COMPOSITION: ELECTRONIC MEDIA II
Feb. 8, 2006
Tuning: Pitches, Myenumbers. Freq., Ratio, Semitone, Intervals, Cents, and yes, GROUPS

1. The chart below shows the tuning structure of a one-octave 12-note equal-tempered scale from C4 to C5.

Pitch	Keynumber	Freq	Ratio	Semitones	Cents
C4	60	261.6 hz	1.0 : 1	0	0.0
C#/Db4	61	277.2 hz	1.059 : 1	1	100.0
D4	62	293.7 hz	1.122 : 1	2	200.0
D#/Eb4	63	311.1 hz	1.189 : 1	3	300.0
E4	64	329.6 hz	1.26 : 1	4	400.0
F4	65	349.2 hz	1.335 : 1	5	500.0
F#/Gb4	66	370.0 hz	1.414 : 1	6	600.0
G4	67	392.0 hz	1.498 : 1	7	700.0
G#/Ab4	68	415.3 hz	1.587 : 1	8	800.0
A4	69	440.0 hz	1.682 : 1	9	900.0
A#/Bb4	70	466.2 hz	1.782 : 1	10	1000.0
B4	71	493.9 hz	1.888 : 1	11	1100.0
C5	71	523.2 hz	2.0 : 1	12	12000.0

2.. Consider pitch name and ocatve number conventions.

3. Compare pitches with MIDI Keynumbers. Consider going above or below the notes in the chart.

4. Discussion of Frequency:
   a. In terms of pitches
   b. In terms of keynumbers
   c. In terms of ratios.

5. Discussion of intervals (measure in semitones), generating intervals, ratios, and generating ratios.

6. Note for a an equal-tempered scale of *n* semitone, the intervals *x*, *y*, … that are relatively prime to *n* generate the scale under mod *n* addition. The generators of an equal-tempered scale form a mathematical group. The generators for the 12-note scale form a 4-group such that:

	1	5	7	11
1	1	5	7	11
5	5	1	11	7
7	7	11	1	5
11	11	7	5	1

This is a Klien 4-group under mod 12 multiplication

7. Consider the isomorphism of the group above to the group formed by the contrapuntal refelctions operations P, I, R, RI:

	P	I	R	RI
P	P	I	R	RI
I	I	P	RI	R
R	R	RI	P	I
RI	RI	R	I	P

This is a Klien 4-group under composition of operations.