Note, Frequency, and Mussete Tuning

AccordionLab (http://acclab.com)

There are 12 notes in each octave. Only note A in every octave has an integer frequency: 110, 220, 440, 880, 1760, 3520, 7040 Hertz.

When you raise the pitch one octave, the frequency doubles. So for A = 440 hertz, the pitch of one octave above – the note A^1 should be 880 hertz, A^2 = 1760 Hertz. Thus A_2 = 110, A_1 = 220 Hertz, …

There are 12 half steps within each one octave. The 12 half steps between A (440 hertz) and A^1 (880 hertz) are:

$A^{\#}$ (B^b) = 440 x $2^{1/12}$ = 440 * 1.059463094 = 466.1637614

B = B^b x $2^{1/12}$ = A * $2^{2/12}$ = 440*1.122462048 = 493.8833013

C = B x $2^{1/12}$ = A * $2^{3/12}$ = 440*1.189207115 = 523.2511306

$C^{\#}$ = C* $2^{1/12}$ = A * $2^{4/12}$ = A * $2^{1/3}$ = 440* 1.25992105 = 554.3652619

D =

$D^{\#}$ (E^b) =

E =

F =

$F^{\#}$ (G^b) =

G =

$G^{\#}$ (A^b) = A * $2^{11/12}$ = 440*1.887748624 = 830.6093947

A^1 = $G^{\#}$ * $2^{1/12}$ = A * $2^{12/12}$ = A * 2^1 = 440*2= 880 Hertz

Remembering that

$2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * 2^{1/12} * = 2^{(1/12+1/12+1/12+1/12+1/12+1/12+1/12+1/12+1/12+1/12+1/12+1/12)} = 2^1 = 2$

One of the fundamentals about mussete: Tuning is often measured in "cents".

1 cent = 1/100 of a half-step, or a difference in pitch by a factor of 2 raised to the 1/1200 power. That is:

1 cent = $2^{1/1200}$ = 1.000577790. So +1 cents from note A – 440.2542276 hertz

5 cents = $2^{5/12000}$ = 1.002892288. So +5 cents from note A – 441.2726067

10 cents = $2^{10/1200}$ = 1.005792941. So +10 cents from note A – 442.548894

15 cents = $2^{15/1200}$ = 1.008701984. So +15 cents from note A – 443.8288728

20 cents = $2^{20/1200}$ = 1.01161944. So +20 cents from note A – 445.1125537

25 cents = $2^{25/1200}$ = 1.014545335. So +25 cents from note A – 446.3999474

…

100 cents = $2^{100/1200}$ = $2^{1/12}$ = 1.059463094. So +100 cents from note A becomes $A^{\#}$ (B^{b}) = 440 x $2^{1/12}$ = 440 * 1.059463094 = 466.163761

…

-1 cent = 1/cent = 1/1.000577790 = 0.999422433

-5 cents = $1/2^{5/12000}$ = 1/1.002892288 = 0.997116053. So -5 cents from note A – 438.7310634

-10 cents = $1/2^{10/1200}$ = 1/1.005792941. So -10 cents from note A – 437.4657865

-15 cents = $1/2^{15/1200}$ = 1/1.008701984. So -15 cents from note A – 436.2041584

-20 cents = $1/2^{20/1200}$ = 1/1.01161944. So -20 cents from note A – 434.9461691

-25 cents = $1/2^{25/1200}$ = 1/1.014545335. So -25 cents from note A – 440*0.985663198 = 433.6918074

…

-1200 cents = $1/2^{1200/1200}$ = 1/2. So -1200 cents from note A becomes A_1 = 440 x 1/2 = 220 hertz