

# MARBLE RUN

Designed by Coco,  
Design engineer at Dyson

## The brief

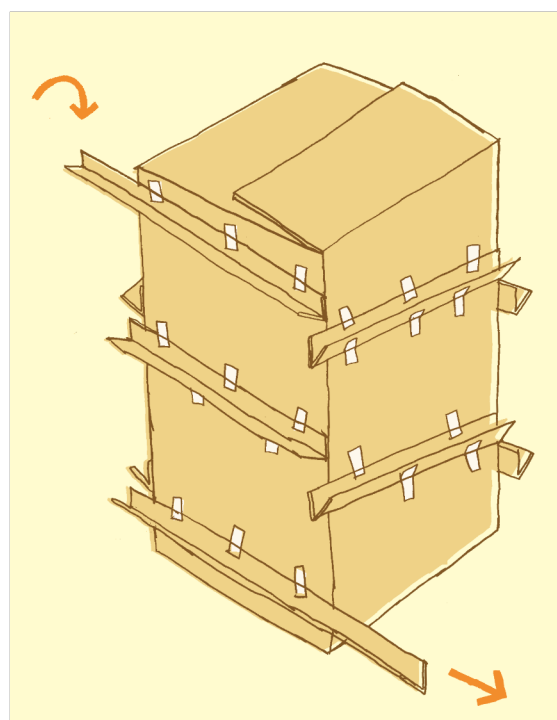
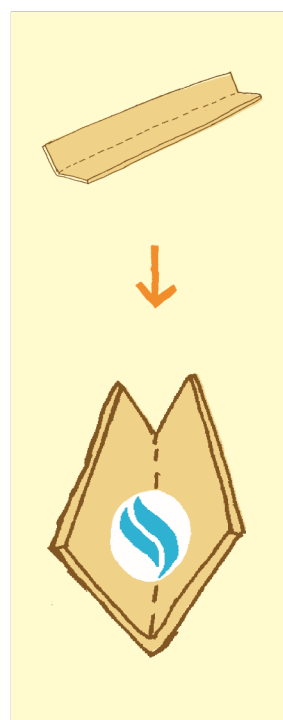
Use a cardboard box and cardboard struts to create a marble run. The marble must run for 60 seconds.

## The method

1. Use sticky tape to attach the cardboard struts to the cardboard box, creating a run for the marble.
2. Place the marble at the top of the run and time how long it takes for it to reach the bottom.
3. Keep improving your design until the marble takes exactly 60 seconds to reach the bottom.

## Top tip

If you can't find cardboard struts, make your own by folding four inch wide strips of cardboard in half to create a V shape.



## Materials

- Large cardboard box
  - Cardboard struts
  - Sticky tape
  - Marbles
  - Scissors
- (with adult supervision)

## How does it work?

To help you to control the time your marble takes to run its course you'll need to consider a few factors:

**Potential energy = mass x gravity x height**

The heavier your marble and higher your slope, the more energy your marble will have.

### Friction

The rougher or stickier the surface, the slower your marble will travel.

### Angle of the slope

The less steep the angle of the slope, the longer the marble will take to reach the bottom.

# STRONG AS A DRINKING STRAW

Designed by Phil,  
Design engineer at Dyson

## The brief

Use a drinking straw to pierce through a raw potato.

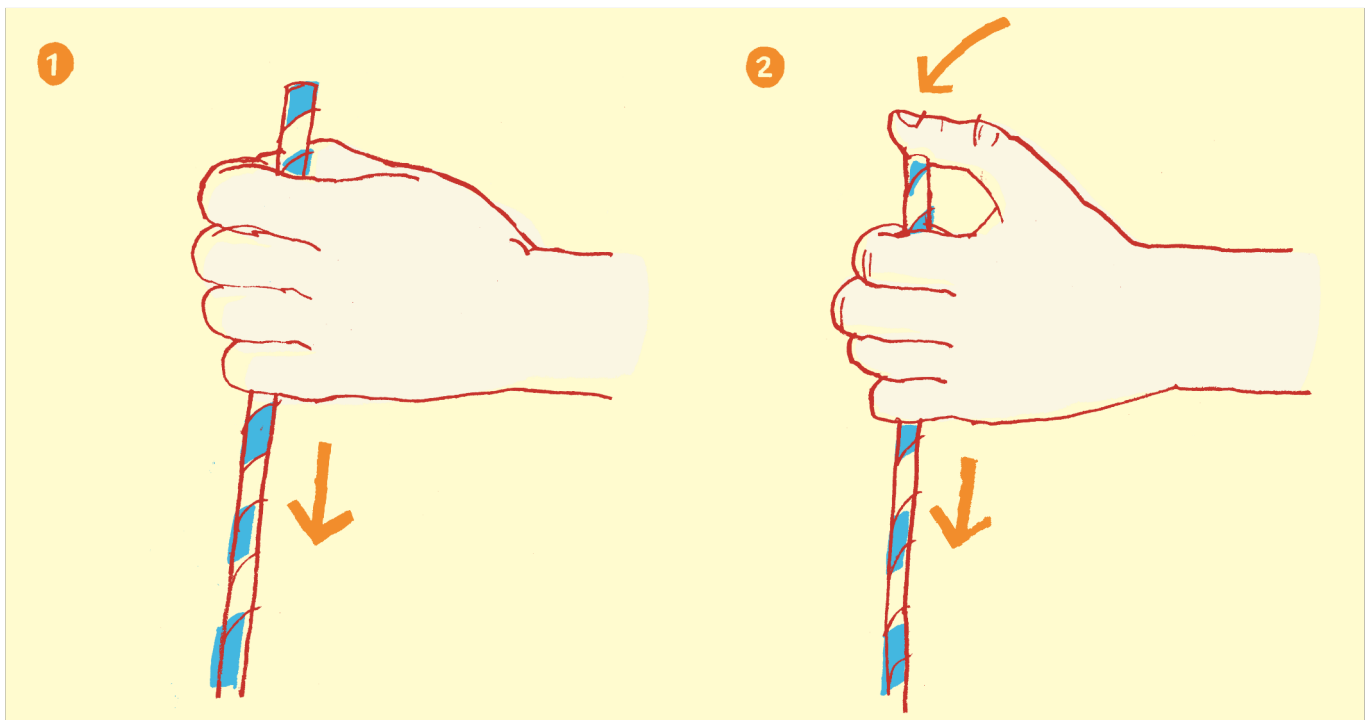
## Materials

Two stiff drinking straws

A firm, raw potato

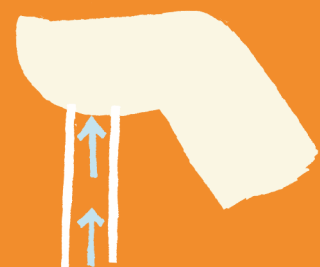
## The method

1. Hold the straw by its sides, without covering the hole at the top and try quickly stabbing the potato.
2. Repeat the experiment with a new straw but this time place your thumb over the top, covering the hole.



## How does it work?

Covering the top of the straw with your thumb traps air inside, forcing it to compress as you stab the straw through the potato skin. This creates enough rigidity within the straw to pierce the potato.



# BOAT POWERED BY A CHEMICAL REACTION

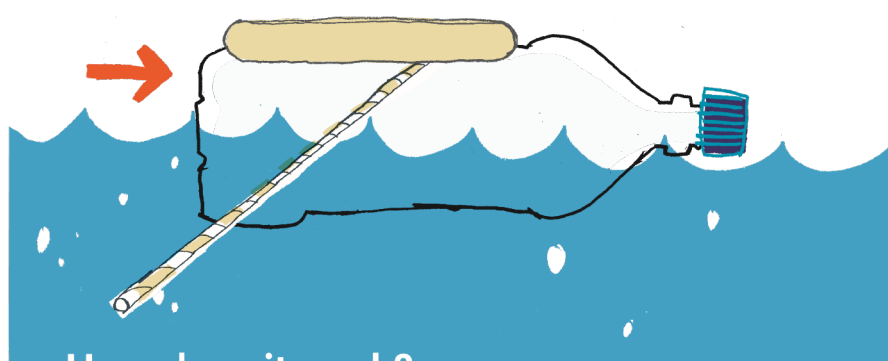
Designed by Rob,  
Engineering reliability  
manager at Dyson

## The brief

Build a boat powered by a chemical reaction.

## The method

1. Tape the cork and ice lolly sticks together to form a triangle.
2. Tape the triangle to the middle of one side of the bottle.
3. Make a hole in the end of the bottle, at the opposite side to the triangle, so it will sit below the water.
4. Push the drinking straw through the hole so the end inside the bottle touches the inside wall.
5. Pour in vinegar and add bicarbonate of soda. Screw the bottle top back on tightly.
6. With a thumb covering the end of the drinking straw, shake the bottle.
7. Once the reaction starts, drop the boat in the water and watch it propel forward.



## How does it work?

When the vinegar and bicarbonate of soda come into contact, a chemical reaction occurs and carbon dioxide is released. This causes pressure to build, gas to be forced down the straw and the boat to be propelled across the water.

## Materials

- Small plastic bottle
- Sticky tape
- A cork
- Two ice lolly sticks
- Scissors  
(with adult supervision)
- A drinking straw
- Vinegar
- Bicarbonate of soda
- Somewhere to sail it  
– such as a bath tub  
or sink

## Design icons



Rockets use a chemical reaction during lift off. Combining fuel and oxygen causes combustion and exhaust gases are released. These gases exit the engine nozzle at high speed and push the rocket skyward.