a) Compute frequencies ratios of E & B in the major scale to finish the 'Pythagorean diatonic scale'. Either go up or down by fifths (3/2) Look at the chromatic scale to figure out whether to go up or down from existing notes

C	D	E	F	G	A	B	C
1	9/8		4/3	3/2	27/16		2

b) Compare the freq of E to the freq. 5/4 which emerges from the harmonic series. To this by finding their ratio (as a simple fraction).

This ratio is called the Syntotic comma.

c) What ratios are there between C & D ?
(1 integer)
D & E ?
E & F ?
etc.

ie the adjacent notes

MATHS WORKSHEET : Tuning systems. 4/8/07

SOLUTIONS.

a) Compute frequencies ratios of E & B in the major scale to finish the 'Pythagorean diatonic scale'. Either go up or down by fifths (3/2) Look at the chromatic scale to figure out whether to go up or down from existing notes

C D E F G A B C D E

3/2

1 9/8 4/3 3/2 27/16 2 81/32

81/64 ← down an octave. (1/2) — 243/128

up 3/2.

E is fifth above A; B is fifth above E (check 7 semitones on piano kbd).

b) Compare the freq of E to the freq. 5/4 which emerges from the harmonic series. To this by finding their ratio (as a simple fraction).

Pythag. E (relative to C=1) is 81/64

Harmonic series E (5:4) is 5/4

} ratio $\frac{81 \times 4}{5 \times 64_{16}} = \frac{81}{80}$

This ratio is called the Syntotic comma.

c) What ratios are there between (integer) C & D ? 9/8 = pythag. tone

D & E ? 9/8

E & F ? 256/243 = pythag. semitone.

etc. F & G 9/8

G & A 9/8

A & B 9/8

B & C 256/243.

ie the adjacent notes