# Challenge 10: Gravity pinball machine

## STEM Olympiad – Stage 4

In this challenge you are required to make the marble run the slowest through the pinball machine from start to finish.

### Outcomes

* **SC4-8WS** selects and uses appropriate strategies, understanding and skills to produce creative and plausible solutions to identified problems

[Science Years 7-10 Syllabus (2018)](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-7-10-2018) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2018

* **TE4-1DP** designs, communicates and evaluates innovative ideas and creative solutions to authentic problems or opportunities

[Technology Mandatory Years 7-8 Syllabus (2017)](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/technologies/technology-mandatory-7-8-new-syllabus) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2017

### Resources

Require resources:

* cardboard
* masking tape
* scissors
* a marble.

Optional resources:

* cardboard box/lid
* straws, paper plates, paddle pop sticks, pvc pipe, paper rolls.

### Glossary

To assist with your understanding of the task, define the following terms in the table below.

Table 1 – Glossary

|  |  |
| --- | --- |
| Term | Definition |
| Motion |  |
| Gravity |  |
| Acceleration |  |
| Mass |  |
| Force |  |

### Directions to students

1. Create a pinball machine from a piece of rectangular cardboard (or this could be made from a box so the marble doesn’t run off the sides). If using a flat piece of cardboard, add sides.
2. Add obstacles using different pieces of cardboard or other materials like paper rolls, straws, paper plates, paddle pop sticks, pvc pipe. Make a maze for the marble to run through from the top of the rectangle to the bottom.
3. Hold the cardboard pinball machine with both hands. Have a peer drop the marble at the top of the maze. Make the marble go from start to finish.
4. Capture evidence of the design - either a digital photo or pencil sketch.
5. Record the time taken for the marble to travel through the pinball machine.
6. Complete the recount and learning reflection activity.
7. Submit evidence of completion to your teacher for feedback.

### Success criteria

A student is successful if their marble stays on the track from start to finish for at least 60 seconds or more.

### Evidence of completion

In the space provided below, provide evidence of your completed pinball machine. This could be a digital photograph or a pencil sketch.

### Data Collection

Measure and record the time to complete each attempt.

Table 2 – Data collection

|  |  |  |
| --- | --- | --- |
| Attempt |  | Time (seconds) |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |

### Procedure recount

In the space provided below, provide a procedure recount of how you made your pinball machine. Remember to include the correct names of materials, equipment and techniques used. Seek advice from your teacher if you need help.

### Challenge reflection

Consider the process of designing, making and testing your pinball machine (the design process). What worked well for you? What did you have difficulty with? What would you do differently next time? Are there other materials you could have used and why?