

# Mozart's Dice Game

Ed Keppelmann – University of Nevada Reno

With excellent Assistance from  
Jeremy Keppelmann

PhD Candidate – Music Performance Indiana University



Table des Chiffres pour le Walzer.  
 Zahlentafel für den Walzer.

<https://dice.humdrum.org/>

Premiere Partie.  
 Erster Theil.

	A	B	C	D	E	F	G	H
2	96	22	141	41	105	122	11	30
3	32	6	128	63	146	46	134	81
4	69	95	158	13	153	55	110	24
5	40	17	113	85	161	2	159	100
6	148	74	163	45	80	97	36	107
7	104	157	27	167	154	68	118	91
8	152	60	171	53	99	133	21	127
9	119	84	114	50	140	86	169	94
10	98	142	42	156	75	129	62	123
11	3	87	165	61	135	47	147	33
12	54	130	10	103	28	37	106	5

Seconde Partie.  
 Zweiter Theil.

	A	B	C	D	E	F	G	H
2	70	121	26	9	112	49	109	14
3	117	39	126	56	174	18	116	83
4	66	139	15	132	73	58	145	79
5	90	176	7	34	67	160	52	170
6	25	143	64	125	76	136	1	93
7	138	71	150	29	101	162	23	151
8	16	155	57	175	43	168	89	172
9	120	88	48	166	51	115	72	111
10	65	77	19	82	137	38	149	8
11	102	4	31	164	144	59	173	78
12	35	20	108	92	12	124	44	131

Strada da Violoncello in G. m. d. l.  
K. 515

M.

écritures de Nissen : Non Mozart und seiner Handschrift.

Baglio  
ma non  
troppo.

Handwritten musical score for Strada da Violoncello in G major, K. 515. The score consists of seven staves of music. The first two staves are for the violin and viola parts, with dynamics markings like "piaz" and "cresc: for:". The remaining five staves are for the cello part. The notation includes various note values, rests, and articulation marks. There are two red circular library stamps: one in the middle of the score and another in the bottom right corner.

Ms-253

Handwritten musical score on ten staves. The notation includes treble clefs, various note values (quarter, eighth, sixteenth notes), rests, and dynamic markings such as *ff* and *f*. The manuscript is densely written with complex rhythmic patterns and phrasing. A red circular stamp is visible in the middle of the page, partially overlapping the fifth and sixth staves.



# Playing the game as Mozart intended



## Table des Chiffres pour le Walzer. Zahlentafel für den Walzer.

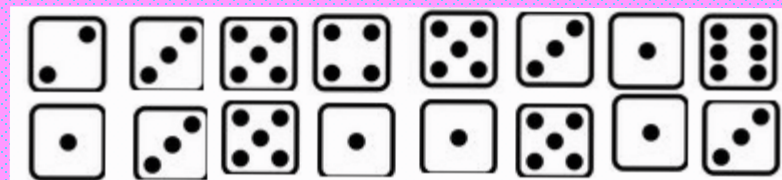
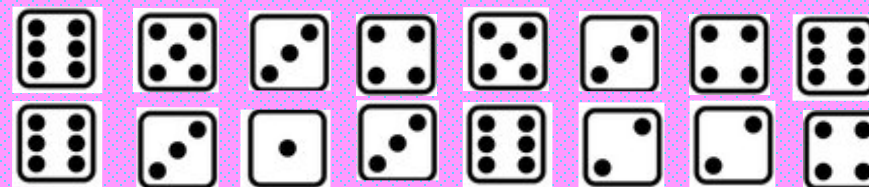
### Première Partie. Erster Theil.

### Seconde Partie. Zweiter Theil.

	A	B	C	D	E	F	G	H
2	96	22	141	41	105	122	11	30
3	32	6	128	63	146	46	134	81
4	69	95	158	13	153	55	110	24
5	40	17	113	85	161	2	159	100
6	148	74	163	45	80	97	36	107
7	104	157	27	167	154	68	118	91
8	152	60	171	53	99	133	21	127
9	119	84	114	50	140	86	169	94
10	98	142	42	156	75	129	62	123
11	3	87	165	61	135	47	147	33
12	54	130	10	103	28	37	106	5

	A	B	C	D	E	F	G	H
2	70	121	26	9	112	49	109	14
3	117	39	126	56	174	18	116	83
4	66	139	15	132	73	58	145	79
5	90	176	7	34	67	160	52	170
6	25	143	64	125	76	136	1	93
7	138	71	150	29	101	162	23	151
8	16	155	57	175	43	168	89	172
9	120	88	48	166	51	115	72	111
10	65	77	19	82	137	38	149	8
11	102	4	31	164	144	59	173	78
12	35	20	108	92	12	124	44	131



PLAY AUDIO  
GAMEPLAYED

There are only two different measures in these columns

In all other columns,  
every measure is different

$$12^{16} = 184884258895036416$$

Possible outcomes?

Mozart Lived January 27, 1756  
to December 5 1791

Mozart was born

≈ 84872448 minutes ago!

Imagine playing the game  
Every minute since  
Mozart's birth  
with a different outcome

**84872448**

**$2 \cdot 2 \cdot 12^{14}$**

**4093**

**=  $\frac{84872448}{247669456896}$**

A B C D E F G H

2	96	22	141	41	105	122	11	30
3	32	6	128	63	146	46	134	81
4	69	95	158	13	153	55	110	24
5	40	17	113	85	161	2	159	100
6	148	74	163	45	80	97	36	107
7	104	157	27	167	154	68	118	91
8	152	60	171	53	99	133	21	127
9	119	84	114	50	140	86	169	94
10	98	142	42	156	75	129	62	123
11	3	87	165	61	135	47	147	33
12	54	130	10	103	28	37	106	5

A B C D E F

2	70	121	26	9	112	49	109	14
3	117	39	126	56	174	18	116	83
4	66	139	15	132	73	58	145	79
5	90	176	7	34	67	160	52	170
6	25	143	64	125	76	136	1	93
7	138	71	150	29	101	162	23	151
8	16	155	57	175	43	168	89	172
9	120	88	48	166	51	115	72	111
10	65	77	19	82	137	38	149	8
11	102	4	31	164	144	59	173	78
12	35	20	108	92	12	124	44	131

Upper bound on fraction of available minuets played so far

# Rolling all two's

A musical score for a piece titled "Rolling all two's". The score is written for piano in 3/8 time. It consists of two staves, treble and bass. The piece is divided into two main sections, 1 and 2, separated by a repeat sign. Section 1 starts at measure 30 and ends at measure 11. Section 2 starts at measure 70 and ends at measure 14. The score includes various musical notations such as notes, rests, and dynamic markings.

PLAY AUDIO ALLTWO'S

Rolling almost all 12s – with the other repeat and other ending

A musical score for a piece titled "Rolling almost all 12s". The score is written for piano in 3/8 time. It consists of two staves, treble and bass. The piece is divided into two main sections, 1 and 2, separated by a repeat sign. Section 1 starts at measure 121 and ends at measure 11. Section 2 starts at measure 35 and ends at measure 78. The score includes various musical notations such as notes, rests, and dynamic markings.

PLAY AUDIO ALMOSTALL12

**While working with some teachers in Vegas  
there was the thinking:  
This seems to work (i.e. always sound good)  
since every measure essentially  
accomplishes the same kind of musical phrase  
in a different way....**

So there must be some  
structure to the  
Game! Does that mean  
Mozart had mathematical  
thoughts – thoughts  
going beyond  
the music?

**The mathematician in me then said – “if that is true then we should  
be able to permute the columns and get good (NEW) Mozart music.”**

Jeremy the musician then said  
“Why do we need to do that?  
We have enough good Mozart already!”



**But this doesn't work?!!!**



## Randomly permuting the columns



The image shows a musical score for a minuet, consisting of two staves (treble and bass clef). The score is presented in a non-chronological order, illustrating a random permutation of the columns. The measures are numbered as follows: 143, 36, 76, 19, 109, 117, 34, 111, 168, 54, 2, 60, 167, 135, 2, 158. The score is presented in a non-chronological order, illustrating a random permutation of the columns.

PLAY AUDIO RANDOMPERMUTE

It's not musically correct.  
The minuet form is not followed and  
the end occurs in the middle!

# Mozart Dice Game

Analysis by Jeremy Keppelmann

Game as Intended

54 60 158 167 135 2 36 1. 123 2.

CM: I ——— V ——— | ——— V<sup>7</sup>/V — V ——— V<sup>7</sup>/V ———

GM: I V

Detailed description: This block contains the first system of musical notation for measures 54 through 123. The notation is in 3/8 time and consists of two staves: a treble clef staff and a bass clef staff. Above the treble staff, measure numbers 54, 60, 158, 167, 135, 2, 36, 1. 123, and 2. are indicated. The music features a sequence of chords and melodic lines. Below the notation, Roman numeral analysis is provided for both Common Meter (CM) and Game Meter (GM). The CM analysis shows a sequence of I, V, V<sup>7</sup>/V, V, and V<sup>7</sup>/V. The GM analysis shows I and V. A black box highlights a specific analysis for the V chord in the GM system.

I ⇒ C major so V ⇒ G major & Tonicized chord on chord  $\frac{V^7}{V} \Rightarrow D$  major

117 143 19 34 76 168 109 111

GM: V ——— | ——— IV

CM: I ——— V ——— | ——— V<sup>7</sup> ——— |

Detailed description: This block contains the second system of musical notation for measures 117 through 111. The notation is in 3/8 time and consists of two staves: a treble clef staff and a bass clef staff. Above the treble staff, measure numbers 117, 143, 19, 34, 76, 168, 109, and 111 are indicated. The music continues the sequence from the first system. Below the notation, Roman numeral analysis is provided for both Game Meter (GM) and Common Meter (CM). The GM analysis shows V and IV. The CM analysis shows I, V, and V<sup>7</sup>. The IV and V<sup>7</sup> chords in the GM and CM analyses are enclosed in boxes.

Looking carefully down each column, Jeremy verified that each game outcome has this analysis.

So if we permute within this structure we get new Mozart Music!

Something the game would never give – start with the game we generated and do the steps given

## C & G Major Swapping

\*Roman Numeral Analysis for 2s, 12s, and swapping remain the same as the original “Game as Intended” example

Musical score for the first system, measures 76 to 123. The score is in treble and bass clefs. Above the staff, measure numbers are written: 76, 60, 109, 54, 135, 158, 36, and 123. The key signature has one sharp (F#). The piece ends with a first and second ending.

Musical score for the second system, measures 117 to 111. The score is in treble and bass clefs. Above the staff, measure numbers are written: 117, 2, 167, 143, 19, 168, 34, and 111. The key signature has one sharp (F#).

Fundamentally different  
but follows the rules?

The original should be modified as follows: (permuting some C majors)

- Measure #1 (54) replaces measure #4 (167)
- Measure #4 (167) should replace measure #11 (19)
- Measure #11 (19) should replace measure #13 (76)
- Measure #13 (76) should replace measure #1 (54)

Note that Mozart's 54 is very close to column 1 Mozart 148 but they are ever so slightly different.

ALSO DO (permuting some G Majors)

- Measure #3 (158) replaces measure #6 (2)
- Measure #6 (2) replaces measure #10 (143)
- Measure #10 (143) replaces measure #12 (34)
- Measure #12 (34) replaces measure #15 (109)
- Measure #15 (109) replaces Measure #3 (158)

PLAY AUDIO PERMUTESTRUCTURE

Dice Game Tune:  
Based on the Dice Game Structure  
of W. A. Mozart

Jeremy Keppelmann

KEY: G MAJOR  
TIME SIGNATURE: 6/8

$\frac{6}{8}$  as opposed to Mozart's  $\frac{3}{8}$   
means measures are twice as long.  
to illustrate the chords

Same Mozart Structure but transposed  
C major is replaced by G major  
G major is replaced by D major

$I \Rightarrow G$  major so  $V \Rightarrow D$  major & Tonicized chord on chord  $\frac{V^7}{V} \Rightarrow A$  major

PLAY AUDIO  
JEREMYCOMPOSITION