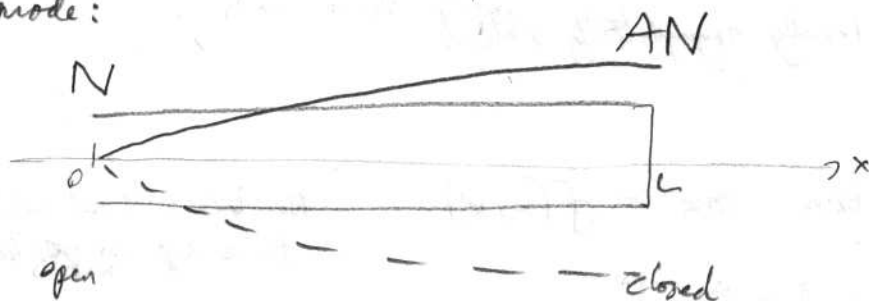


MATH 5 WORKSHEET : Pipe mode frequencies

Barnett
5/4/07

If one end open, other closed ('open-closed' pipe), get
(pressure) $\left\{ \begin{array}{l} \text{Node at open end} \\ \text{Anti Node at closed end.} \end{array} \right.$

1st mode:

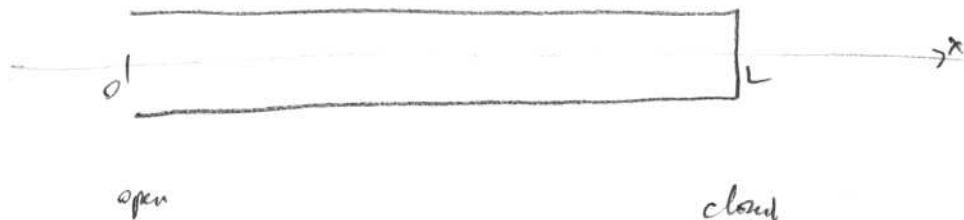


I've drawn mode shape.
What fraction of a
wavelength λ is L ?

So what is frequency f_1 ?
(in terms of L, c)

2nd mode:

draw the next mode that matches the boundary conditions,
labelling N, AN locations.



What fraction of λ is L ?

So what is the freq.?

What is general rule for frequencies (mode n)?

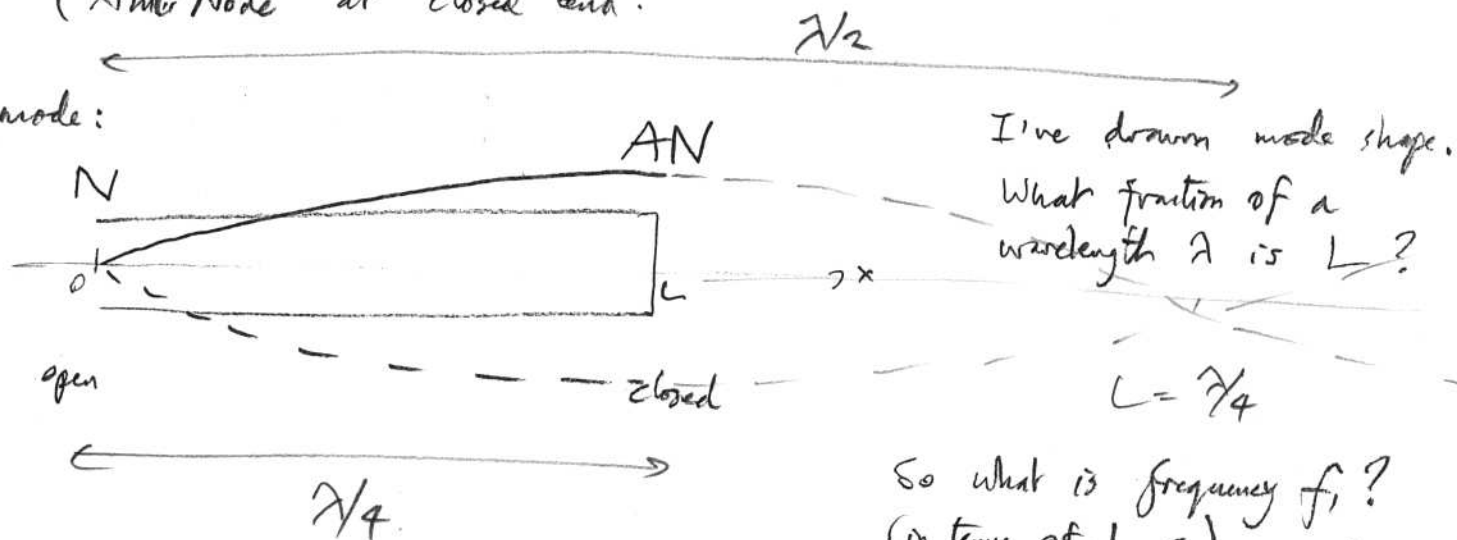
Which harmonics of fundamental are present?

MATH 5 WORKSHEET : Pipe mode frequencies Barnett
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If one end open, other closed ('open-closed' pipe), get

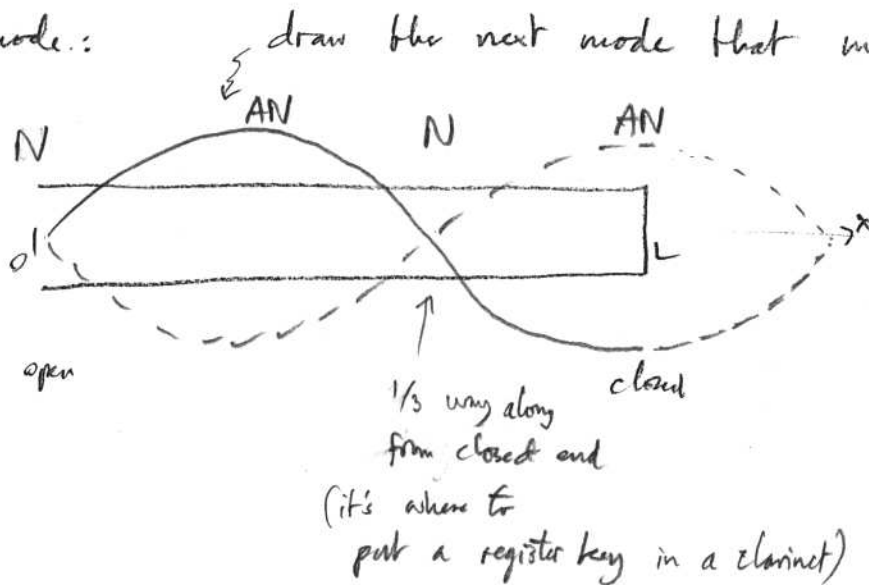
(pressure) $\left\{ \begin{array}{l} \text{Node at open end} \\ \text{Anti Node at closed end.} \end{array} \right.$

1st mode:



So what is frequency f_1 ?
(in terms of L, c) $f_1 = \frac{c}{\lambda} = \frac{c}{4L}$

2nd mode:



What fraction of λ is L ?

$\frac{3}{4}$, i.e. $\lambda = \frac{4}{3}L$

So what is the freq.? $f_2 = \frac{c}{\frac{4}{3}L} = 3 \frac{c}{4L}$

What is general rule for frequencies (mode n)?

$$f_n = (2n-1) \frac{c}{4L}$$

Which harmonics of fundamental are present? 1, 3, 5, ... just odd.