

In robot sumo, two autonomous robots face off on a circular platform, in a high-tech version of the ancient Japanese sport of sumo wrestling. Each robot tries to push its opponent from the platform without being pushed or accidentally straying out of bounds itself. The first robot to touch down outside the platform loses the round.

The competition platform (formally known as the *dohyo*) is built of a heavy, solid material, such as metal or wood. The platform has a non-reflective black surface, and its perimeter is marked with a bright white band, so that the competing robots can sense when they are approaching the edge. Near the center of the platform, there are two short starting lines, which delineate the areas where contestants may place their robots at the start of each round.

Building a Practice Platform

In designing our practice platform, the goal was to create something that would be functionally equivalent to the competition platform in terms of its dimensions and coloring. At the same time, we wanted something lightweight that could be built quickly and inexpensively, without power tools. Keeping the needs of schools in mind, we avoided using spray paint, which can be messy and release harmful fumes.

Foam core composite was chosen as the basic platform material, since it is relatively lightweight, smooth, and easy to cut with a utility knife or box cutter. Available at most art supply stores, the foam core composite is a layer of styrofoam wedged between two layers of paper. A major advantage of this material is that it comes in a matte black finish, which saves the trouble of painting the center of the platform.

Selecting Your Dimensions

Although the practice platform can be built to fit virtually any size requirements, you may want to adhere to the rules specified in one of three emerging robot sumo classes: International, Mini, and Micro. The rule set for each of these classes specifies the diameter of the competition

platform and the width of the white band around the perimeter. Table 1 shows the relevant dimensions, in centimeters and inches.

Table 1. Dimensions for International, Mini, and Micro Robot Sumo Platforms

Class	Diameter (cm)	Diameter (inches)	Edge Band (cm)	Edge Band (inches)
International	154	60.6	5	2.0
Mini	77	30.3	2.5	1.0
Micro	38.5	15.2	1.25	0.5

Gathering the Tools and Supplies

To complete the platform, you will need the following tools and supplies (Figure 1):

- Utility knife or box cutter
- Phillips head screwdriver
- Measuring tape and pencil
- Foam core composite, black matte finish, at least 3/8" in thickness
- Thin wire or string, about 4' in length
- Poster-paint marker, medium point, white (e.g. Sharpie)
- Poster-paint marker, medium point, brown (e.g. Sharpie)
- Acrylic paint, titanium white, 4 oz.
- Paint roller or brush, 1" to 2" wide



Figure 1. Tools and supplies.

Cutting Out the Disk

The first step of the project is to cut a circular disk for your robot sumo platform. You will use your utility knife to make the cut, guided by a length of string or wire.

1. Measure to determine the largest square you can make from your foam core sheet.
2. Using a utility knife, cut the sheet to create the square.
3. Measure diagonally across the square to mark its center point (Figure 2).



Figure 2. Marking the center point.

4. Determine the desired radius of your platform. Note that the radius may be no longer than half the side of your foam core square.
5. Cut a length of wire that is at least 6 inches longer than the intended radius of your platform.
6. Make loops in the ends of the wire or string, just large enough to hold the tip of your Philips screwdriver and the end of your utility knife (Figure 3). Note: It may take a few attempts to position the loops to achieve the desired radius.

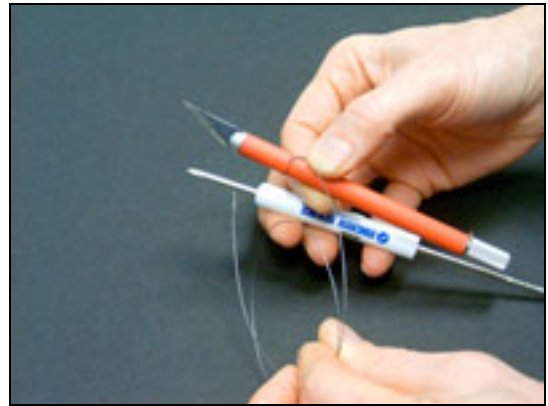


Figure 3. Making loops to hold the screwdriver and utility knife.

7. Puncture the center of your square with the screwdriver, anchoring one end of the wire or string (Figure 4).

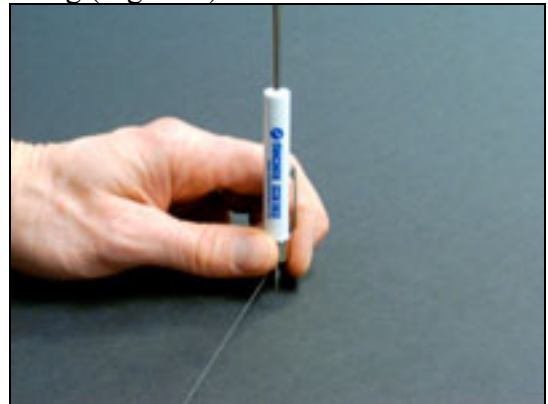


Figure 4. Puncturing the center of the square to anchor one end of the wire.

8. Keeping the wire or string taut at all times, cut out the perimeter of your disk (Figure 5).



Figure 5. Cutting out the disk.

9. After you have scored all the way around the circle, you may need to remove the wire loop from the utility knife to complete the cut (Figure 6).



Figure 6. Completing the cut.

Painting the White Perimeter Band

Now that you have cut out a disk, the next step is to create the white band around the perimeter. You will use the white poster-paint marker to define the inner boundary of the band, and then fill in the rest with the white acrylic paint.

1. Referring to Table 1, determine the desired width of the white band.
2. Repeat the procedures described in steps 5 and 6 from the previous section to create a second length of wire or string that will guide the white poster-paint marker. Make the loops slightly closer together than they were in the previous step, reflecting the width of the perimeter band.
3. Insert the screwdriver tip into the center hole in your foam core disk.
4. Again, keeping the wire or string taut, draw a line all the way around your disk. This will guide you in painting the white perimeter band (Figure 7).



Figure 7. Drawing a circle to mark the inside of the perimeter band.

5. Now, using your paint brush or roller, carefully fill in the area between the edge of the platform and the white marker line with titanium white acrylic paint (Figure 8). Be careful not to get any paint inside the circle you created with the white marker.



Figure 8. Painting the outer area of the platform.

Finishing Touches

The acrylic paint takes only a few minutes to dry, leaving you with one final step: making the starting lines in the center of the board. As with the dimensions of the board itself, the size and position of the starting lines depend on the class of robot sumo you are preparing for. In international class, the lines are 20 cm by 2 cm (7.8" by 0.8"); in mini class, the lines are 10 cm by 1 cm (3.9" by 0.4"); and in micro sumo, the lines are 5 cm by 0.5 cm. (2" by 0.2"). In each case, the distance of each line from the center of the platform is equal to its half its length. Templates for drawing the lines on your board are available for download as PDF documents at www.machinescience.org/sumo.

1. Download the appropriate PDF document from the Machine Science web site.
2. Using the utility knife, carefully cut out the rectangles representing the two starting lines.
3. Place the template on the board, aligning the mark for the center hole with the center hole in the platform.
4. Using the screwdriver, anchor the template to the board (Figure 9).

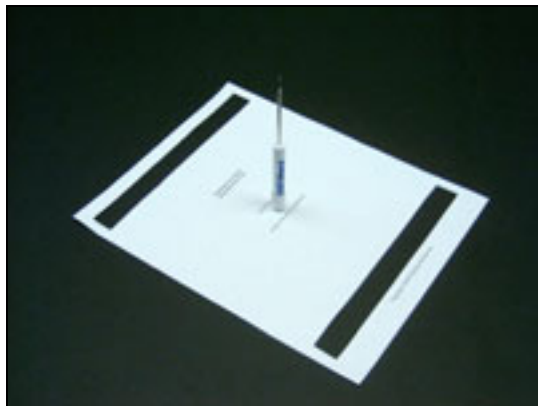


Figure 9. Positioning template on platform.

5. With the brown poster-paint marker, carefully trace the inside of each rectangular cut out, making sure that the template does not move from its original position.



Figure 10. Tracing the starting lines

Ordinarily, competition platforms are raised a one or two inches off the ground, so that it is obvious when a robot touches outside the ring. The foam core material is not quite stiff enough to be supported in this way, but even when placed on the floor, it is usually evident when a robot strays off the edge. Figure 11 shows the completed platform.

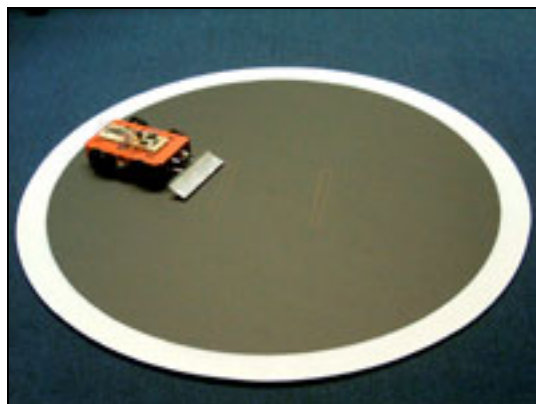


Figure 11. Completed robot sumo practice platform.