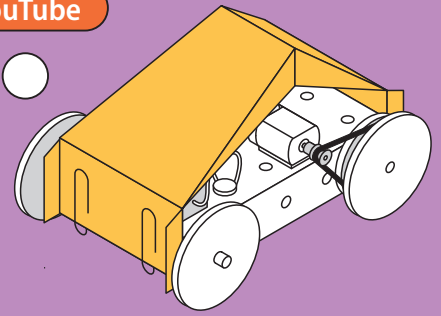




Visit TechCard at techcard.co.uk & Instagram & YouTube

Simple Vehicle

Workshop Pack Skill Level ●●●●●

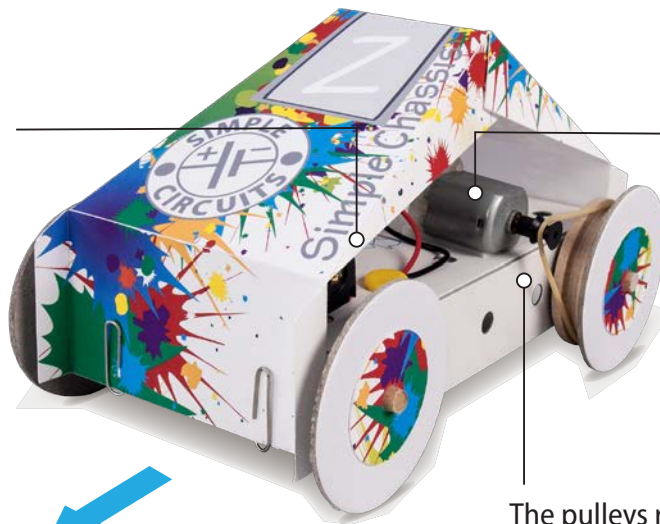


Build a speedy motorised vehicle with a pulley drive.

Explore simple circuits and discover how electricity flows!

See how to make with TechCard on our website.

The battery stores electrical energy.



The motor converts electrical energy into mechanical force.

The pulleys reduce the speed of the force.

Assembly videos on YouTube!

Parts to make 1 model

Structural Parts

TechCard Base 1

Mechanical Parts

50mm Wheel 4
40mm Pulley 1
300mm Dowel Axle 1

Motor 1
Motor Pulley 1
No16 Rubber Band 1
1.5V AA Battery Holder 1
Sticky Foam Pads 2
Rivets and Collars 3
Paper Clips 6

Additional Materials

1.5V AA Battery 1
A4 Size Thin Card 1

You will have parts left over towards other models.

Parts to make 10 models

Structural Parts

TechCard Base 10

Mechanical Parts

50mm Wheel 40
40mm Pulley 10
300mm Dowel Axle 10

Motor 10
Motor Pulley 10
No16 Rubber Band 10
1.5V AA Battery Holder 10
Sticky Foam Pads 20
Rivets and Collars 30
Paper Clips 60

Additional Materials

1.5V AA Battery 10
A4 Size Thin Card 10

Based on pupils sharing off-cuts between them.

Using Batteries Safely

Important! Please read these guidelines before using the Workshop Pack

What is a battery and how do they work?

Batteries are a common part of our everyday lives but it's important to understand how they work to use them safely in circuits that we build ourselves.

A battery is basically a little power station. When a circuit is switched on, chemical compounds inside the battery react and electrical energy (electricity) is generated which flows through the circuit.

A battery has two terminals which are often positioned one at each end of the battery. When a circuit is switched on, electrical energy flows from one battery terminal through the various components in the circuit and back to the other terminal of the battery.

It is important to remember that electricity flows in a 'circuit'. It doesn't just fall out of the ends of a battery! The terminals of a battery have to be connected in some form of circuit before electricity is generated by the battery.

In normal use, the energy in the circuit flows through components which consume the energy. For example, electrical energy flowing through a motor is consumed as the motor converts the electrical energy into a useful mechanical force. The motor will continue to run until the chemical compounds in the battery are depleted and can no longer produce electrical energy.

Problems occur with batteries when what is called a 'short circuit' occurs. A short circuit occurs when the terminals of a battery (or any power supply) are connected without anything in the circuit to use the energy. When a short circuit occurs, electrical energy still flows from one terminal to the other but there is nothing in the circuit to use the energy. As a result, the energy is converted into heat inside the battery and the battery can become dangerously hot. Hot enough to cause a painful burn.

Sometimes more than one battery is used to power a circuit to increase the voltage. For example two 1.5 volt batteries can be used together to generate 3 volts. The rules are the same for circuits powered by a series of batteries as for those powered by a single battery.

How to prevent a short circuit.

There are three likely ways a short circuit can occur. The first is if the battery is inserted in the battery holder before the battery holder is incorporated into the circuit. In this case, the wires from the battery holder can touch and cause a short circuit. The second is if the circuit has not been assembled correctly and electrical energy flows from one battery terminal to the other without being properly connected to the components intended to use the energy. The third is if a piece of conductive material comes into contact with the circuit and allows the electricity to bypass parts of the circuit creating a direct route from one battery terminal to the other.

Conductive materials are materials that electricity can flow through. Most metals are conductive no matter what form they take. For example a metal foil food tray is just as conductive as a piece of wire. Most other materials such as wood, paper, plastic and stone are not conductive.

Keep other conductive materials away when building and do not use conductive materials for decorating or developing the models. Examples of conductive materials that pupils might find to use but should not be used are wire of various kinds and paper clips (apart from those supplied with the kit) paper fasteners and drawing pins, metal tins, foil packaging, aluminium foil, pipe cleaners, wire wool and any other items that may have a metal or conductive surface or coating.

If at any point a short circuit is suspected then disconnect the batteries immediately, allow components to cool and investigate. Be careful to store batteries safely so that they cannot short circuit when not in use.

Using the Workshop Pack

Discuss the safe use of batteries with your pupils explaining that, like many familiar things, they can be dangerous if misused. Teachers should remember to check circuits are assembled correctly before batteries are fitted, not to allow other conductive materials to be used when making powered models and to store and dispose of batteries safely. There are detailed instructions at the end of the model assembly instructions for the installation of batteries which must be followed.

Teachers should also check that models are assembled correctly and supervise their use. Axles, and other mechanical parts, should revolve freely so as not to slow the motor. Obstacles must not obstruct the motor and prevent the motor axle from turning when it is powered as this can cause the electrical components to become hot.

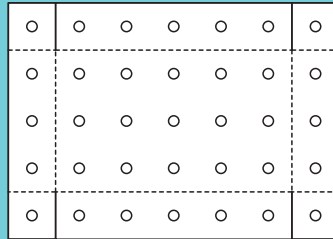
Building simple circuits and using batteries is part of the curriculum and an important learning experience. Building simple circuits and making powered models is an ideal way to demonstrate important topics in the science and technology curriculums and makes learning engaging, memorable and fun!

Make the Simple Vehicle

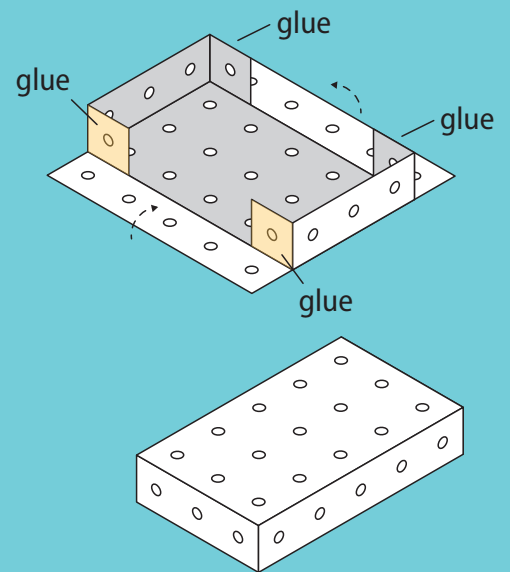


Before you start see
'Make with TechCard'
on our website.

1 Make the chassis.



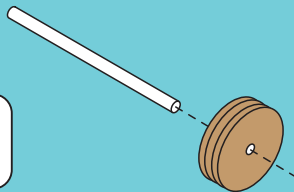
Fold and glue a TechCard
base to make the chassis.



2 Fit the pulley.

Cut a 100mm axle.

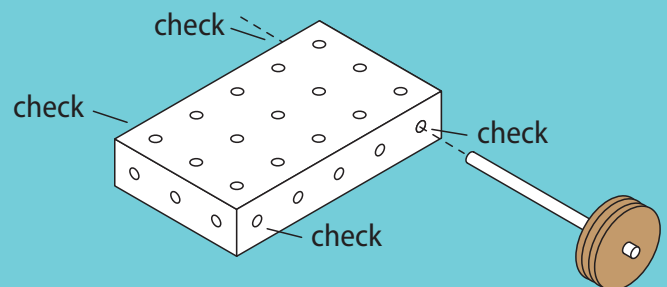
Pass the axle through
a 40mm pulley.



If the axle fit is too tight then sand the axle a
little. If the pulley is loose put a thin piece of
string through the pulley and then fit the axle.

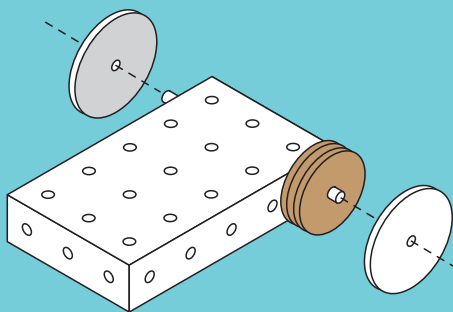
3 Fit the rear axle.

It's important to check the axles will turn
freely so widen the holes if needed.



Pass the axle through the
chassis where shown.

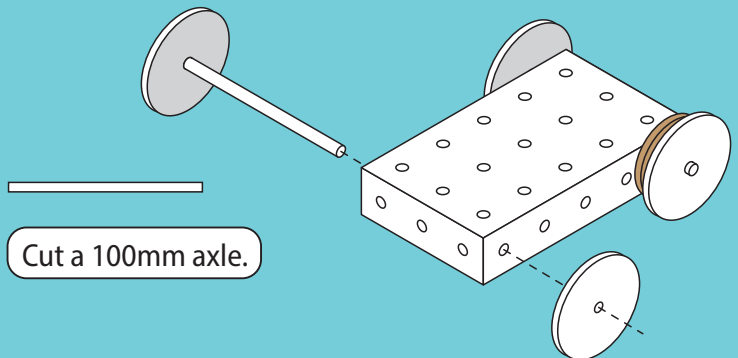
4 Fit the rear wheels.



Fit two 50mm wheels
to the rear axle.

5 Check the axles.

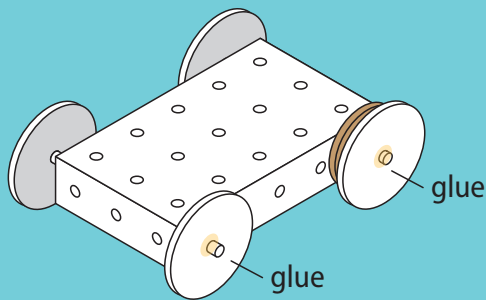
Cut a 100mm axle.



Fit a 50mm wheel to the end of the axle.
Pass the axle through the front of the
chassis and fit a second wheel.

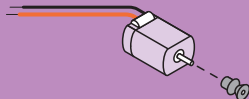
6 Glue the wheels.

Check there is a gap between the wheels and the chassis and axles turn easily.

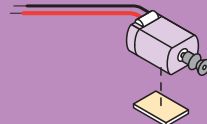


Check the wheels are straight and glue them to the axles.

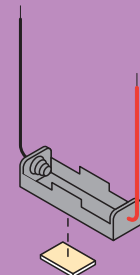
7 Prepare the motor and battery holder.



Fit the motor pulley onto the motor axle.

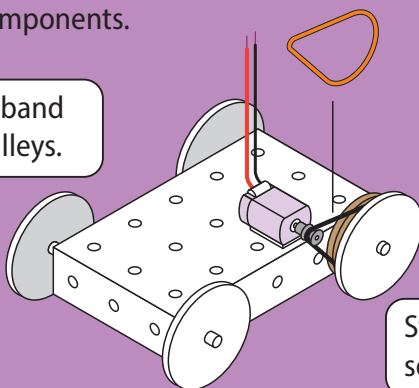


Fit a double sided foam pad under the motor and battery holder.

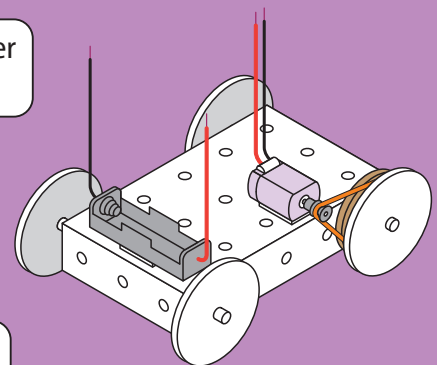


8 Fit the components.

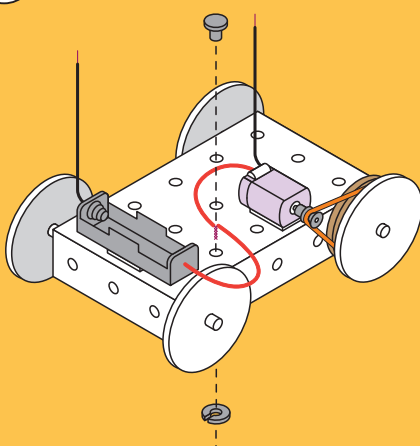
Fit the rubber band around the pulleys.



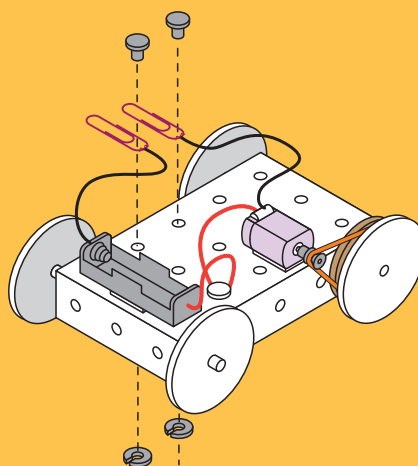
Stick the battery holder where shown.



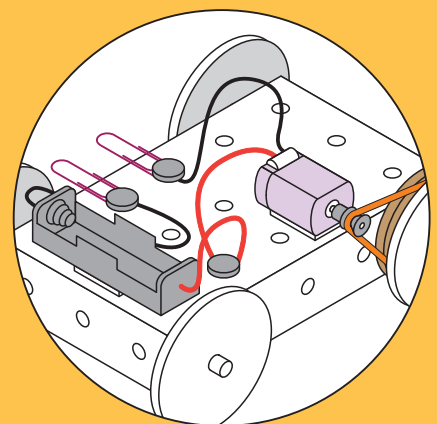
9 Connect the components.



Twist the ends of the two red wires together and use a rivet and collar to fix them to the chassis where shown.



Twist the ends of the black wires around two paper clips. Use a rivet and collar to fix them to the chassis where shown.



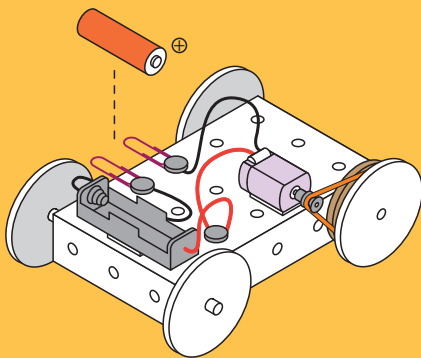
View of the completed circuit.

10

Important! Follow these instructions to install the battery.

1. Your teacher or supervising adult must check your model before fitting the battery.
2. Fit the battery under adult supervision.
3. Operate the model under adult supervision.
4. The model must be assembled as shown in the instructions.
5. Do not insert the battery until the model is complete.
6. Check the switch is in the 'off' position before inserting the battery.
7. Requires one 1.5 volt AA battery.
8. Make sure you insert the battery correctly checking the polarity of the battery is correct. The '+' symbol on the battery must align with the '+' symbol in the battery holder.
9. Make sure the supply terminals in the battery holder are not short circuited.
10. Remove the battery from the model when not in use.
11. Replace exhausted batteries right away to avoid damage.
12. Rechargeable batteries must be removed from the model before recharging.
13. Rechargeable batteries must be recharged under adult supervision.
14. Do not attempt to recharge non-rechargeable batteries.
15. Do not mix old and new batteries.
16. Do not mix alkaline, standard (carbon-zinc) and rechargeable (ni-Cd) batteries.

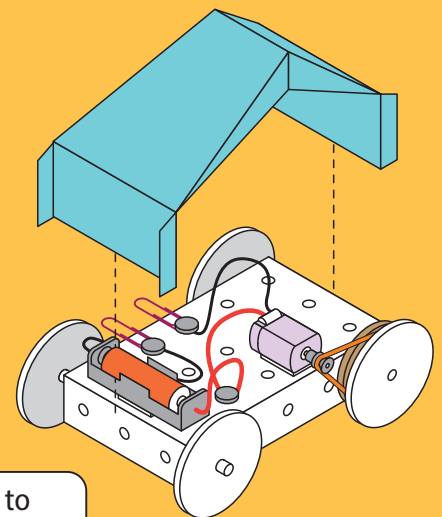
11 Fit the battery.



Fit the battery into the battery holder following the instructions above.

12 Fit the body.

Cut, fold and fit the body.



Use four paper clips to hold the body in place.

13 What happens when you race your car?

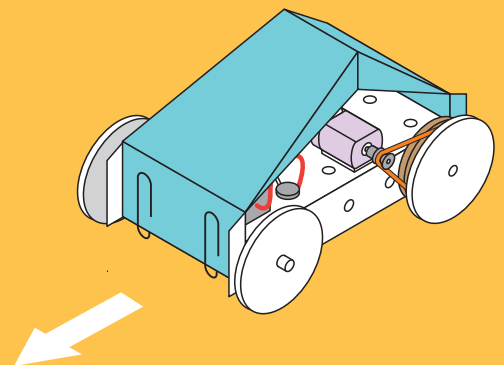
When you 'close' the switch, electricity flows in a 'circuit' from the battery, through the motor and back to the battery.

As the electricity flows through the motor it generates a 'magnetic field' in wire coils arranged around the motor axle.

The magnetic field in the wire coils is attracted to fixed magnets in the motor and this attraction causes the motor axle to spin.

The motor converts the electrical energy into a mechanical force.

Generating the magnetic field eventually uses up the electricity stored in the battery.



Race your car on a smooth surface.

Card Panels



Print and cut along the solid lines and fold the along dotted lines of the panels or design and make your own!

25mm
25mm