

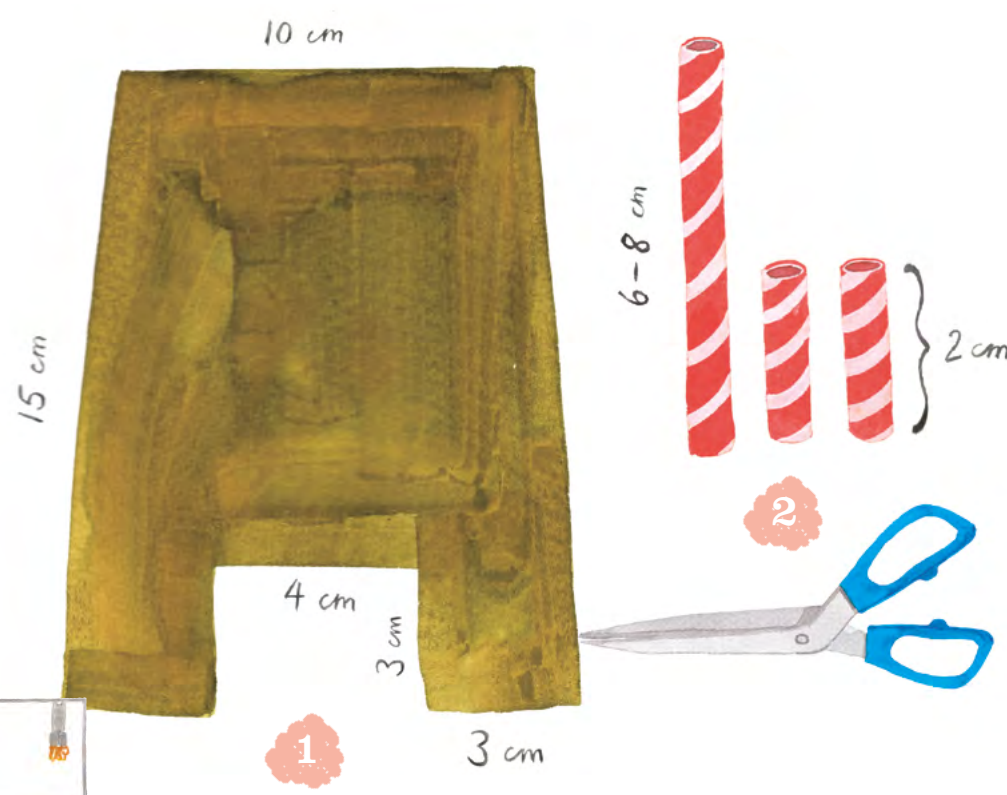
# RUBBER-BAND RACER

## PARTS REQUIRED

- \* Piece of stiff cardboard about 15 cm by 10 cm
- \* 2 wooden kebab skewers
- \* 1 drinking straw (kebab skewers must fit through)
- \* 4 round plastic milk-bottle lids or similar
- \* Sticky tape
- \* Scissors
- \* A lump of plasticine, or blu-tack, or a pencil eraser
- \* 2 small rubber bands to fit around bottle tops
- \* 1 long rubber band, at least 15 cm when cut open



Very few machines have changed the world as much as cars have. On the positive side, they made it much easier for people to travel long distances, and to transport things like food from one place to another. However, cars have also been responsible for producing a lot of pollution and contributing to climate change. Sadly, this rubber-band-powered car isn't the solution to more environmentally friendly transport, but it will provide you with a challenging build and lots of fun if you get it right!

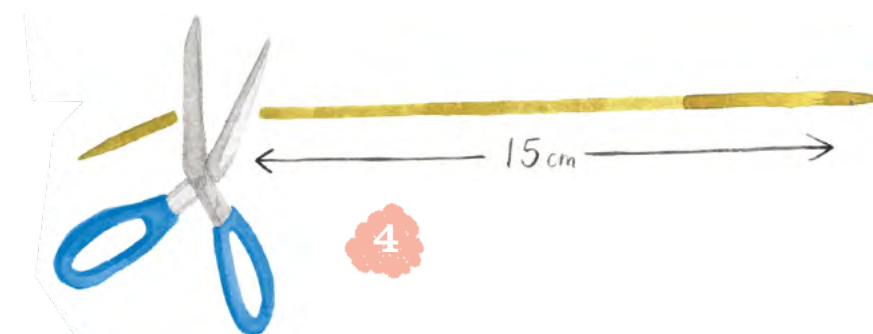


## METHOD

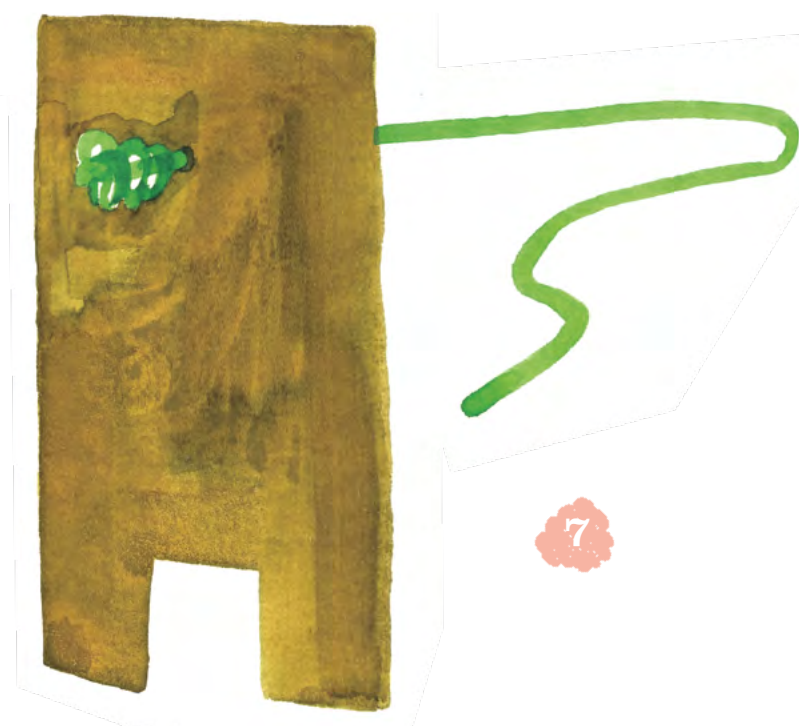
Follow the pictures to build a basic rubber-band-powered car.

**1** Cut a notch about 4 cm wide and 3 cm long in the middle of one end of your piece of cardboard, as shown.

**2** Cut your straw so that you have three little tubes, two of which are 2 cm long and one that is between 6 and 8 cm long.



Take care when using the kebab skewers, and follow the instructions carefully to minimise the risk of hurting yourself.



**3** Use sticky tape to attach the straws to the piece of card in the positions shown.

**4** Carefully cut or break your skewers so that they are 15 cm or so long, including the pointy end.

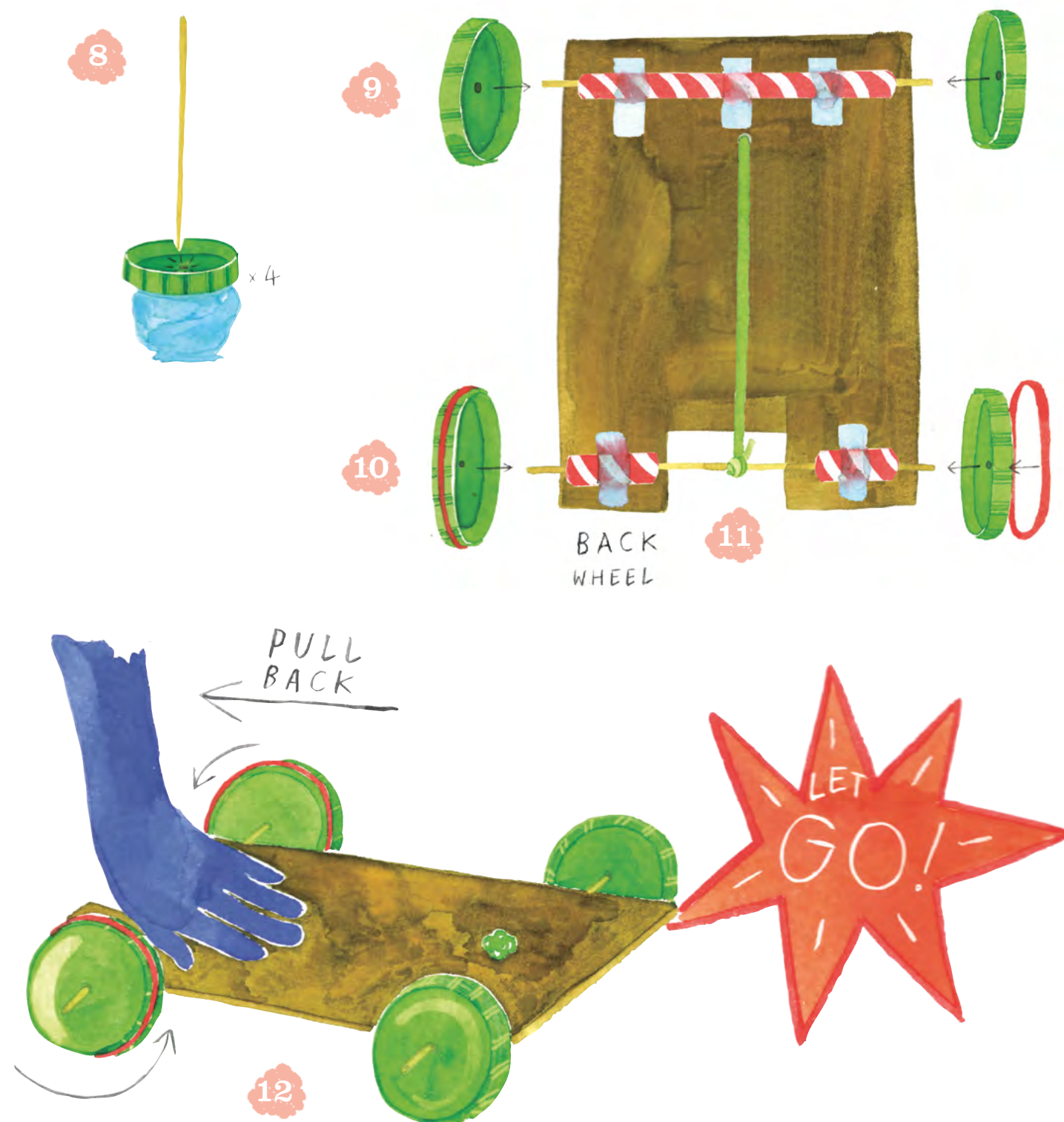
**5** Use a skewer to make a small hole in the card roughly in the position shown.

**6** Cut your long rubber band so that you have a long piece of rubber. This will be your 'motor'.

**7** Thread the rubber band through the hole in the card and tie a double or triple knot in it so that it can't be pulled back through the hole easily.

What could you change to make your car go further or faster?





**8** Place a bottle top on top of a lump of plasticine (or blu-tack or eraser) and pierce it using a kebab skewer. Repeat this for each bottle top.

**9** Pass the skewers through the straws and fix the wheels on the end.

**10** Put a rubber band round each of the back wheels.

**11** Tie the loose end of the long piece of rubber to the back skewer.

**12** Place your car on a smooth floor (not carpeted) and gently pull it back so that the rubber winds round the back axle of your car.

**13** Let go of your car!

What would happen if you used a **thicker** or **longer** rubber band for the 'motor'?

What would happen if you used **bigger** or **smaller** wheels?



*MR SHAHA says...*

When you pull the car back, the rubber band is stretched and stores energy. The more you stretch the rubber band, the more energy is stored. When you release the car, the rubber band unwinds and makes the back axle spin, driving the car forward. Scientists say that energy has been transferred from the elastic potential store of the rubber band to the kinetic energy store of the car.

The wheels at the back of the car spin very quickly when the rubber-band motor unwinds. The rubber bands around the back wheels help them to grip onto the surface the car is on. If you look carefully at what the wheels are doing, you'll see that they push backwards on the floor to make the car move forward.

This is an example of Newton's Third Law in action. The law says that forces always occur in pairs of equal size but



acting in opposite directions. So, if you push something, it will always push back on you with the same amount of force in the opposite direction. The effect of these forces is not always the same, because the forces act on different objects. So, when the car pushes the floor backwards, we don't see the floor move, but we do see the result of the car being pushed forward by the floor.

