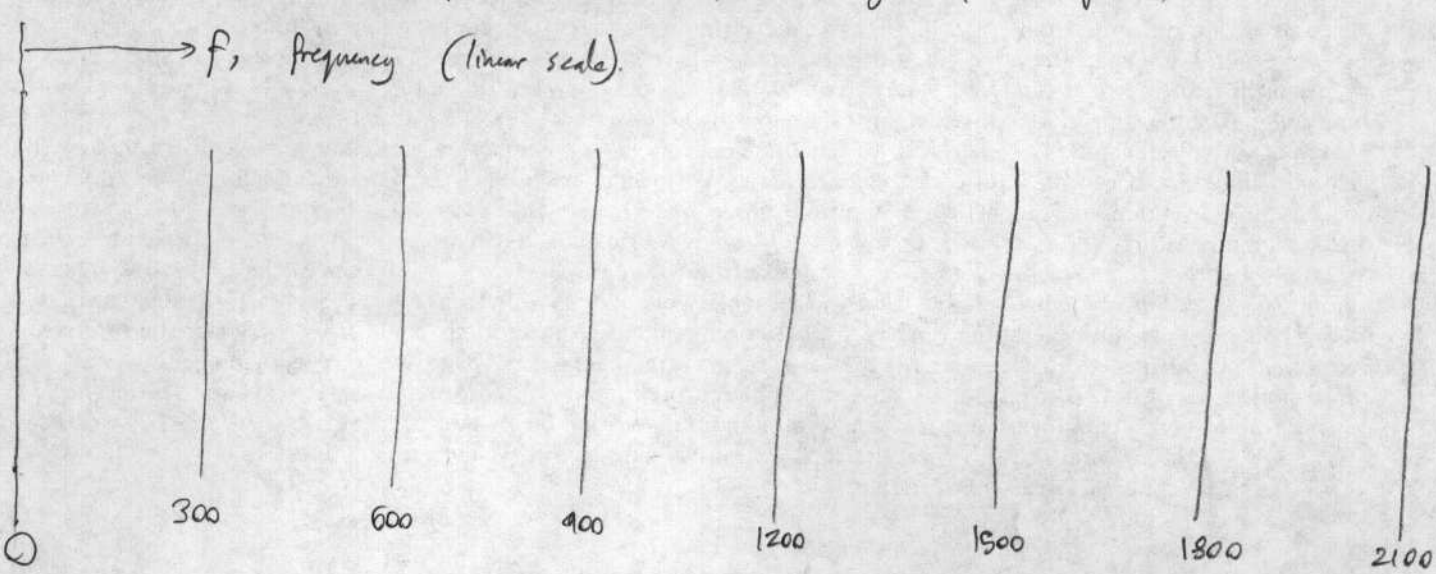
MATH 5 WORKSHEET : Helmholtz theory of dissonance 4/11/07 Barnett

Consider the harmonic partials of a periodic signal (musical pitch) at 300Hz:



A) The major 6^{th} above this is at 500 Hz (using 'just' tuning ratio 5:3). Add short vertical lines to the diagram giving this note's <u>harmonic partials</u>.

Which partials are 'dissonant'* with the original set?

*Two pure tones are dissonant if they have a freq. <u>difference</u> of 10% or less (ie a ratio between about 0.9 to 1.1) but <u>not exactly equal</u> in frequency either.

B) The 'tritone' (6 semitones) above the 300 Hz is very close to 425Hz. Add its harmonic partials to the diagram using blobs (or some symbol).

Which partials are dissonant (against those of the original 300Hz)?

C) Which interval has <u>more</u> dissonant partials?

Which does this theory predict is more consonant?

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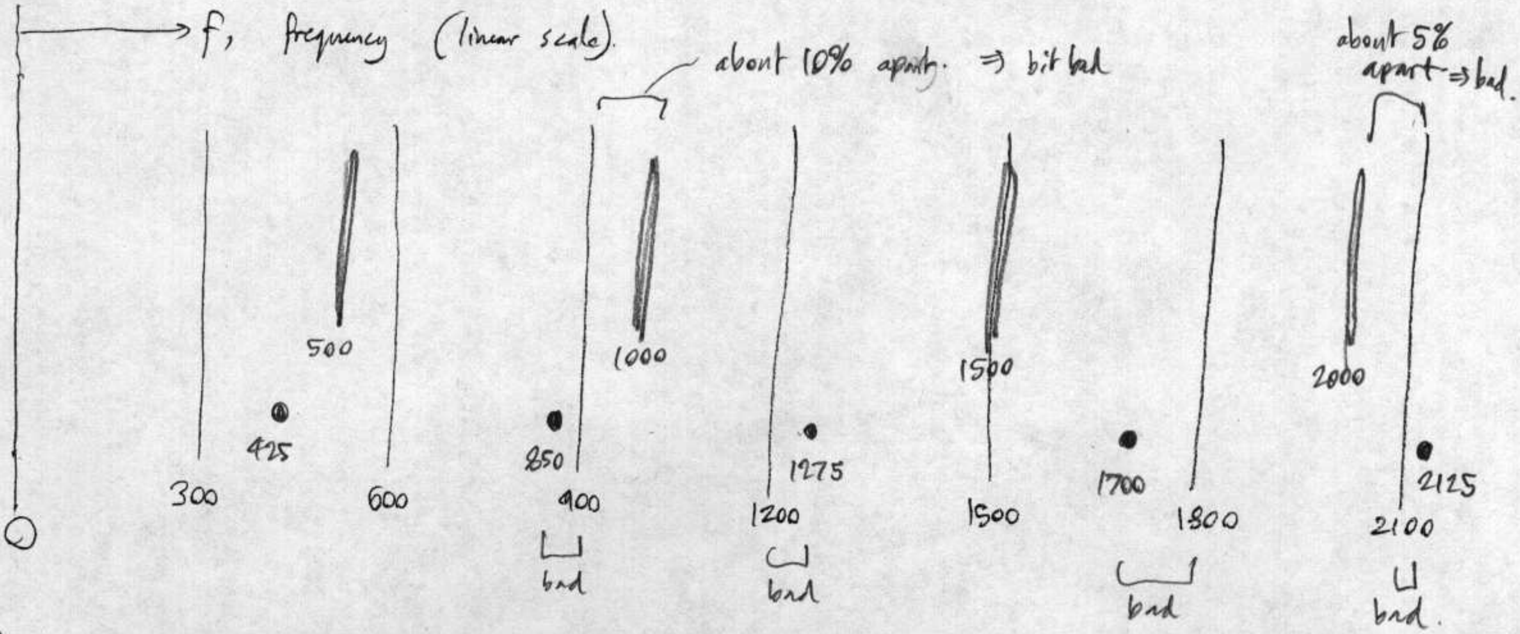

A) The major 6th above this is at 500 Hz (using 'just' tuning ratio 5:3). Add short vertical lines to the diagram giving this note's <u>harmonic partials</u>.

Which partials are 'dissonant'* with the original set? 900 & 1000, 2000 & 2100.

* Two pure tones are dissonant if they have a freq. <u>difference</u> of 10% or less (ie a ratio between about 0.9 to 1.1) but <u>not exactly equal</u> in frequency either.

B) The 'tritone' (6 semitones) above the 300 Hz is very close to 425 Hz. Add its harmonic partials to the diagram using blobs (or some symbol).

Which partials are dissonant (against those of the original 300Hz)?
850, 1275, 1700, 2125, ie almost all of them!

C) Which interval has <u>more</u> dissonant partials? the tritone. (4 vs 2 dissonant partials)
Which does this theory predict is more consonant? the major 6th.