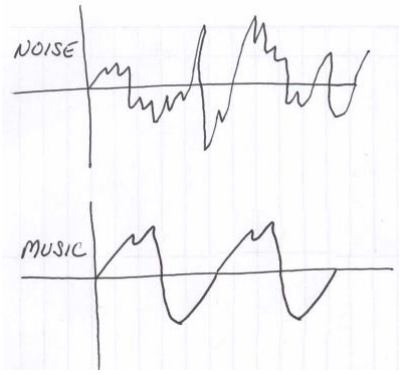
Music

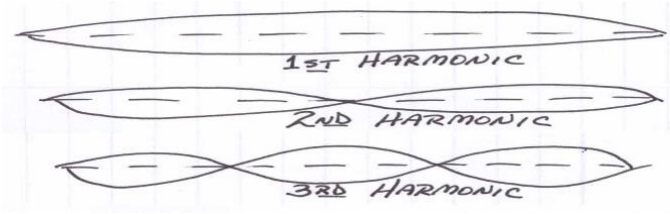
- **Musical Sound**
  - **The difference between _____ vs. _____ is mixed vs. periodic frequencies.**
  - **Musically speaking there are three main characteristics: pitch, loudness, and quality.**

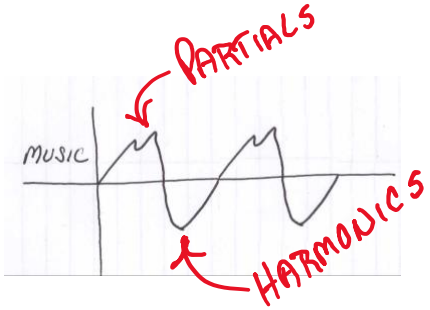


- **Sound: Pitch**
  - **The _____ of a sound is its frequency.**
  - **"Concert A" is the standard note everyone tunes to. It is 440 Hz.**
  - **Humans perceive music logarithmically. We hear the same gap between A220, A440, and A880.**
- **Sound: Loudness**
  - **The _____ of a sound is the wave intensity which is ~ amplitude$_2$.**
  - **Units or dimensions of intensity are watts/m$_2$.**
  - **Humans can't hear below 10^{-12} W/m$_2$.**
  - **The threshold of pain starts at about 1 W/m$_2$.**
  - **Every power of ten in W/m$_2$ is called a "bel" (named after Alexander Graham Bell). Starting with 10^{-12} W/m$_2$ = 0 bel. 10^{-11} W/m$_2$ = 1 bel, and so on. Now we often use decibels (1 bel = 10 decibels).**
  - **Physiological hearing gets damaged at 85 dB.**
  - **We are more sensitive at high frequencies. 80dB at 3500Hz sounds twice as loud as 80dB at 125Hz.**

SOUND	W/m$_2$	dB
Jet airplane 30 m away	10_2	140
Air-raid siren, nearby (threshold of pain)	1	120
amplified music	10_{-1}	115
riveter	10_{-3}	100
	10_{-4}	
busy street traffic	10_{-5}	70
conversation	10_{-6}	60
quiet background music	10_{-8}	40
whisper	10_{-10}	20
leaves rustling	10_{-11}	10
threshold of hearing	10_{-12}	0

- **Sound: Quality**
  - **What is the difference of a clarinet, voice and piano performing the same note?**
    The _____ of a sound is the difference from *partials* and *harmonics.*
    - **_____ are frequencies that *superposition* with the original, lowest one.**
    - **_____ are frequencies that are *multiples* of the original, lowest one.**





- **Musical Instuments:**
  Basically are of three types: string, air, and percussion.
  - **_____ of a musical instrument depends on the *form or geometry*.**
  - **Joseph Fourier found that all periodic waves can be analyzed (taken apart) to pure parts. This is _____.**
  - **Vinyl records' grooves (a) = cassette tape iron filings (a) = optical patterns on CDs (d). They all represent notes to the playing device. *The difference is analog (a) vs. digital (d)!***
  - **_____ signals *mimic* the original:** loud - bigger … high – higher.
  - **_____ signals *abstract* the original:** loud – one digit … high – another digit.