

**Table useful for figuring the lengths of solids (metal, wood) to tune a chromatic scale.
Useful for sets of chimes, xylophones, tongue drums etc.**

. John Murphree, Associate Prof. Core Studies Boston Conservatory at Berklee

The table is used by: 1) Deciding what interval is desired, 2) figuring the length of the lower pitch from the material you have, 3) Multiplying that length by the multiplier column on the far right, 4) cut the length by the new number.

For example: Your longest bar is a C_4 and it is 100 cm long (it is best to measure in metric), and you want another bar of the same material to be a major third higher, E_4 . Multiply 100 cm x .8771 to get the length of your major third, $\text{E} = 87.71\text{cm}$. Now you have two bars, the first is a $\text{C}_4 @ 100\text{cm}$ and the other is an $\text{E}_4 @ 87.71\text{cm}$.

Note! The material used must be uniform! If there are variances in thickness, density etc it will have a drastic effect on the tuning. For best results cut from the same material or tune each piece individually. i.e. Treat each bar as though it is the fundamental. One bar is a C_4 and it is 100cm, another bar is a C_4 and it is 105 cm. Multiply the desired pitch by 105 and keep the 100 (or vice versa).

Additional note! Not all of these make perfectly equal intervals. Use the cents table to adjust as needed. It's always best to cut a piece a little long and then sand or grind from there.

Additional additional note! If you use a grinder on a piece of metal it will heat the metal and the piece will expand causing the pitch to go down. You must cool the piece down before testing the tuning each time you grind a little off the end.

Number of half steps (ascending)	Ratio	Cents (100 = equal temper half step)	Multiplier
1 (minor 2 nd)	89:84	100	.9715
2 (major 2 nd)	55:49	200	.9439
3 (minor 3 rd)	19:16	297	.9176
4 (major 3 rd)	65:50	400	.8771
5 (perfect 4 th)	4:3	498	.866
6 (augmented 4 th / diminished 5 th)	99:70	600	.841
7 (perfect 5 th)	3:2	702	.8165
8 (minor 6 th)	22:17	801	.7935
9 (major 6 th)	121:72	899	.7714
10 (minor 7 th)	98:55	1000	.7491
11 (major 7 th)	17:9	1101	.7276
12 (octave)	2:1	1200	.7071

