basics of (western) music theory

sovannjet lim

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scales (& keys)

- let's define the notes we have available. (the modern western tuning system uses *12-tone equal temperament* - partition the *octave* into *twelve* notes/pitches)
  - why do pitches an octave apart sound "equivalent"? *2:1 frequency ratio*
  - how would we divide the octave "evenly" into 12 while maintaining the doubling relation? *multiplicative / common ratio / geometric series / logarithmic, NOT additive / common difference / arithmetic series / linear*
    - (other cultures divide the octave into different numbers of pitches…)

power	**2^power**	**freq. = 220(2^power)**	**note** (write later)
0/12	1.0000	220.00	A(3) = 220 Hz
1/12	1.0595	233.08	
2/12	1.1225	246.94	B
3/12	1.1892	261.63	C
4/12	1.2599	277.18	
5/12	1.3348	293.66	D
6/12	1.4142	311.13	
7/12	1.4983	329.63	E
8/12	1.5874	349.23	F
9/12	1.6818	369.99	
10/12	1.7818	392.00	G
11/12	1.8877	415.30	
12/12	2.0000	440.00	A(4)

  - western note names (reveal cycle), staff notation, & notes on piano (who is familiar?)
- in western music, the *pitch collection* (e.g. for a song or piece) is a selection of 7 of these 12
  - (…and/or other cultures select a different set of pitches for their pitch collections)
- key = starting note + scale/mode (major/minor (who is familiar?); independent of starting note)
  - scale/mode is a pattern of spacings (half/whole steps) that define which 7 pitches are selected
    - other sources describe as WWHWWWH or WHWWHWW; encoded in cardboard here; provides us a "general formula" (independent of starting note)
  - can number scale degrees (independent of starting note!)
    - this is like "moveable Do", if you've heard of it (ignore if not)
  - western notation: key signatures indicate the pitch collection (for a song/piece)
- exercises - generating pitch collection from key & naming key from pitch collection

intervals

- now that we have notes (i.e., we've defined a set of notes we're "limited" to), we can define distances (*intervals*) between them, in pitch/frequency space
- names

    - (who has heard of a perfect 5th? perfect 4th? major 3rd? minor 3rd? can you guess what these mean?)
    - ordinal numbers (<- scale degrees) + quality (major/minor/perfect/diminished/augmented)
- more consonant intervals roughly (cultural!) correspond to smaller-whole-number ratios
    - historically, just intonation came before 12-TET
- western music is very rich in harmony (vertical relationships between the pitches of simultaneous notes), not so rich in rhythm (horizontal relationships between the durations of notes spaced out in time); other musical cultures are much more rich in rhythm
- exercises - naming & generating intervals

chords

- a *chord* (can anyone define?) = 2+ notes; vertical instead of horizontal composition
- the basic/"standard" chord in western music is a *triad* (how many notes?) - *three* notes
    - specifically, scale degrees 1, 3, 5
    - start with the 1st and 5th
    - for the 3rd, we have a choice between major (brighter) and minor (darker)
        - other sources might call their qualities "happy" and "sad", but
            - there are contexts in which major can sound sad or minor can sound happy (examples?)
            - this perception is cultural/conditioned by western music, not universal/objective
        - *could* think of as M3-m3 vs. m3-M3, but not very helpful imo
    - can have inversions
    - deciding between enharmonic equivalents: make sure it's 1 3 5
- exercises: naming & generating chords (include inversions)
    - naming: get used to finding 1 and 5, and then identifying 3 as major or minor
    - generating: get used to 1 3 5 pattern - alternates scale degrees
- dim, aug, dom7, maj7, min7, °7, ø7, mM7, sus(2, 4), power
- exercises - naming & generating ✨fancy✨ chords
    - naming: multiple answers might be possible; analysis depends on surrounding musical context
    - generating: start with triad

(3-minute break)

chord progressions

- let's apply all that to actual songs! when you listen to music, do you ever hear just One chord, on its own? (rarely.) chords exist not in isolation but in context; most songs have multiple chords that change in time/horizontally to form a sequence - a *chord progression*
- with each chord change, the chord you start on and the chord you end on both contribute to the *feel* of that change

- listen to how the following chord progressions feel similar (in fact, give me a starting note/chord/key and i can generate the similar-feeling chord progression):
    - [i iv V7 i in Gm, Cm, X]
    - [I V vi IV I in Db, X]
    - [I iii vi IV V I in A, X]
    - what do they have in common? *scale degrees of/intervals between roots*
- → so what if we thought about the chords in terms of scale degrees (of their roots) instead?
    - need a tonic/key in order to assign numbers
        - i've designed these to start on I/i, but can switch around (ex. many pop songs use vi IV I V)
- by convention, roman numerals are used to refer to chords (cf. numbers for scale degrees)
    - uppercase for major, lowercase for minor
- now we have a general formula for [this feeling]! the only difference is the tonic / key / starting note/chord; they "differ by a constant"
    - go backwards: apply this formula to various tonics/in various keys → get back our original chord progressions
- analyzing (chords -> roman numerals) & transposing (roman numerals -> chords) a pop song (song & new key suggested by students)
    - most melody notes in a song are found in the current chord
- I V vi IV: 4-chords song (axis of awesome)
- non-diatonic chords & chord tones can sound Awesome
    - i IV V(7): why does V want to resolve to I/i so badly (have such a strong tendency to ")? *leading tone* (chordal 7th also contributes)
        - notice how we're analyzing solely in terms of the general formula now, so this works in any key! (ex. G7 → C, D7 → G, A7 → D, C7 → F, F7 → Bb)
    - I III IV iv: creep (radiohead)
- classifying roman numerals (and even scale degrees) based on function?

(links)

- https://www.physicsclassroom.com/mmedia/waves/tfl.cfm
- https://app.midiano.com/
- (Major isn't happy, Minor isn't sad)
- (Dear Theodosia)
- 4 Chords
- Creep
- google search "chords and harmonic functions"