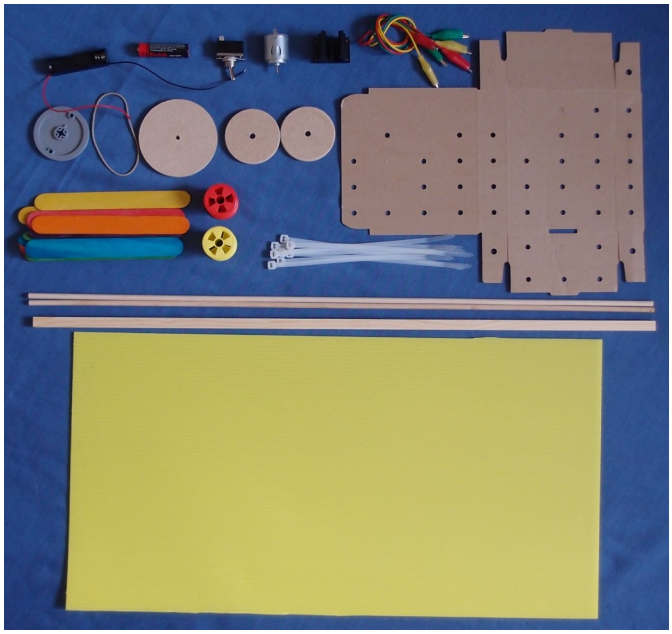
Make your own merry-go-round

Follow this step by step guide on how to make your own pulley-driven merry-go-round.

What you'll need

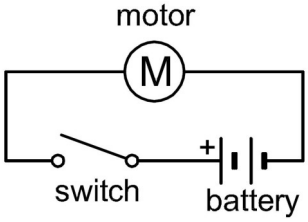
Components and materials:
Battery holder
AA zinc chloride cell (**do not use alkaline or rechargeable cells** - if you accidentally short circuit your battery these will get hot)
Toggle switch
Motor
Motor mount
3 crocodile leads
Plastic pulley 50 mm diameter
Rubber band ~ 1.5 mm x 1.5 mm x 10 cm long
Wheel with 5 mm diameter hole
2 wheels with 6 mm diameter hole
Focused task box
15 giant lolly sticks
2 cotton reels
Several cable ties 30 cm long
Wooden dowel 5 mm diameter x 120 cm long (if you are short of 5 mm dowel you can use a 27 cm length for the central shaft and use garden cane or wooden skewers for the outer poles)
Square section wood 8 mm x 50 cm long
Sheet of 3 mm thick Corriflute 25 cm wide x 50 cm long
Passengers: you could use small soft toys or make these from pine cones with stick-on eyes

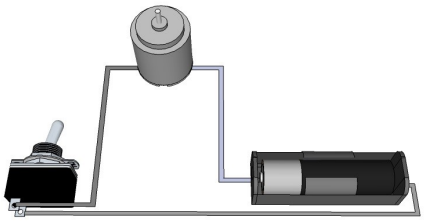


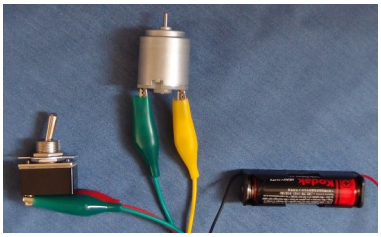
Tools:
Ruler
Pencil
Pencil sharpener
Blu Tack
Pair of compasses (or a plate about 24 - 25 cm in diameter)
Protractor
Large scissors
Junior hacksaw and vice
Sandpaper
Low melt temperature glue gun
Secateurs (optional - to be used by adults only)

Step 1.

Make this circuit and check that the motor shaft goes round when you switch on. Be careful not to short circuit your battery (i.e. connect the wires from your battery directly together) - they must go via the motor. Switch off.

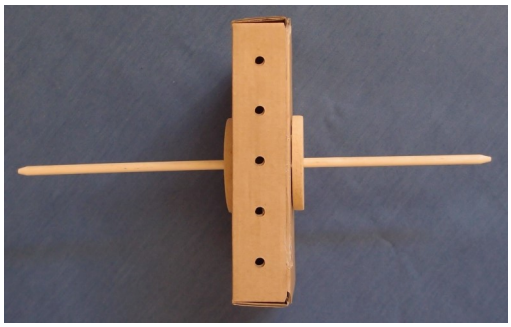






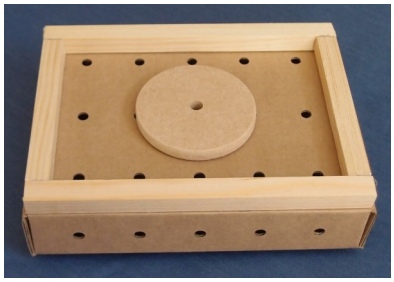
Step 2.

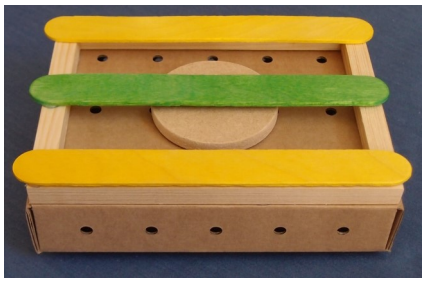
Fold up the focused task box and glue the final seam to make a cardboard base. Cut a central shaft 27 cm long from the 5 mm dowel, using either the hacksaw and vice or the secateurs. Use the pencil sharpener to sharpen both ends slightly; don't make a sharp point. Push it through the central holes and use this as a guide to attach the wheels with the 6 mm hole. Glue these one each side of the base.



Step 3.

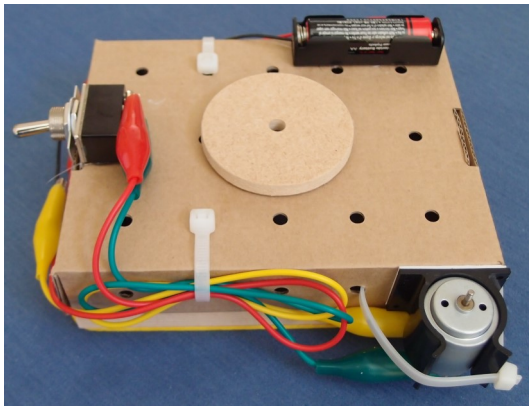
Remove the shaft from the base. Cut two 14 cm lengths of square section wood and two 8.5 cm lengths. Smooth the ends with sandpaper. Make a rectangular frame out of the wood and glue it to the base as shown. Take three giant lolly sticks and glue them onto the frame, with one stick either side and one in the middle. Turn the base over.





Step 4.

Clip the motor into the motor mount and stick it to the base so that the motor shaft is sticking up above the level of the base as shown. Attach it firmly to the base with a cable tie. If you fit the motor near a corner it is easier to get the cable tie around it. If your cable ties won't fit through the holes in the base you can enlarge the holes with the pencil. Glue the switch on somewhere you can access it easily. Glue on the battery. Fold the wires neatly round the outside of the base so they won't get in the way of the rotating parts and attach them with cable ties. Switch on and check the motor shaft still rotates, then switch off.

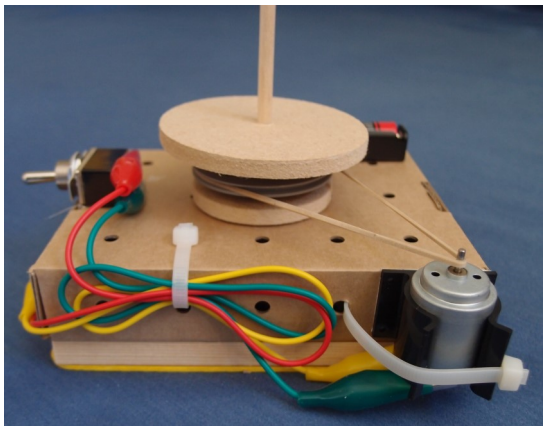


Step 5.

Make two pencil marks on the shaft 5 cm and 6 cm from the end. First push on the wheel with a 5 mm hole and push it along the shaft until the 6 cm mark is visible as shown. Push on the 50 mm pulley and slide it along the shaft until the 5 cm mark is visible. The wheel and pulley can both be a very tight fit; you could clamp the rod in a vice just below the 6 cm mark and use your weight to push them down the shaft.

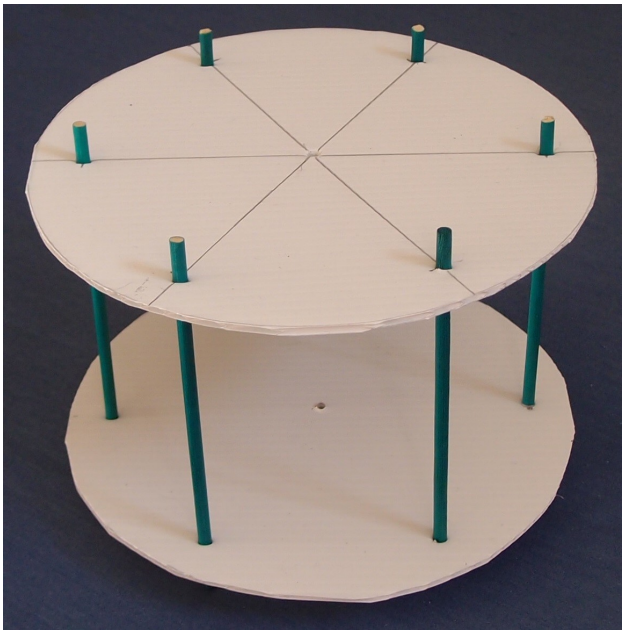
Step 6.

Hold the rubber band over the pulley and, with the wheel uppermost, slide the end of the shaft down through the central holes in the base until it rests on the giant lolly stick. Stretch the rubber band over the motor shaft and switch on. Check that the shaft rotates and the rubber band doesn't come off the end of the motor shaft when running. If it does then slide the motor up slightly and try again. The rubber band should run roughly in the middle of the motor shaft.



Step 7.

Use the compasses or draw round the plate to mark a circle of about 24 - 25 cm diameter on the Corriflute (at the edge, not the middle of the sheet) and cut it out. Use the ruler and pencil to mark a line passing through the centre. Use the protractor to mark out 6 lines at 60° to this as shown. Measure and mark each line 2 cm from the edge. Make sure the pencil is sharp, and use it to make holes in the centre and the 6 positions you have marked. The holes should be just big enough to push the end of the wooden rod into; it needs to be a tight fit. If you are using garden cane or wooden skewers for the outer poles then make sure the holes just fit these.



Step 8.

Use your first disc as a template to mark out a second one. Place the disc on the remaining Corriflute, draw round it and pierce the holes with the pencil. Use the pencil to enlarge the holes so that the wooden rod (or garden cane or skewer) just fits tightly. Cut 6 pieces of rod 15 cm long, and sharpen one end slightly. Slide the pointed end through the 6 outer holes in both the discs as shown, so that there is about 1 cm protruding at either end.

Step 9.

Slide the central shaft upwards out of the cardboard base (without losing the rubber band!) Push the disc assembly onto the shaft and glue it to the top of the wheel. Hold the rubber band onto the pulley, slide the shaft back through the central holes in the base and stretch the rubber band over the motor shaft. Switch on to try out your merry-go-round. Glue two cotton reels onto the top of the merry-go-round and then glue on the lolly sticks as shown. Populate your ride with small lightweight soft toys, plastic figures, pine cones with stick on eyes etc.

Step 10.

You could stick a piece of brightly coloured insulating tape onto the fairground ride (near the middle so that you can see it as it rotates) and time 10 revolutions, to work out the revolutions per minute (rpm). You could calculate the circumference of the circle made by the passengers, multiply by the rpm, then convert your units into miles per hour to find out how fast they are travelling. You could also try connecting a second battery in series to find out how it affects the rotational speed.

