

## **Practical Title: Marble Maze Activity: Problem solving**

**Focus and Principles:** Choice of learning objectives and focused assessment

### **Equipment per pair:**

Board or tray (e.g. 30 x 60cm) with e.g. 2 cotton reels under one end to form a slope

1 marble

1 timer – optional (depends what you want the pupils to focus on!)

*Small* quantity of blu-tac

Selection of materials to use to slow down the marble e.g. lolly sticks, material strips, match sticks, bottle tops, any small objects.

*As far as possible give each pair of pupils the same amount of materials.*

**Suggested pupil group size:** 2

**Time:** 45 – 60 mins

**Challenge:** Design and create a 'Marble Maze' using the materials provided so that the marble takes ***as long as possible*** to roll, *without stopping*, from the top to the bottom of the slope. A useful target is to ask the pupils to aim for their age in seconds. The activity can be run at tables or on the floor.

### **Learning Objectives:**

Focused learning objectives are vital for maximum learning. However, they do not always need to be shared with the pupils at the beginning of the lesson because this can give the game away! If they are shared at the beginning, then it is likely that they will need to be worded differently from those in your planning - for example, they might need to be worded as a question. Sometimes it is good practice to share them at the end of the lesson so that the pupils can self-assess against them. There are many different ways (and timings) for using the objectives.

Learning objectives can be just skills based and link to the Working Scientifically section of the curriculum. This still means that they will be 'taught through and clearly related to the teaching of substantive science content in the programme of study' (National Curriculum).

Below are some possible learning objectives but it is important to choose from them and not use all at once. Also, you will probably be able to produce better ones!

### **Possible Learning Objectives:**

- To take measurements with timers with increasing accuracy and precision, and take repeat readings when appropriate



- To make systematic and careful observations and find ways of improving what has already been done
- To understand that objects roll down slopes due to the force of gravity
- To explore the effect of friction on movement and find out how it slows or stops moving objects

**Possible objectives to share with the pupils:**

- Be able to explain the challenge with reference to forces and friction
- Use the timers accurately to measure the time the marble takes to reach the bottom of the slope on each occasion
- Make continual improvements to your design so that the marble takes as long as possible to reach the bottom

**Science:** This activity relates to the science of forces – a marble will roll down a slope due to the force of gravity. Pupils will need to use the force of friction to slow the marble down – either by using different material surfaces or by creating a path for the marble to follow so that it has to travel over as much of the board as possible on its way down the slope.

**Marble Maze - Practical Tips**

- At the start, show pupils the set-up with the board and cotton reels and discuss their ideas for how they might use the materials provided to slow the marble down.
- As a clue, you could time how long it takes a pupil to walk from one side of the class to the other in a straight line and then compare it to how long it takes for them to do the same thing if they follow a zig-zag path.
- The cotton reels can only be used to prop up the board and the blu-tac should only be used (sparingly) to stick other objects to the board.
- *Every time pupils make a change to their maze they should test it with the marble. The marble only needs to follow one edge of an object so the pupils do not need to create a path with 2 sides.*
- Half-way through the activity it is worth doing a class 'practice run' (timing optional) so that the pupils can see what they need to improve. One way of arranging this is for one pupil from each pair to stand up, while the other gets ready to release the marble on your command. The standing pupil has to sit down as soon as their marble



reaches the end, falls off the side or gets stuck (and if it gets stuck the pupils are not allowed to touch it or help it along). Can be repeated to allow pupils to swap roles.

- The final run could end with the class gathered around the 2-3 boards which seem to last the longest, watching the marbles roll down the slope. This would allow a final winner to be verified and could lead into a discussion about why these particular boards were the most effective at slowing the marble down.

**Assessment:** The assessment needs to focus on the chosen learning objectives. How would you assess them? What would need to be recorded and how?

**Health & Safety:**

Teachers always need to risk assess practical activities for their children and defer to their health and safety advisor for the most up-to-date source of health and safety guidance. This training cannot be relied upon as source of health & safety guidance.

