Yongwoo Lee

Exponential Prelude

for Piano Trio
and Live Electronics

2023

PROGRAM NOTE
곡 해설

피아노 삼중주와 라이브 일렉트로닉스를 위한 곡 Exponential Prelude는 지수 함수(exponential function)를 적극 활용한 곡이다. 삼중주의 각 악기 소리에 반응하는 전자음향들은 시간(time)과 기울기를 매개변수로 하여, 다양한 그래프의 모양을 가지고 지수함수에서 옥타브를 등분 짓는 수(nums)에 따라 다양한 지점들의 비율을 얻어 리듬가와 음정을 얻어 실제 라이브 음원에 더하며 미분화된 미세한 소리를 다룬다. 즉, 지수 함수에서 나타나는 굴곡적인 그래프에서 발견한 함수적 특성을 악기의 음에 대응하는 인위적 하모닉스와 같은 전자음향을 만들어내는 수단으로서 활용한 것이다. 다양한 기울기(slope)와 매개변수 등으로부터 만들어지는 지수 함수에서 추출한 특정 비율의 값들은 악기의 소리 위에 마치 인위적인 배음과 같이 쌓이며, 각 배음의 리듬 또한 위의 비율에 의해 세분화된다.

함수로부터 비롯된 인위적인 배음렬(artificial harmonics series)들은 곡의 초기에는 마치 배음(overtone)의 의미와 같이 기음으로부터 점차 시간 간격을 두고 그 배음들이 나타는 것과 같이 점진적으로 지수 함수의 기울기에 비례하여 나타난다. 그러던 전자음들은 점차 라이브 악기들의 소리에 지연 없이 즉각적으로 반응하며 연주의 라이브 음향과 딜레이를 두지 않고 인위적인 배음렬들이 실제 악기 소리와 합쳐져 하나의 음색이 되어버린다. 이러한 곡의 전개는 마치 지수 함수가 x값이 증가할수록 y값이 조밀해지는 것을 연상시키듯 리듬이 점차 조밀해지며 템포가 빨라지는 것으로 나타난 것이다. 더불어, 곡의 구성 상에 나타나는 상대적으로 협화적인 부분들은 이러한 인위적인 하모닉스들이 자연적인 배음렬로 환기되는 것을 의미하며, 이러한 특징들은 수학적인 정렬 상태와 비정렬 상태를 떠올릴 수 있게 한다.

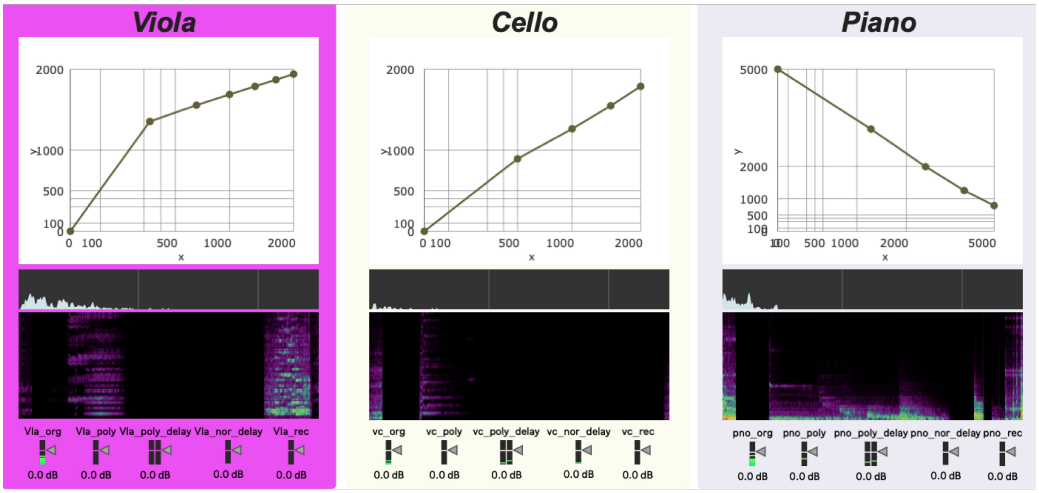
* 괄호 안의 영어는 맥스(max)에서 강조된 매개변수들을 확인하기 쉽게 하기 위해 첨가되었습니다.
* 첨부된 시뮬레이션 음원은 사보프로그램 MIDI 음원으로부터 추출된 한계로 인해 extended technique을 비롯한 다양한 기법들이 제대로 적용되지 못하였고, 이 곡의 모든 전자음은 실제 악기에서부터 비롯된 소리이나 위와 같은 이유로 실제 공연에서의 소리와 동일하지 않습니다.

The piece *Exponential Prelude* for piano trio and live electronics extensively utilizes exponential functions. The electronic sounds, responsive to each instrument's sound in the trio, are parameterized by *time* and *slope*. They take on various shapes based on different graphs and divide octaves in the exponential function, obtaining ratios of various points according to the number of divisions (*nums*). These ratios contribute rhythm and pitch to the actual live audio, dealing with differentiated subtle sounds, microtones. Essentially, the piece employs the functional characteristics found in the exponential function, creating electronic sounds akin to artificial harmonics corresponding to an natural overtone series of instruments. The values extracted from the exponential function, derived from various *slopes* and parameters, are stacked upon the sound of the instruments, much like artificial overtones, and the rhythm of each electronics is also finely subdivided according to the above ratios.

The artificial harmonic series derived from functions gradually emerge in the initial stages of the piece, much like overtones gradually manifesting from a fundamental tone over time, in proportion to the slope of the exponential function. Meanwhile, the electronic sounds seamlessly and immediately respond to the live instruments without delay, blending the artificial harmonic series with the actual instrument sounds to form a distinctive and unified timbre. The development of the piece is reminiscent of how, as the x-values increase in an exponential function, the function's y-values become denser, just like in music, where the rhythm gradually densifies and the tempo accelerates. Additionally, the relatively consonant sections in the composition signify the transition of these artificial harmonics into natural harmonic series, evoking both ordered and disordered mathematical states.

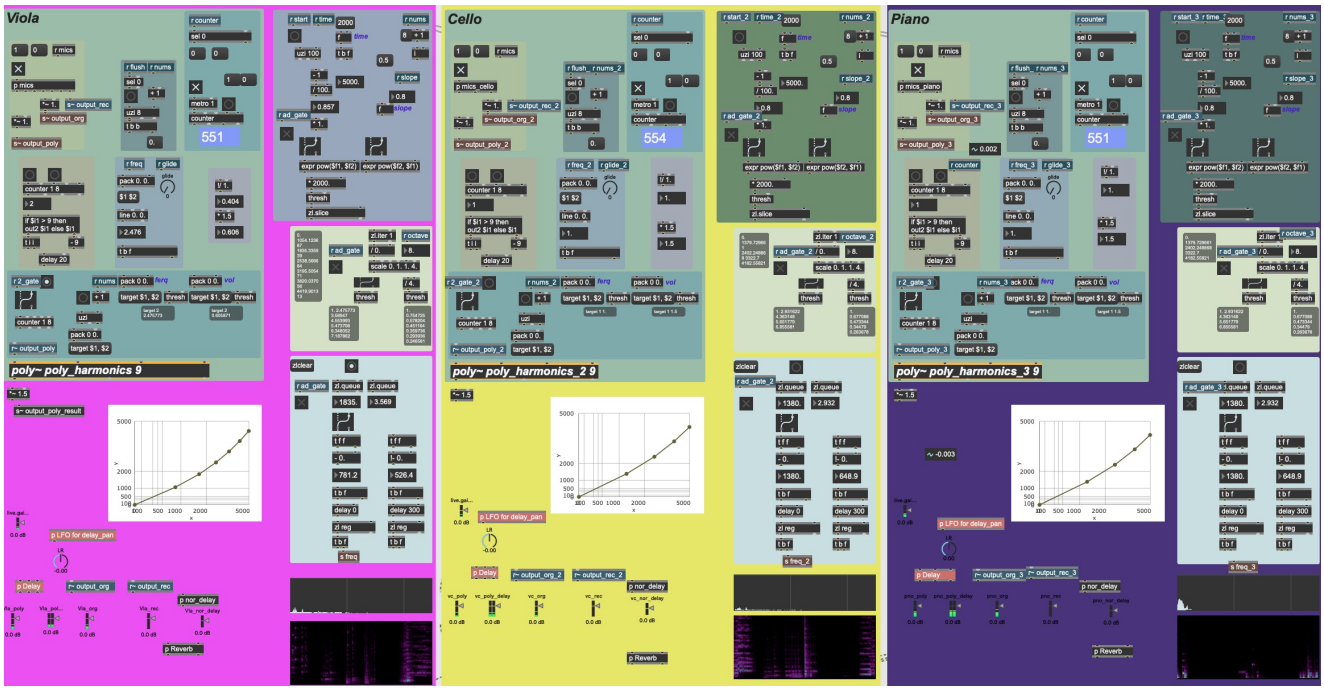
* The italic font indicates the parameter values of Max so that they can be checked.
* The attached simulation sound source was not properly applied with various techniques, including extended techniques, due to the limitations extracted from the program MIDI sound source, and all electronic sounds of this piece are not the same as those of the actual performance for the above reasons.

MAX Patch



맥스로 표현된 위의 그래프는 함수의 기울기에 따라 달라지는 곡선과 그에 따른 시간과 음정의 비율을 포인트의 개수에 따라 등분하여 나타냈다. 함수에서 얻어진 다양한 포인트들은 poly~ 오브젝트를 통해 라이브 음원을 다양한 시간의 간격과 마이크로한 음정으로 pfft~를 통해 각기 프로세싱되었다. 이 곡은 4개의 마이크(vla vc. 1개씩, pno 2개)를 필요로 하며, 2ch 스테레오 환경을 대상으로 작곡되었다.

The graph above, depicted in Max, illustrates the curve that varies based on the function's slope, indicating the number of points affecting the ratio of time and pitch. The function's multiple points were processed using pfft~ with diverse time intervals and micro pitches via the poly~ object. This composition necessitates the use of four microphones (one for the viola, one for the cello, and two for the piano), and it was designed for a two-channel stereo environment.



NOTATION

Strings (for vla, vc.)

damping the string to make white noise (w.n.)

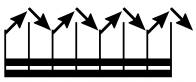
bowing on the bridge (o.t.b.)

bowing behind the bridge (b.t.b.)

circular bowing (c.b.)

a highest note

notes of indefinite pitch
relating with chance music



rub the bow up and down
on the string

Piano

tap the wood located at front below the keyboard

pluck the string inside

sweep the surface of the white keys
with the fingernails to produce the noise

knock a fallboard with knuckles

Common

" ***mp*** "

action dynamics: intensity of playing,
not related to the absoulte volume

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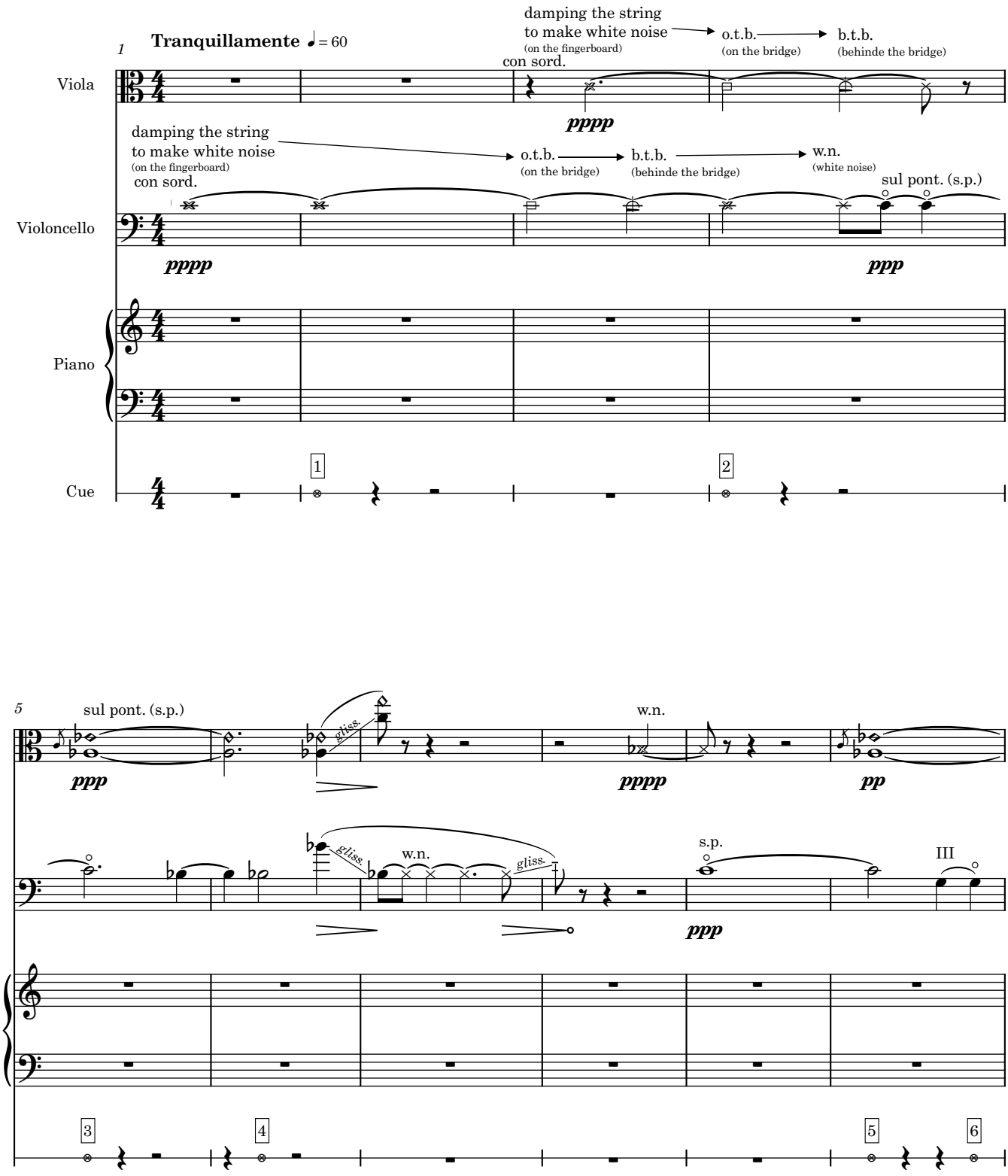
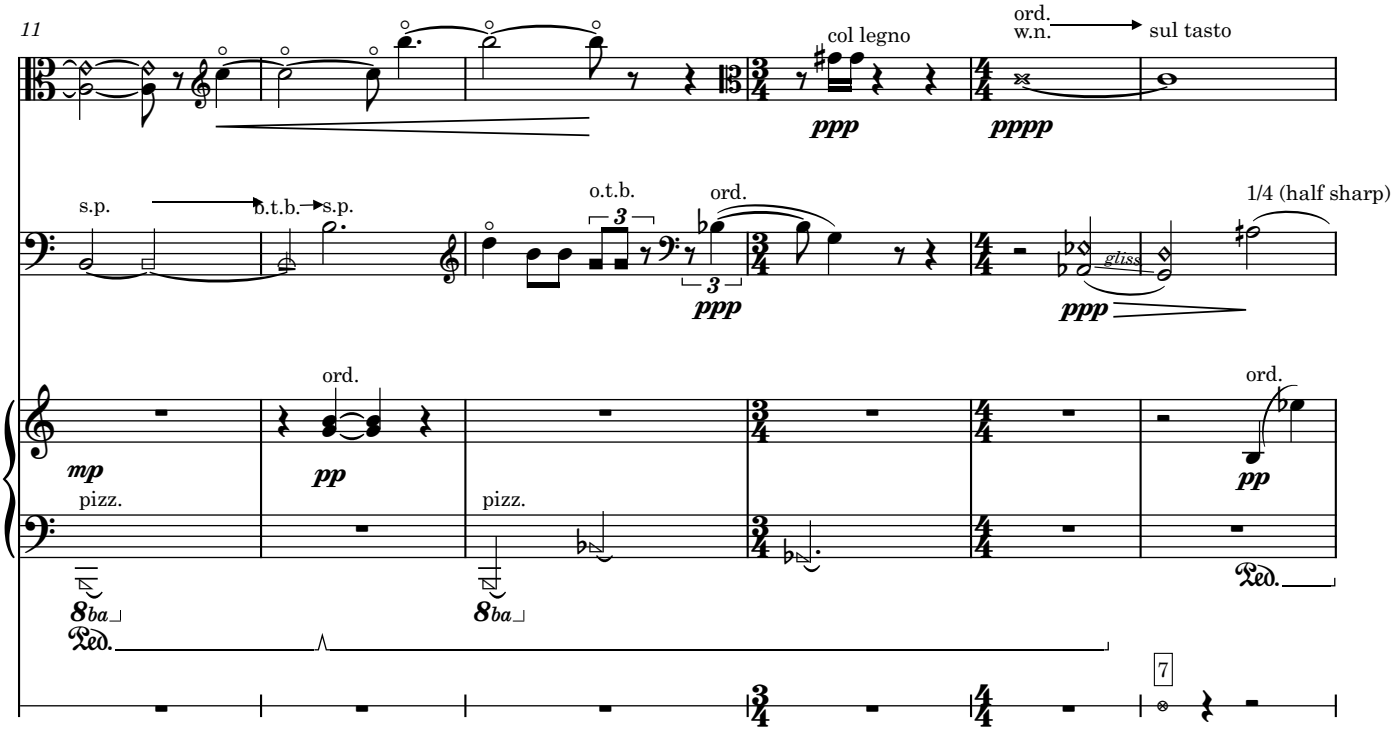
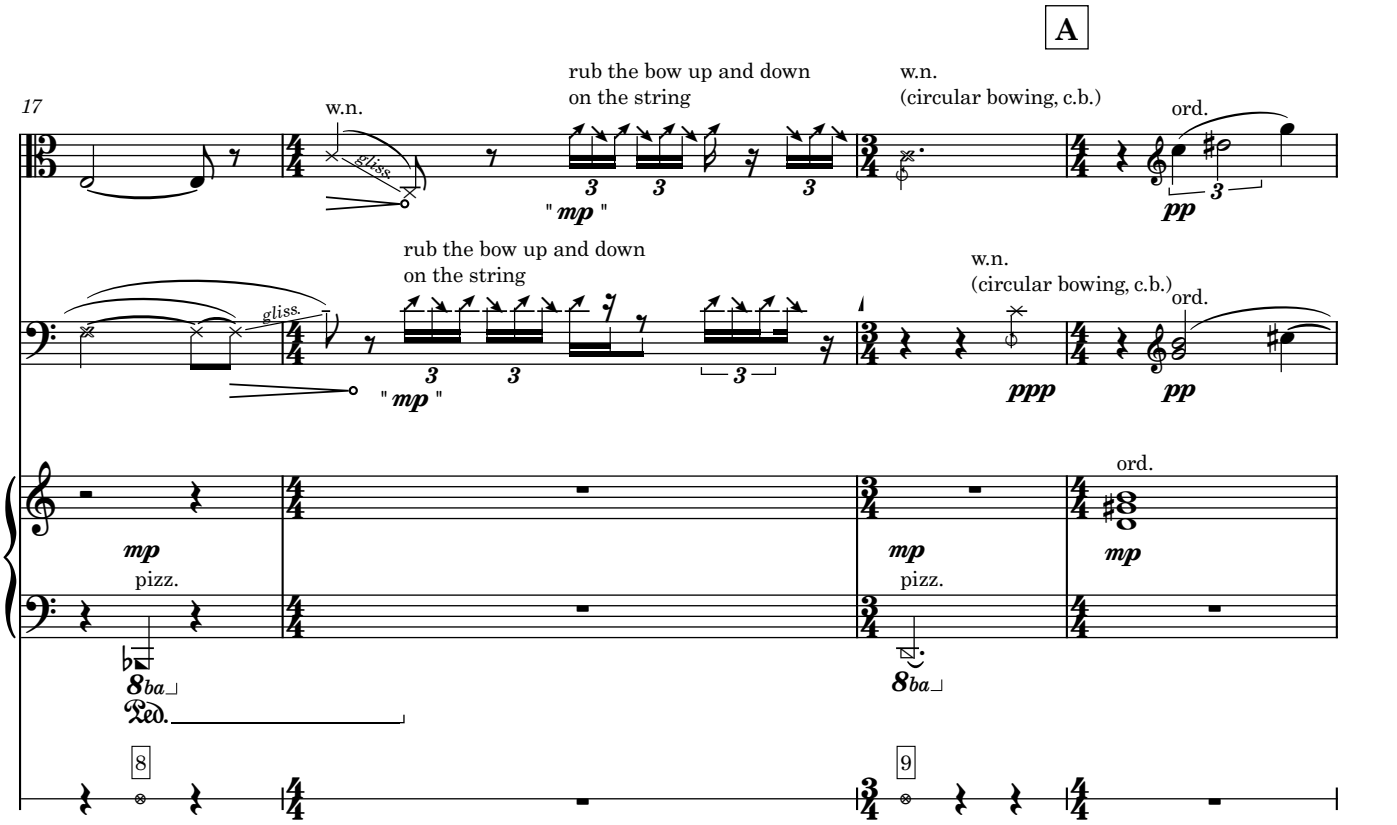
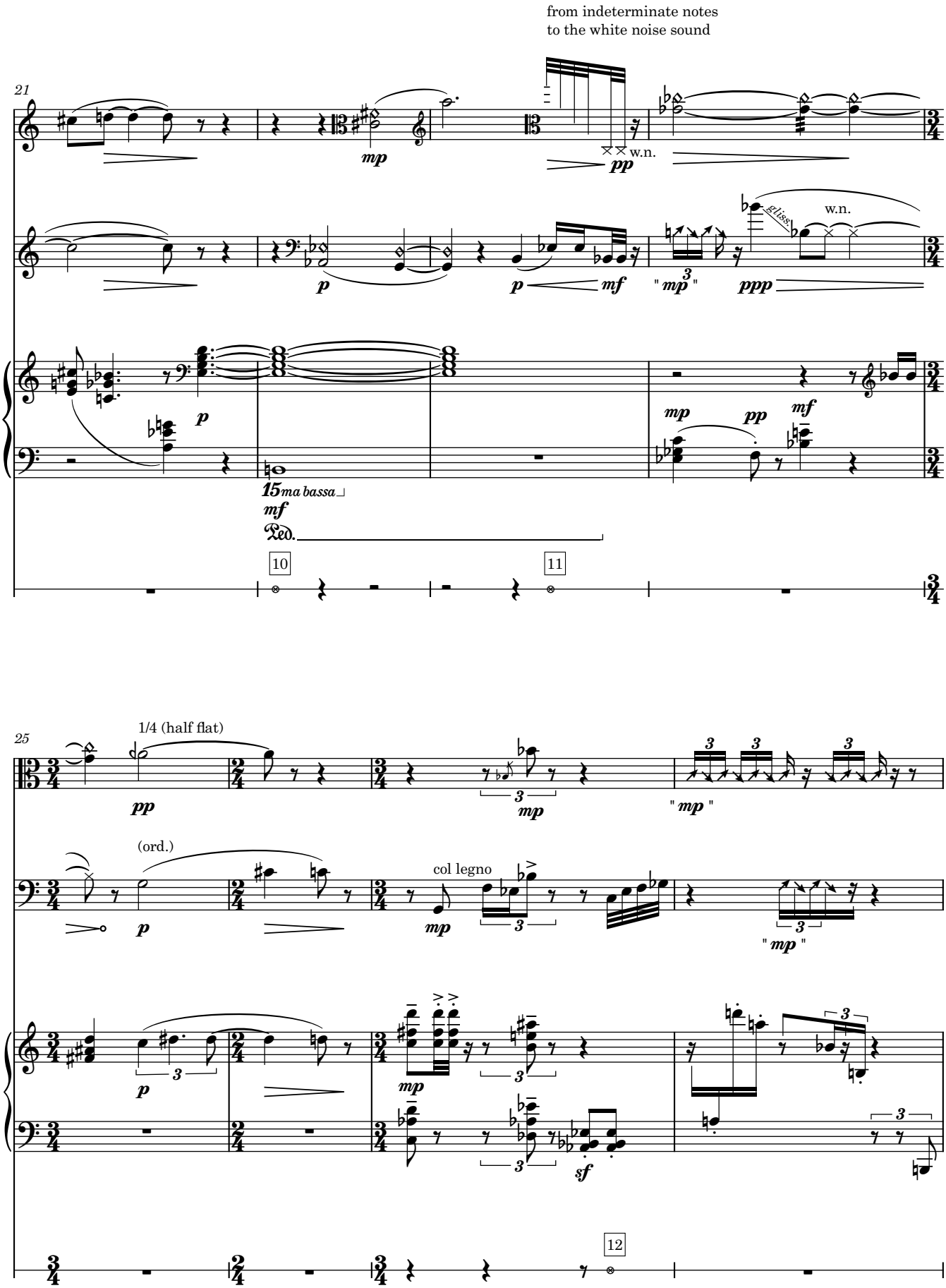
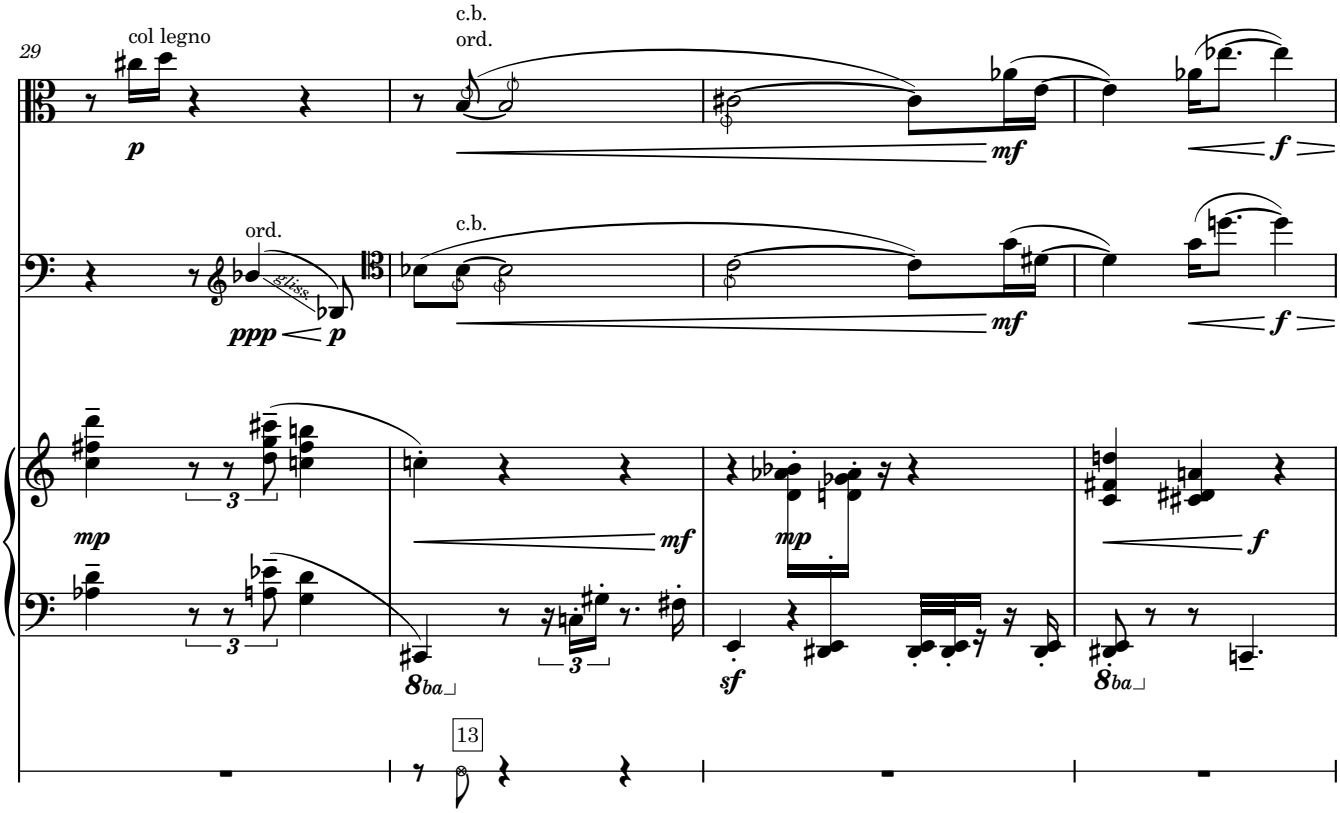
이용우(yongwoo lee)

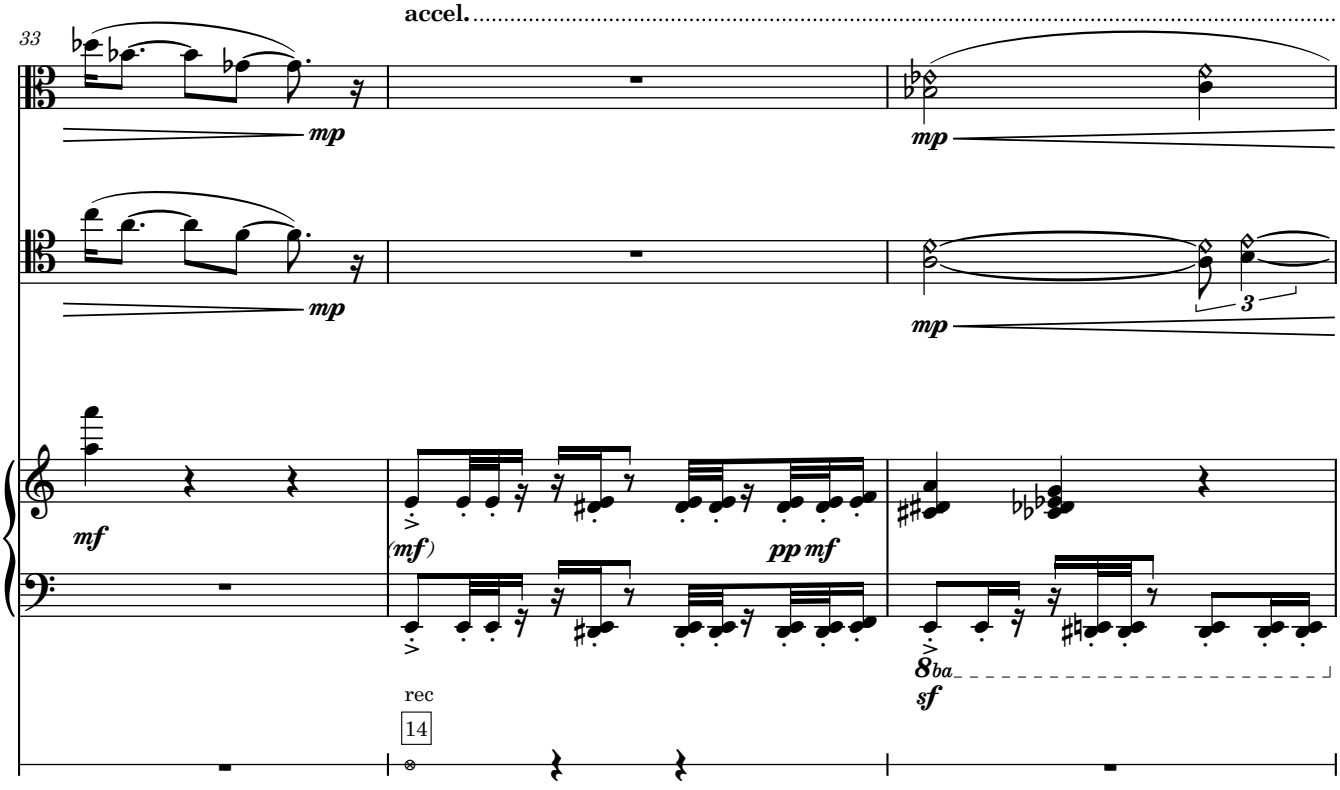


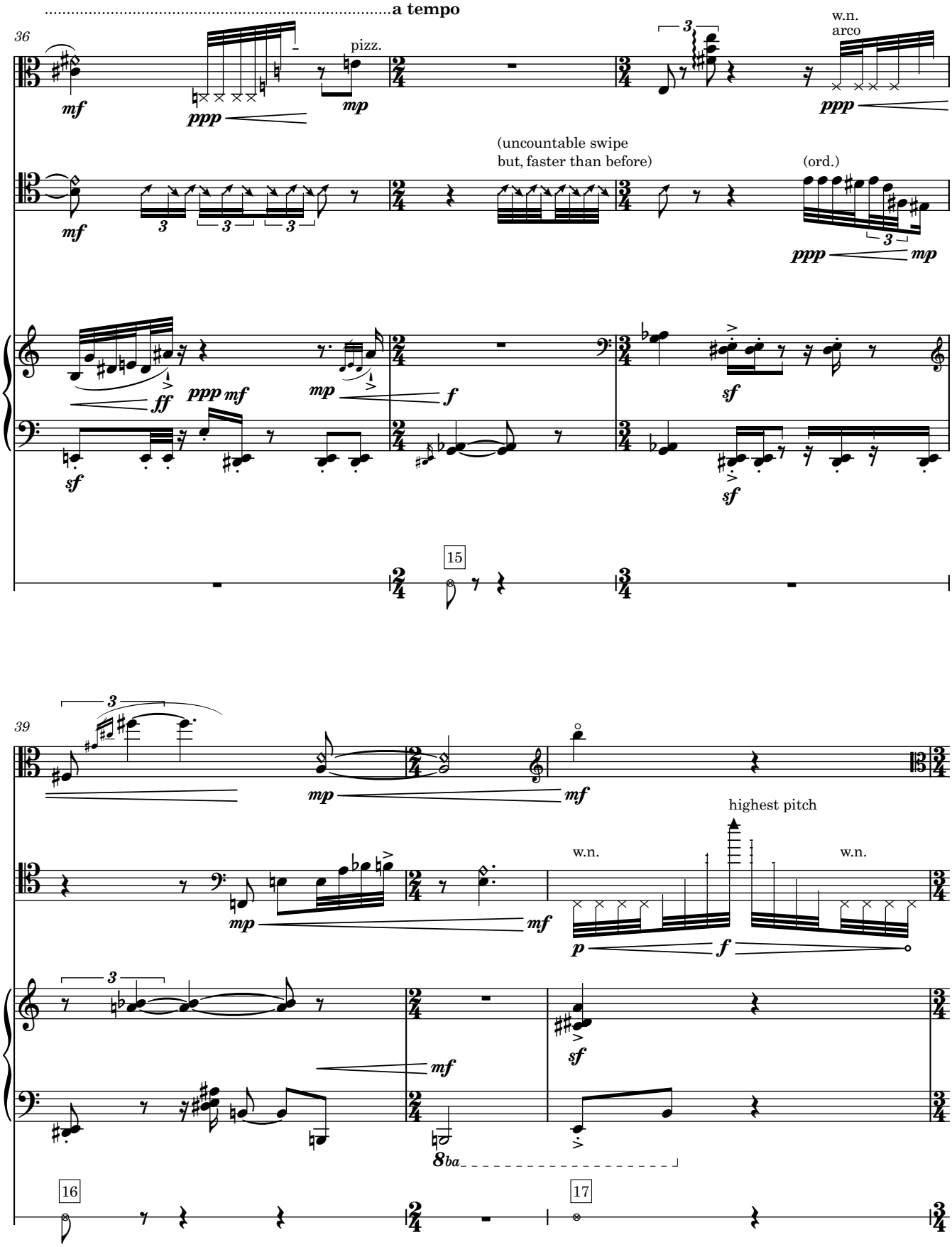

11
col legno
ord.
w.n.
sul tasto
ppp
pppp
s.p.
o.t.b.
s.p.
o.t.b.
ord.
1/4 (half sharp)
gliss.
ppp
ppp
mp
pizz.
ord.
pp
pizz.
ord.
pp
8ba
8ba
Ped.
Ped.
7

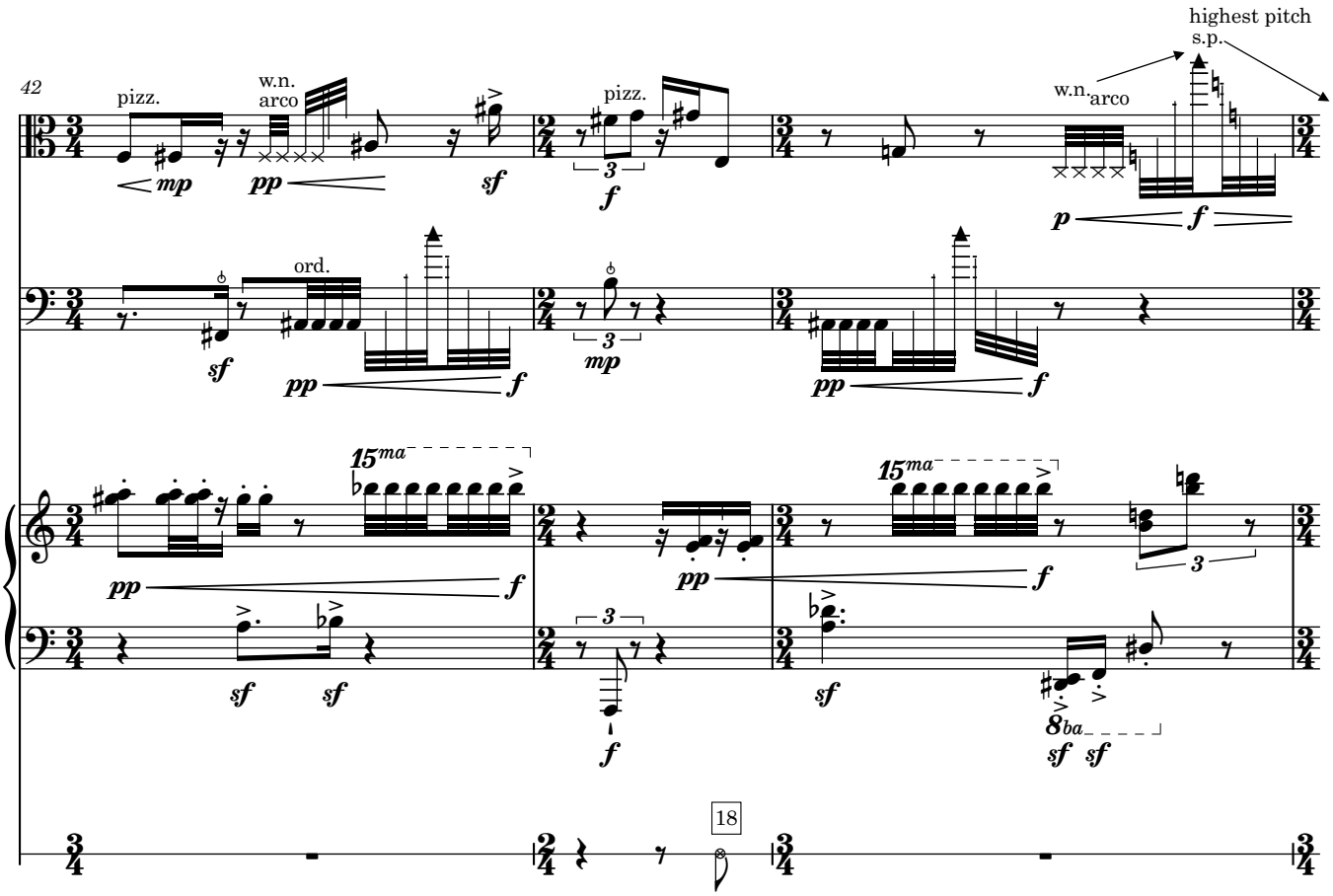

A
17
w.n.
gliss.
rub the bow up and down
on the string
" mp "
w.n.
(circular bowing, c.b.)
ord.
pp
rub the bow up and down
on the string
gliss.
" mp "
w.n.
(circular bowing, c.b.)
ord.
ppp
pp
ord.
mp
pizz.
mp
pizz.
mp
8ba
8ba
Ped.
8
9

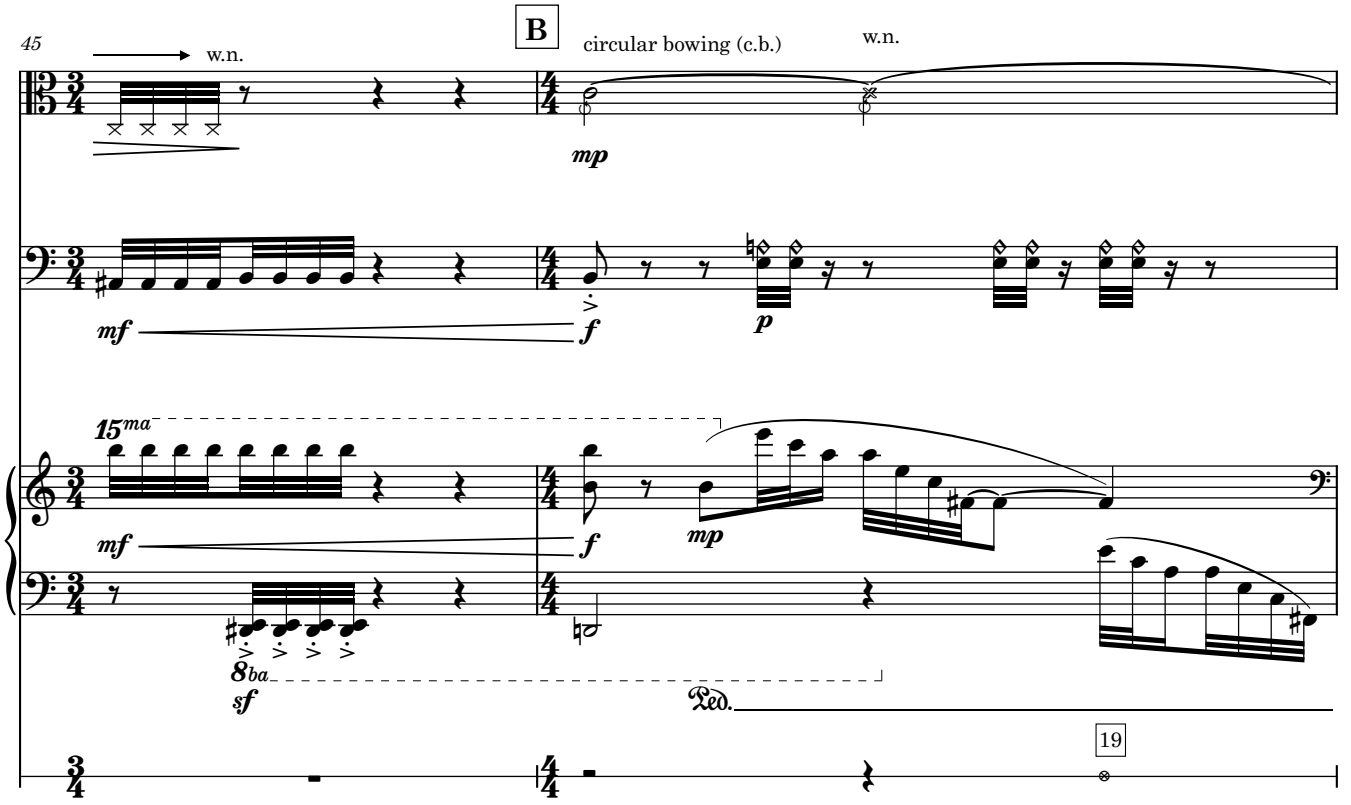

from indeterminate notes
to the white noise sound
21
w.n.
w.n.
gliss.
15ma bassa
Ped.
10
11
25
1/4 (half flat)
(ord.)
col legno
12

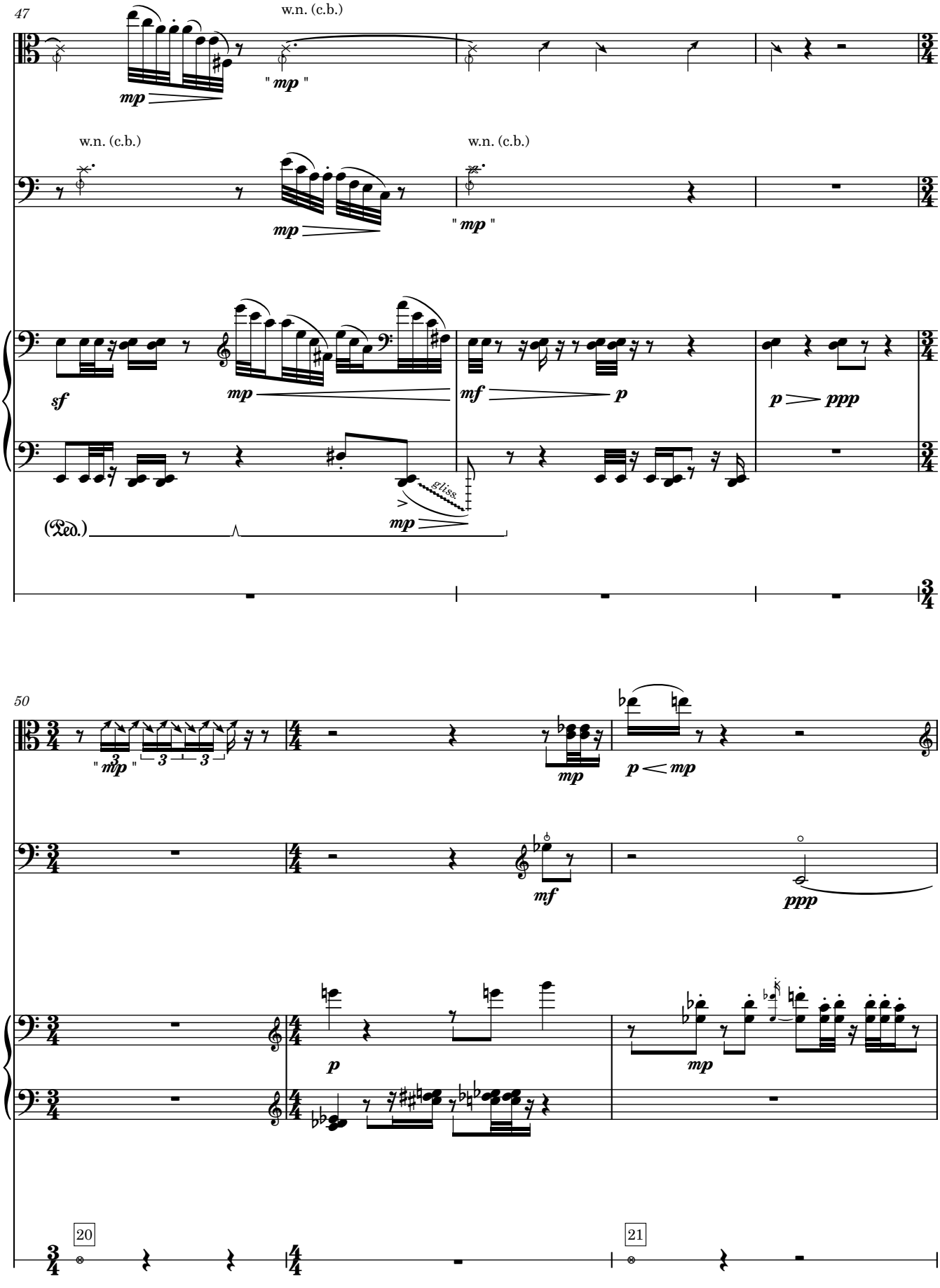

29
col legno
p
c.b.
ord.
mf
f
ord.
gliss.
ppp
p
c.b.
mf
f
mp
3
mf
mp
f
8ba
sf
8ba
13

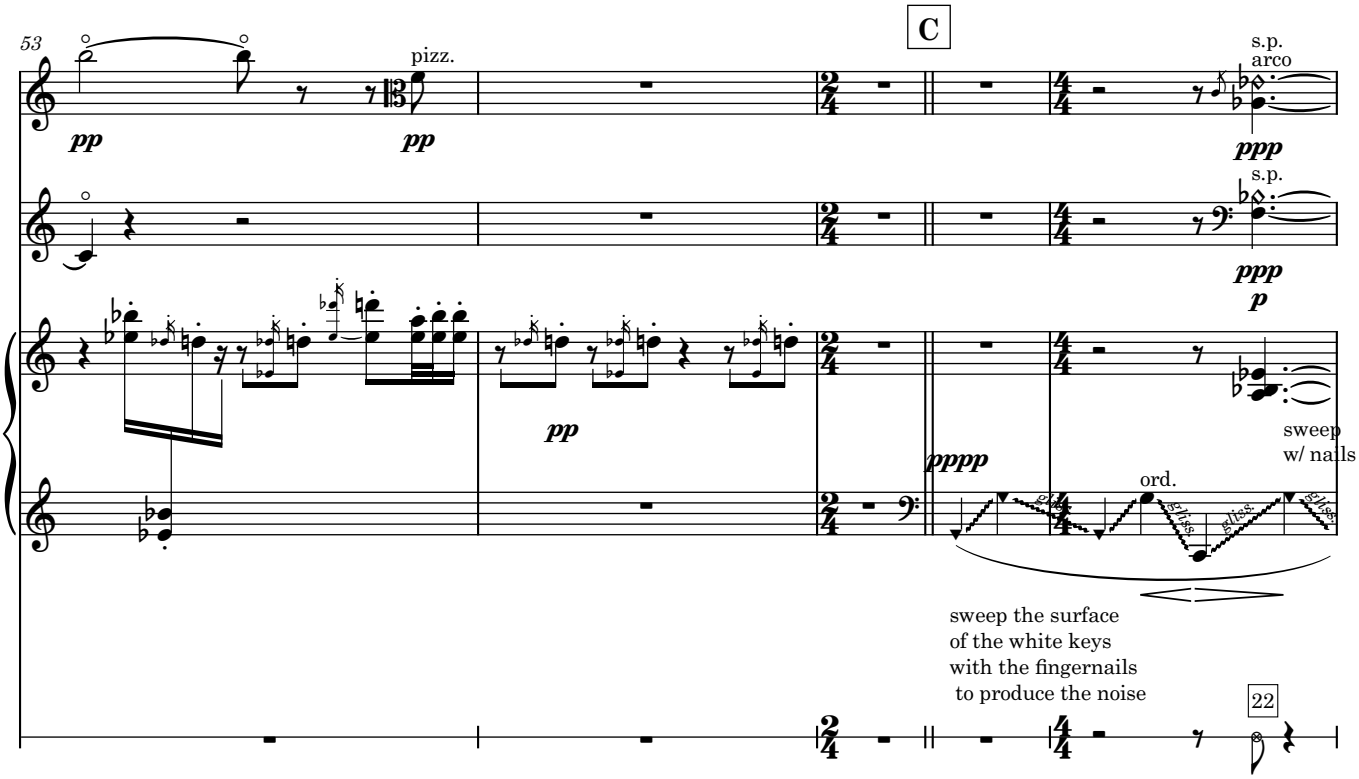

accel.
33
mp
mp
mp
mp
3
mf
(mf)
pp mf
8ba
sf
rec
14

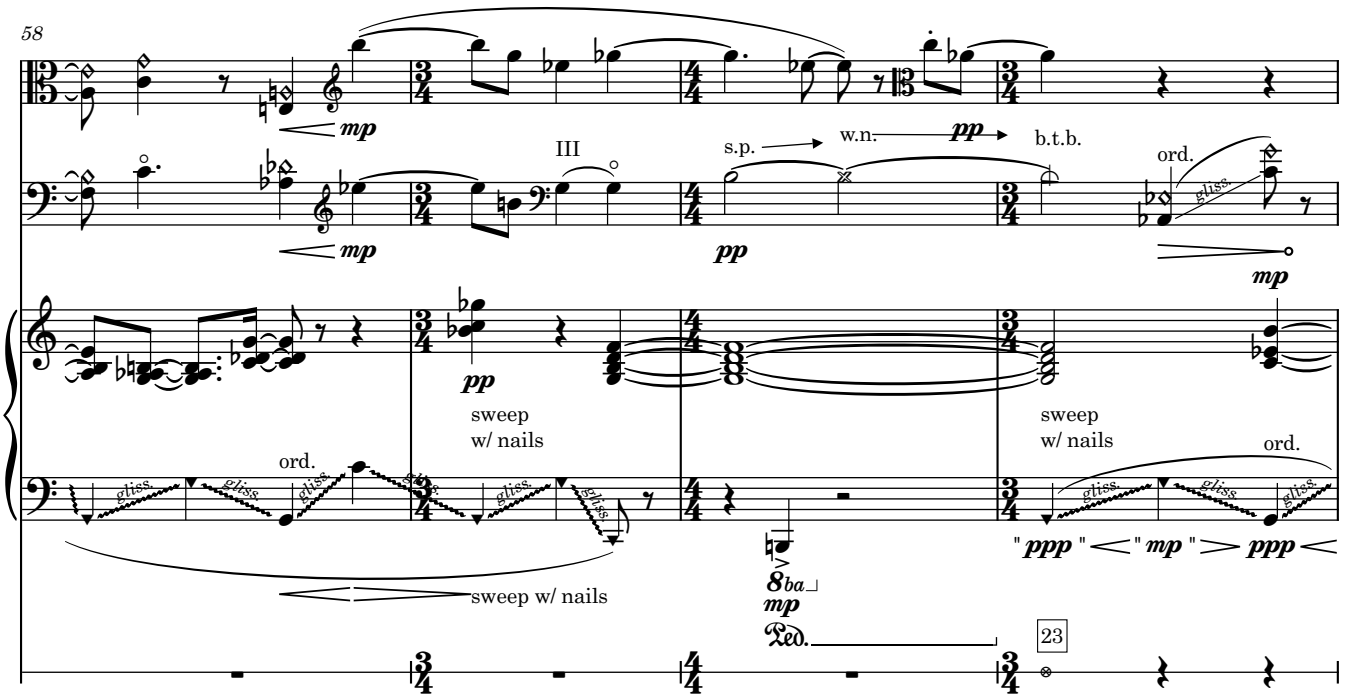

a tempo
36
pizz.
w.n.
arco
(uncountable swipe
but, faster than before)
(ord.)
15
39
highest pitch
w.n.
w.n.
8ba
16
17

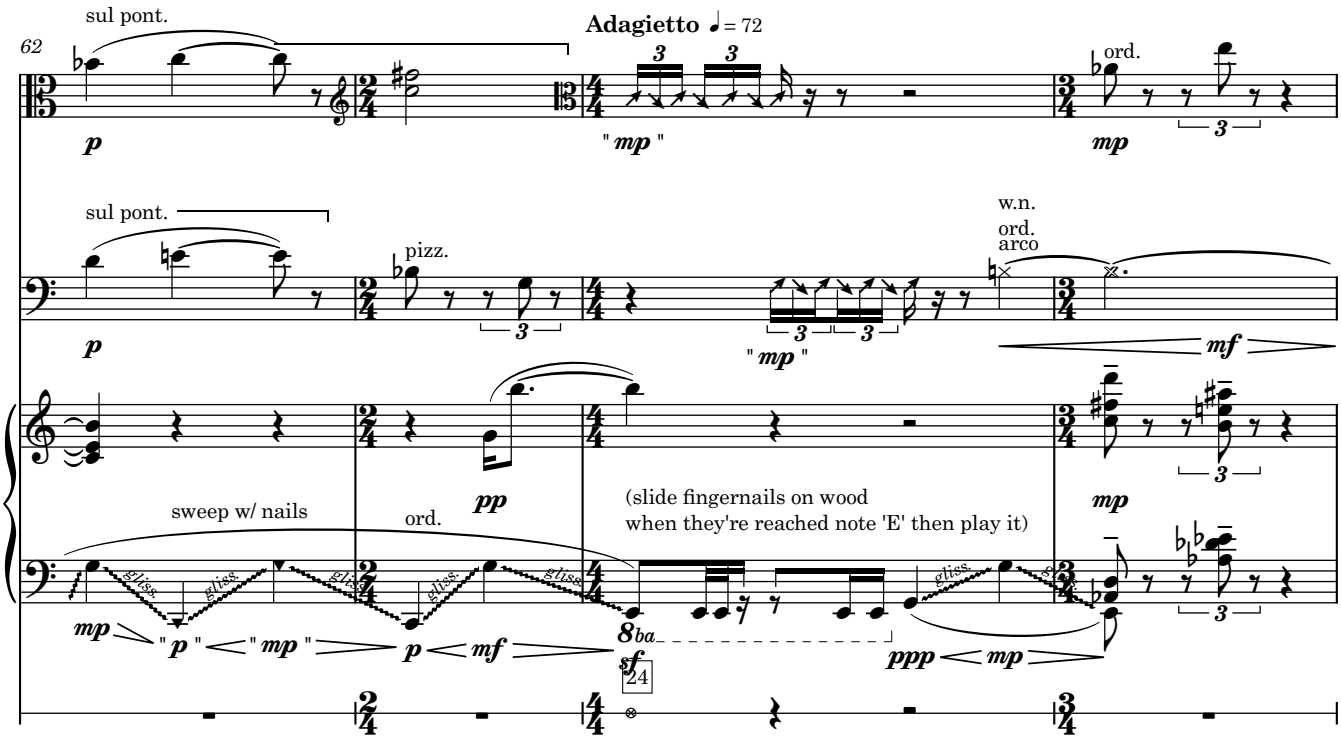

42
pizz.
w.n.
arco
ord.
highest pitch
s.p.
15ma
8ba
18

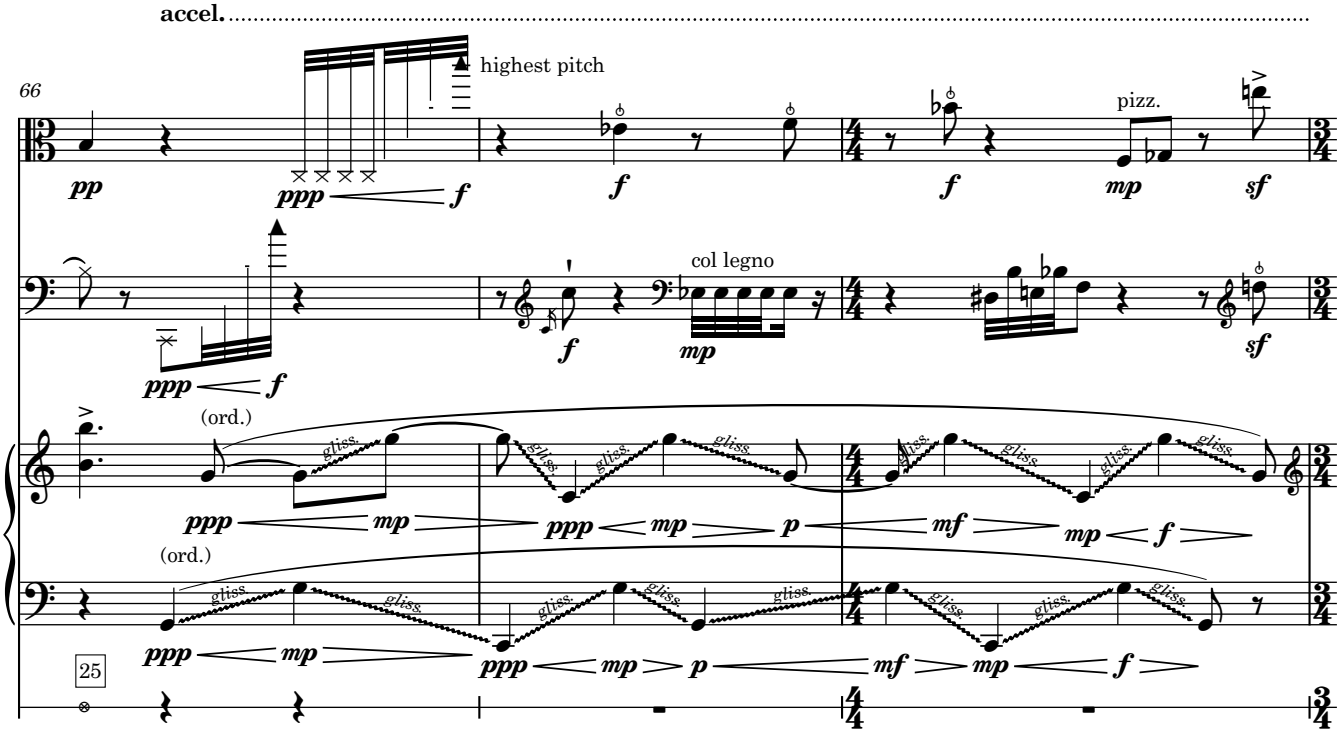

B
45
w.n.
circular bowing (c.b.)
15ma
8ba
Ped.
19

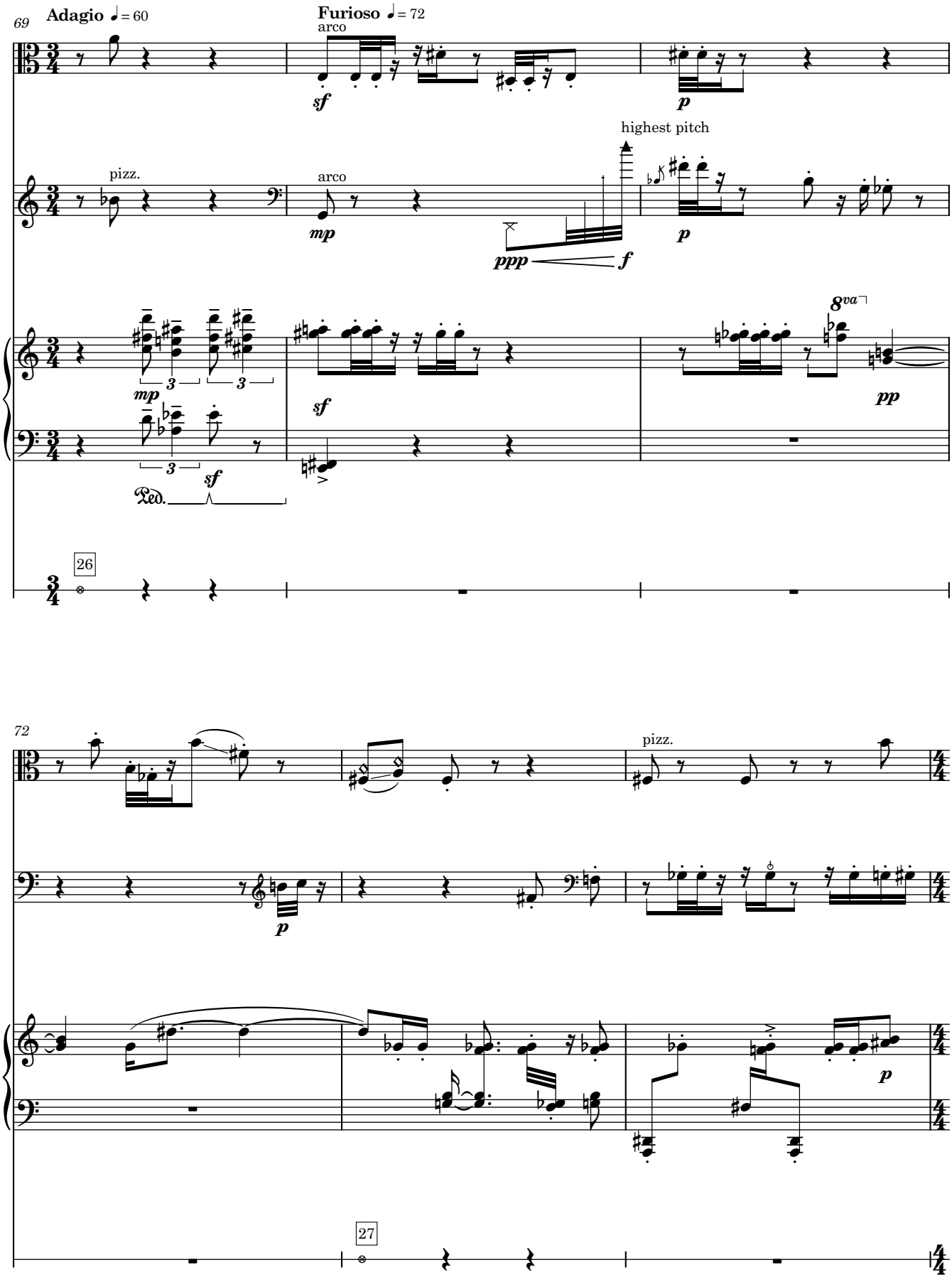

47
w.n. (c.b.)
" mp "
mp
w.n. (c.b.)
w.n. (c.b.)
" mp "
mp
sf
mp
mf
p
p
ppp
gliss.
mp
(Ped.)
50
" mp "
3
3
3
mp
p
mp
mf
ppp
p
mp
20
21

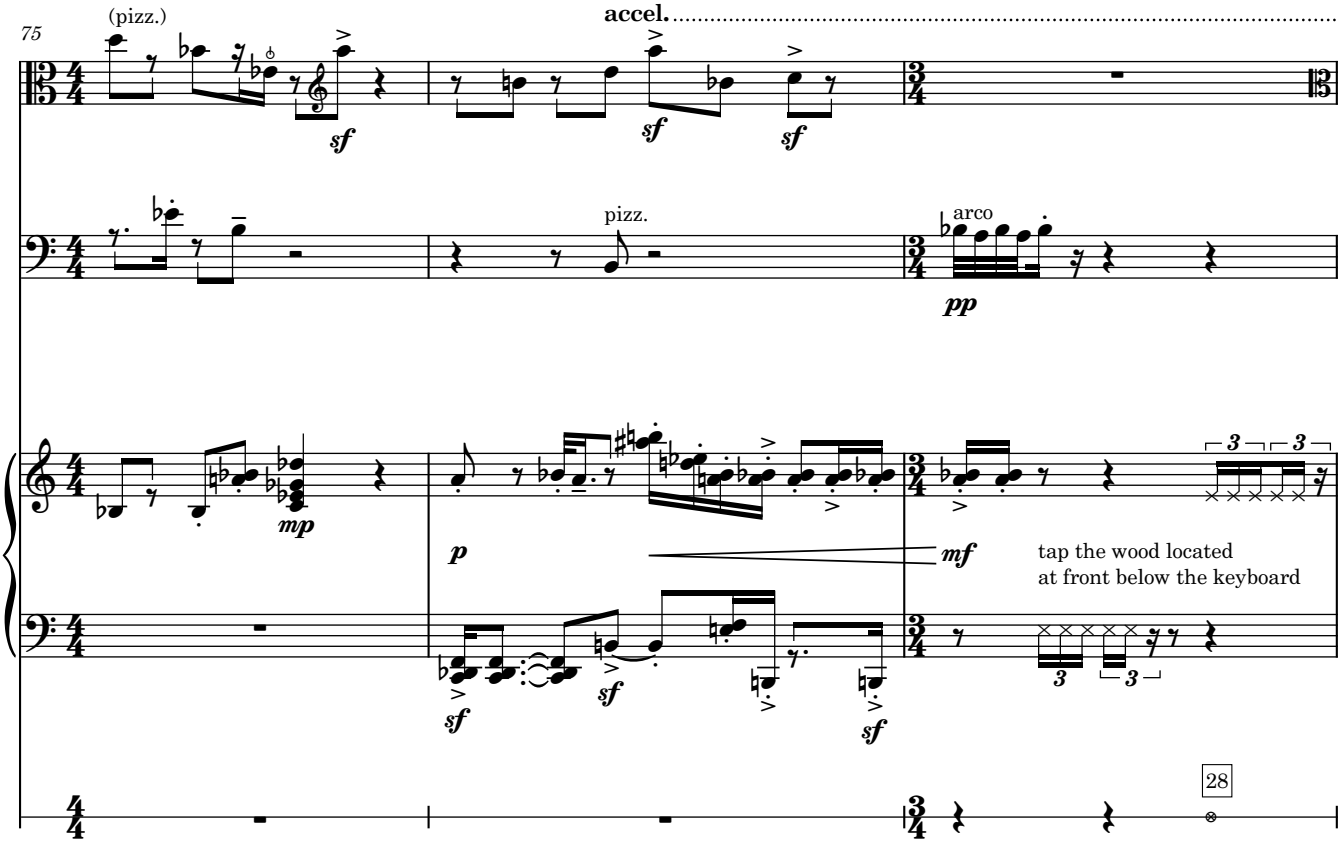

53
C
pizz.
s.p.
arco
sweep
w/ nails
ord.
sweep the surface
of the white keys
with the fingernails
to produce the noise
22

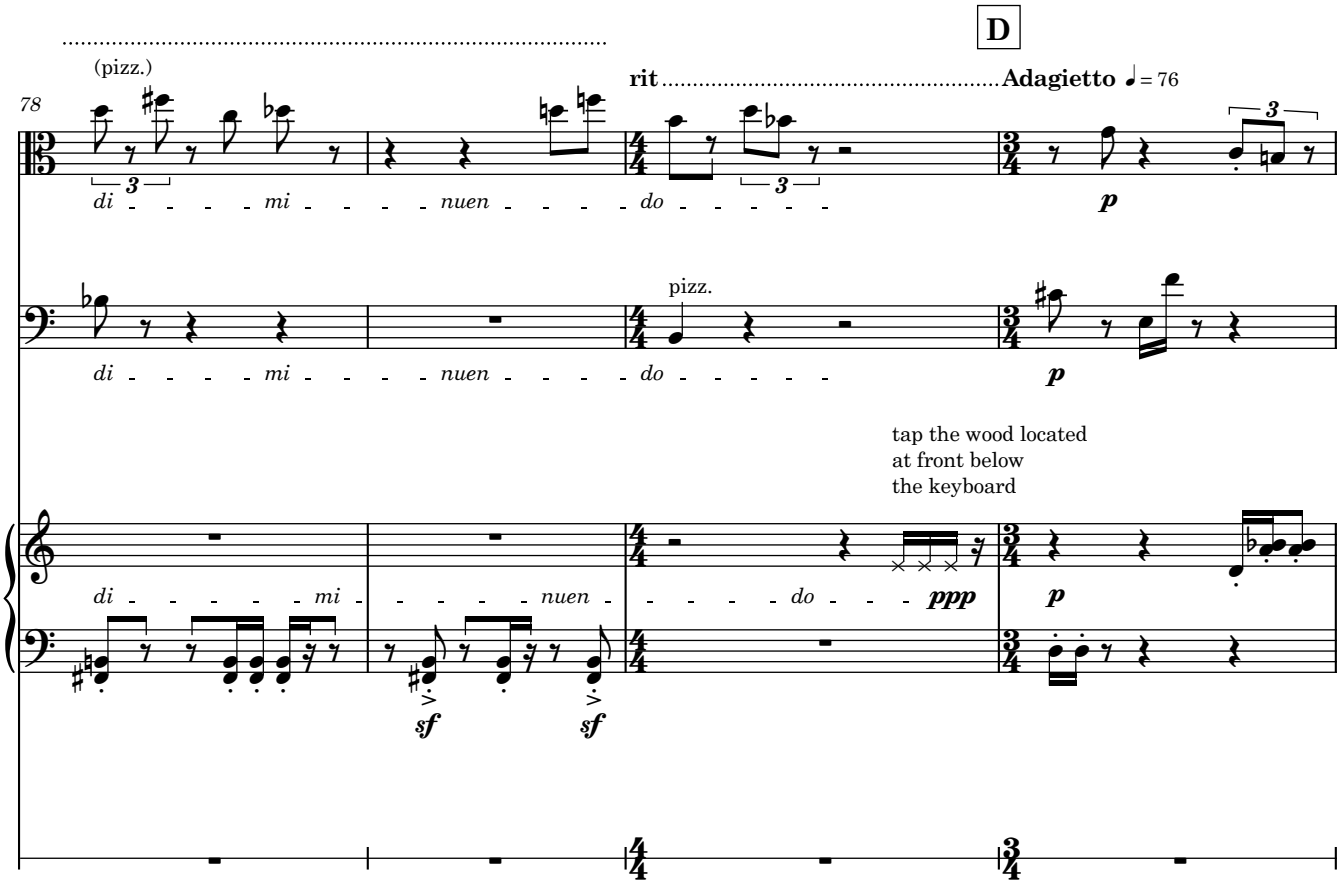

58
III
s.p.
w.n.
b.t.b.
ord.
sweep
w/ nails
sweep w/ nails
23

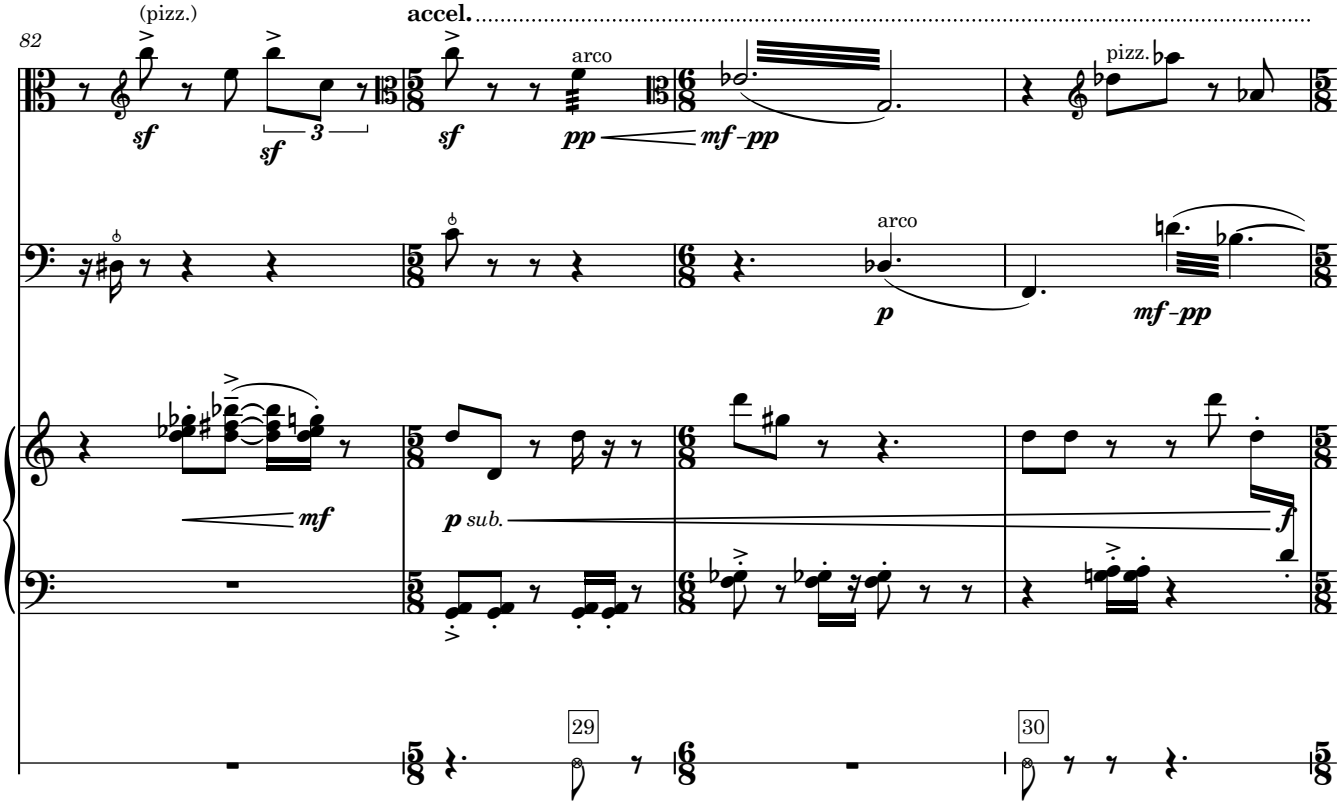

62
sul pont.
Adagietto ♩= 72
ord.
sul pont.
pizz.
w.n.
ord.
arco
sweep w/ nails
ord.
(slide fingernails on wood
when they're reached note 'E' then play it)
24

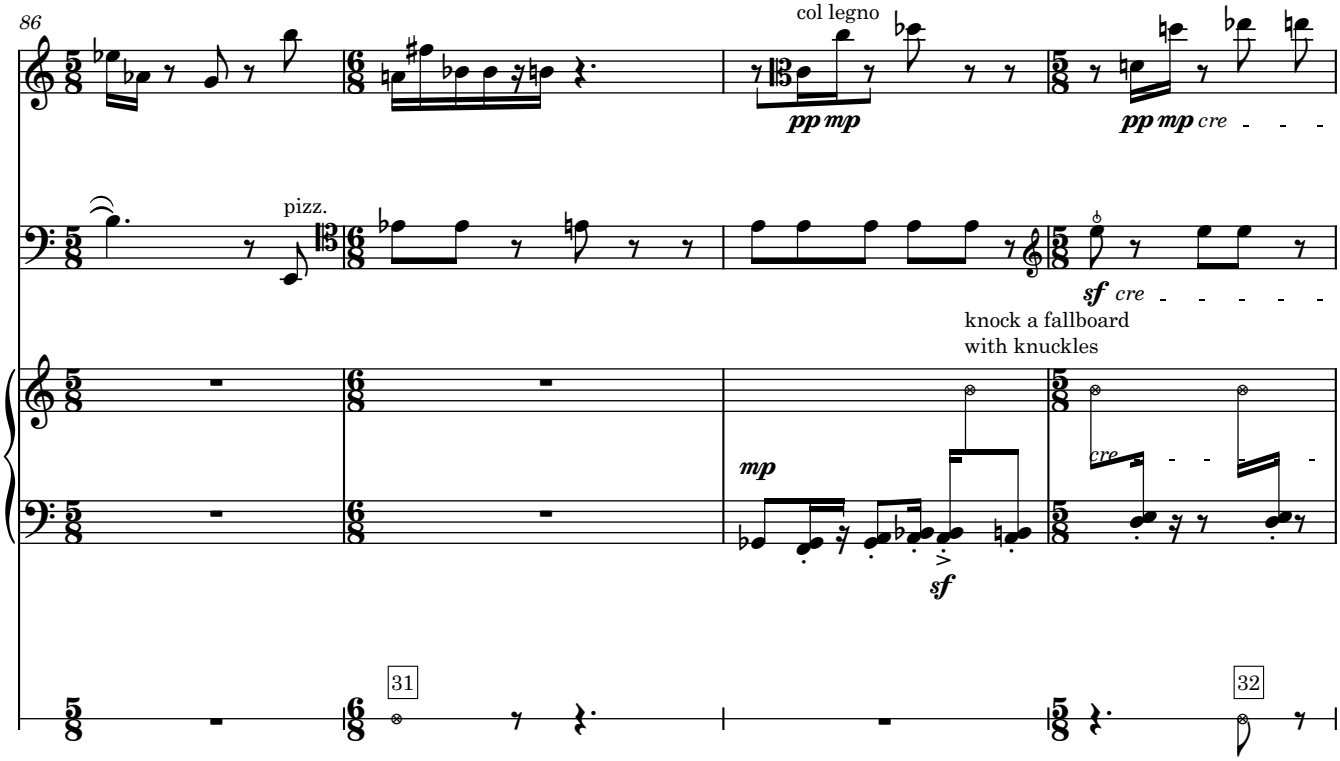

accel.
66
highest pitch
pizz.
col legno
(ord.)
(ord.)
25

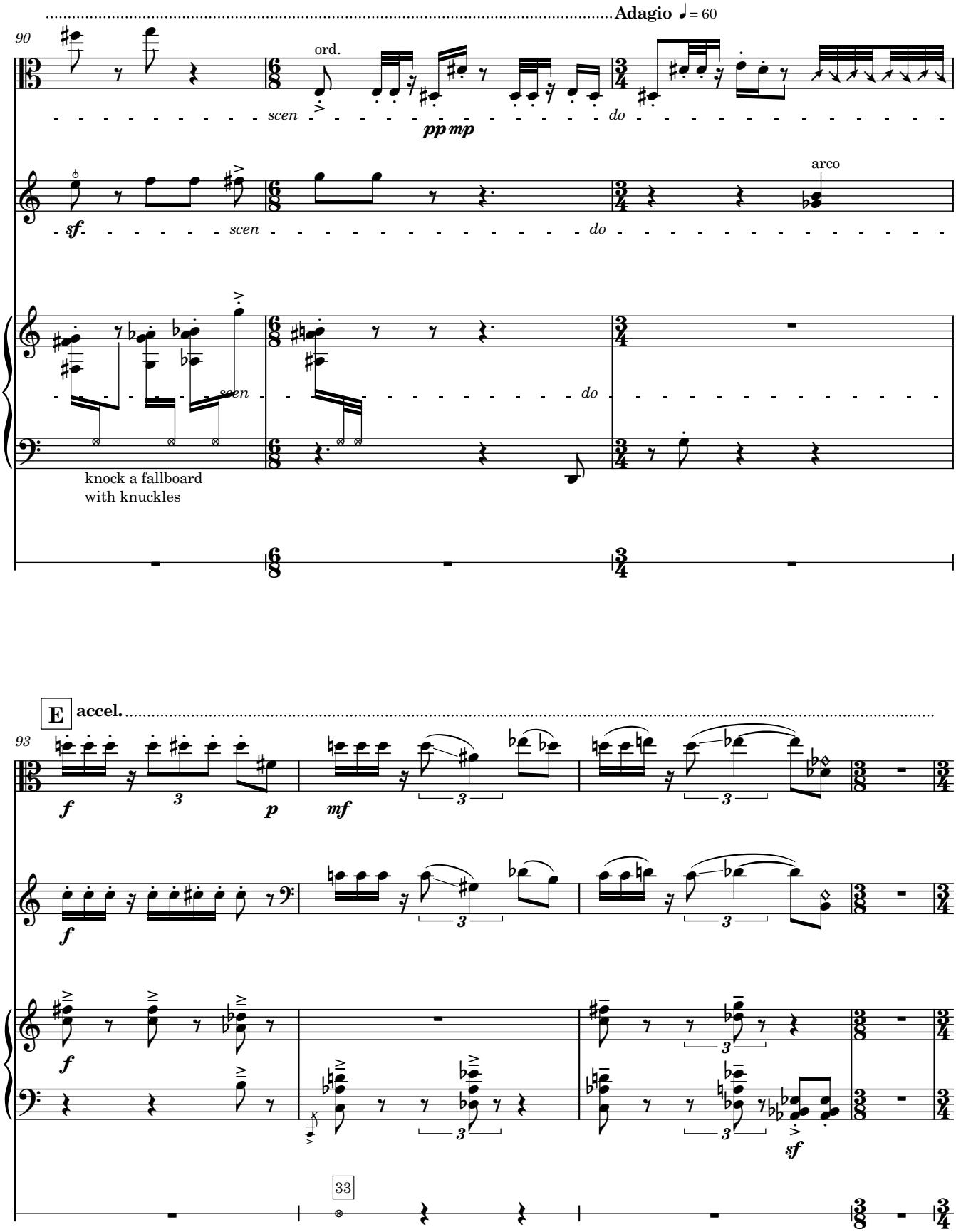

69
Adagio ♩ = 60
Furioso ♩ = 72
arco
pizz.
arco
highest pitch
8va
26
72
pizz.
27

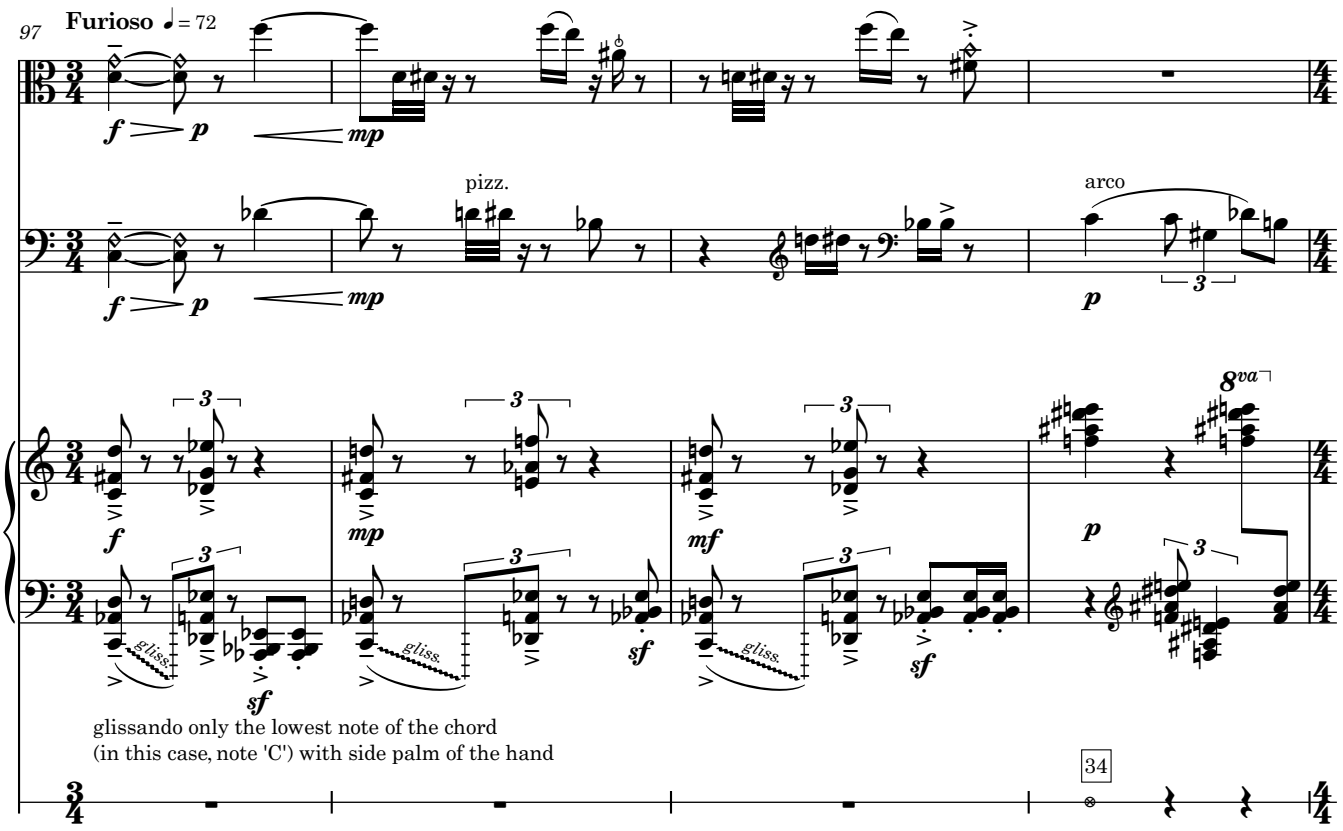

75
(pizz.)
accel.
pizz.
arco
tap the wood located
at front below the keyboard
28

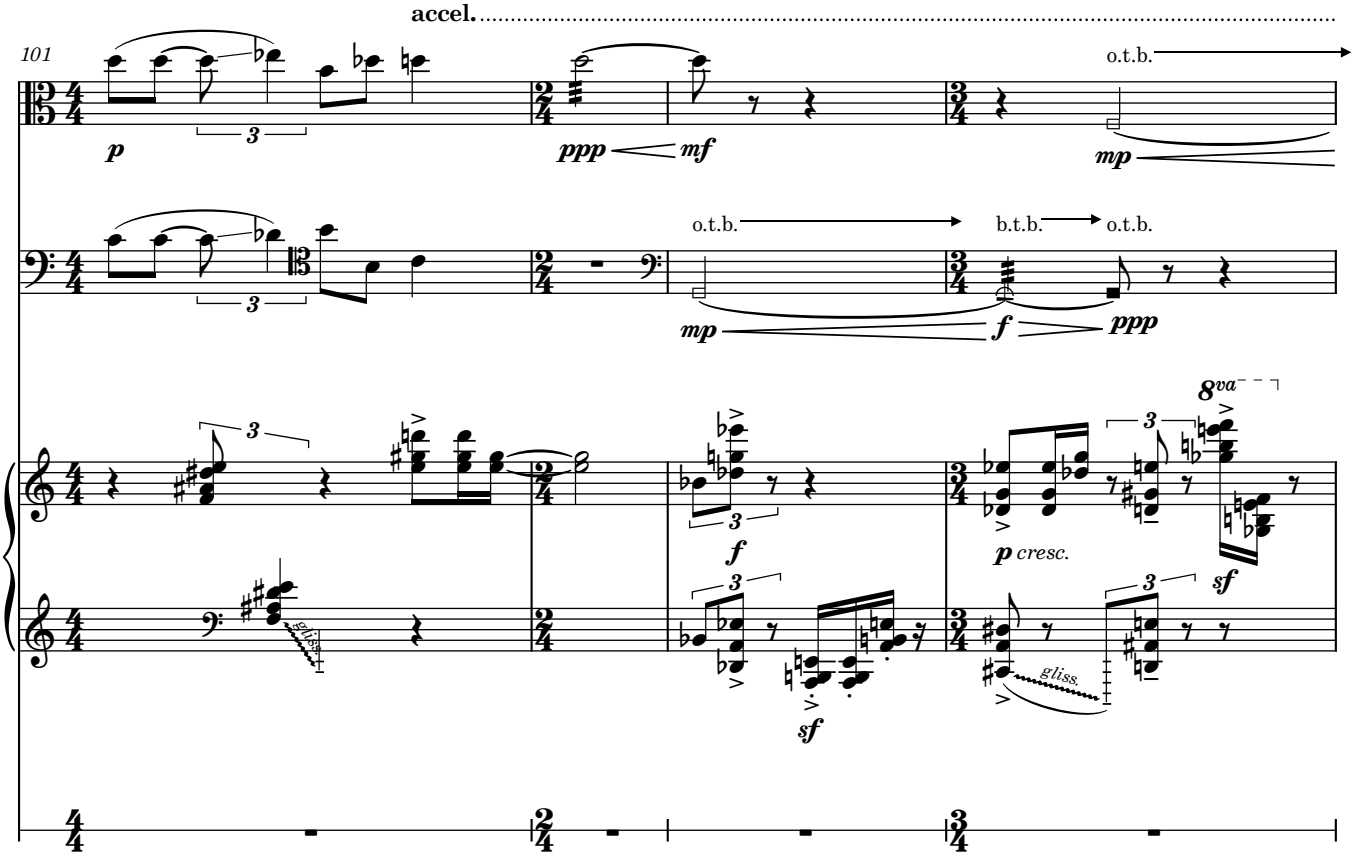

D
78
(pizz.)
rit
Adagietto ♩= 76
di mi nuen do
pizz.
tap the wood located
at front below
the keyboard

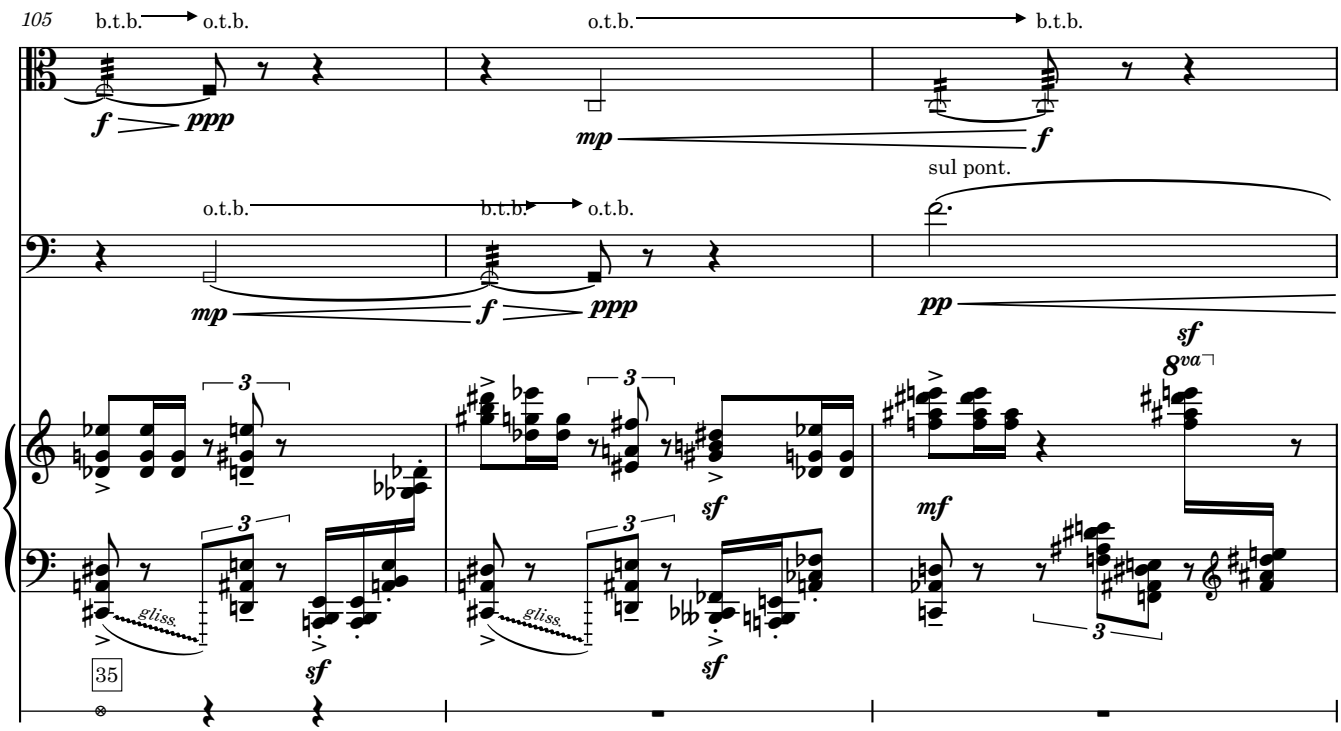

82
(pizz.)
accel.
arco
pizz.
arco
pizz.
29
30

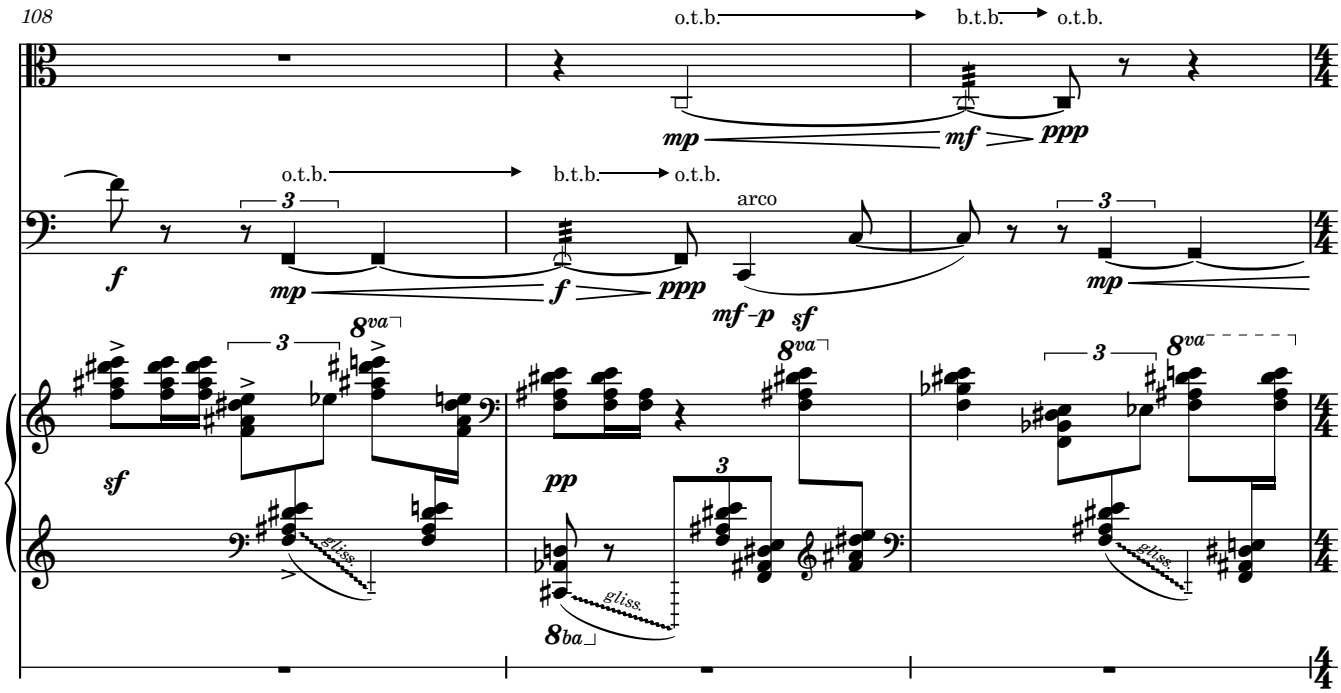

86
col legno
pizz.
knock a fallboard
with knuckles
31
32


Adagio ♩= 60
90
ord.
scen
pp mp
do
arco
sf
scen
do
scen
do
knock a fallboard
with knuckles
E
accel.
93
f
3
p
mf
3
3
f
3
3
f
3
3
sf
33


97
Furioso ♩= 72
pizz.
arco
8va
glissando only the lowest note of the chord
(in this case, note 'C') with side palm of the hand
34


accel.
101
o.t.b.
b.t.b.
8va
p cresc.


105
b.t.b.
o.t.b.
o.t.b.
b.t.b.
f
ppp
mp
f
sul pont.
o.t.b.
b.t.b.
o.t.b.
mp
f
ppp
pp
sf
8va
mf
gliss.
sf
35


108
o.t.b.
b.t.b.
o.t.b.
mp
mf
ppp
o.t.b.
b.t.b.
o.t.b.
arco
f
mp
f
ppp
mf–p
sf
mp
8va
sf
pp
gliss.
8ba

rit.

111

pluck the string from the fingerboard
to the right above the bridge then
back to the fingerboard

pizz. o.t.b. position ord. (pizz.)

mf ppp ppp

36

115 **Adagietto** ♩ = 72

(pizz.)

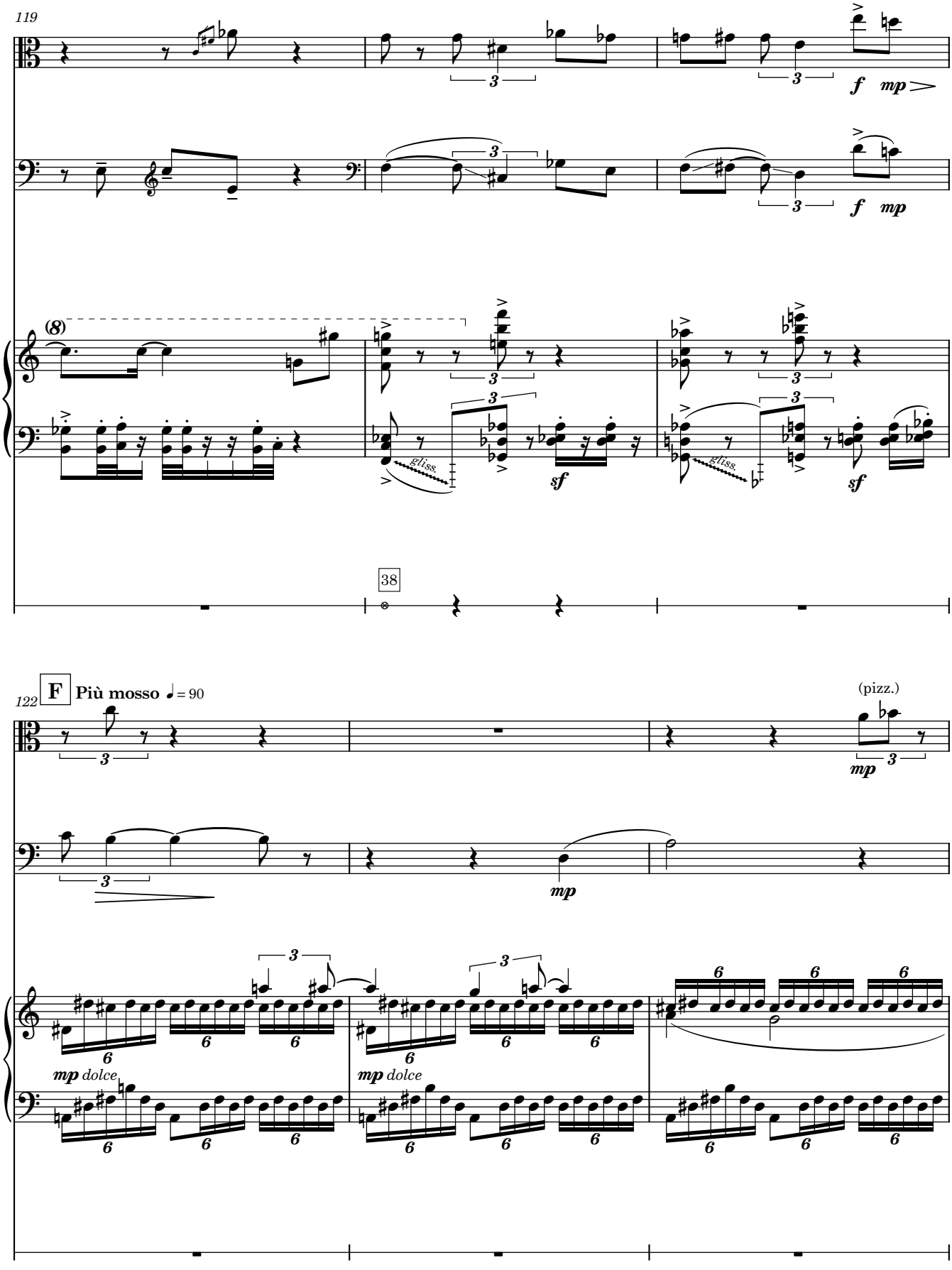
mf mf sf

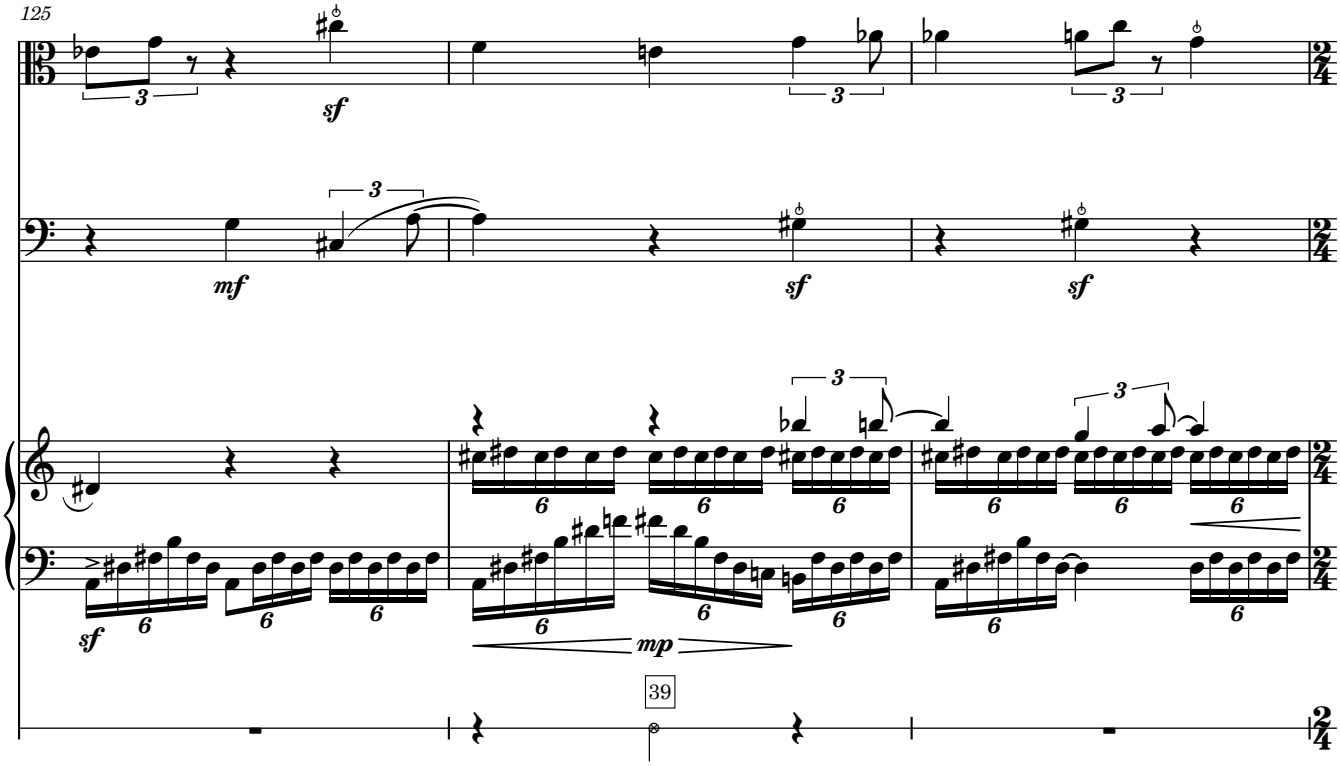
pp mp mf

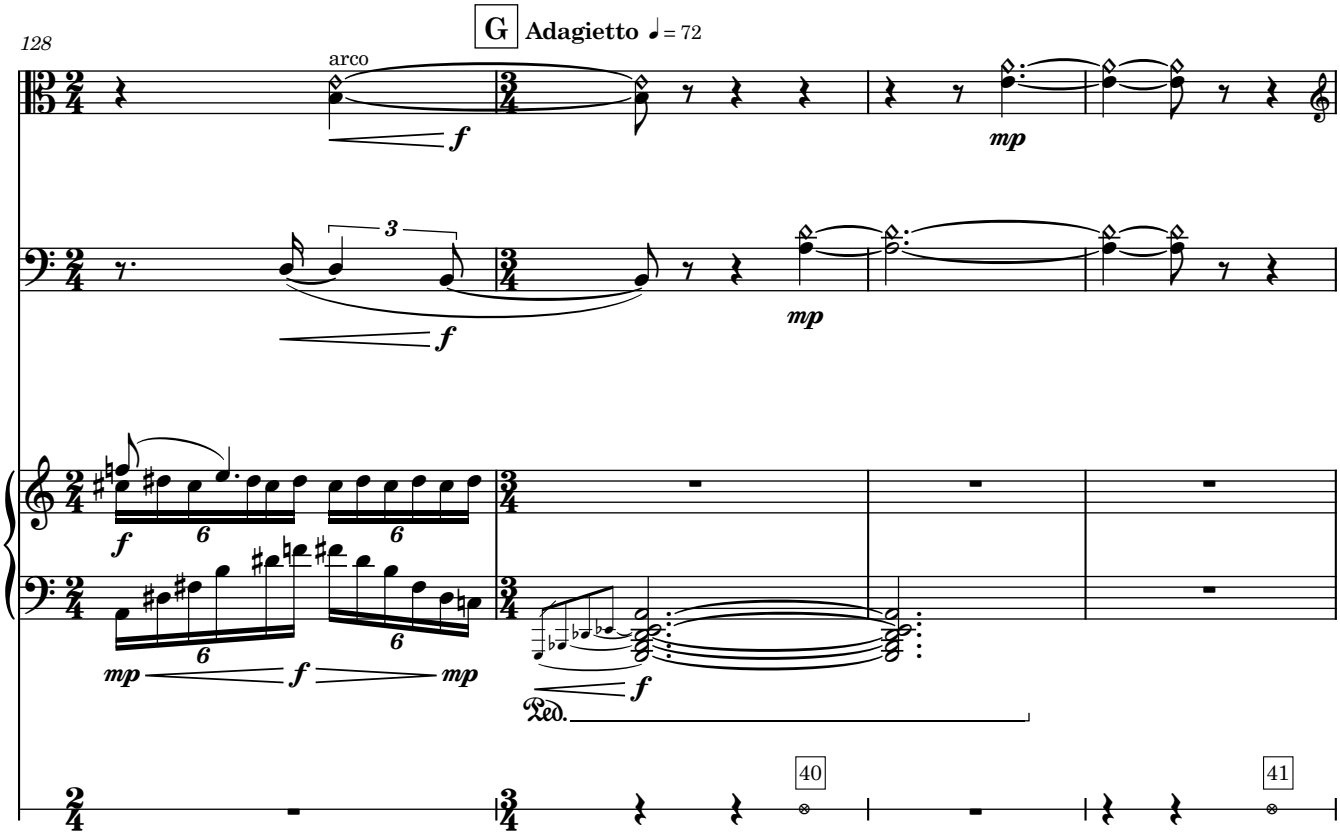
8va 8ba sf

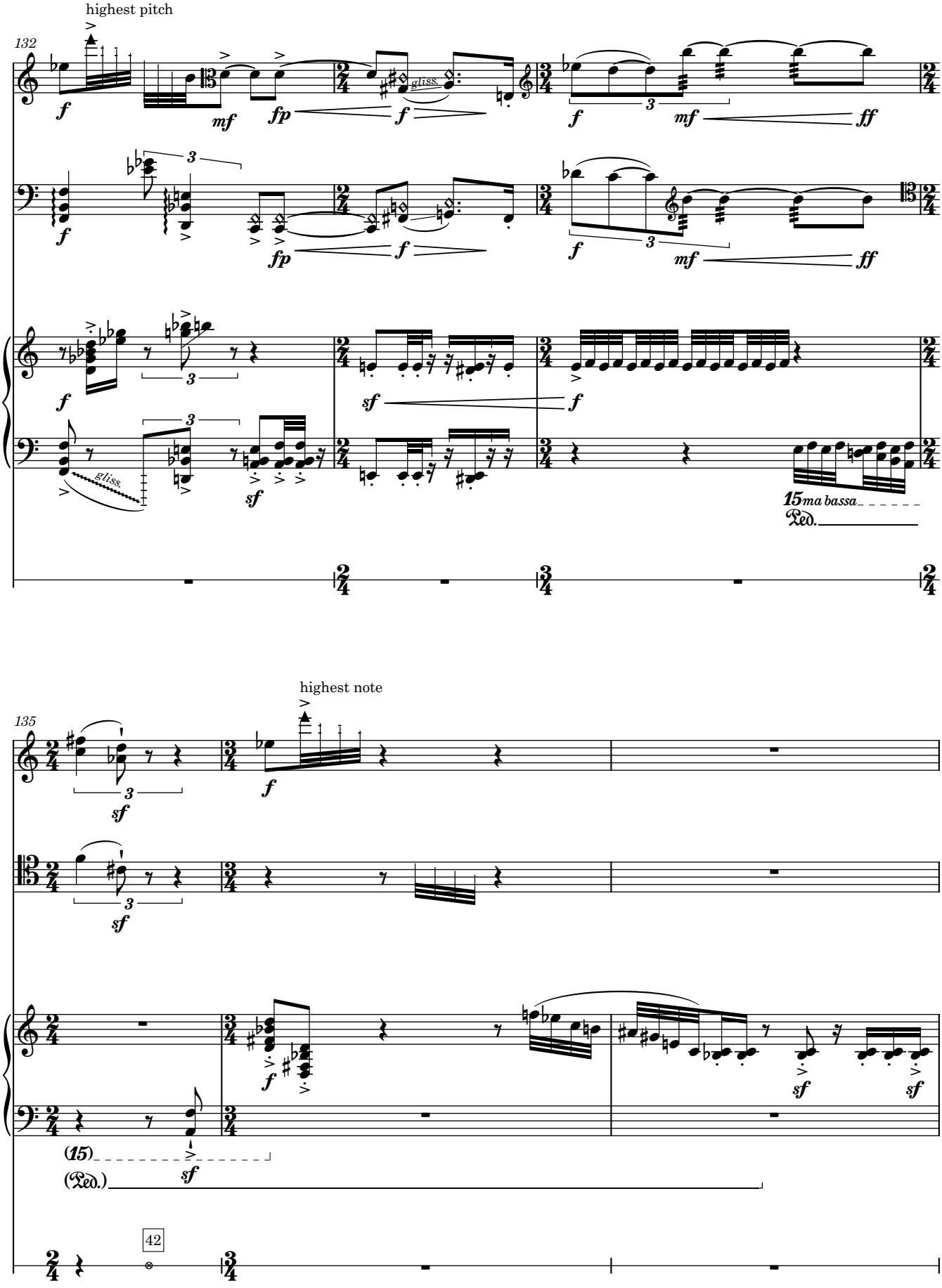
Ped.

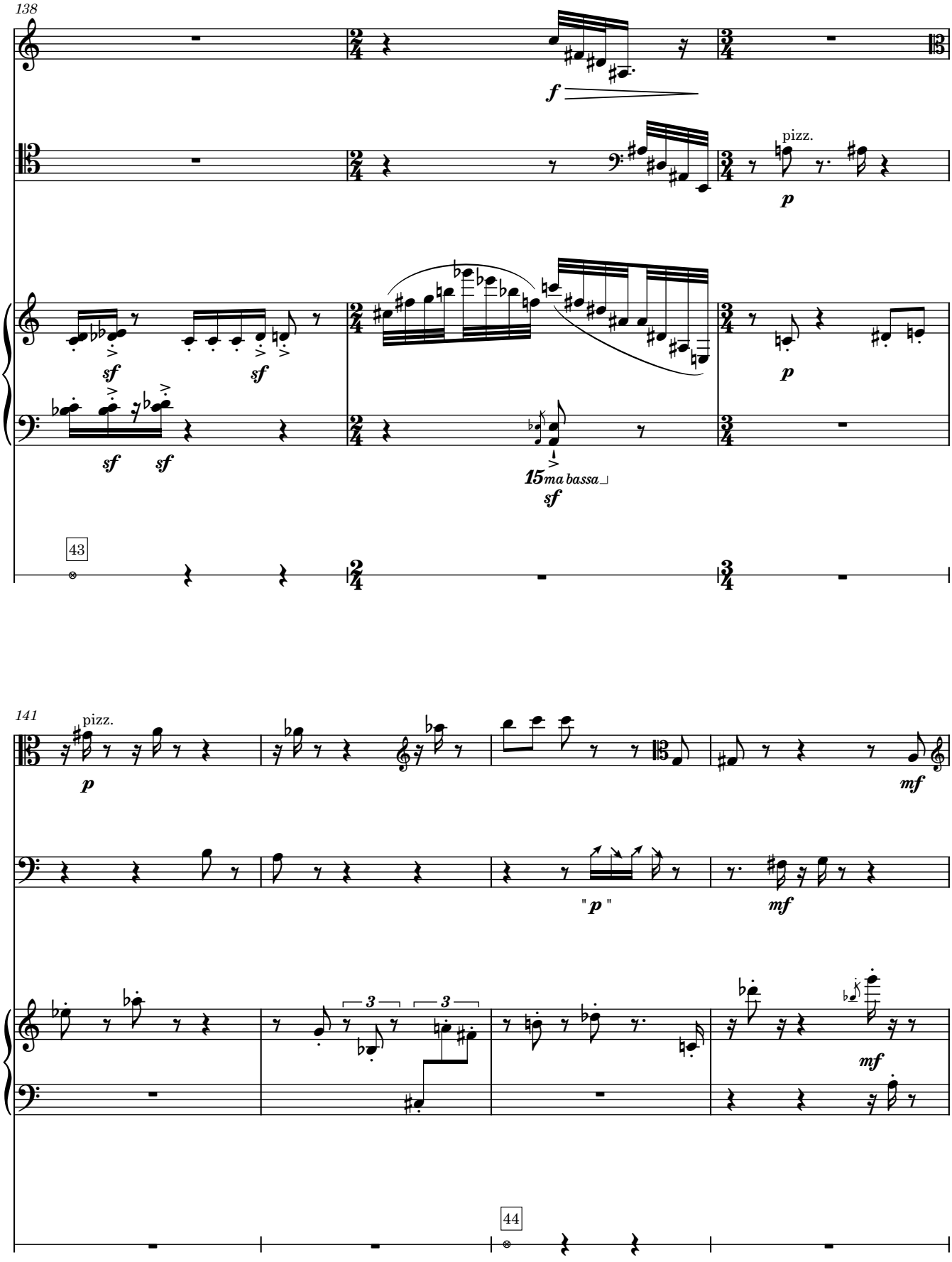
37

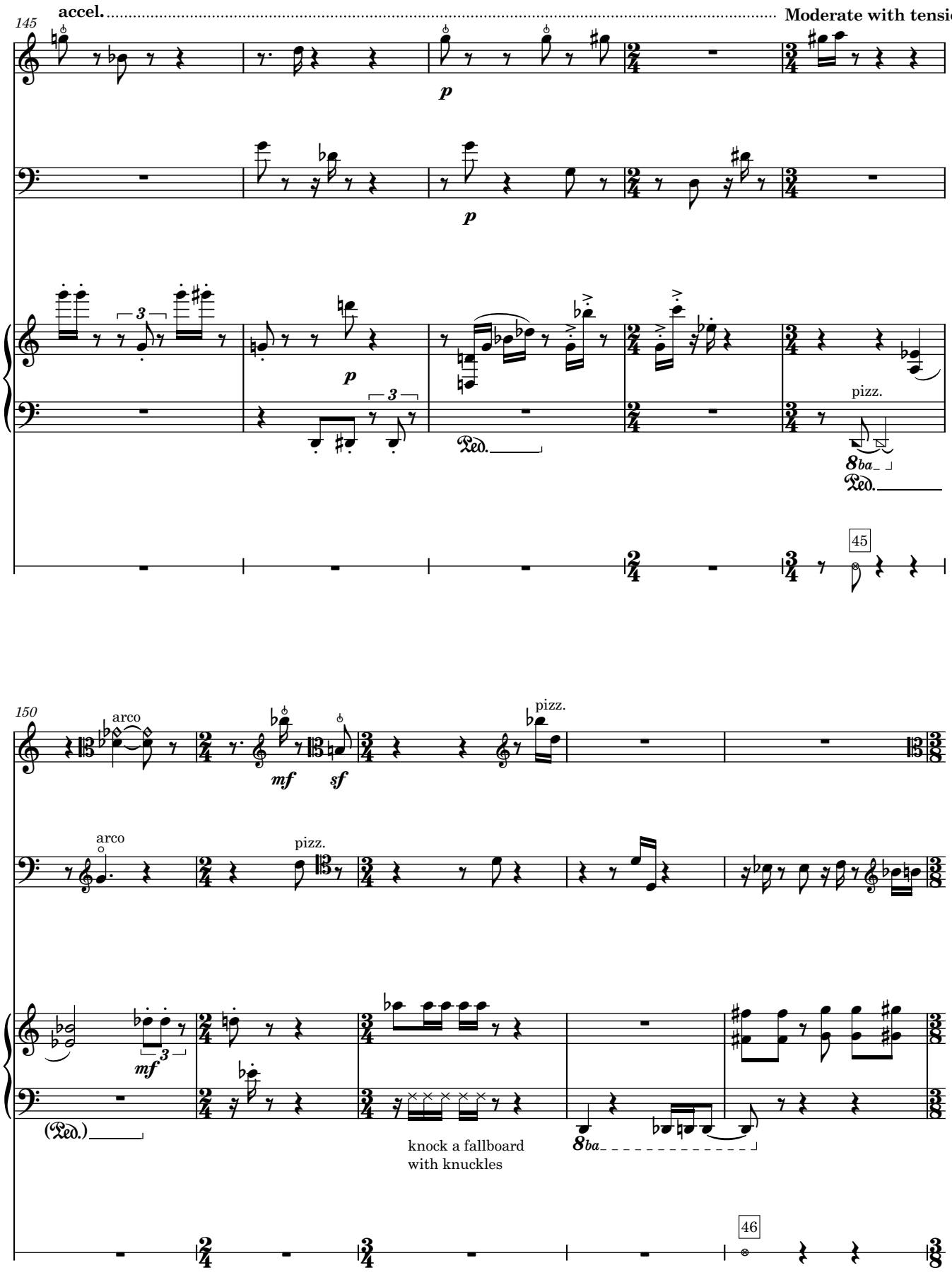

119
(8)
gliss.
gliss.
38
122
F
Più mosso ♩= 90
(pizz.)
mp dolce
mp dolce

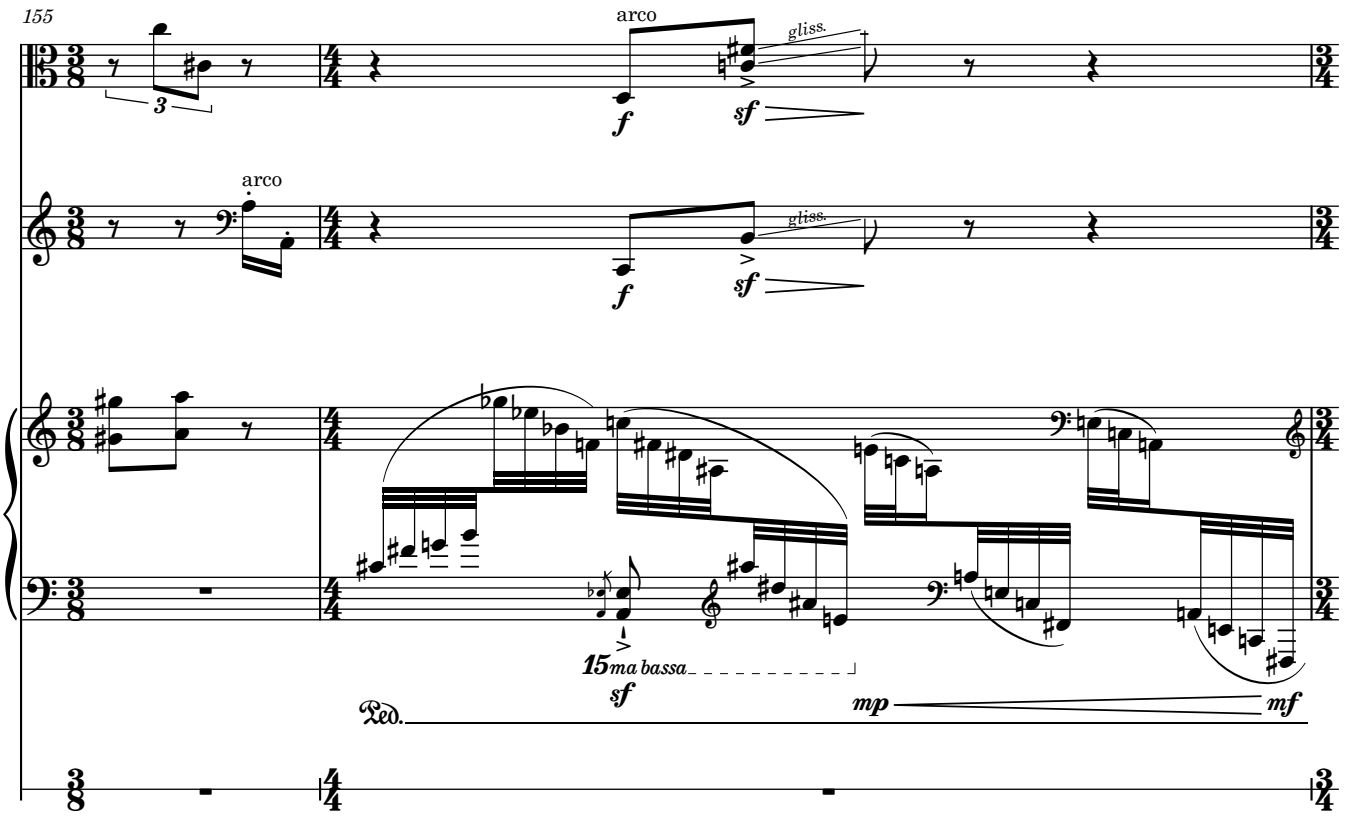

125
sf
mf
sf
sf
mp
39

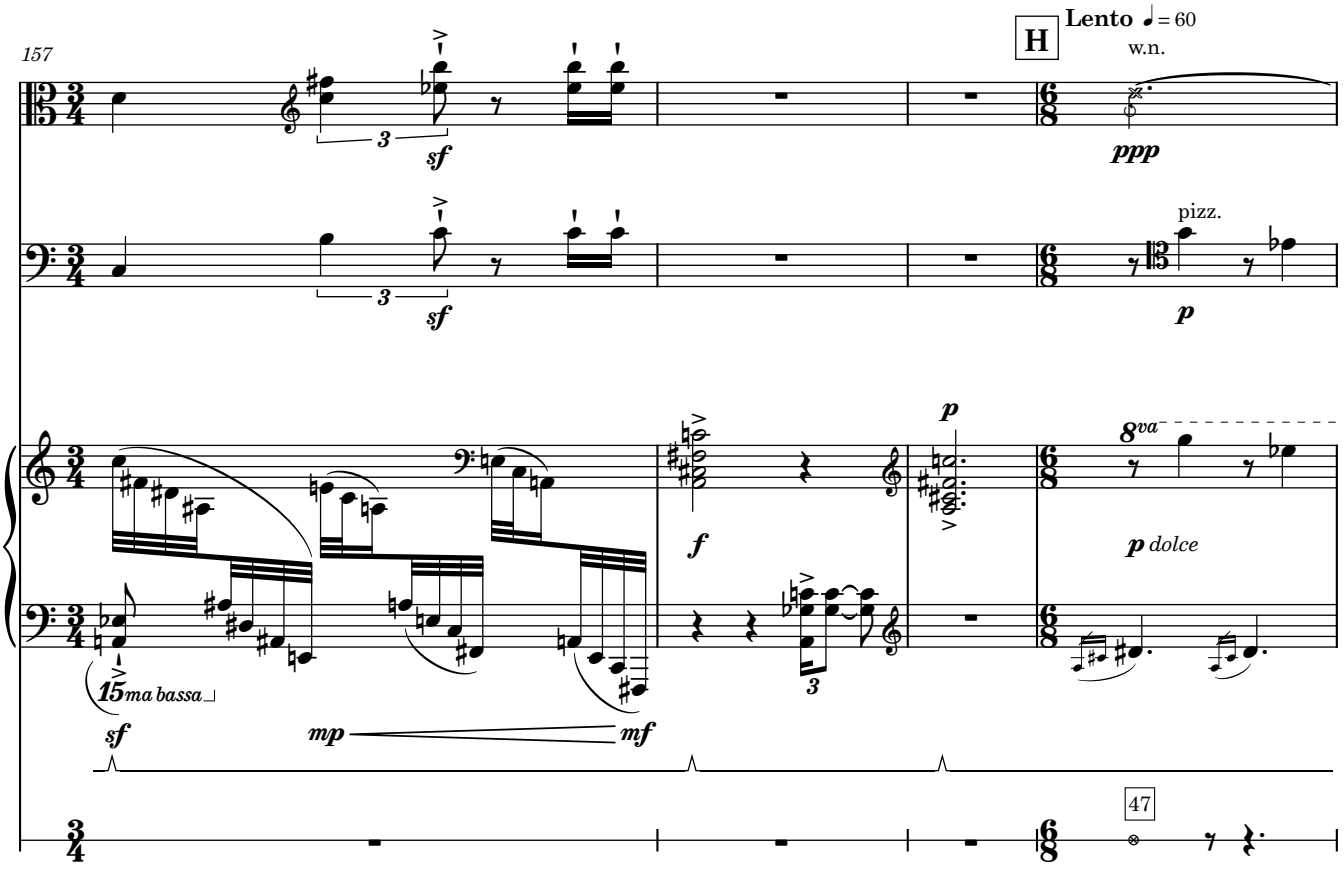

G
Adagietto ♩= 72
128
arco
f
mp
f
mp
f
mp
f
mp
Ped.
40
41


highest pitch
132
gliss.
15ma bassa
Ped.
highest note
135
(15)
(Ped.)
42

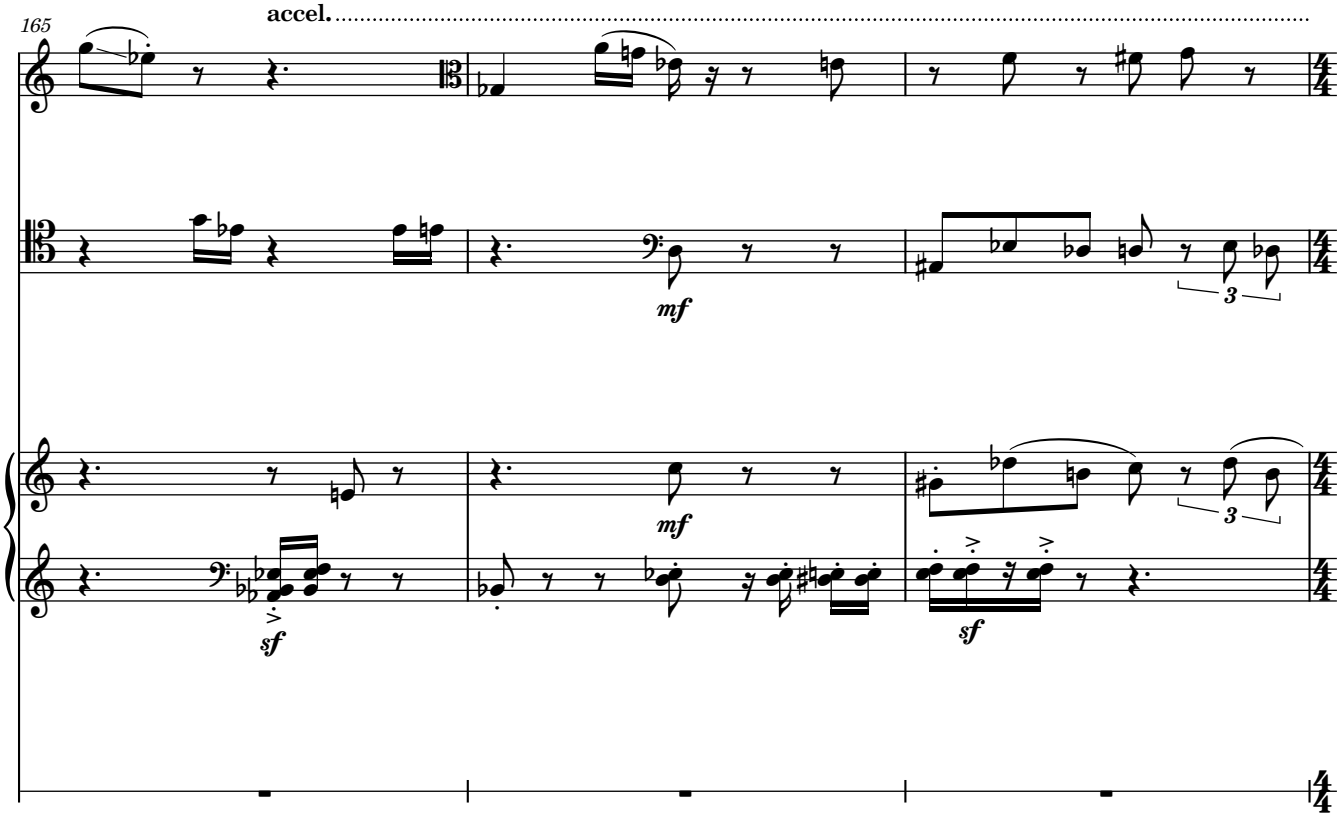

138
f
pizz.
p
sf
sf
sf
sf
p
15ma bassa
sf
43
141
pizz.
p
mf
"p"
mf
3
3
mf
44

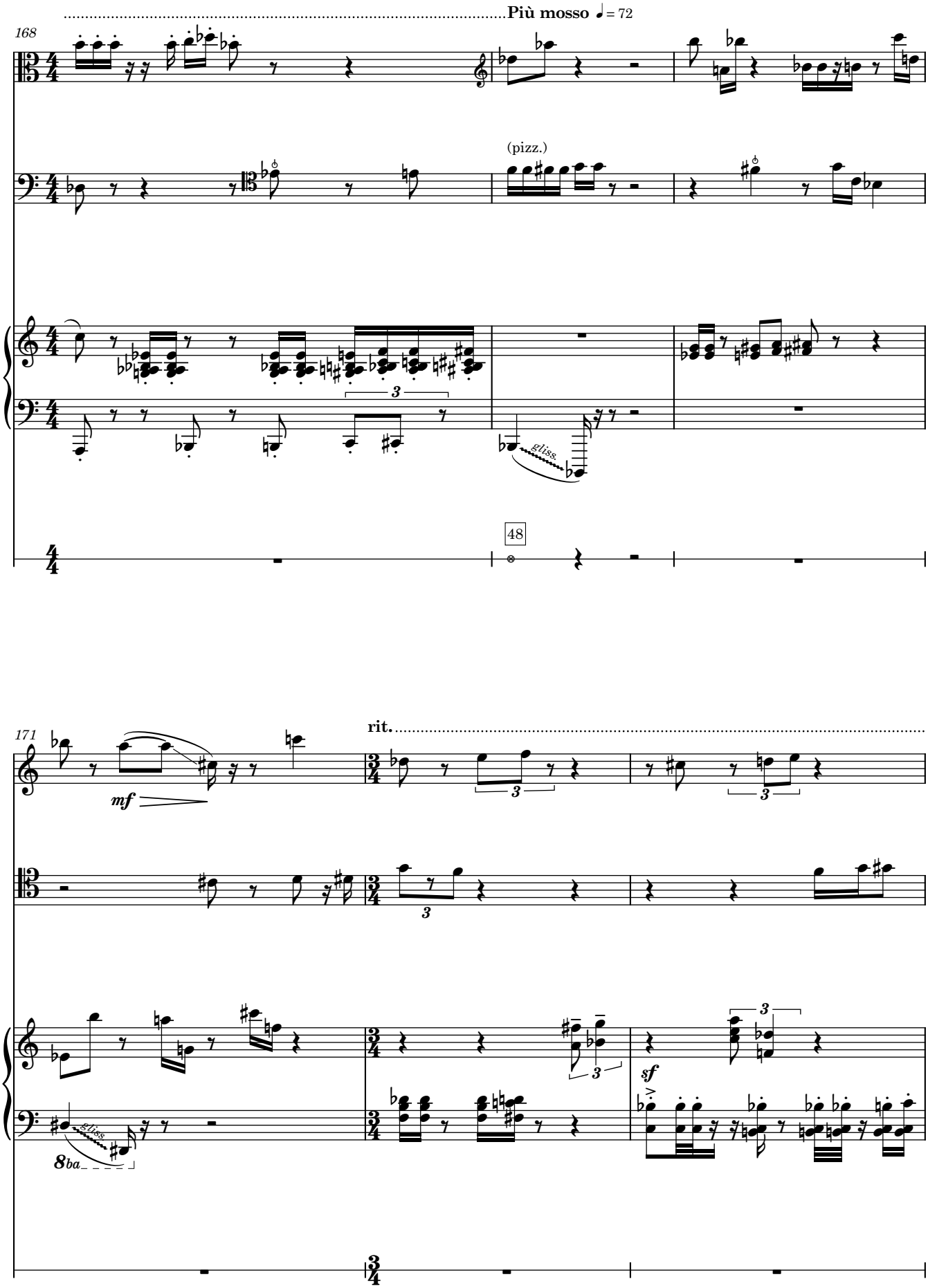

145
accel.
Moderate with tension ♩= 90
p
p
p
pizz.
8ba
Ped.
45
150
arco
mf
sf
pizz.
arco
pizz.
mf
(Ped.)
knock a fallboard
with knuckles
8ba
46

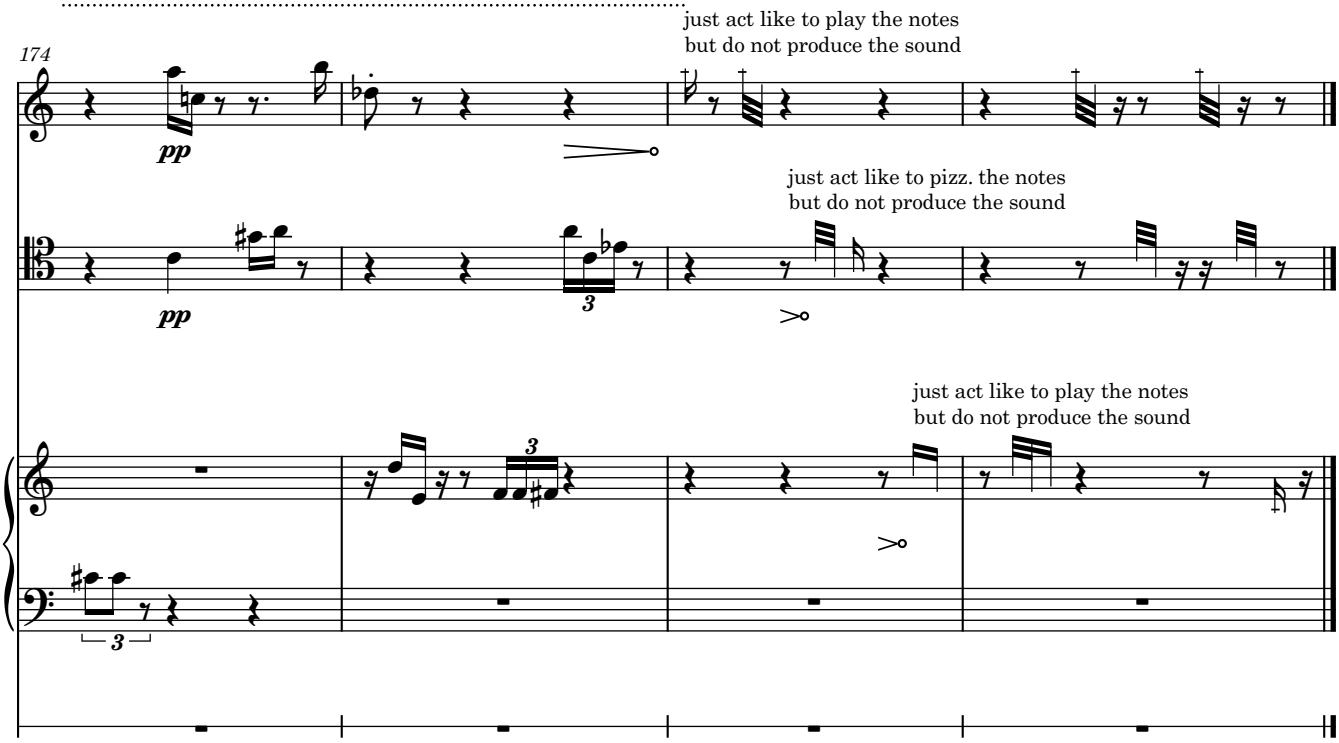

155
arco
gliss.
arco
gliss.
15ma bassa
Ped.
mp
mf


157
H
Lento ♩= 60
w.n.
ppp
pizz.
p
8va
p dolce
15ma bassa
mp
mf
47


161
mp
sul tasto
arco
ppp
pizz.
mp
(8)
3
(Ped.)


165
accel.
mf
3
mf
sf
sf


Più mosso ♩= 72
168
(pizz.)
gliss.
48
171
rit.
mf
gliss.
8ba
sf


174
pp
just act like to play the notes
but do not produce the sound
pp
3
just act like to pizz. the notes
but do not produce the sound
3
just act like to play the notes
but do not produce the sound
3