

11-A

Music Scales and Mathematics

TABLE 10.1 Frequencies of Notes in the Octave Above Middle C

NOTE	FREQUENCY (CPS)	RATIO TO FREQUENCY OF PRECEDING NOTE	RATIO TO FREQUENCY OF MIDDLE C
C	260	$\sqrt[12]{2} \approx 1.05946$	1.00000 = 1
C#	275	$\sqrt[12]{2} \approx 1.05946$	1.05946
D (second)	292	$\sqrt[12]{2} \approx 1.05946$	1.12246
D#	309	$\sqrt[12]{2} \approx 1.05946$	1.18921
E (third)	328	$\sqrt[12]{2} \approx 1.05946$	1.25992 $\approx \frac{3}{2}$
F (fourth)	347	$\sqrt[12]{2} \approx 1.05946$	1.33484 $\approx \frac{4}{3}$
F#	368	$\sqrt[12]{2} \approx 1.05946$	1.41421
G (fifth)	390	$\sqrt[12]{2} \approx 1.05946$	1.49831 $\approx \frac{3}{2}$
G#	413	$\sqrt[12]{2} \approx 1.05946$	1.58740
A (sixth)	437	$\sqrt[12]{2} \approx 1.05946$	1.68179 $\approx \frac{5}{3}$
A#	463	$\sqrt[12]{2} \approx 1.05946$	1.78180
B (seventh)	491	$\sqrt[12]{2} \approx 1.05946$	1.88775
C (octave)	520	$\sqrt[12]{2} \approx 1.05946$	2.00000 = 2

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A Curious Golden Ratio Limit

<u>Nested Square Roots of 1</u>	<u>Value</u>
$\sqrt{1+\sqrt{1}}$	1.41421356237...

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A Curious Golden Ratio Limit

<u>Nested Square Roots of 1</u>	<u>Value</u>
$\sqrt{1+\sqrt{1}}$	1.41421356237...
$\sqrt{1+\sqrt{1+\sqrt{1}}}$	1.55377397403...

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A Curious Golden Ratio Limit

<u>Nested Square Roots of 1</u>	<u>Value</u>
$\sqrt{1+\sqrt{1}}$	1.41421356237...
$\sqrt{1+\sqrt{1+\sqrt{1}}}$	1.55377397403...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}$	1.59805318248...

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A Curious Golden Ratio Limit

<u>Nested Square Roots of 1</u>	<u>Value</u>
$\sqrt{1+\sqrt{1}}$	1.41421356237...
$\sqrt{1+\sqrt{1+\sqrt{1}}}$	1.55377397403...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}$	1.59805318248...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}}$	1.61184775413...

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A Curious Golden Ratio Limit

<u>Nested Square Roots of 1</u>	<u>Value</u>
$\sqrt{1+\sqrt{1}}$	1.41421356237...
$\sqrt{1+\sqrt{1+\sqrt{1}}}$	1.55377397403...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}$	1.59805318248...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}}$	1.61184775413...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}}}$	1.61612120651...

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A Curious Golden Ratio Limit

Nested Square Roots of 1

Value

$\sqrt{1+\sqrt{1}}$	1.41421356237...
$\sqrt{1+\sqrt{1+\sqrt{1}}}$	1.55377397403...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}$	1.59805318248...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}}$	1.61184775413...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1}}}}}}$	1.61612120651...
$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\dots}}}}}}$	$\frac{1+\sqrt{5}}{2} = \phi$

As you continue to nest more roots, you will get infinitely closer to the golden ratio.

Parthenon Proportions & Golden Ratio

