Let it Roll: *The Soup Can Experiment*

Objectives – To roll different kinds of soup cans down a ramp to determine how the **content** and **weight** of the can affects how **fast** and how **far** it rolls.

Materials –

- Ramp or thin board; 50 – 80 cm long X 30cm wide.
- Books or blocks of equal height.
- 4 (same size) cans of different kinds of soup.
- Tape measure.
- Masking tape for marking distance.
- Ruler for a starting gate.

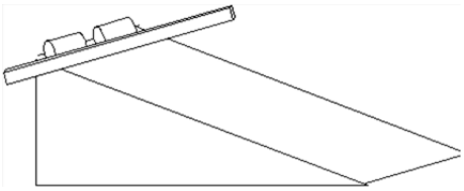


Figure 1

Procedure –

→ **SET-UP:**

1. Form groups of 3 people. Assign jobs; *starter, marker,* and *measurer.*
2. Measure the masses (weight) of your 4 cans of soup using the balances or digital scale. Record in the "Data Analysis Table", the weights (in grams) along with a one or two word description of the contents of the cans.
3. Check that each can is the same size, have no dents, or flat spots on the edges.
4. Make a prediction in the "Data Analysis Table" which can, when rolled down the ramp:
   - Will reach the 2 metre mark first.
   - Will travel the greatest distance.
5. Position your ramp in a long, open area. Place a lengthy piece of tape at **2 metres** from the bottom of the ramp.
6. Set up the ramp with a height of 15-20 cm.
   - Ensure the entire class is using the same books or sized blocks to prop up the ramp. Everyone should have the same height of ramp.
   - Draw a start line on the top of the ramp for your starting ruler to sit.

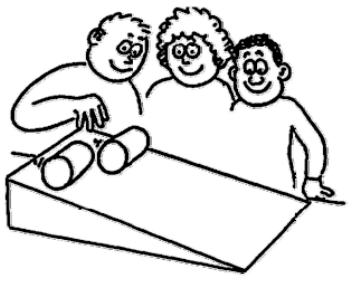
→ **PERFORMING THE EXPERIMENT:**

7. Shake the cans each time before rolling them.
8. Position the ruler on the start line at the top of the ramp and place 2 cans side-by-side, behind the ruler (See Figure 1 above). Ensure there is at least 15 cm between the cans so they don't hit each other on the way down the ramp. (**HINT**: Place the top of each can facing away from each other… Why?). **Let the cans roll!**
9. Record on your "Data Collecting Table" which can crosses the 2 metre line first and the distance that each can rolls. Repeat this with the remaining two cans.
10. Have a "Race Off" between the 2 slowest cans and the 2 fastest cans. Record your data.
11. Perform the experiment one more time (steps 7–10) and record results in your data table.

Data Analysis Table: (Description, Mass and Predictions)

1. Measure the masses (weight) of your 4 cans of soup using the balances or digital scale. Record in the data table below the weights along with a description of the contents of each can.
2. In the "prediction Distance" column place a number 1 next to the can that you think will roll the furthest. Continue rating in order so you have 1-4, with 4 representing the can that you think will have the shortest distance.
3. In the "prediction Fastest" column place a number 1 next to the can that you think will roll the fastest. Continue rating in order so you have 1-4, with 4 representing the can that you think will travel the slowest.

Can Description	**Mass (g)** (Weight)	**Prediction** Distance (cm) (Rank 1-4)	**Prediction** Fastest to slowest (Rank 1-4)



TRIAL # 1

Data Collecting Table: (Actual Distance and Placing)

Soup Description	**Mass (g)** (Weight)	**Actual Distance** (cm)	**Actual Finishing Place (1st to 4th)**

TRIAL # 2

Data Collecting Table: (Actual Distance and Placing)

Soup Description	**Mass (g)** (Weight)	**Actual Distance** (cm)	**Actual Finishing Place (1st to 4th)**

1. Find the average distance of your two trials:

Add the 1st distance to the 2nd distance and divide by 2 to find the average.

Soup Description	D1 + D2 / 2	Average Distance (cm)

2. Find the overall placing from your two trials:

Add the placing from the 1st trial to the 2nd trial. Lowest overall number is the fastest can.

Soup Description	Place 1 + Place 2	Overall Placing

Post Lab Questions:

1. Which soup can rolled the farthest? Explain why you think this can went further.

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_____
_____
_____

2. Which soup can rolled the fastest? Explain why you think this can went faster.

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_____
_____
_____

3. Which soup can rolled the farthest **and** had the fastest time? Explain why.

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_____

4. Which soup can rolled the shortest **and** had the slowest time? Explain why.

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_____
_____

5. Do cans that roll faster always roll further? Why or why not? Explain.

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_____
_____

6. Why do the soup cans roll left or right after they leave the ramp?

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_____
_____
_____

7. If carpet or fabric was placed on the ramp's surface, how would it affect the cans' rolling distance and speed? Explain.

_____
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_____
_____
_____
_____

8. Predict what affect each of the following factors would have on a rolling can:
    a. Increasing the pitch (angle) of the ramp. Decreasing the pitch.

    _____
    _____
    _____

    b. Viscosity (thickness) of the can's content.

    _____
    _____

    c. The radius of the can.

    _____
    _____

    d. The weight of the can.

    _____
    _____

    e. The weight distribution inside the can (i.e. contents is more on one side of the can than the other or not shaken).

    _____
    _____

    f. How freely the contents move within the can.

    _____

    _____

9. Describe the ideal conditions (listed above - i.e. can contents, can size, can weight, etc…) for a rolling can to roll the <u>greatest</u> distance and in the <u>fastest</u> time.

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