

# PLUCK TO THE DATA

## UNIT: UKULELE

### OBJECTIVE:

Students will collect, display, and analyze data to investigate how changing the amount of energy applied to a string affects vibration time and sound, using graphs and statistical measures.

### MATERIALS:

- Ruler
- Stopwatch
- String
- Pencil

### ACTIVITY SETUP:

Students know how to measure distance in centimeters and time in seconds and how to record numerical data in a table.

### STUDENT CHALLENGE:

Determine how pull distance affects vibration time by collecting data, organizing it, and analyzing patterns.

**STUDENT DIRECTIONS:****1. Prepare your string**

Secure a ukulele string from the kit so it is stretched tightly and ready to vibrate when plucked.

**2. Collect Data**

You will test how pull distance affects vibration time.

- Start with a pull distance of **1 cm**.
- Pull the string back to the measured distance and release it.
- Time how long the string vibrates and record the result.
- Repeat until you have **three trials** for 1 cm.
- Repeat the same steps for **2 cm** and **3 cm** pull distances.

**3. Record Your Data****Energy Transfer Data Table**

<b>Pull Distance</b>	<b>Trial 1 (sec)</b>	<b>Trial 2 (sec)</b>	<b>Trial 3 (sec)</b>
<b>1 cm</b>			
<b>2 cm</b>			
<b>3 cm</b>			

#### 4. Summarize the Data

##### How to Calculate Mean (Average)

$$\text{Mean} = \frac{\text{Sum of all values}}{\text{Number of values}}$$

##### Steps:

1. Add all vibration times together.
2. Count how many vibration times there are.
3. Divide the total by the number of values.

##### Mean Vibration Time

- 1 cm: \_\_\_\_\_ sec
- 2 cm: \_\_\_\_\_ sec
- 3 cm: \_\_\_\_\_ sec

##### How to Calculate Median

##### Steps:

1. Write the vibration times in order from least to greatest.
2. Find the middle value.

##### Median Vibration Time

- 1 cm: \_\_\_\_\_ sec
- 2 cm: \_\_\_\_\_ sec
- 3 cm: \_\_\_\_\_ sec

## 5. Collect Class Data and Display

Create a Histogram for each pull distance to show how often values occur within ranges of data.

- Gather class data of mean vibration times for each pull distance.
- Find frequency of each interval using the tables provided.
- Create a histogram based upon class data.

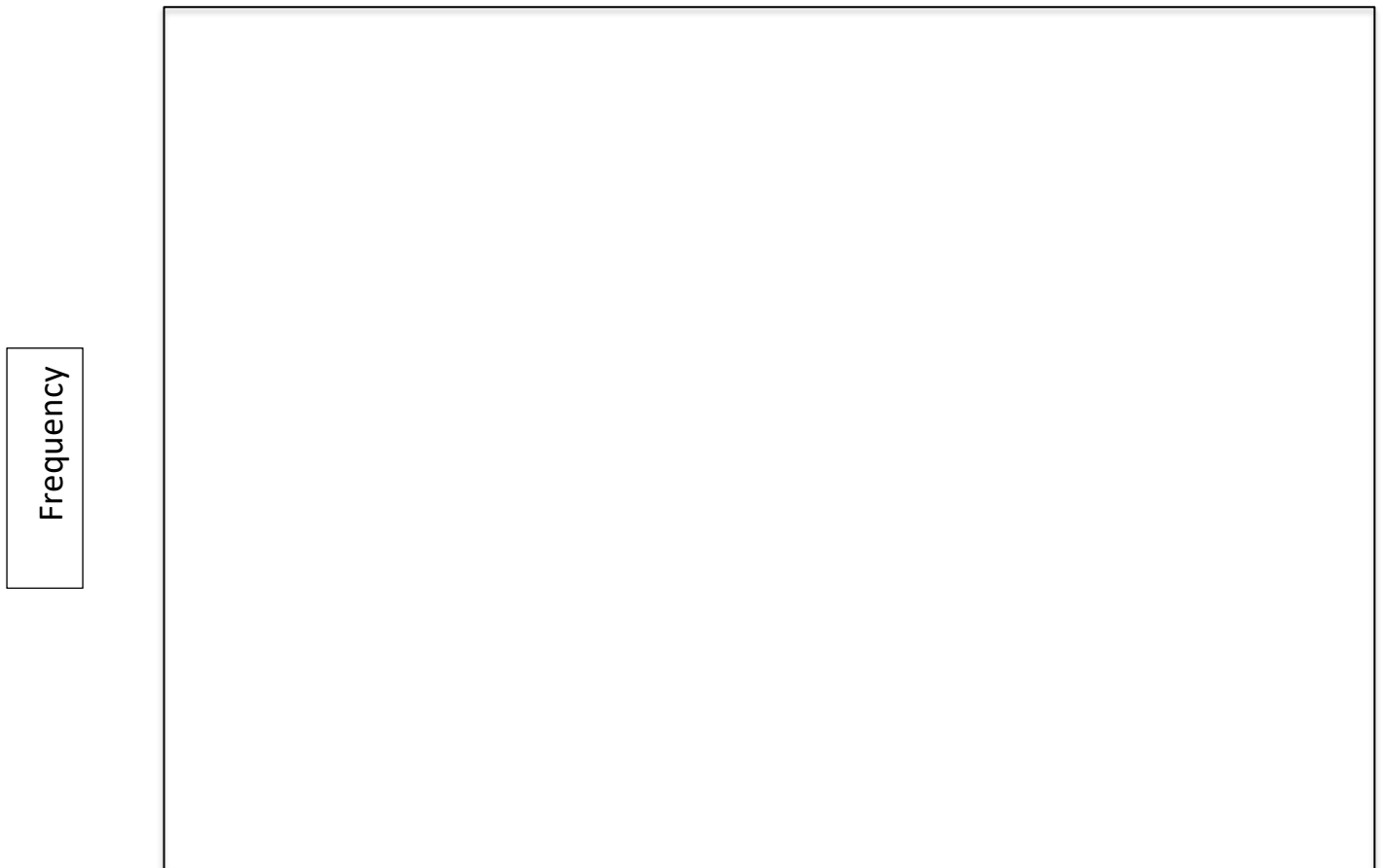
*Create your histogram on the next pages.*

Name: \_\_\_\_\_

Period: \_\_\_\_\_

**1 cm Length**

Mean Vibration Times (Seconds)	Frequency
0-1 seconds	
2-3 seconds	
3-4 seconds	
5-6 seconds	
7-8 seconds	



Frequency

Vibration Time (seconds)

Name: \_\_\_\_\_

Period: \_\_\_\_\_

**2 cm Length**

Mean Vibration Times (Seconds)	Frequency
0-1 seconds	
2-3 seconds	
3-4 seconds	
5-6 seconds	
7-8 seconds	

Frequency

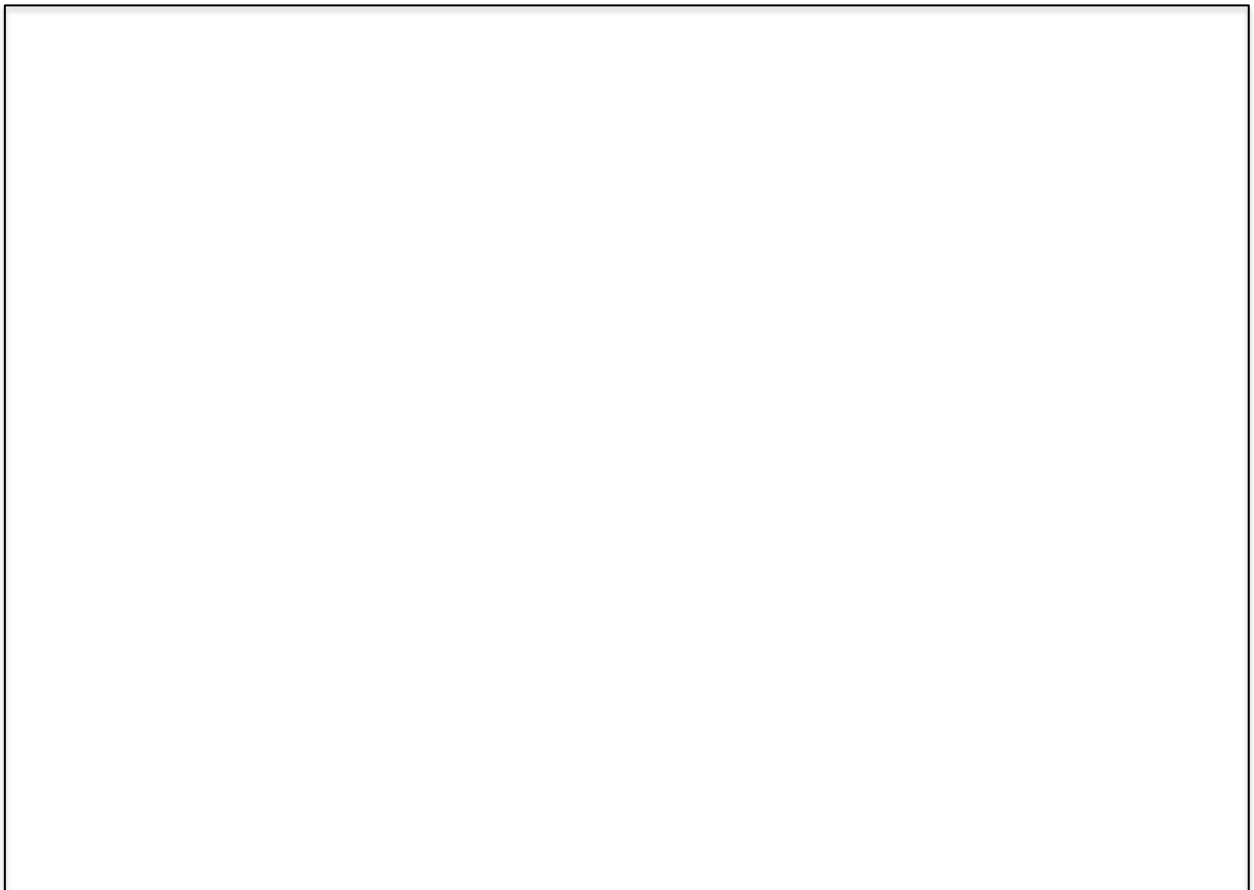


Vibration Time (seconds)

### 3 cm Length

Mean Vibration Times (Seconds)	Frequency
0-1 seconds	
2-3 seconds	
3-4 seconds	
5-6 seconds	
7-8 seconds	

Frequency



Vibration Time (seconds)

**USING THE DATA FROM THE 1 CM PULL HISTOGRAM, ANSWER THE FOLLOWING QUESTIONS**

What does the overall shape of your histogram look like (clustered, spread out, skewed, symmetrical)?

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Where do you see the data most concentrated?

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Are there any gaps or empty bins? What might that mean?

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Which interval (bin) has the highest frequency? Why do you think that is?

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**REFLECTION:**

1. How did organizing your data in a table help you understand the results?

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2. If someone only saw your 1cm pull histogram (not the raw data), what could they understand from it?

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3. What pattern do you notice between the pull distance and vibration time based on your data?

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