

# Rollercoasters – Worksheet

By: Louise Lopes, based on the workshop investigation by Jonathon Schumack

## Introduction:

People either find rollercoasters really fun or terrifying, which are you? In this investigation, you are going to be a roller coaster engineer, where you will be able to design your own track. What twists and turns can you envision for your riders?

**Efficiency:** Attempting to get more motion (kinetic energy) from the ball when dropping it from the same height (gravitational potential energy) each time.



## ACTIVITY ONE

### Question:

Aim: To measure the efficiency of three different tracks.

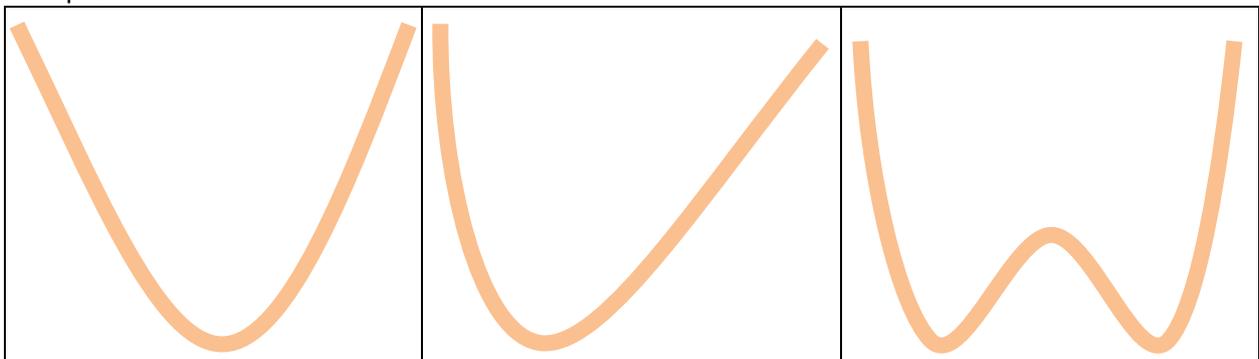
### Plan:

This activity has been planned for you. You will use the following materials:

- Clear plastic tubing or computer cable channel
- Retort stands and clamps
- Balls
- A meter ruler
- Pipe Cleaners
- Blu-Tack (optional)

### Conduct:

1. Using the materials you have been given, construct rollercoaster tracks that have the following shapes:



2. Measure the starting height of the marble.

3. Allocate a person to mark where the marble reaches before it turns back with a small bit of Blu-Tack.
4. Release the marble
5. Record the height the marble was released and the height it reached in a table below:

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Analyse:

Calculate the efficiency of each track design by using the following calculation:

$$efficiency = \frac{\textit{height marble reached}}{\textit{height marble was released}} \times 100\%$$

Make your calculations below:

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Problem-Solves:

Evaluate the strengths and weaknesses of each track design:



## ACTIVITY TWO

### Question:

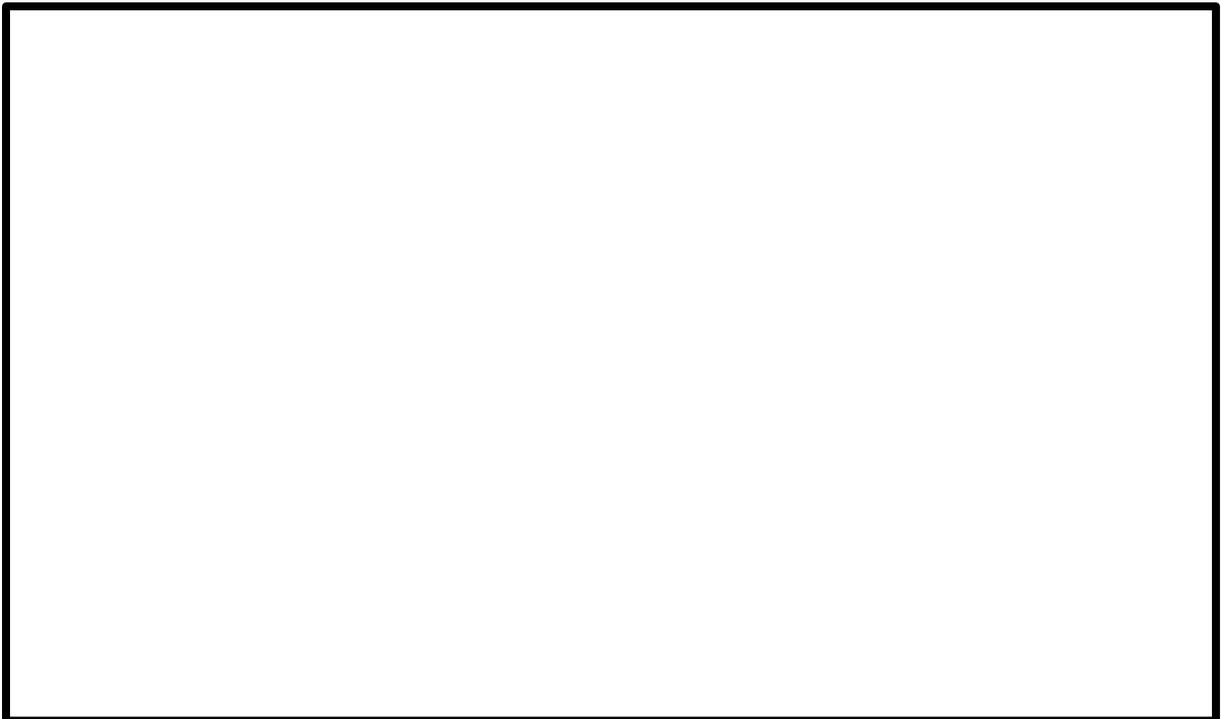
Your aim is to design the best rollercoaster you can. You have to ensure that if life-size it would:

- Be safe
- Have the maximum run time possible
- Be fun to ride

### Plan:

You can use the same materials used in the first activity.

Plan your design by sketching ideas below:



### Conduct:

Record the height the marble reaches, the run-time and how many changes in direction for your prototype below:

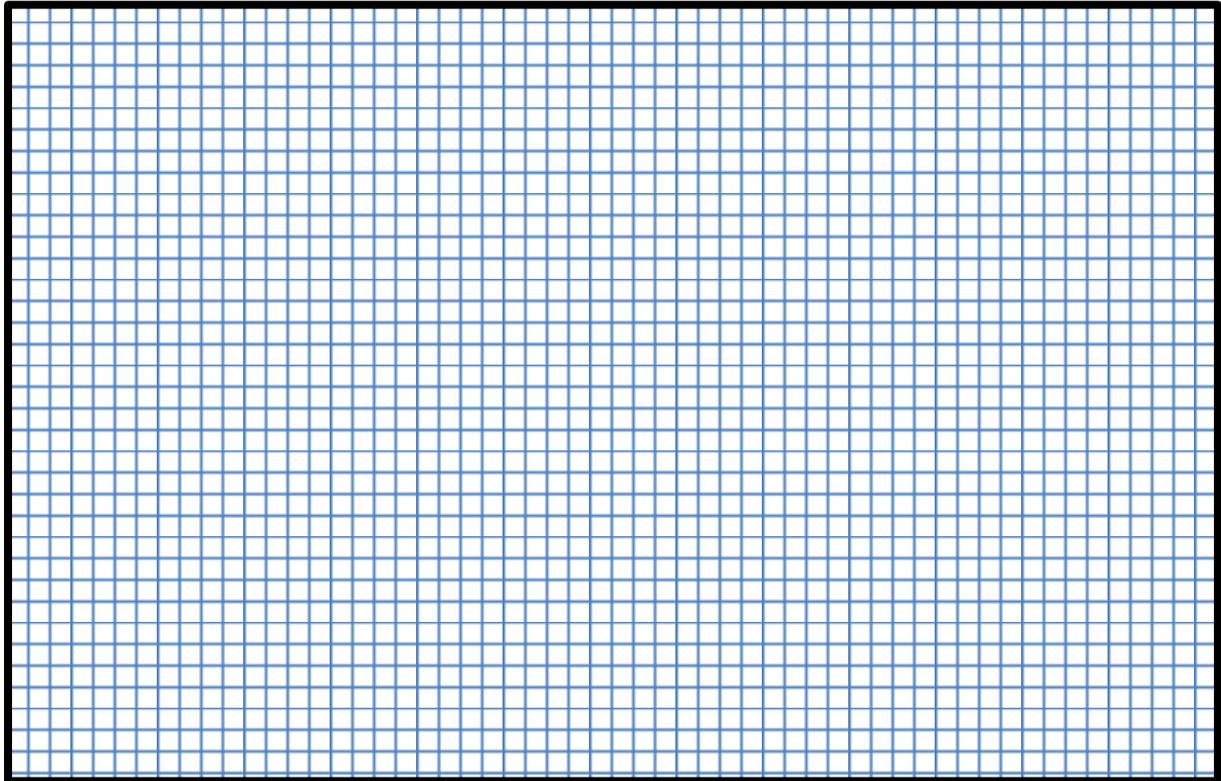


Analyse:

Calculate the efficiency of your prototype below:



Draw a graph comparing the efficiency values for the three models constructed in Activity 1 and your prototype:



Problem-Solves:

Assess your prototype. Was it better than the models constructed in Activity 1? Why or why not?

A large empty rectangular box with a black border, intended for writing an assessment of the prototype.

Outline any energy transfers and transformations that occurred in your prototype:

A large empty rectangular box with a black border, intended for outlining energy transfers and transformations.

Explain why the efficiency is less than 100%:

Evaluate the reliability of your experiment. Were there any sources of human error? How could you have improved the investigation?

Conclusion:

Write a short statement about what you learnt about efficiency by doing this investigation:

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