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PROJECT 1 – 6.005 ABC Player

Datatypes

Pitch = Pitch(value: int,accidental: int,octave: int)

NoteLength = NoteLength(numerator: int,denominator: int)

NoteOrRest = Note(p: Pitch,l: NoteLength) + Rest(l: NoteLength)

Tuplet = Duplet(a: Note,b: Note) + Triplet(a: Note,b: Note,c: Note) + Quadruplet(a: Note,b: Note,c: Note,d: Note)

Chord = Chord(notes: ImList<Note>)

PlayableElement = Chord + Tuplet + NoteOrRest

Measure = RegularMeasure(elements: ImList<PlayableElement>,boolean: isMajorStart,measureID: int,nextMeasureID: int) + RepeatableMeasure(elements: ImList<PlayableElement>,boolean: isMajorStart,measureID: int,nextMeasureID: int,repeatMeasureID: int) + IncompleteMeasure(elements: ImList<PlayableElement>,measureID: int,nextMeasureID: int)

Voice = Voice(name: String, music: List<Measure>, playingOrder: List<int>)

MeterTempo = MeterTempo(numerator: int, denominator: int, bpm: int, ticksPerUnit: int, defaultNoteNumerator: int, defaultNoteDenominator: int) //I added Note in the names of the default note length values (for clarity)

AbcHeader = AbcHeader(title: String, pieceNumber: int, composer: String, mtempo: MeterTempo, key: Key)

Key = Key(modifiers: int) //modifiers is a bitmask containing information about sharps and flats for all notes: binary representation - xbagfedc - x is 1 if sharps, 0 if flats; c is 1 if note C has a modifier; d is 1 if note D has a modifier and so on. Will employ lookup table to translate between key names (e.g. "Cbm") to bitmasks.

KeyTempoChange(firstMeasureID: int,mtempo: MeterTempo,k: Key) //datatype that specifies the measure when a new tempo/key is specified in the middle of the file; assumes that measure IDs are consistent across voices (the first measure in every voice is measure ID 0, the second has ID 1 and so on).

AbcMusic = AbcMusic(changes: KeyTempoChange,voices: ImList<Voice>)

AbcFile = AbcFile(header: AbcHeader,music: AbcMusic)

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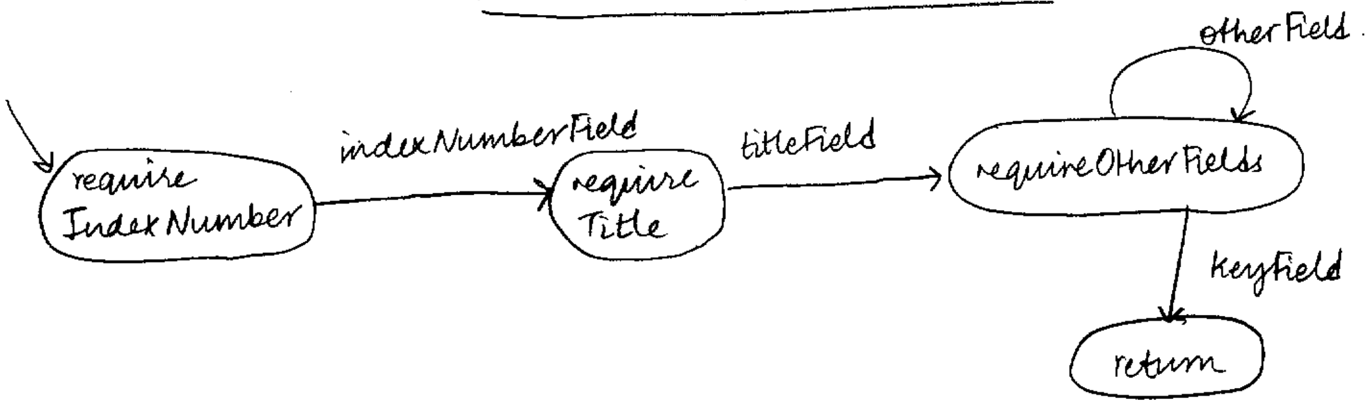
ABC Grammar

A subset of ABC 1.6 in BNF format for 6.005 Project 1

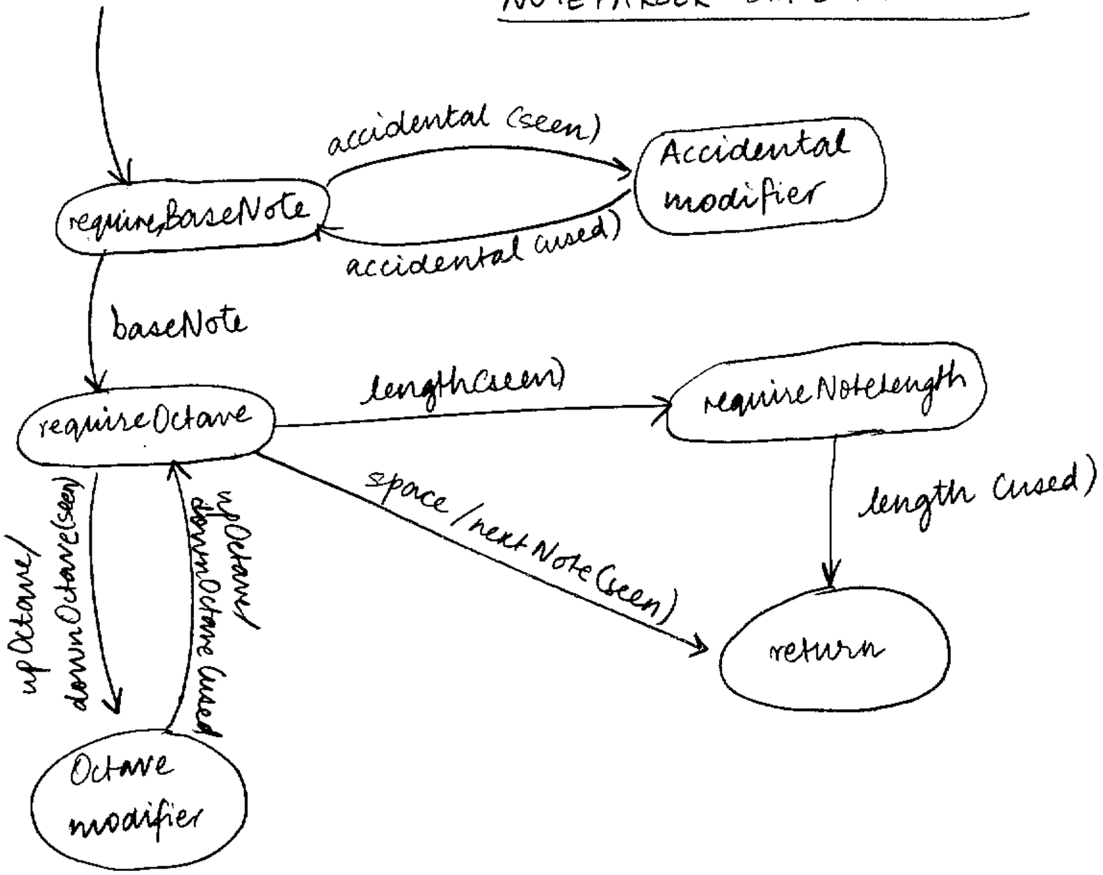
```
abc-file ::= abc-header abc-music
abc-header ::= field-number comment* field-title other-fields* field-key
field-title ::= "T:" text end-of-line
other-fields ::= field-composer | field-default-length | field-meter
      | field-tempo | field-voice | comment | field-index
field-composer ::= "C:" text end-of-line
field-default-length ::= "L:" note-length-strict end-of-line
field-meter ::= "M:" meter end-of-line
field-tempo ::= "Q:" tempo end-of-line
field-voice ::= "V:" text end-of-line
field-key ::= "K:" key end-of-line
field-index ::= "X:" key end-of-line

key ::= "C" | "G" | "D" | "A" | "E" | "B" | "F#" | "C#" | "F" | "Bb" | "Eb"
      | "Ab" | "Db" | "Gb" | "Cb" | "Em" | "Bm" | "F#m" | "C#m" | "G#m" | "D#m"
      | "A#m" | "Dm" | "Gm" | "Cm" | "Fm" | "Bbm" | "Ebm" | "Abm"

meter ::= "C" | "C|" | meter-fraction
meter-fraction ::= DIGIT+ "/" DIGIT+

tempo ::= DIGIT+

;;;;;;;;; END OF HEADER ;;;;;;;;;

abc-music ::= abc-line+
abc-line ::= (measure+ end-of-line) | mid-tune-field | comment
measure ::= [space+] [nth-repeat] [space+] playable-element+ [space+] barline

playable-element ::= note | chord | tuplet-element

; note is either a pitch or a rest
note ::= note-or-rest [note-length]
note-or-rest ::= pitch | rest
pitch ::= [accidental] basenote [octave]
octave ::= ("'"+) | (","+)
note-length ::= [DIGIT+] ["/" [DIGIT+]]
note-length-strict ::= DIGIT+ "/" DIGIT+
; "^" is sharp, "_" is flat, and "=" is neutral
accidental ::= "^" | "^^" | "_" | "__" | "="

basenote ::= "C" | "D" | "E" | "F" | "G" | "A" | "B"
        | "c" | "d" | "e" | "f" | "g" | "a" | "b"

rest ::= "z"

; tuplets
tuplet-element ::= tuplet-spec (note | chord)+
tuplet-spec ::= "(" DIGIT

; chords
chord ::= "[" note+ "]"
```

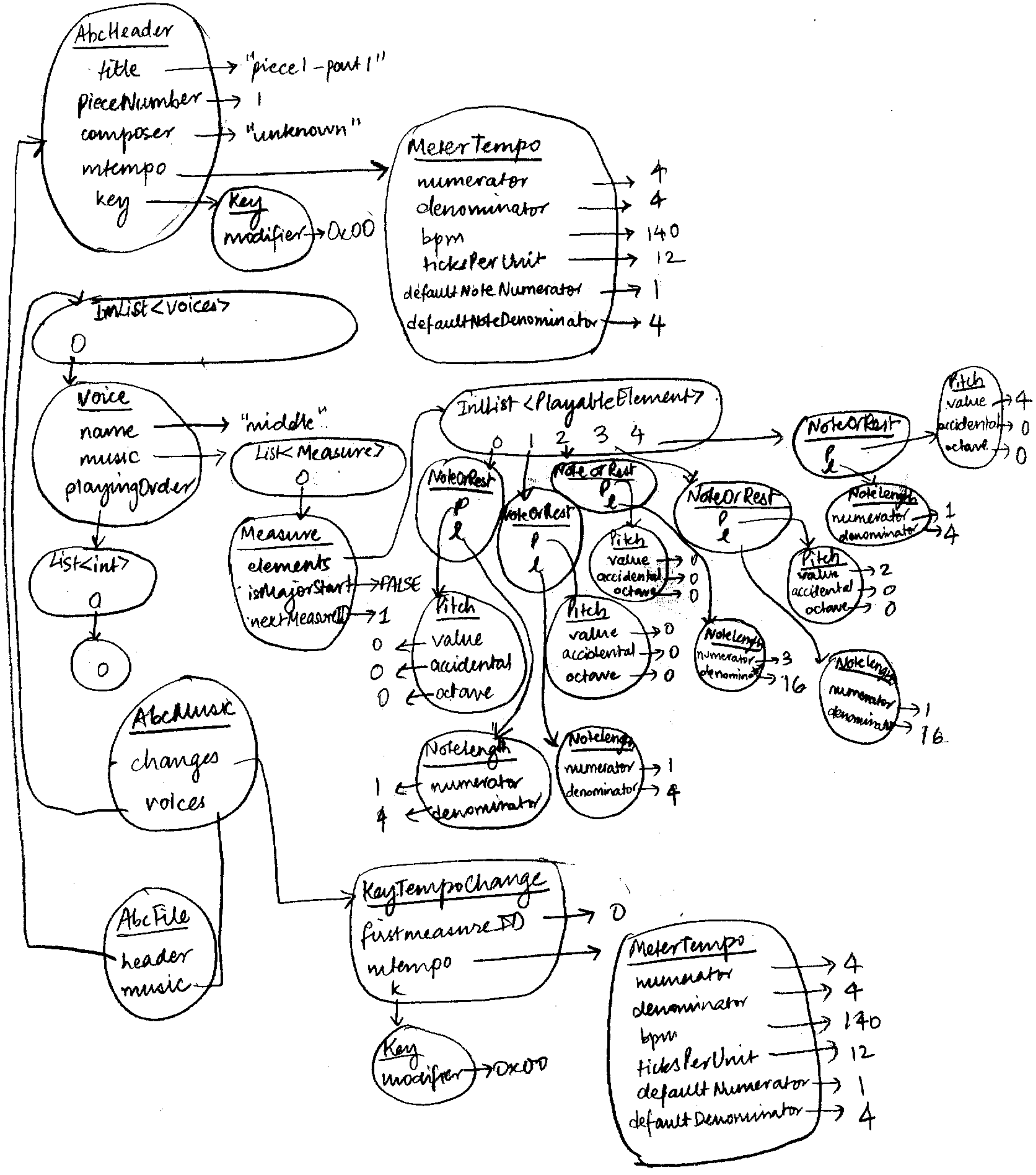
```
barline ::= "|" | "||" | "[|" | "|]" | ":|" | "|:"
nth-repeat ::= "[1" | "[2"

;;;;;;;;;;;;;;; MISC ;;;;;;;;;;;;;;
mid-tune-field- ::= field-voice | field-tempo
comment ::= "%" text linefeed
end-of-line ::= comment | linefeed
```

HEADER PARSER STATE MACHINE

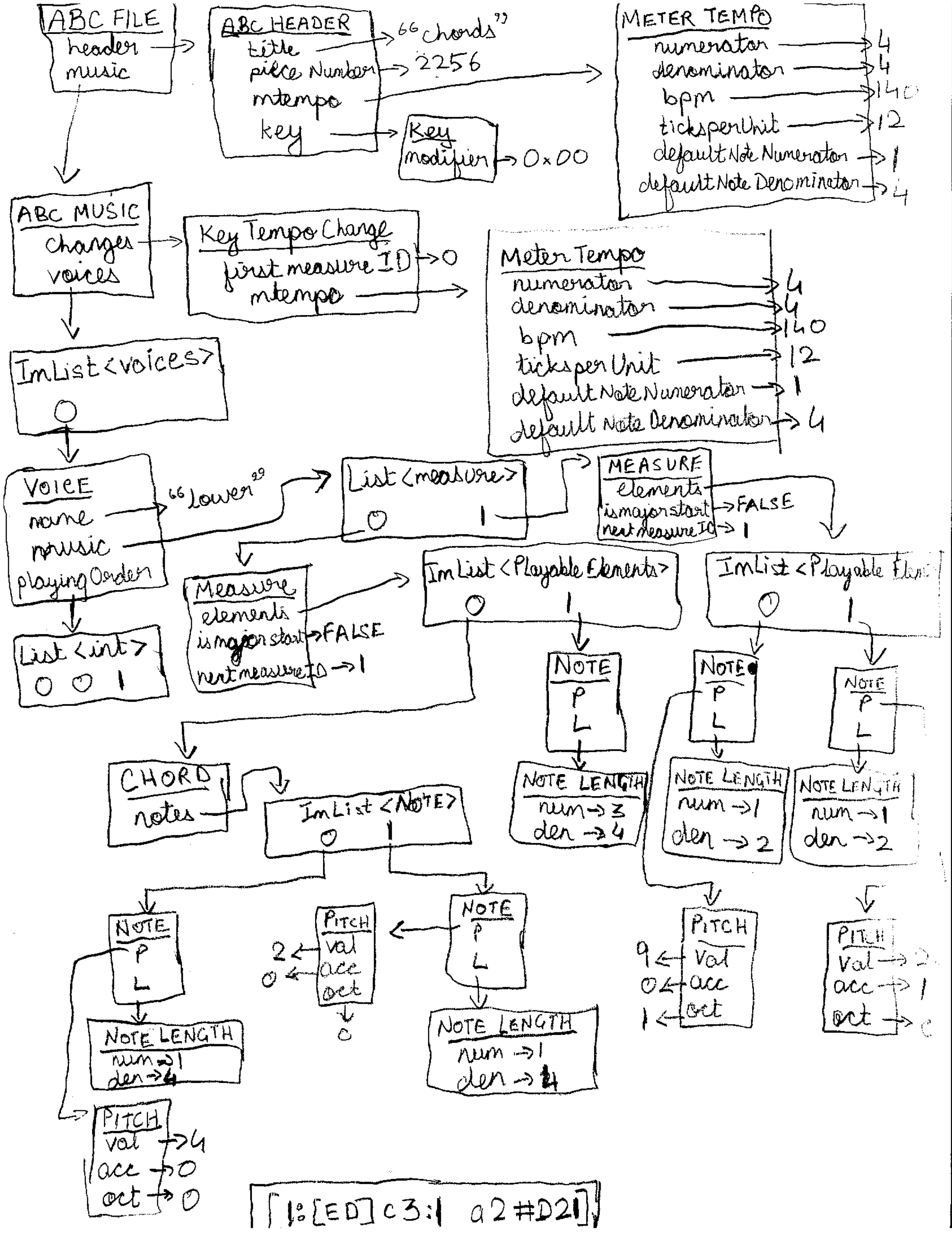


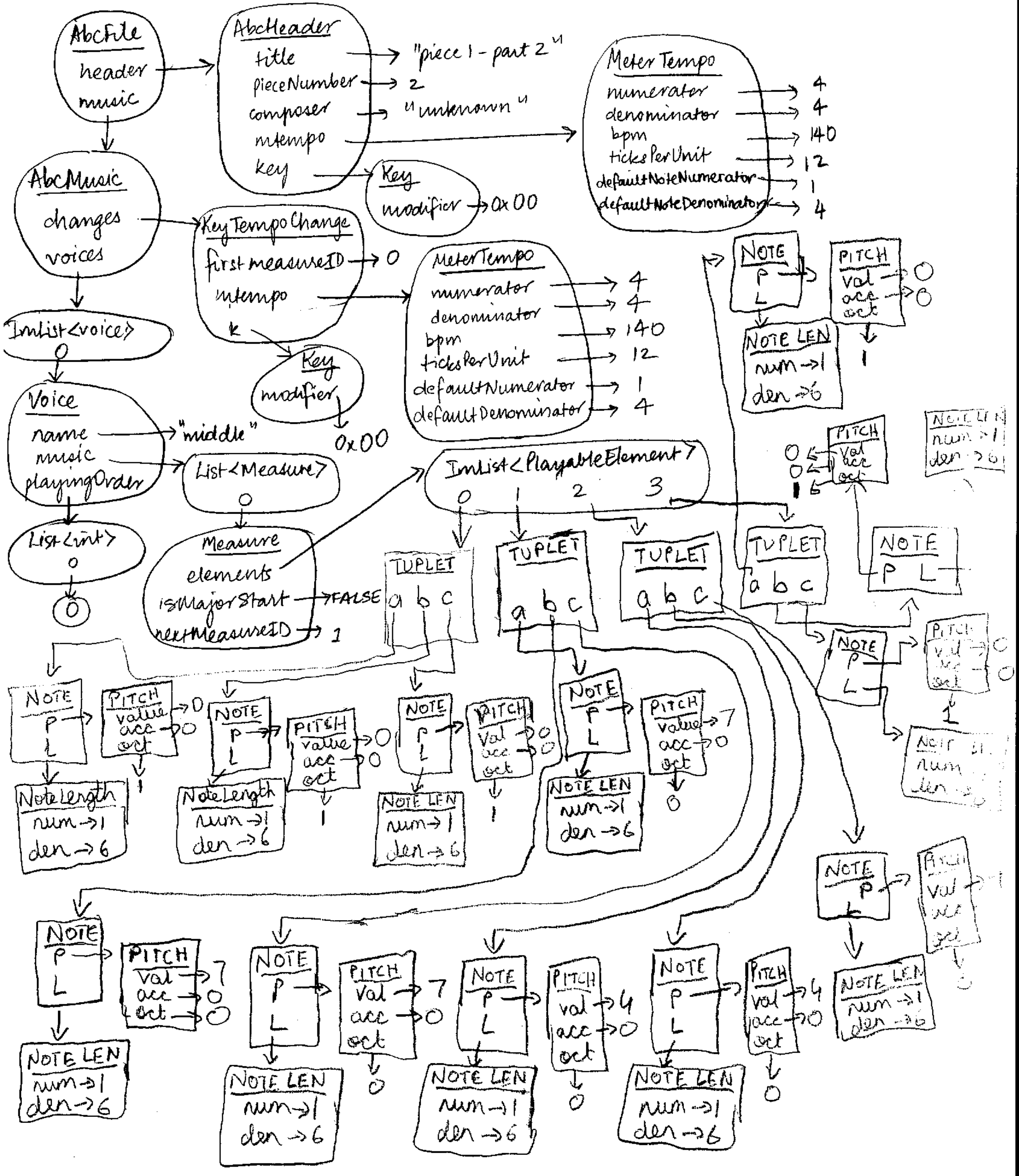
NOTEPARSER STATE MACHINE



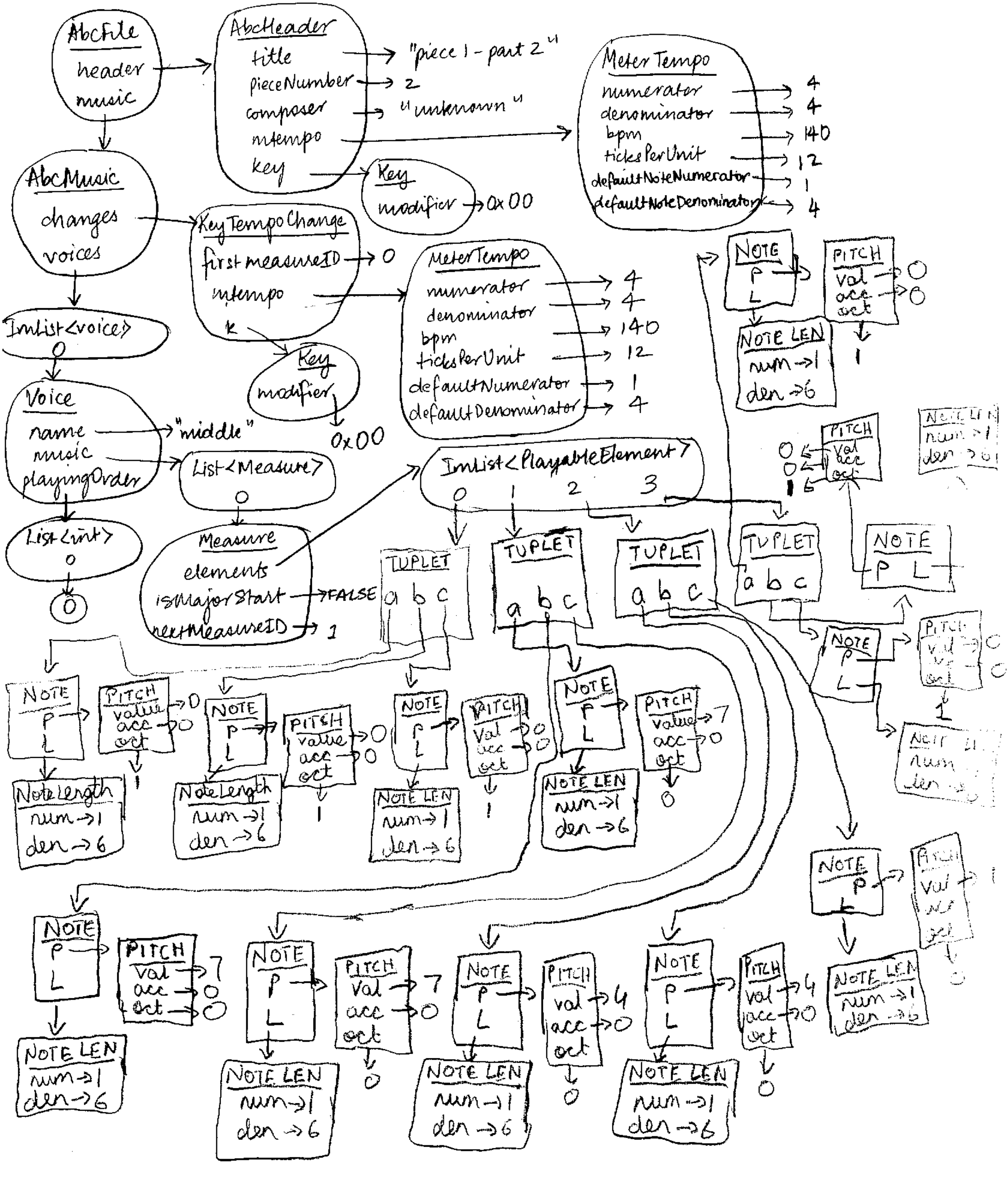

AbcHeader
title
"piece1-part1"
pieceNumber
1
composer
"unknown"
mtempo
key
Key
modifier
0x00
MeterTempo
numerator
4
denominator
4
bpm
140
ticksPerUnit
12
defaultNoteNumerator
1
defaultNoteDenominator
4
ImList<Voices>
0
Voice
name
"middle"
music
playingOrder
List<Measure>
0
Measure
elements
isMajorStart
FALSE
nextMeasureID
1
List<int>
0
0
ImList<PlayableElement>
0 1 2 3 4
NoteOrRest
p
l
Pitch
value
accidental
octave
0
0
0
NoteLength
numerator
denominator
1
4
NoteOrRest
p
l
Pitch
value
accidental
octave
0
0
0
NoteLength
numerator
denominator
1
4
Note or Rest
p
l
Pitch
value
accidental
octave
0
0
0
NoteLength
numerator
denominator
3
16
NoteOrRest
p
l
Pitch
value
accidental
octave
2
0
0
NoteLength
numerator
denominator
1
16
NoteOrRest
p
l
Pitch
value
accidental
octave
4
0
0
NoteLength
numerator
denominator
1
4
AbcMusic
changes
voices
AbcFile
header
music
KeyTempoChange
firstmeasureID
0
mtempo
k
Key
modifier
0x00
MeterTempo
numerator
4
denominator
4
bpm
140
ticksPerUnit
12
defaultNumerator
1
defaultDenominator
4

| C C C3/4 D3/4 E |


ABC FILE
header
music
ABC HEADER
title
piece Number
mtempo
key
"chords"
2256
Key
modifier
0x00
METER TEMPO
numerator
denominator
bpm
ticksperUnit
defaultNoteNumerator
defaultNoteDenominator
4
4
140
12
1
4
ABC MUSIC
changes
voices
Key Tempo Change
first measure ID
mtempo
0
Meter Tempo
numerator
denominator
bpm
ticksperUnit
defaultNoteNumerator
defaultNoteDenominator
4
4
140
12
1
4
ImList<voices>
0
VOICE
name
music
playingOrder
"lower"
List<int>
0 0 1
List<measure>
0 1
MEASURE
elements
ismajorstart
nextmeasureID
FALSE
1
Measure
elements
ismajorstart
nextmeasureID
FALSE
1
ImList<Playable Elements>
0 1
ImList<Playable Elem
0 1
NOTE
P
L
NOTE LENGTH
num → 3
den → 4
NOTE
P
L
NOTE LENGTH
num → 1
den → 2
NOTE
P
L
NOTE LENGTH
num → 1
den → 2
PITCH
val
acc
oct
9
0
1
PITCH
val → 2
acc → 1
oct → 0
CHORD
notes
ImList<NOTE>
0 1
NOTE
P
L
NOTE LENGTH
num → 1
den → 4
PITCH
val → 4
acc → 0
oct → 0
PITCH
val
acc
oct
2
0
0
NOTE
P
L
NOTE LENGTH
num → 1
den → 4
[1: [ED] c3:| a2 #D2|]



|(3c/c/c/ (3G/G/G (3E/E/E/ C3c/c/c



|(3c/c/c/ (3G/G/G (3E/E/E/ (3C/C/C|