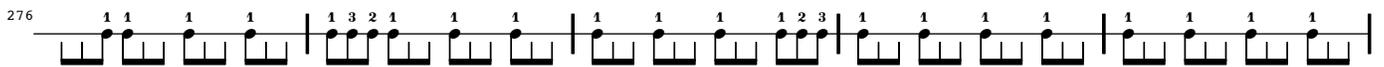
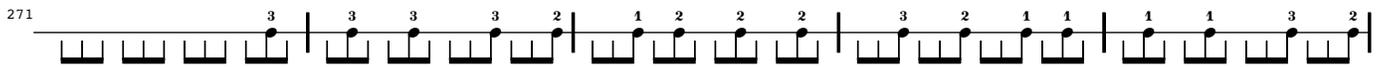
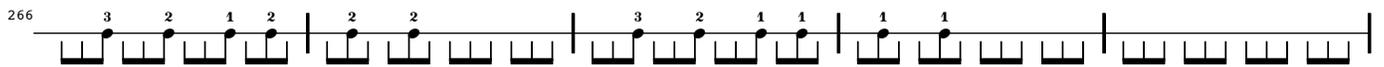
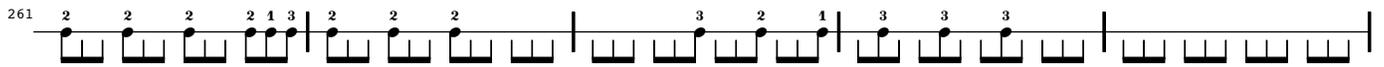
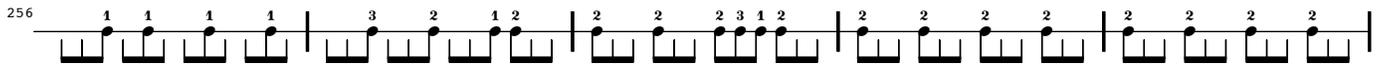
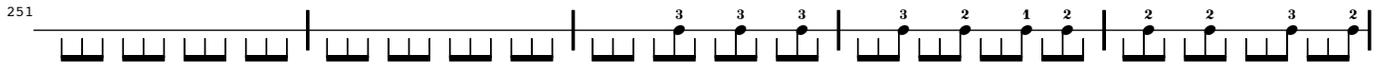
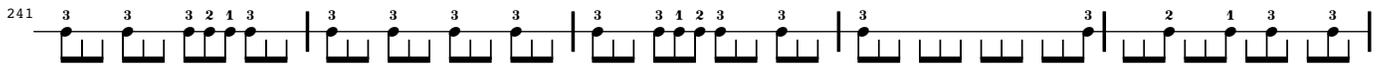
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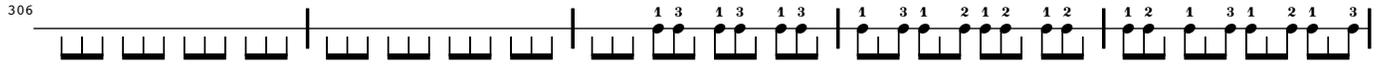


301



Musical notation for measure 301. The staff contains a sequence of notes with fingerings: 2 1, 2 1, 2 1, 2 3, 2 1, 3 2, 3 1, 2 3, 2 1, 1 3, 1 2.

306



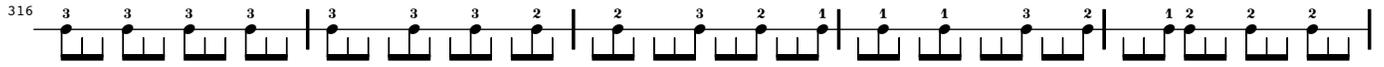
Musical notation for measure 306. The staff contains a sequence of notes with fingerings: 1 3, 1 3, 1 3, 1 3, 1 2, 1 2, 1 2, 1 2, 1 3, 1 2, 1 3.

311



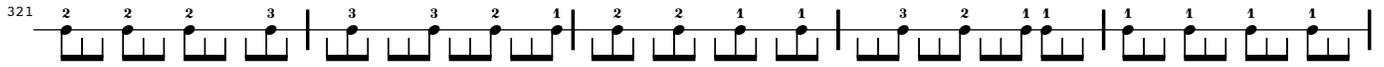
Musical notation for measure 311. The staff contains a sequence of notes with fingerings: 1 2, 3 2, 3 1, 2 3, 2 1, 1 3, 1 2.

316



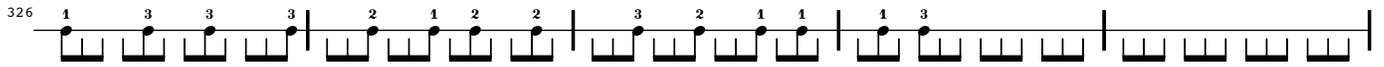
Musical notation for measure 316. The staff contains a sequence of notes with fingerings: 3, 3, 3, 3, 3, 3, 3, 2, 2, 3, 2, 1, 1, 1, 3, 2, 1 2, 2, 2.

321



Musical notation for measure 321. The staff contains a sequence of notes with fingerings: 2, 2, 2, 3, 3, 3, 2, 1, 2, 2, 1, 1, 3, 2, 1 1, 1, 1, 1, 1.

326



Musical notation for measure 326. The staff contains a sequence of notes with fingerings: 1, 3, 3, 3, 2, 1, 2, 2, 3, 2, 1, 1, 1, 3.

lower limit
for stephen wolfram

part 4

michael winter (1a, 2011)

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61 3 3 2 1 | | | 3 3 | | | 2 2 |

66 3 2 1 | | | 1 1 | | | |

71 | | | |

76 | | | 2 2 2 | 2 2 2 3 | 2 1 |

81 | | | 3 3 3 2 | 1 | | | 2 | 2 |

86 | | | 1 | 1 | | | |

91 | | | |

96 1 | 1 1 1 1 | 1 2 1 | 3 3 | 3 3 2 1 |

101 2 2 | 2 3 2 1 | 1 1 | 1 3 2 1 | 3 3 |

106 3 3 2 1 | | | 2 2 2 | 3 2 1 | | |

111 1 1 1 | | | |

116 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 3 3 3 | 3 3 3 3 |

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241 2 1 2 | 2 2 3 2 | 1 1 1 | 1 3 2 3 1 3 | 3 3 3 3 |

246 3 3 2 3 1 3 | 3 3 3 3 | 3 3 2 3 2 3 2 | 3 2 3 1 3 3 | 3 3 3 3 |

251 3 1 3 1 3 1 3 2 | 3 1 2 3 2 1 1 3 | 1 2 3 2 1 | 3 3 3 3 | 2 1 2 2 |

256 2 3 2 1 | 1 1 1 3 | 2 1 3 | 3 3 3 2 | 1 2 2 2 |

261 3 2 1 | 1 1 1 2 3 | 2 1 2 2 2 | 2 2 2 2 3 | 2 3 2 3 2 3 2 1 |

266 2 2 2 2 | 2 2 2 3 2 1 | 2 2 2 2 | 2 2 2 1 2 1 | 2 1 3 2 3 1 2 3 |

271 2 1 1 3 1 2 3 | 2 1 3 3 | 3 3 2 1 | 2 2 2 3 | 2 1 1 1 |

276 1 3 2 1 | 3 3 3 | 3 2 1 | 2 2 2 3 | 2 1 1 1 |

281 1 1 3 1 2 1 | 1 1 1 1 | 1 1 3 1 3 1 3 | 1 3 1 2 1 1 | 1 1 1 1 |

286 1 2 1 2 1 2 1 3 | 1 2 1 1 1 | 1 1 1 3 2 | 3 1 2 3 2 1 1 3 | 1 2 3 3 3 |

291 2 1 2 2 | 3 2 1 1 | 1 3 2 3 1 3 | 3 3 2 3 1 3 | 3 3 2 3 2 |

296 3 2 3 1 3 3 | 3 1 3 1 3 1 3 2 | 3 1 2 3 2 1 1 3 | 1 2 3 2 1 | 3 3 2 2 |

301 3 2 1 1 | 1 2 3 2 1 2 | 2 2 3 2 3 2 3 | 2 3 2 1 2 2 | 2 3 2 1 2 2 |

306 2 1 2 1 2 1 3 2 | 3 1 2 3 2 1 1 3 | 1 2 3 2 1 | 3 3 3 2 | 1 2 2 1 |

311 1 1 3 1 2 1 | 1 1 3 1 3 1 3 | 1 3 1 2 1 1 | 1 2 1 2 1 2 1 3 | 1 2 1 1 3 2 |

316 3 1 2 3 2 1 1 3 | 1 2 3 2 3 1 3 2 | 3 1 3 2 3 2 3 2 | 3 2 3 1 3 1 3 1 | 3 1 3 2 3 1 2 3 |

321 2 1 1 3 1 2 2 3 | 2 1 2 3 2 3 2 3 | 2 3 2 1 2 3 2 1 | 2 1 2 1 2 1 3 2 | 3 1 2 3 2 1 1 3 |

326 1 2 1 3 1 2 1 3 | 1 3 1 3 1 3 1 2 | 1 2 1 2 1 2 1 3 | 1 2 3 2 3 1 2 3 1 | 2 1 3 1 3 2 1 2 3 3 2 1 ||

lower limit
for stephen wolfram

michael winter (1a, 2011)

The image displays a musical score for a piece titled "lower limit" by Michael Winter, composed in 2011. The score is written for two staves, likely representing a piano and a lower voice or another instrument. The notation consists of numbered notes (1-6) placed on a five-line staff, with vertical bar lines indicating the end of measures. The score is organized into systems of five measures each, with measure numbers 6, 11, 16, 21, 26, 31, and 36 marking the beginning of new systems. The notes are often beamed together in groups, suggesting a specific rhythmic pattern. The overall style is minimalist and rhythmic, characteristic of contemporary experimental music.

41

Musical notation for measures 41-45. Each measure contains two staves. The upper staff has a sequence of eighth notes with fingerings: 4, 1 6 5, 1 6 4, 1 5 6, 1 5 4, 1 4 6, 1 4 5 6, 6, 2 6, 1 6 3, 6 3, 6 3, 6, 5 6, 4 6 5, 6 5, 6 5, 6, 3 6, 2. The lower staff has fingerings: 4, 5, 6, 5, 6, 6, 6, 5, 4, 3, 3, 3, 2, 1, 5, 5.

46

Musical notation for measures 46-50. Each measure contains two staves. The upper staff has fingerings: 6, 1 6 2, 6 2, 6 2, 6, 5 6, 4 6 4, 6 4, 6 4, 6, 3 6, 2 6, 1, 6 1, 6 1, 6 1, 6, 5, 6, 4, 6 3, 6 2, 6 1. The lower staff has fingerings: 5, 6, 5, 4, 2, 2, 3, 2, 1, 4, 4, 4, 6, 5, 4, 1, 1, 6, 6, 6.

51

Musical notation for measures 51-55. Each measure contains two staves. The upper staff has fingerings: 3 6, 3 5, 3 4, 5 3, 5 2, 5 1, 2 6, 2 5, 2 4, 4 3, 4 2, 4 1, 1 6, 1 5, 1 4, 3 6, 3 6, 3 6. The lower staff has fingerings: 6, 6, 6, 6, 6, 6, 6 5 4 6, 6, 6, 6, 6, 6, 6, 6 4 5 6, 6, 6, 6, 5, 4.

56

Musical notation for measures 56-60. Each measure contains two staves. The upper staff has fingerings: 3, 6 3, 5 3, 4 3 5, 3 5, 3 5, 3, 6 3, 5, 3, 4 3 4, 3 4, 3 4, 3, 6 3, 5 3, 4, 6 5, 6 4, 5 6, 5 4, 4 6. The lower staff has fingerings: 6, 6, 6, 6, 5, 4, 5, 5, 5, 6, 5, 4, 4, 4, 4, 3, 3, 3, 3, 3, 3.

61

Musical notation for measures 61-65. Each measure contains two staves. The upper staff has fingerings: 4 5 5 6, 5 6, 5 6, 5, 3 5, 2 5, 1 5 3, 5 3, 5 3, 5, 6 5, 4, 5, 3 5, 2 5, 1 5 2, 5 2, 5 2, 5, 6 5, 4. The lower staff has fingerings: 3, 3, 2, 1, 6, 6, 6, 6, 5, 4, 3, 3, 5, 5, 5, 6, 5, 4, 2, 2.

66

Musical notation for measures 66-70. Each measure contains two staves. The upper staff has fingerings: 5 4, 5 4, 5 4, 5 3, 5, 2 5, 1 5 1, 5 1, 5 1, 5, 6 5, 4, 6 3, 6 2, 6 1, 3 6, 3 5, 3 4, 5 3, 5 2. The lower staff has fingerings: 3, 2, 1, 4, 4, 4, 6, 5, 4, 1, 1, 5, 5, 5, 5 6 4 5, 5, 5, 5, 5.

71

Musical notation for measures 71-75. Each measure contains two staves. The upper staff has fingerings: 5 1, 2 6, 2 5, 2 4, 4 3, 4 2, 4 1, 1 6, 1 5, 1 4, 2 6, 2 6, 2 6, 2, 6 2, 5, 2, 4, 2 5, 2 5, 2 5. The lower staff has fingerings: 5, 5, 5, 5, 5, 5, 5, 5 4 6, 5, 5, 5, 6, 5, 4, 6, 6, 6, 6, 5, 4.

76

Musical notation for measures 76-80. Each measure contains two staves. The upper staff has fingerings: 2, 6 2, 5 2, 4 2 4, 2 4, 2 4, 2, 6 2, 5, 2, 4, 6 5, 6 4, 5 6, 5 4, 4 6, 4 5 4 6, 4 6, 4 6, 4, 3 4, 2. The lower staff has fingerings: 5, 5, 5, 6, 5, 4, 4, 4, 4, 2, 2, 2, 2, 2, 2, 2, 3, 2, 1, 6, 6.

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211

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231

236

241

Musical notation for measures 241-245. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

246

Musical notation for measures 246-250. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

251

Musical notation for measures 251-255. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

256

Musical notation for measures 256-260. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

261

Musical notation for measures 261-265. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

266

Musical notation for measures 266-270. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

271

Musical notation for measures 271-275. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

276

Musical notation for measures 276-280. Each measure contains two staves of music with fingerings indicated by numbers 1-6 above or below notes.

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311

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321

2 2 2 3 | 3 3 2 1 | 2 2 1 1 | 3 2 1 1 | 1 1 1 1

2 1 1 3 | 1 2 2 3 | 2 1 2 3 | 2 3 2 3 | 2 3 2 1 | 2 1 2 1 | 2 1 3 2 | 3 1 2 3 | 2 1 1 3

326

1 3 3 3 | 2 1 2 2 | 3 2 1 1 | 1 3 |

1 2 1 3 | 1 2 1 3 | 1 3 1 2 | 1 2 1 2 | 1 2 1 3 | 1 2 3 2 | 3 1 2 2 | 3 1 2 1 | 3 1 3 2 | 1 2 3 3 | 2 1 3 1 | 3 2 1 2 | 3 3 2 1

lower limit

for stephen wolfram

part 1

michael winter (1a, 2011)

6 4 5 5 6 4 5 4 6 4 6 5 | 4 5 6 6 5 4 6 4 6 5 | 6 5 6 5 6 5 6 4 | 6 4 6 4 6 4 6 5 |

5 6 4 6 5 6 4 5 6 | 5 4 4 6 4 5 5 6 | 5 6 5 6 5 6 5 4 | 5 6 5 4 5 4 5 4 |

9 5 4 5 6 5 4 6 5 | 6 4 5 6 5 4 4 6 | 4 5 4 6 4 6 4 6 | 4 6 4 5 4 5 4 5 |

13 4 5 4 6 4 5 4 6 | 4 5 6 5 6 4 5 6 | 5 4 4 6 4 5 6 5 | 6 6 3 5 6 3 4 6 5 3 |

17 6 5 2 6 5 1 6 6 | 6 2 5 6 2 4 6 4 3 6 4 2 | 6 4 1 6 6 6 1 5 | 6 1 4 6 6 5 |

21 5 6 5 4 4 4 6 5 | 4 3 6 5 3 6 4 3 5 6 | 3 5 4 3 4 6 3 4 5 5 6 3 |

25 5 6 2 5 6 1 5 5 | 5 3 6 5 3 4 5 5 | 5 2 6 5 2 4 5 4 3 5 4 2 | 5 4 1 5 5 5 1 6 |

29 5 1 4 6 6 6 | 5 4 5 5 | 4 4 6 5 | 4 2 6 5 2 6 4 2 5 6 |

33 2 5 4 2 4 6 2 4 5 4 6 3 | 4 6 2 4 6 1 4 4 | 4 3 6 4 3 5 4 5 3 4 5 2 | 4 5 1 4 4 4 2 6 |

37 4 2 5 4 4 4 1 6 | 4 1 5 6 6 6 | 5 4 5 5 | 6 5 4 4 |

41 4 1 6 5 1 6 4 1 5 6 | 1 5 4 1 4 6 1 4 5 6 | 6 2 6 1 6 3 6 3 | 6 3 6 5 6 4 6 5 |

45 6 5 6 5 6 3 6 2 | 6 1 6 2 6 2 6 2 | 6 5 6 4 6 4 6 4 | 6 4 6 3 6 2 6 1 |

49 **6 1 6 1 6 1 6 5 | 6 4 6 3 6 2 6 1 | 3 6 3 5 3 4 5 3 | 5 2 5 1 2 6 |**

53 **2 5 2 4 4 3 4 2 | 4 1 1 6 1 5 | 1 4 3 6 3 6 3 6 | 3 6 3 5 3 4 3 5 |**

57 **3 5 3 5 3 6 3 5 | 3 4 3 4 3 4 3 4 | 3 6 3 5 3 4 6 5 | 6 4 5 6 5 4 4 6 |**

61 **4 5 5 6 5 6 5 6 | 5 3 5 2 5 1 5 3 | 5 3 5 3 5 6 5 4 | 5 3 5 2 5 1 5 2 |**

65 **5 2 5 2 5 6 5 4 | 5 4 5 4 5 4 5 3 | 5 2 5 1 5 1 5 1 | 5 1 5 6 5 4 6 3 |**

69 **6 2 6 1 3 6 | 3 5 3 4 5 3 5 2 | 5 1 2 6 2 5 2 4 | 4 3 4 2 4 1 |**

73 **1 6 1 5 1 4 2 6 | 2 6 2 6 2 6 2 5 | 2 4 2 5 2 5 2 5 | 2 6 2 5 2 4 2 4 |**

77 **2 4 2 4 2 6 2 5 | 2 4 6 5 6 4 5 6 | 5 4 4 6 4 5 4 6 | 4 6 4 6 4 3 4 2 |**

81 **4 1 4 3 4 3 4 3 | 4 6 4 5 4 5 4 5 | 4 5 4 3 4 2 4 1 | 4 2 4 2 4 2 4 6 |**

85 **4 5 4 3 4 2 4 1 | 4 1 4 1 4 1 4 6 | 4 5 6 3 6 2 6 1 | 3 6 3 5 3 4 |**

89 **5 3 5 2 5 1 | 2 6 2 5 2 4 4 3 | 4 2 4 1 1 6 1 5 | 1 4 1 6 1 6 1 6 |**

93 **1 6 1 5 1 4 1 5 | 1 5 1 5 1 6 1 5 | 1 4 1 4 1 4 1 4 | 1 6 1 5 1 4 6 5 |**

97 **6 4 5 6 5 4 4 6 | 4 5 6 3 6 6 | 6 3 2 6 3 1 6 6 | 6 6 6 6 |**

101 6 2 3 6 2 1 6 6 | 6 6 6 6 | 6 1 3 6 1 2 6 6 | 6 6 6 6 |

105 3 3 6 5 | 4 5 5 5 | 3 2 1 2 | 2 6 5 4 |

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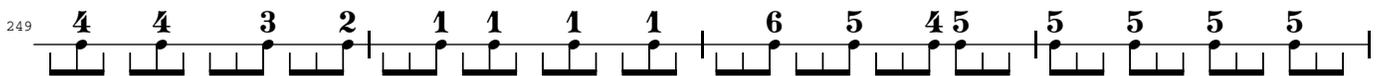
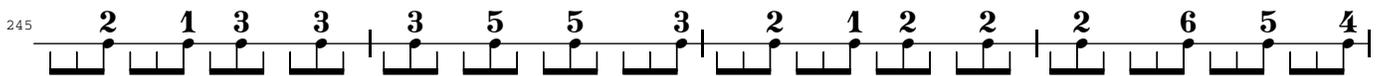
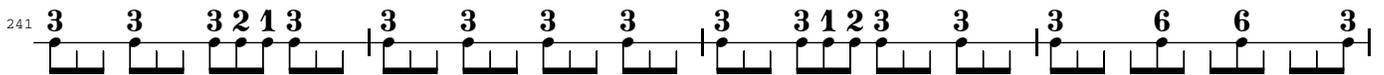
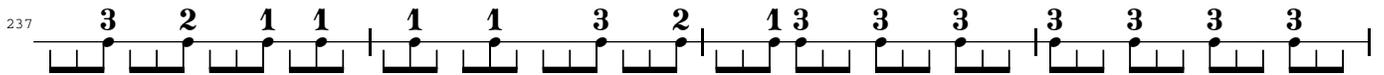
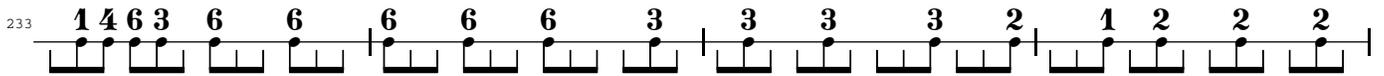
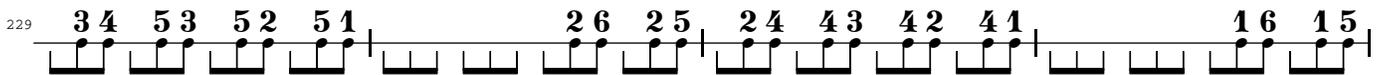
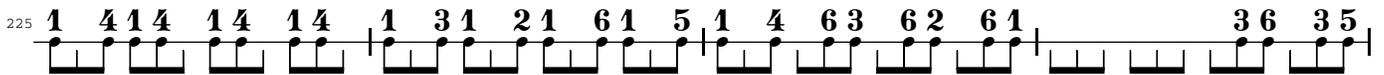
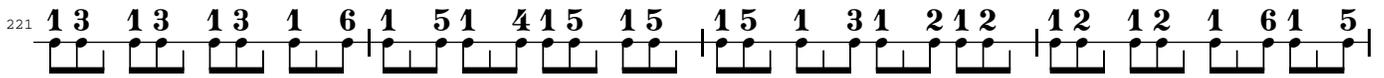
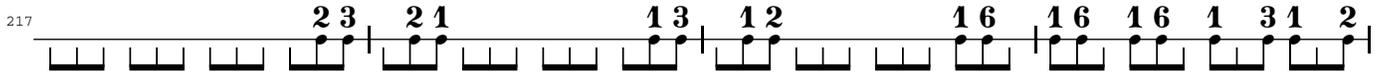
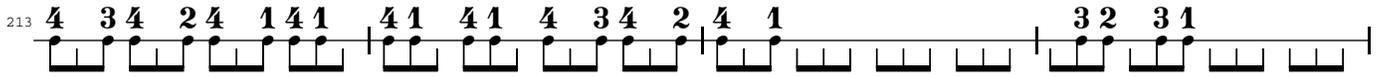
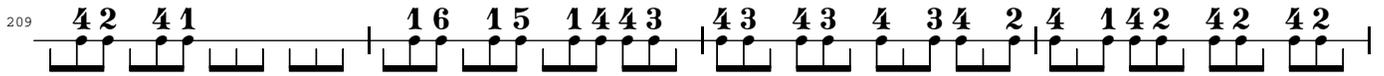
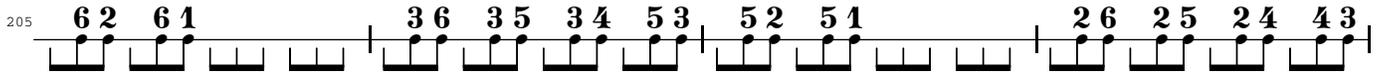
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lower limit
for stephen wolfram

part 2

michael winter (1a, 2011)

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