Demonstrations for *Psychoacoustics Second Edition*
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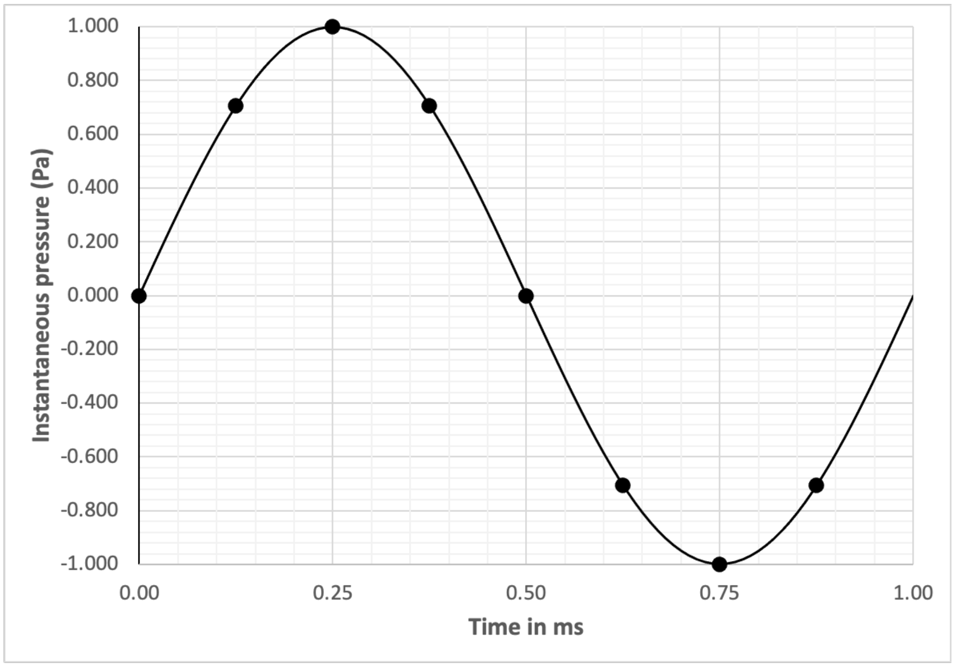
Demonstration 2.1

RMS calculation

Illustration of rms calculation for a pure tone.

Consider the following 1000-Hz ~~the~~ pure tone with a peak pressure of 1Pa.



Recall that rms pressure is the ***root mean squared pressure***, calculated over some time frame. Because rms uses the mean, and a periodic sound repeats over time, we can calculate the rms pressure over a single period for a periodic wave.

To calculate the root mean squared pressure, we

1. Square the pressure taken at specific, evenly spaced time points,
2. Take the mean of the squared pressures from step 1, and
3. calculate the square root of the mean from step 2

Step 1. So, we first determine the pressure of the wave at specific, evenly spaced, time points. In this illustration, the wave is sampled every .125 ms. To fully sample the period of this wave, we need 8 samples, and we then square the instantaneous pressures. These steps are shown in this table:

Time in ms	Instantaneous pressure	Instantaneous pressure squared
0.0000	0.000	0.000
0.1250	0.707	0.500

0.2500	1.000	1.000
0.3750	0.707	0.500
0.5000	0.000	0.000
0.6250	-0.707	0.500
0.7500	-1.000	1.000
0.8750	-0.707	0.500

<u>Step 2</u>. To calculate rms pressure, we must take the mean of the instantaneous pressure squared values (column 3):

(0 + 0.5 + 1 + 0.5 + 0 +.0 5 + 1 + 0.5) /8 = 4/8 = 0.5

<u>Step 3</u>. Then we take the square root of that sum:
$\sqrt{0.5} = 0.707$

<u>Result.</u> So, for this wave, with an amplitude of 1Pa, the rms pressure is 0.707 Pa.

While this is just an illustration, any pure tone will have an rms pressure that is 0.707x peak pressure.