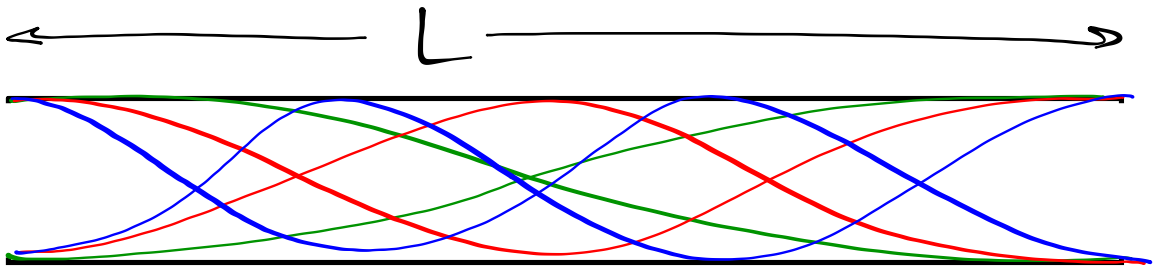
L&D: Sound effects cont'd…

-standing waves in pipes

-beats



	n	a	NAME
$L = \frac{\lambda}{2}$	1	2	1ST HARMONIC (AKA FUNDAMENTAL)
$L = \frac{2\lambda}{2}$	2	3	2ND HARMONIC
$L = \frac{3\lambda}{2}$	3	4	3RD HARMONIC

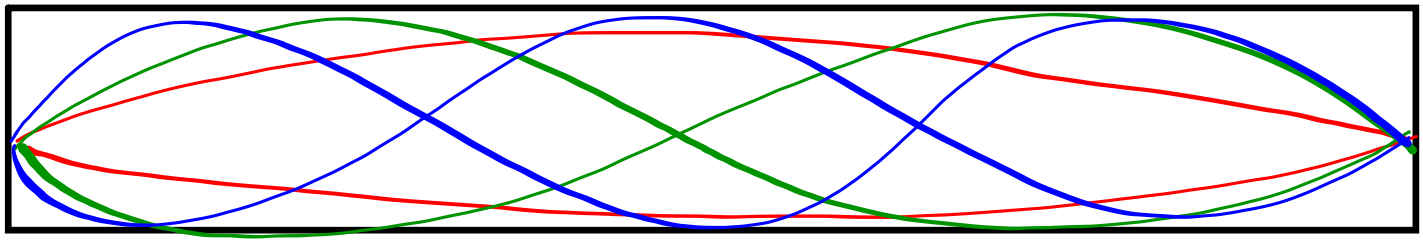
$$v = \lambda f$$

$$L = \frac{n\lambda}{2} \Rightarrow \lambda = \frac{2L}{n}$$

$$v = \frac{2Lf}{n}$$

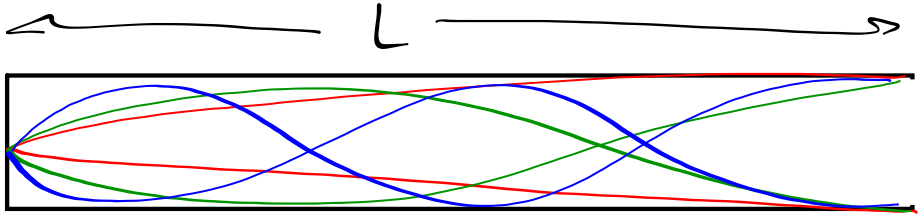
$$f_n = \frac{vn}{2L}$$

THE FORMULA FOR THE n^{th} HARMONIC, BASED ON PIPELENGTH & WAVE SPEED



similar pattern

to open-open



	n	a	NAME
$L = \frac{1\lambda}{4}$	1	1	FUNDAMENTAL (1ST HARMONIC)
$L = \frac{3\lambda}{4}$	2	2	3RD HARMONIC
$L = \frac{5\lambda}{4}$	3	3	5TH HARMONIC
$L = \frac{n\lambda}{4}$	$\frac{n+1}{2}$	$\frac{n+1}{2}$	n^{th} HARMONIC

$$v = \lambda f$$

$$\lambda_n = \frac{4L}{n}$$

$$v = \lambda_n f_n$$

$$f_n = \frac{v}{\lambda_n}$$

$$\boxed{f_n = \frac{vn}{4L}}$$

n^{th} HARMONIC FREQUENCY FOR CLOSED-OPEN PIPE OF LENGTH L (NO EVENS!)

$$f_{BEAT} = |f_2 - f_1|$$

f_1 & f_2