Build the workshop maze

As an aid to help with teaching students how to build and program robotics, we have developed a dynamic maze. This maze is a continuous line with junctions allowing the maze builder to build dead ends and loops.

In our workshops, students use the maze pieces to learn how to calibrate their robots, test their programs, and time willing they organise their own impromptu competitions, seeing whose robot can navigate the maze the quickest.

The maze is made up of sheet wood squares no larger than 300x300mm. Each square has a line portion painted against a background. Some squares have an additional coloured square marking a type of intersection.

The maze is formed be placing the squares together to form a continuous line. Because of the intersections, the line may have dead ends, and loops.
Our experience has shown that students rearrange the pieces to make the most challenging mazes.

Making your own maze pieces

Materials - 1200x2400 sheet of 3ply, or 3mm thick wood product sheet. It should be cut into equal squares just smaller than 300x300mm. (most likely to be 297x297mm allowing for the saw blade width)

Line - The line is 20mm wide. It is painted black. Each square has a line, which connects to the middle of the side.

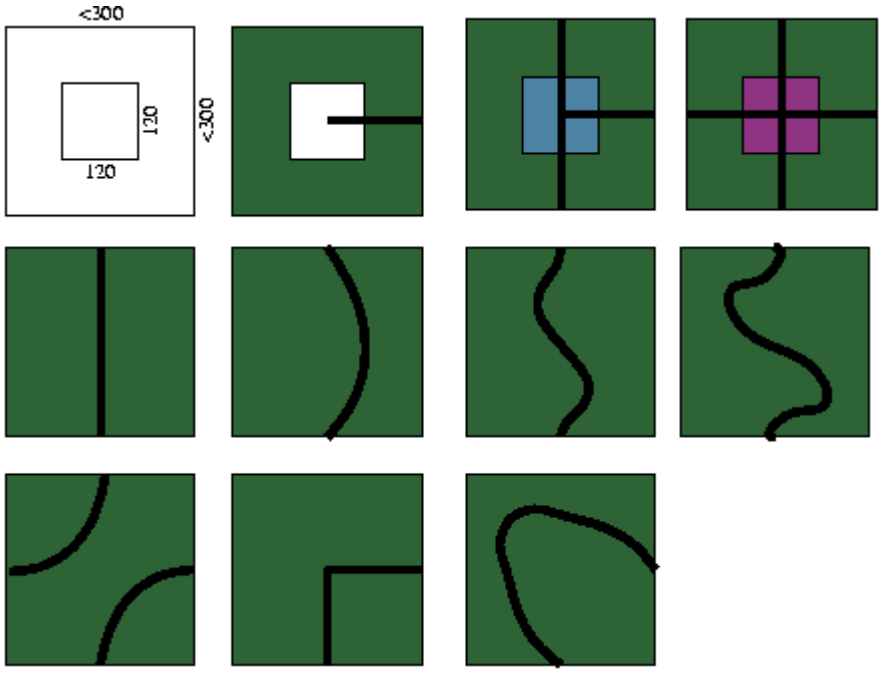
Tile types:

- **Terminal Tiles -** The Terminal Tiles will require an extra action from the robot. All of these tiles are marked by a coloured square in the centre of the tile. These tiles are the last three in the top row of the image shown below. The colours used in the image are not necessarily the colours that should be used. The centre square of the intersections should be the same colour for all of the same type of intersections.

- **Termination** - These tiles have a white square (80x80mm) in the middle. The line extends form the middle of the tile to the middle of only one edge. These dimensions on the diagram below are incorrect, please refer to the text.

- **T intersection** - These tiles have lines going to the middle of 3 edges. It has a coloured square (80x80mm) in the centre of the tile. The square colour has a Lego® light sensor reading in the middle between the background and one of the terminating colours, white or black.

- **Cross intersection** - These tiles have lines going to the middle of all edges. It also has a square (80x80mm) in the centre of the tile. The square colour is a Lego light sensor reading in the middle between the background and the other termination colour, black or white.



Simple pieces:
These are just the background colour and the line. To make the maze more interesting and challenging, curves are added to the lines. The avoid making the maze impossible to complete the inside radius of any curve should be no less than 50mm.

- **Straight** - These tiles have the line joining two opposite edges. Examples of this type of tile are shown in the middle row, above.

- **Corners** - On these tiles the line joins two adjacent edges. Right-angle corners should be rounded. Examples are shown in the bottom row.

Colours:
The choice of colours is very important. Each colour chosen should be some distance in light intensity, as measured by a Lego light sensor, away from each other. We chose colours by recording light sensors readings from paint swatches available from hardware stores. Each colour is about 5 percent apart.

- **The Line colour** should be black (the bottom end of the light sensor range).

- **The Terminating squares** are white (the top end of the light sensor range).

- **The Background** is a colour with a light sensor reading in the middle of black and white readings (the middle of the light sensor range).

- **Intersection colours** are halfway between, the background and the 2 terminal colours. (These colours are the middle of the middle and ends of the light sensor range).

To the Lego Light sensors, Red returns the same value as white. All the colours should also appear different to humans. Shades of grey will return the required light sensor readings, but may be difficult for humans to determine the differences.