Raw Data Sheet

Student Name: _____

Team members:
1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor: _____

Waves on a String

string linear mass density, μ

mass = _____ (gr); length = _____ (cm);

Standing waves

String length, L = _____ (cm);

Table 1: Resonance data to obtain wave velocities.

$M = 150$ (gr)				
Harmonics	$n = 2$	$n = 3$	$n = 4$	$n = 5$
Frequency (Hz)				
$M = 300$ (gr)				
Frequency (Hz)				

Speed of Sound

Table 2: Data to obtain the speed of sound.

material	Δt (s)	D(m)
air		
counter top		

Introduction[1]

Analysis

Standing Waves

1. Find the linear mass density μ (in kg/m). Show your work.

2. First, calculate the tension of the string with 150g and 300g masses. Then use $v = \sqrt{\frac{T}{\mu}}$ (i.e. Equation 1 on page 66) to calculate for the corresponding wave velocities. Show your work.

   T_{150g}: _____ T_{300g}: _____ v_{150g}: _____ v_{300g}: _____

3. Calculate the ratio: $\frac{v_{300g}}{v_{150g}}$. Show your work and explain your answer.

[1]This is an adaption from S. Sugaya's original version

4. For both of the masses and each of the harmonics (n = 2, 3, 4, and 5 –see the diagrams on page 67) find the corresponding wavelength of the wave using: $\lambda = \frac{2L}{n}$ (i.e. Equation 3 on page 67). Then calculate the velocity of the wave for each n using: $v = f\lambda$. Fill in the tables below.

150g	$n = 2$	$n = 3$	$n = 4$	$n = 5$
Wavelength				
Velocity				

300g	$n = 2$	$n = 3$	$n = 4$	$n = 5$
Wavelength				
Velocity				

5. Now, calculate the average of the velocities for each mass. Show your work.

   $v_{av,150g}$: _____ $v_{av,300g}$: _____

6. Calculate the ratio: $\frac{v_{av,300g}}{v_{av,150g}}$, and compare it to the theoretical value you obtained in step 3. Explain and discuss any discrepancies.

Beats.

Read the bullet on the page 68 and answer the questions. Make sure to explain your answers.

Direct Measurement of v_{sound}

1. Find the sound speed in air, using $v_{sound} = \frac{D}{\Delta t}$.

2. Find the speed of sound in the countertop.

3. Why is the speed of sound much faster in the countertop? Explain

Conclusions