

Cents, The Line of Fifths, & Scale Creation

You will need to read the following three Web pages before attempting to complete this assignment:

1.	<i>Cents: A convenient unit for measuring interval size</i>	www.music.sc.edu/fs/bain/atmi02/cents/default.html
2.	<i>The Line of Fifths</i>	www.music.sc.edu/fs/bain/atmi02/lof/
3.	<i>A Pythagorean Tuning of the Diatonic and Chromatic Scales</i>	www.music.sc.edu/fs/bain/atmi02/pst/

In question 1 below, you will be asked to convert frequency ratio to cents. You will need to use the JavaScript application **RatioToCents** to perform this conversion. The application may be found in the blue frame located at the bottom of the *Cents: A convenient unit for measuring interval size* page referenced above.

1. Complete the following chart:

In 1a.-1j below, convert the given natural interval frequency ratio to cents. In 1k.-1t., express the corresponding 12TET (modern piano tuning) interval size in cents. In 1u.-1dd., compare the relative size of the natural intervals in 1a.-1j. with the corresponding 12TET intervals in 1k.-1t as shown in the examples. (The first two sets of answers have been done for you.)

Natural interval size as a frequency ratio	Natural interval size as cents (c.)	12TET interval size as a traditional tonal interval name	12TET interval as cents	Compare natural interval size with the 12TET (modern piano tuning) for each interval. Express the difference in cents as shown in the examples.
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a. 16:15	112 c.	k. m2	100 c.	u. 16:15 is 12 c. larger than a 12TET m2.
b. 9:8	204 c.	l. M2	200 c.	v. 9:8 is 4 c. larger than a 12TET M2.
c. 6:5	_____	m. m3	_____	w. _____ is _____ than a 12TET m3.
d. 5:4	_____	n. M3	_____	x. _____ is _____ than a 12TET M3.
e. 4:3	_____	o. P4	_____	y. _____ is _____ than a 12TET P4.
f. 3:2	_____	p. P5	_____	z. _____ is _____ than a 12TET P5.
g. 8:5	_____	q. m6	_____	aa. _____ is _____ than a 12TET m6.
h. 5:3	_____	r. M6	_____	bb. _____ is _____ than a 12TET M6.
i. 9:5	_____	s. m7	_____	cc. _____ is _____ than a 12TET m7.
j. 15:8	_____	t. M7	_____	dd. _____ is _____ than a 12TET M7.

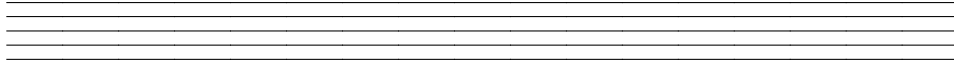
2. What important traditional tonal interval is conspicuously missing from the chart above?

3. Complete the *line of fifths* below by filling in the blanks provided:

... _____ B^{bb} _____ B^b F C G D A E B F[#] _____ F^x _____ ...

Notice that any set of 6 consecutive fifths yields a diatonic scale, and every 5 yields a major pentatonic scale

4. On the 5-line musical staff provided below, write out a *major diatonic scale* starting on C using whole note heads and a treble clef.



(Use the musical staff above as a workspace for your calculations, if necessary.)

5. **Complete the following chart:** Specify the interval frequency ratio for each of the seven tones of a major diatonic scale in a Pythagorean tuning based on C4. Then determine the size of each scale step as a frequency ratio and convert those frequency ratios to cents.

Pitch name	C4		D4		E4	F4		G4		A4		B4	(C5)
Interval Frequency ratio	x		$\frac{9}{8} x$					$\frac{3}{2} x$					$\frac{2}{1} x$
Step-size as a frequency ratio		9:8		_____	_____	_____		_____		_____		_____	_____
Step-size as cents		204		_____	_____	_____		_____		_____		_____	_____

6. Examine the size of each adjacent interval in the chart above. How many different step sizes are produced by a Pythagorean tuning of the diatonic scale tuning? _____

7. Examine the tuning major triad C4-E4-G4 that is produced by this tuning. How does it compare with the tuning of the major triad implied by the harmonic series?

USE THIS SPACE FOR YOUR INTERVAL FREQUENCY CALCULATIONS, IF NECESSARY: