

**Recycled Sounds: Multiplying Fractions**

**Focus: Use fractional equivalents to tune bottles**

**The Problem:** How can an eight-note scale be made with 1-liter bottles?

**The Facts**

* Sounds can be created in a variety of ways. Glass liter bottles can make sounds by striking them with a mallet. Plastic liter bottles can make sounds by blowing across the top of the bottle.
* Filling the bottles with different amounts of water can make different pitches.
* The chart below can help you decide how much water you need to use to fill each bottle to make each pitch by blowing across the opening.

|  |  |
| --- | --- |
| **To make this pitch:** | **Fill the bottle with this much water:** |
| 1 | Empty |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |

**The Task**

1. Your team will create a set of eight tuned bottles. Each bottle will be a different pitch. Your team will then perform a melody on the tuned bottles.

2. Your team will also create a chart showing:

* *The amount of water in each bottle*
* *How the amounts were calculated*

3. Each person on the team will write an explanation of the team’s solution. This explanation will answer these questions:

* How did your team calculate the amount of water in each bottle?
* Did all of the teams use the same method for calculating the amount of water? Why do you suppose that happened?
* How is the amount of water in the bottle related to the pitch you hear? Why do you suppose that is true?

**Recycled Sounds Songs**

Play each numbered bottle in order. The vertical lines divide the music into groups of 3 or 4 bottles. The horizontal lines indicate a note that should shound longer.

*On Top of Old Smokey*

1 | 1 3 5 | 8 - - | 6- 6 | 4 5 6 | 5 - - | - - 1 | 1 3 5 | 5 - - | 2 – 3 | 4 3 2 | 1 - -

*Twinkle, Twinkle, Little Star*

1 1 5 5 | 6 6 5 - | 4 4 3 3 | 2 2 1 - | 5 5 4 4 | 3 3 2 - | 5 5 4 4 | 3 3 2 - | 1 1 5 5 |   
6 6 5 - | 4 4 3 3 | 2 2 1 -

*Joy to the World* (simplified version)

*8 – 7 6* | 5 - - 4 | 3 – 2 - | 1 - - 5 | 6 - - 6 | 7 - - 7 | 8 - - 8 | 8 7 6 5 | 5 4 3 8 |   
8 7 6 5 | 5 4 3 3 | 3 3 3 4 |5 – 4 3 | 2 2 2 3 | 4 – 3 2 | 1 8 - 6 | 5 4 3 4 | 3 – 2 - |   
1 - - -

*Row, Row, Row, Your Boat*

*1 - - 1 - -*| 1 – 2 3 | 3 – 2 3 - 4 | 5 - - - - - | 8 8 8 5 5 5 | 3 3 3 1 1 1 | 5 – 4 3 2 |  
1 - - - - -

*A Tisket A Tasket*

*5* | 5 – 3 6 | 5 – 3 4 | 5 5 3 6 | 5 – 3 3 | 4 4 2 2 | 5 4 3 2 |3 – 1 -

**Things to Consider**

**Understanding the Problem**

Read the *Recycled Sounds* problem page, and then answer these questions.

* *How many bottles do you need to use? How many different pitches do you need to have?*
* *How will you change the pitch?*

**Making a Plan**

Before you make your plan, answer these questions.

* *What measurements can you use? What tools will you need to make these measurements?*
* *How will you calculate the amount of water needed? Does the measurement chosen make a difference in your calculations? Why do you think so?*

**Carrying Out the Plan**

Before you begin planning your presentation, answer these questions.

* *What does your presentation have to include? Do you have all of the necessary information? What other calculations do you need to make? Which song will you play?*
* *What information needs to be displayed? How will you display your information? What other ways could you show the information?*

**Evaluating the Solution**

* *Did you answer the question? How do you know?*
* *Does your answer make sense? Was your group able to perform the song?*
* *Did everyone in the group write an explanation?*

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**Using the Calculator**

**Multiplying Fractions**

What happens to a number when you multiply it by a fraction?

Try this:

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

Now try this:

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

Try one more:

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

A conjecture is a mathematical hypothesis. Write a conjecture about what happens when you multiply by a unit fraction (a fraction with 1 in the numerator). Test your conjecture by trying several more examples.

What do you suppose would happen if you multiplied a number by a fraction other than a unit fraction?

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

Multiply 12 times .

|  |  |
| --- | --- |
| **Press** | **The display shows:** |
|  |  |

Write a conjecture about what happens when you multiply by a fraction. Test your conjecture by trying several more examples.