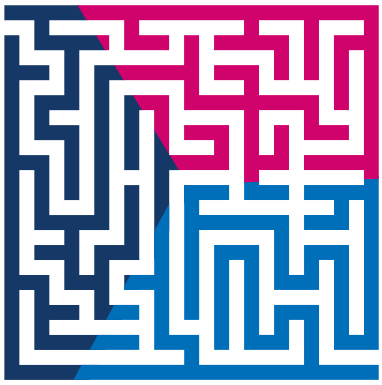
Formech
Perfectly formed



Maze Puzzle

Completion time: 4 Lessons

Materials and Resources:

- Pencil, marker, paper and ruler
- 30cm x 30cm square of MDF, 2cm thick
- A steel ball bearing of any size, under 1cm is recommended
- Drill press, disc sander, files, sandpaper
- Drill bit slightly larger than the gauge of the chosen ball bearing, 1.5mm drill bit
- Formech vacuum forming machine, suitable plastic material for vacuum forming (1.5mm ABS or HIPS is recommended)
- https://formech.com/case-studies/formech-at-big-monster-toys-chicago-il

Skills at a glance:

Mathematics

Measurement, scale, numeracy

Language

Listening, following instructions

Thinking skills

Design, expression, research and development, and independent thought

Science

Heating plastics and effects, plastic /polymer material knowledge, and computer technology

Project Outline:

Students will produce a square maze puzzle, through which a single steel ball bearing can be navigated by holding the puzzle flat, and tilting it gently in different directions. The maze will have starting and finishing points, paths that closely weave alongside each other, dead ends, and tricky turns. The soul material used to make the mould to be vacuum formed will be a square piece of MDF, with which students can demonstrate their knowledge and abilities using both a drill press and disc sander to shape it appropriately.

Method:

Firstly, students must design their maze which they will carve into their MDF to be used as a vacuum forming mould. This piece of MDF should be 2cm thick and approximately 30cm x 30cm, or of a size that fits within the forming area of the Formech vacuum forming machine. With these dimensions in mind, students can design their maze on paper.

At the maze design stage, it is important to consider what gauge steel ball will be put inside the maze for it to be played. This will affect what size drill bit will be used to cut its path, how wide the paths in the completed maze will need to be, and in turn, how closely paths will be able to travel to one another. Once the maze design is complete on paper, it can now be drawn directly on to the MDF material.

Using the drill press, and a drill bit slightly wider than the gauge of the steel ball, students can now begin cutting out their design. With the MDF lay flat on the table of the drill press, students can drop the moving drill 1cm to 1.5cm into the MDF at the starting point of the maze. Students can now move the MDF using both hands to guide the drill around the path of the maze, creating a path for the steel ball to travel. Sandpaper and files can be used to soften the harsh edges and corners created during the milling process.

All the way around the path of the maze, 1.5mm venting holes will need to be drilled through the mouldat 3cm intervals.

The final stage before vacuum forming is to add draft angles to each of the four outer sides of the maze mould, using the disc sander. The mould is now ready to be vacuum formed.

Once formed, students will have their custom maze which will need to have excess plastic trimmed off from around the edges. Students will now have their completed maze, ready to be played and enjoyed.

Homework Tasks:

To reduce the amount of time spent in class designing the maze, students might do this for homework, using the internet to look at examples.

Vacuum forming makes up a huge part of the toy manufacturing industry. With this in mind, students can take some time at home to identify other toys which have been manufactured using this process.

Optional Extras:

The final vacuum formed mazes will be ready to be played right away, which students will enjoy, but there is also scope to use these mazes in group activities promoting communication skills, or even learning in foreign languages. For example, in pairs with one student blind folded and holding the maze, and with another giving verbal instructions of how to tilt it to move the ball, the pair must complete the maze as quickly as possible.This can be done in English, French, Spanish, or any other language that students might be studying. Students will have opportunity to utilise foreign vocabulary relating to directions and instructions, teamwork and listening skills.

Student Accomplishments:

- The production of a food mould for multiple use
- Knowledge of food safe plastics
- Following verbal instructions and making observations
- Learning how existing objects can be utilised within research and design, as well as manufacture
- Practical hands on experience using a vacuum forming machine, and understanding its wider application
- Applied knowledge

Teachers notes:

Share pictures and videos of your Formech project across social media, using **#formechmade**

Need materials for this project?

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