Fairground rides

Have you been on any rides like these?

What makes them fun?

Fairground rides

Who are these rides designed for?

Fairground rides

Which parts move?

Which parts stay still?

Context

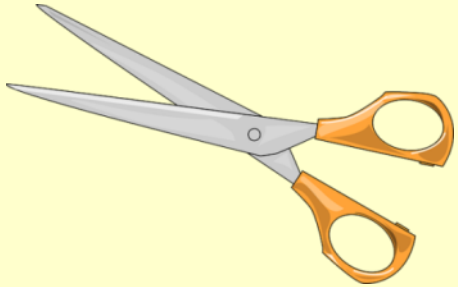
Your local theme park wants to attract more visitors by including some rotating fairground rides. They have asked you to design and build some working examples to help select the new rides.

Learning Objectives

- Make and use simple series circuits.
- Understand and use mechanical systems, e.g. pulleys, shafts and bearings
- Design and build purposeful, functional appealing products
- Measure length and time, calculate distance travelled and speed, convert between units

1. Safety

Look at the tools and equipment. Can you spot any potential hazards?



Can you think of ways to reduce the risks?

2. How the fairground ride works

- Try out the sample chair-o-plane and discuss how it works.
- Identify the following:

  motor

  drive belt (rubber band)

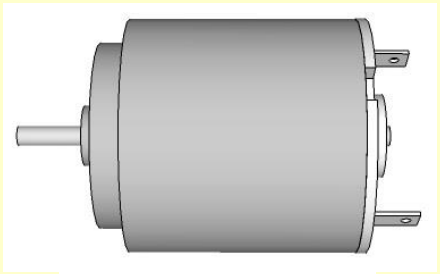
  pulley

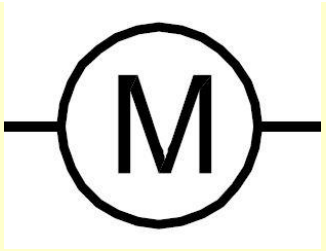
  shaft (wooden rod)

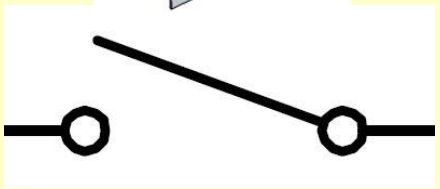
  bearings (wheels with 6 mm diameter hole)

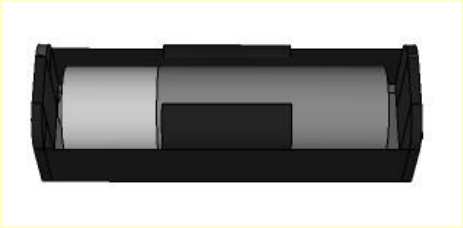
3. Electrical parts

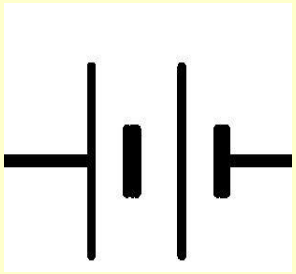
Name these electrical components:

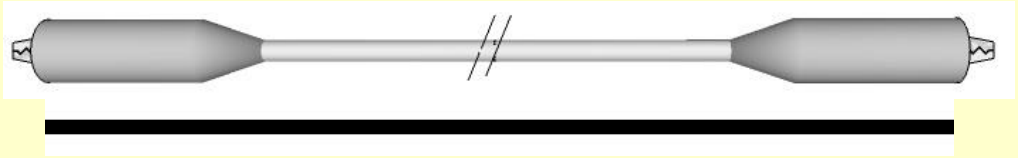








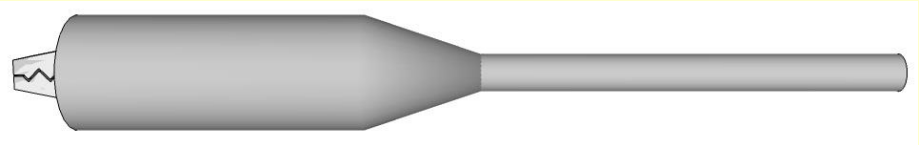




4. Avoid short circuits

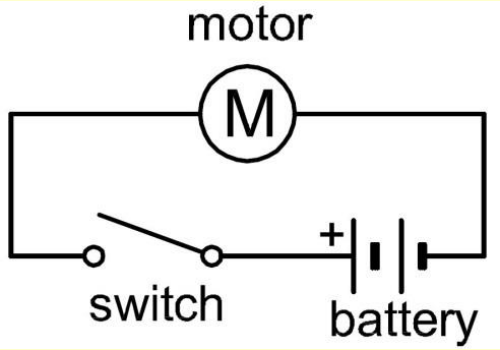
If batteries are ‘short-circuited’ they can get hot. So:

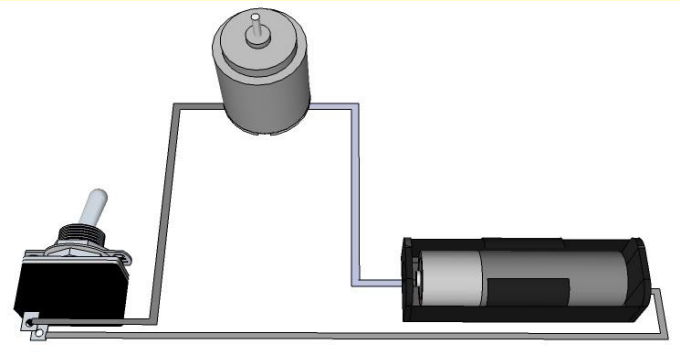
- **Do not use alkaline or rechargeable batteries.**
- Do not connect the bare ends of the wires from the battery directly together; they must be connected across the motor.
- Make sure the plastic sleeves cover the crocodile clips as shown here, to help prevent short-circuits if the clips touch.



5. Make your circuit

- Fit the cell into the battery holder (the right way round).
- Lay out your components in a triangle and make the following circuit, then check it works.





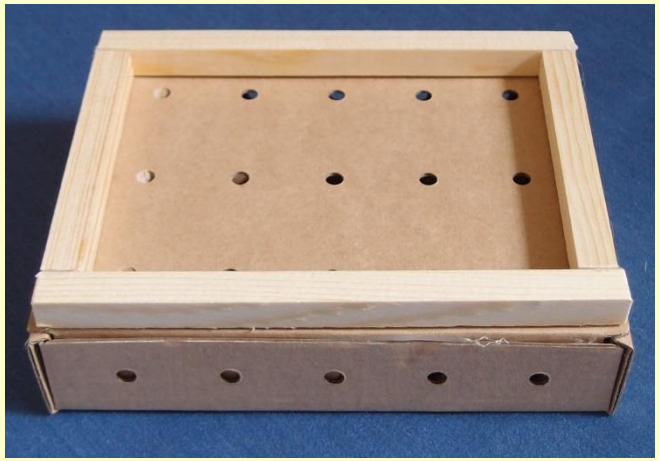
- Crocodile leads must be clipped onto bare metal, not onto plastic insulation!

6. Design your fairground ride

- More able pupils should come up with their own fairground ride designs using the design sheet provided.
- This PowerPoint gives step-by-step instructions on making a chair-o-plane. This is probably the easiest ride to make.
- The merry-go-round is slightly harder. Instructions on making a merry-go-round are given in the ‘How to make a merry-go-round’ blog (link).

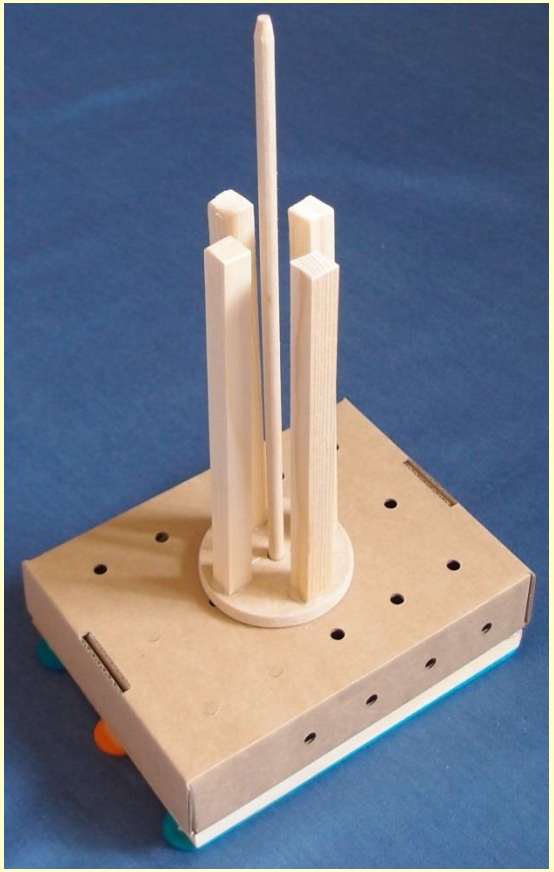
7. Chair-o-plane base

- Fold up the cardboard task box and glue the final seam.
- Cut two 14 cm lengths of square section wood and two 8.5 cm lengths.
- Make a frame and glue it to the base as shown.
- Glue 3 giant lolly sticks to the frame, one each side and one in the middle.



8. Chair-o-plane column

- Cut 25 cm of wooden rod and sharpen both ends slightly.
- Turn the base over. Slide the rod down through the two central holes so that it rests on the lolly stick.
- Use the rod as a guide to glue on a wheel with a 6 mm hole.
- Cut four 14 cm lengths of square wood. Make sure the ends are square and glue them onto the wheel.

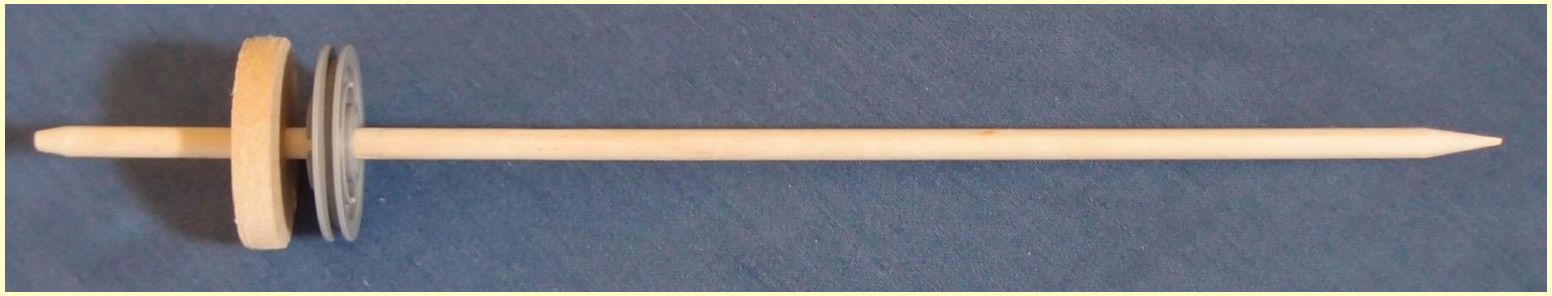


8. Chair-o-plane column continued

- Glue the second wheel with the 6 mm hole onto the top, again using the rod as a guide.
- Don’t get glue on the rod or in the hole.
- Remove the rod so that you don’t get glue on it.
- Glue the ends of the eight remaining giant lolly sticks onto the two wheels as shown.

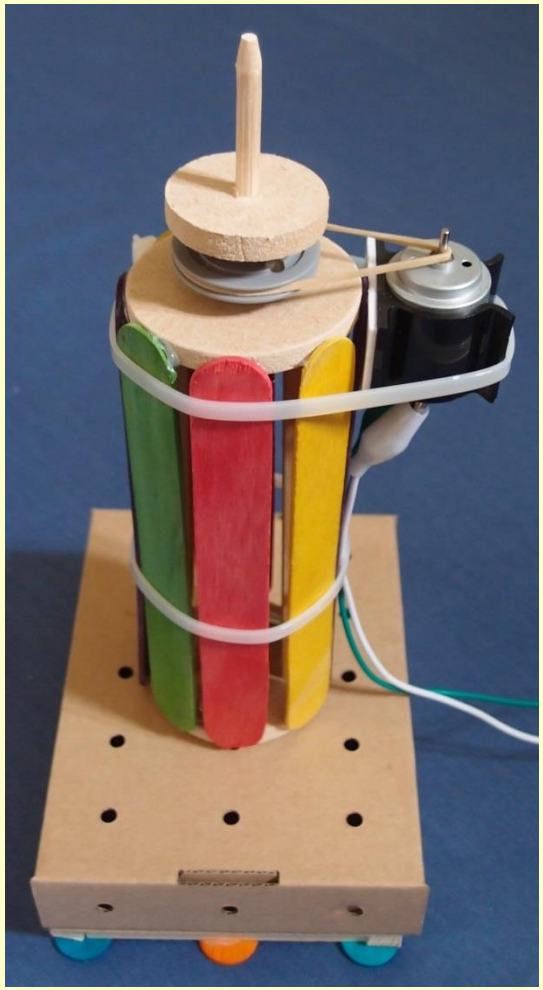
9. Prepare your shaft

- Mark the rod 5 cm from the end.
- Push on the pulley so that it covers the mark. If it is tight you could clamp the rod in a vice so that the mark is just showing then push the pulley on.
- Push the 35 mm diameter wheel onto the short end of the rod until it is about 1 cm from the pulley.
- Sharpen the rod end furthest from the wheel to reduce friction.



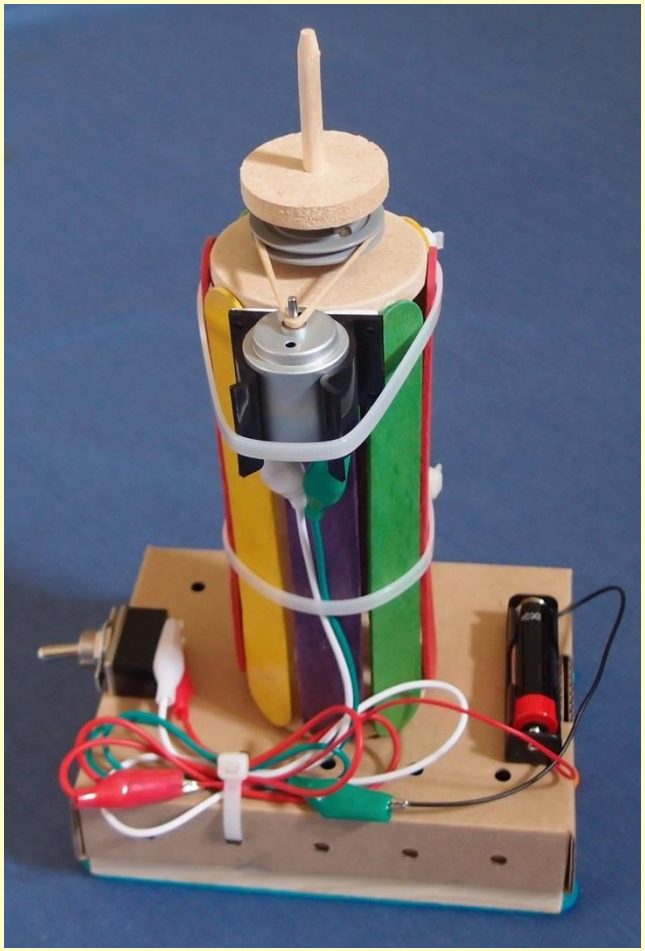
10. Fit your motor

- Clip the motor into the motor mount.
- Stick it to the top of a lolly stick.
- Attach firmly with a cable tie.
- Cable tie the crocodile leads to the column.
- Slide the rod down the column.
- Stretch the rubber band over the pulley and motor shaft.
- Turn on and check the rod rotates.



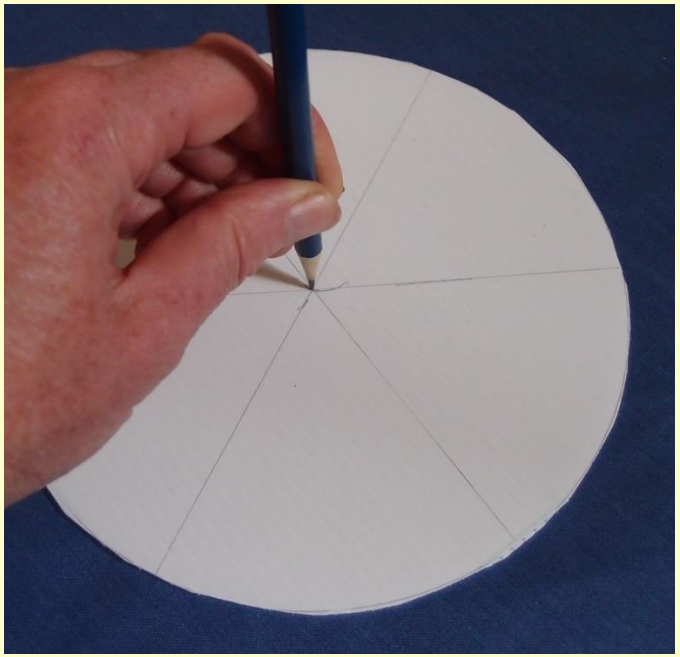
11. Attach your electrical parts

- Glue the switch and battery box to the base.
- Tidy the crocodile leads up and cable tie them to the base.



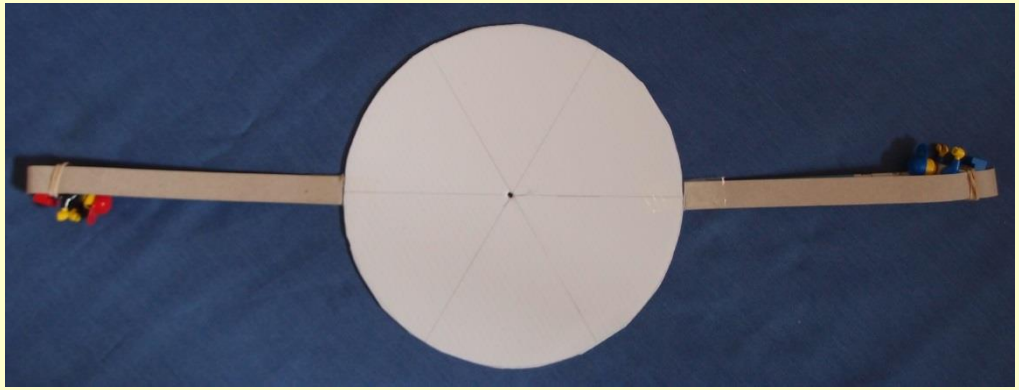
12. Make your rotating disc

- Mark out a circle on the corrugated plastic sheet about 17 cm diameter.
- Cut it out with large scissors.
- Draw a line though the centre.
- Mark out lines at 60° to this.
- Use a sharp pencil to make a hole in the centre just big enough to fit onto the shaft.
- Glue the disc onto the top of the 35 mm wheel.



13. Make your chairs

- Design chairs for your passengers.
- Sellotape them firmly to the disc at the positions marked. The Sellotape should act as a hinge so that the chairs can fly out as the disc rotates.
- Passengers with equal weight and chairs of equal length should be opposite one another so the forces balance.



14. Complete your chair-o-plane

- Try out your chair-o-plane to make sure it works.
- Decorate it and make any adjustments.
- Tidy up and fill on your worksheet.

15. Extension activity

Find out how fast the passengers are travelling.
Stick a piece of tape onto the disc near the centre, time 10 revolutions (revs) and estimate the diameter of the circle travelled by the passengers.

Here is a worked example:
10 revs in 8 seconds; revs per minute = 8 x 60/10 = 48 rpm
Diameter of circle = 0.38 m; circumference = π x 0.38 = 1.2 m
Distance travelled in one minute = 48 x 1.2 = 58 m
Distance travelled in one hour = 60 x 58 m = 3500 m = 3.5 km
Distance travelled in one hour (miles) = 3.5 x 5/8 = 2.2 miles

So speed = 3.5 kilometres per hour, or 2.2 miles per hour

16. Plenary

Discuss how the activity went and what you have learnt.

- What difficulties did you encounter and how did you overcome them?
- What would you do differently if you were starting again?
- Which rides would you choose for the theme park and why?

- What have you learnt about:
  - Electric circuits?
  - Pulleys, shafts and bearings?
  - Calculating speed?

- What did you enjoy most about the activity?

More fun design & make project kits from TTS