

Piano key frequencies

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This is a list of the absolute frequencies in hertz (cycles per second) of the keys of a modern 88-key standard or 102-key extended piano in twelve-tone equal temperament, with the 49th key, the fifth A (called A₄), 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 1.05946). For example, to get the frequency a semitone up from A₄ (A#₄), multiply 440 by the twelfth root of two. To go from A₄ to B₄ (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 1.12246). 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 Rainsback curve.

The following equation gives the frequency f of the n^{th} 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)

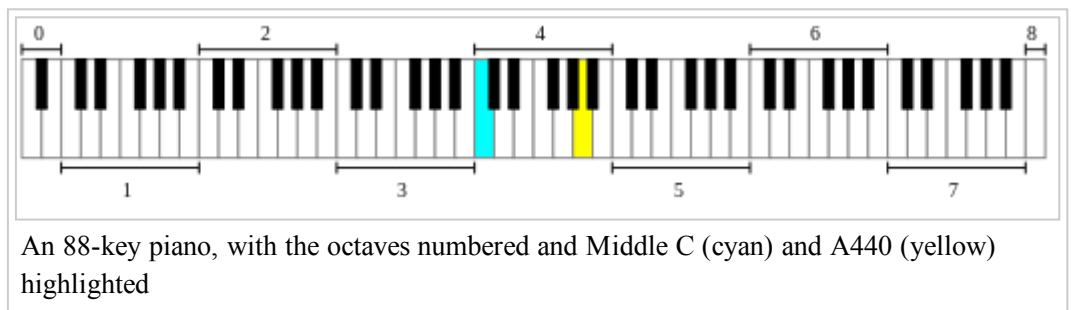
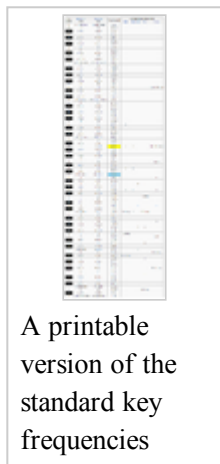
Alternatively, this can be written as:

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

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



Values in **bold** are exact on an ideal piano. Keys shaded gray are rare and only appear on extended pianos.

Key number	Helmholtz name	Scientific name	Frequency (Hz)	Corresponding Open Strings				
				Violin	Viola	Cello	Bass	Guitar
102	f ^{'''}	F ₈	5587.65					
101	e ^{'''}	E ₈	5274.04					
100	d ^{'''} /e ^{b'''}	D ₈ /E _b ₈	4978.03					
99	d ^{'''}	D ₈	4698.64					
98	c ^{'''} /d ^{b'''}	C ₈ /D _b ₈	4434.92					
88	c ^{'''} 5-line octave	C ₈ Eighth octave	4186.01					
87	b ^{'''}	B ₇	3951.07					
86	a ^{'''} /b ^{b'''}	A ₇ /B _b ₇	3729.31					
85	a ^{'''}	A ₇	3520.00					
84	g ^{'''} /a ^{b'''}	G ₇ /A _b ₇	3322.44					
83	g ^{'''}	G ₇	3135.96					
82	f ^{'''} /g ^{b'''}	F ₇ /G _b ₇	2959.96					
81	f ^{'''}	F ₇	2793.83					
80	e ^{'''}	E ₇	2637.02					
79	d ^{'''} /e ^{b'''}	D ₇ /E _b ₇	2489.02					
78	d ^{'''}	D ₇	2349.32					
77	c ^{'''} /d ^{b'''}	C ₇ /D _b ₇	2217.46					
76	c ^{'''} 4-line octave	C ₇ Double high C	2093.00					
75	b ^{'''}	B ₆	1975.53					
74	a ^{'''} /b ^{b'''}	A ₆ /B _b ₆	1864.66					
73	a ^{'''}	A ₆	1760.00					
72	g ^{'''} /a ^{b'''}	G ₆ /A _b ₆	1661.22					
71	g ^{'''}	G ₆	1567.98					
70	f ^{'''} /g ^{b'''}	F ₆ /G _b ₆	1479.98					
69	f ^{''}	F ₆	1396.91					
68	e ^{''}	E ₆	1318.51					
67	d ^{'''} /e ^{b'''}	D ₆ /E _b ₆	1244.51					
66	d ^{'''}	D ₆	1174.66					
65	c ^{'''} /d ^{b'''}	C ₆ /D _b ₆	1108.73					
64	c ^{'''} 3-line octave	C ₆ Soprano C (High C)	1046.50					

63	b''	B ₅	987.767				
62	a#''/bb''	A# ₅ /B _{b5}	932.328				
61	a''	A ₅	880.000				
60	g#''/ab''	G# ₅ /A _{b5}	830.609				
59	g''	G ₅	783.991				
58	f#''/gb''	F# ₅ /G _{b5}	739.989				
57	f''	F ₅	698.456				
56	e''	E ₅	659.255	E			
55	d#''/eb''	D# ₅ /E _{b5}	622.254				
54	d''	D ₅	587.330				
53	c#''/db''	C# ₅ /D _{b5}	554.365				
52	c'' 2-line octave	C ₅ Tenor C	523.251				
51	b'	B ₄	493.883				
50	a#'/bb'	A# ₄ /B _{b4}	466.164				
49	a'	A ₄ A440	440.000	A	A		High A (Optional)
48	g#'/ab'	G# ₄ /A _{b4}	415.305				
47	g'	G ₄	391.995				
46	f#'/gb'	F# ₄ /G _{b4}	369.994				
45	f'	F ₄	349.228				
44	e'	E ₄	329.628				High E
43	d#'/eb'	D# ₄ /E _{b4}	311.127				
42	d'	D ₄	293.665	D	D		
41	c#'/db'	C# ₄ /D _{b4}	277.183				
40	c' 1-line octave	C ₄ Middle C	261.626				
39	b	B ₃	246.942				B
38	a#/bb	A# ₃ /B _{b3}	233.082				
37	a	A ₃	220.000			A	
36	g#/ab	G# ₃ /A _{b3}	207.652				
35	g	G ₃	195.998	G	G		G
34	f#/gb	F# ₃ /G _{b3}	184.997				
33	f	F ₃	174.614				F (7 string)

32	e	E ₃	164.814					
31	d [#] /e ^b	D [#] ₃ /E ^b ₃	155.563					
30	d	D ₃	146.832			D		D
29	c [#] /d ^b	C [#] ₃ /D ^b ₃	138.591					
28	c small octave	C ₃	130.813	C (5 string)	C		C (6 string)	
27	B	B ₂	123.471					
26	A [#] /B ^b	A [#] ₂ /B ^b ₂	116.541					
25	A	A ₂	110.000					A
24	G [#] /A ^b	G [#] ₂ /A ^b ₂	103.826					
23	G	G ₂	97.9989			G	G	
22	F [#] /G ^b	F [#] ₂ /G ^b ₂	92.4986					
21	F	F ₂	87.3071	F (6 string)				
20	E	E ₂	82.4069					Low E
19	D [#] /E ^b	D [#] ₂ /E ^b ₂	77.7817					
18	D	D ₂	73.4162				D	
17	C [#] /D ^b	C [#] ₂ /D ^b ₂	69.2957					
16	C great octave	C ₂ Deep C	65.4064			C		
15	B ₁	B ₁	61.7354					B (7 string)
14	A [#] ₁ /B ^b ₁	A [#] ₁ /B ^b ₁	58.2705	B ^b (7 string)				
13	A ₁	A ₁	55.0000				A	
12	G [#] ₁ /A ^b ₁	G [#] ₁ /A ^b ₁	51.9131					
11	G ₁	G ₁	48.9994					
10	F [#] ₁ /G ^b ₁	F [#] ₁ /G ^b ₁	46.2493					F [#] (8 string)
9	F ₁	F ₁	43.6535					
8	E ₁	E ₁	41.2034				E	
7	D [#] ₁ /E ^b ₁	D [#] ₁ /E ^b ₁	38.8909					
6	D ₁	D ₁	36.7081					
5	C [#] ₁ /D ^b ₁	C [#] ₁ /D ^b ₁	34.6478					C [#] (9 string)
4	C ₁ contra-octave	C ₁ Pedal C	32.7032					
3	B ₀	B ₀	30.8677				B (5 string)	

2	A [♯] _∞ /B [♭] _∞	A [♯] ₀ /B [♭] ₀	29.1352					
1	A _∞	A ₀	27.5000					
97	G [♯] _∞ /A [♭] _∞	G [♯] ₀ /A [♭] ₀	25.9565					G [♯] (10 string)
96	G _∞	G ₀	24.4997					
95	F [♯] _∞ /G [♭] _∞	F [♯] ₀ /G [♭] ₀	23.1247					
94	F _∞	F ₀	21.8268					
93	E _∞	E ₀	20.6017					
92	D [♯] _∞ /E [♭] _∞	D [♯] ₀ /E [♭] ₀	19.4454					
91	D _∞	D ₀	18.3540					
90	C [♯] _∞ /D [♭] _∞	C [♯] ₀ /D [♭] ₀	17.3239					
89	C _∞ sub-contra-octave	C ₀ Double Pedal C	16.3516					

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 (<http://home.arcor.de/mdoege/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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