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Piano key frequencies

This is a list of the fundamental frequencies in hertz (cycles per second) of the keys of a modern 88-key standard or 108-key extended piano in twelve-tone equal temperament, with the 49th key, the fifth A (called A_4), tuned to 440 Hz (referred to as A440). Each successive pitch is derived by multiplying (ascending) or dividing (descending) the previous by the twelfth root of two (approximately 1.059463). For example, to get the frequency a semitone up from A_4 ($A\sharp_4$), multiply 440 by the twelfth root of two. To go from A_4 to B_4 (up a whole tone, or two semitones), multiply 440 twice by the twelfth root of two (or just by the sixth root of two, approximately 1.122462). For other tuning schemes refer to musical tuning.

This list of frequencies is for a theoretically ideal piano. On an actual piano the ratio between semitones is slightly larger, especially at the high and low ends, where string stiffness causes inharmonicity, i.e., the tendency for the harmonic makeup of each note to run sharp. To compensate for this, octaves are tuned slightly wide, stretched according to the inharmonic characteristics of each instrument. This deviation from equal temperament is called the Railsback curve.

The following equation gives the frequency f of the nth key, as shown in the table:

$$f(n) = \left(\sqrt[12]{2}\right)^{n-49} \times 440\,\text{Hz}$$

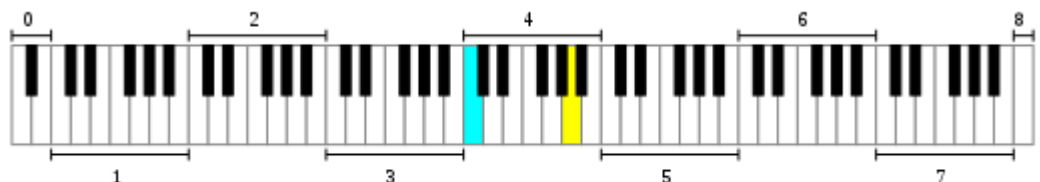(a' = A4 = A440 is the 49th key on the idealized standard piano)

Alternatively, this can be written as:

$$f(n) = 2^{\frac{n-49}{12}} \times 440\,\text{Hz}$$

Conversely, starting from a frequency on the idealized standard piano tuned to A440, one obtains the key number by:

$$n = 12 \log_2\left(\frac{f}{440\,\text{Hz}}\right) + 49$$

List

An 88-key piano, with the octaves numbered and Middle C (cyan) and A440 (yellow) highlighted

A printable
version of the
standard key
frequencies
(only including
the 88 keys on
a standard
piano)

Values in **bold** are exact on an ideal piano. Keys shaded gray are rare and only appear on extended pianos. The normally included 88 keys have been numbered 1–88, with the extra low keys numbered 89–97 and the extra high keys numbered 98–108. (A 108-key piano that extends from C_0 to B_8 was first built in 2018 by Stuart & Sons.)

Key number	Helmholtz name	Scientific name	Frequency (Hz)	Corresponding Open Strings				
				Violin	Viola	Cello	Bass	Guitar
108	b′′′′′	B_8	7902.133					
107	a#′′′′′/b♭′′′′′	$A\sharp_8/B\flat_8$	7458.620					
106	a′′′′′	A_8	**7040.000**					
105	g#′′′′′/a♭′′′′′	$G\sharp_8/A\flat_8$	6644.875					
104	g′′′′′	G_8	6271.927					
103	f#′′′′′/g♭′′′′′	$F\sharp_8/G\flat_8$	5919.911					
102	f′′′′′	F_8	5587.652					
101	e′′′′′	E_8	5274.041					
100	d#′′′′′/e♭′′′′′	$D\sharp_8/E\flat_8$	4978.032					
99	d′′′′′	D_8	4698.636					
98	c#′′′′′/d♭′′′′′	$C\sharp_8/D\flat_8$	4434.922					
88	c′′′′′ 5-line octave	C_8 Eighth octave	4186.009					
87	b′′′′	B_7	3951.066					
86	a#′′′′/b♭′′′′	$A\sharp_7/B\flat_7$	3729.310					
85	a′′′′	A_7	**3520.000**					
84	g#′′′′/a♭′′′′	$G\sharp_7/A\flat_7$	3322.438					
83	g′′′′	G_7	3135.963					
82	f#′′′′/g♭′′′′	$F\sharp_7/G\flat_7$	2959.955					
81	f′′′′	F_7	2793.826					
80	e′′′′	E_7	2637.020					
79	d#′′′′/e♭′′′′	$D\sharp_7/E\flat_7$	2489.016					
78	d′′′′	D_7	2349.318					
77	c#′′′′/d♭′′′′	$C\sharp_7/D\flat_7$	2217.461					
76	c′′′′ 4-line octave	C_7 Double high C	2093.005					
75	b′′′	B_6	1975.533					
74	a#′′′/b♭′′′	$A\sharp_6/B\flat_6$	1864.655					
73	a′′′	A_6	**1760.000**					
72	g#′′′/a♭′′′	$G\sharp_6/A\flat_6$	1661.219					
71	g′′′	G_6	1567.982					
70	f#′′′/g♭′′′	$F\sharp_6/G\flat_6$	1479.978					
69	f′′′	F_6	1396.913					
68	e′′′	E_6	1318.510					
67	d#′′′/e♭′′′	$D\sharp_6/E\flat_6$	1244.508					

66	d‴	D6	1174.659					
65	c#‴/d♭‴	C#6/D♭6	1108.731					
64	c‴ 3-line octave	C6 Soprano C (High C)	1046.502					
63	b″	B5	987.7666					
62	a#″/b♭″	A#5/B♭5	932.3275					
61	a″	A5	**880.0000**					
60	g#″/a♭″	G#5/A♭5	830.6094					
59	g″	G5	783.9909					
58	f#″/g♭″	F#5/G♭5	739.9888					
57	f″	F5	698.4565					
56	e″	E5	659.2551	E				
55	d#″/e♭″	D#5/E♭5	622.2540					
54	d″	D5	587.3295					
53	c#″/d♭″	C#5/D♭5	554.3653					
52	c″ 2-line octave	C5 Tenor C	523.2511					
51	b′	B4	493.8833					
50	a#′/b♭′	A#4/B♭4	466.1638					
49	a′	A4 A440	**440.0000**	A	A			
48	g#′/a♭′	G#4/A♭4	415.3047					
47	g′	G4	391.9954					
46	f#′/g♭′	F#4/G♭4	369.9944					
45	f′	F4	349.2282					
44	e′	E4	329.6276					High E
43	d#′/e♭′	D#4/E♭4	311.1270					
42	d′	D4	293.6648	D	D			
41	c#′/d♭′	C#4/D♭4	277.1826					
40	c′ 1-line octave	C4 Middle C	261.6256					
39	b	B3	246.9417					B
38	a#/b♭	A#3/B♭3	233.0819					
37	a	A3	**220.0000**			A		
36	g#/a♭	G#3/A♭3	207.6523					
35	g	G3	195.9977	G	G			G
34	f#/g♭	F#3/G♭3	184.9972					
33	f	F3	174.6141					

Key	Note	Scientific	Frequency				
32	e	E_3	164.8138				
31	d#/e♭	$D\#_3/E\flat_3$	155.5635				
30	d	D_3	146.8324		D		D
29	c#/d♭	$C\#_3/D\flat_3$	138.5913				
28	c small octave	C_3	130.8128	C			
27	B	B_2	123.4708				
26	A#/B♭	$A\#_2/B\flat_2$	116.5409				
25	A	A_2	**110.0000**				A
24	G#/A♭	$G\#_2/A\flat_2$	103.8262				
23	G	G_2	97.99886		G	G	
22	F#/G♭	$F\#_2/G\flat_2$	92.49861				
21	F	F_2	87.30706				
20	E	E_2	82.40689				Low E
19	D#/E♭	$D\#_2/E\flat_2$	77.78175				
18	D	D_2	73.41619			D	
17	C#/D♭	$C\#_2/D\flat_2$	69.29566				
16	C great octave	C_2 Deep C	65.40639		C		
15	B,	B_1	61.73541				Low B (7 string)
14	A#,/B♭,	$A\#_1/B\flat_1$	58.27047				
13	A,	A_1	**55.00000**			A	
12	G#,/A♭,	$G\#_1/A\flat_1$	51.91309				
11	G,	G_1	48.99943				
10	F#,/G♭,	$F\#_1/G\flat_1$	46.24930				
9	F,	F_1	43.65353				
8	E,	E_1	41.20344			E	
7	D#,/E♭,	$D\#_1/E\flat_1$	38.89087				
6	D,	D_1	36.70810				
5	C#,/D♭,	$C\#_1/D\flat_1$	34.64783				
4	C, contra-octave	C_1 Pedal C	32.70320				
3	B,,	B_0	30.86771			B (5 string)	
2	A#,,/B♭,,	$A\#_0/B\flat_0$	29.13524				
1	A,,	A_0	**27.50000**				
97	G#,,/A♭,,	$G\#_0/A\flat_0$	25.95654				
96	G,,	G_0	24.49971				

95	F#$_{\prime\prime}$/G♭$_{\prime\prime}$	F#$_0$/G♭$_0$	23.12465					
94	F$_{\prime\prime}$	F$_0$	21.82676					
93	E$_{\prime\prime}$	E$_0$	20.60172					
92	D#$_{\prime\prime}$/E♭$_{\prime\prime}$	D#$_0$/E♭$_0$	19.44544					
91	D$_{\prime\prime}$	D$_0$	18.35405					
90	C#$_{\prime\prime}$/D♭$_{\prime\prime}$	C#$_0$/D♭$_0$	17.32391					
89	C$_{\prime\prime}$ sub-contra-octave	C$_0$ Double Pedal C	16.35160					

See also

- Piano tuning
- Scientific pitch notation
- Music and mathematics

External links

- interactive piano frequency table (http://shakahara.com/pianopitch2.php) – A PHP script allowing the reference pitch of A4 to be altered from 440 Hz.
- PySynth (https://mdoege.github.io/PySynth/) – A simple Python-based software synthesizer that prints the key frequencies table and then creates a few demo songs based on that table.
- "Keyboard and frequencies (http://www.sengpielaudio.com/calculator-notenames.htm)", *SengpielAudio.com*.
- Notefreqs (http://www.deimos.ca/notefreqs) – A complete table of note frequencies and ratios for midi, piano, guitar, bass, and violin. Includes fret measurements (in cm and inches) for building instruments.

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