A tube is 1.45 m long and open at both ends. Resonances are found at 234 Hz, 585 Hz, 936 Hz, and 1404 Hz among others.

(a) Find the largest value of the fundamental allowed by these data.
(b) How many nodes for pressure are there for 1404 Hz—not counting the ends.
(c) Calculate the velocity of sound for this system.

\[
\begin{align*}
\alpha v &= 23.2 \\
\sigma &= 2.94 \\
\frac{\alpha}{\sigma} &= 3
\end{align*}
\]

**SECOND MIDTERM**

Name (print)  Kastro M. Hamed  Name (sign)  Kastro M. Hamed

Discussion Instructor (circle one): DeTienne  Hamed  Molina  Paul  Smith  Zhang

Discussion Section #

**SHOW ALL WORK!!!!!!**

**REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!**

Use the conversion constants and data given on the front page.

(a) The Fundamental Frequency = 117 Hz.
   (It is the largest; notice that \( \frac{117}{2}, \ldots \) etc divide the other frequencies, but 117 is the one which satisfies the problem).

(b) \( n = \frac{1403}{117} = 12 \)
   \[ \Rightarrow \text{number of nodes} = 11 \]

(c) \[ v = \lambda f \]
   \[ \lambda = 2L \]
   \[ f \text{ is the fundamental} \]
   \[ = f_s(2L) \]
   \[ = \left(117 \cdot \frac{1}{2}\right)(2(1.45 \text{ m})) \]
   \[ = 339 \text{ m/s} \]