



Science and Engineering cards 5th March

How many of these
Challenges can
you complete?

Tweet or Upload to Teams and let us know how you
got on.



Good Luck!



CHALLENGE CARDS

40 engineering and science challenges
from the engineers at Dyson.

THE
JAMES
DYSON
FOUNDATION



Please note that the activities contained here in are intended for children
ages seven and above. Adult supervision is recommended for all projects.

TORNADO IN A BOTTLE



TORNADO IN A BOTTLE

Designed by Adam,
Design engineer at Dyson

The brief

Create a water vortex in a bottle.

The method

1. Fill the plastic bottle with water until it reaches around three quarters full.
2. Add a few drops of washing up liquid.
3. Sprinkle in a few pinches of glitter (this will make your tornado easier to see).
4. Put the cap on tightly.
5. Turn the bottle upside down and hold it by the neck. Quickly spin the bottle in a circular motion for a few seconds. Stop and look inside to see if you can see a mini tornado forming in the water. You might need to try it a few times before you get it working properly.

Materials

Water

A clear plastic bottle
(used clean bottles
are best)

Glitter

Washing up liquid



How does it work?

The water is rapidly spinning around the centre of the vortex due to centripetal force. This is an inward force directing an object or fluid such as water towards the centre of its circular path.

Did you know?

Vortices found in nature include tornadoes, hurricanes and waterspouts.



NON- NEWTONIAN FLUID



NON- NEWTONIAN FLUID

Designed by Rory,
Design engineer at Dyson

The brief

Create a liquid that turns into a solid when tapped.

The method

1. Add the corn starch to the bowl.
2. Add water slowly to the mixture, stirring in one tablespoon at a time, until all of the powder is wet.
3. Continue to add water until the corn starch acts like a liquid when you stir it slowly – but when you tap it with your finger it becomes hard.
4. Scoop the mixture into your hand and slowly work it into a ball.
5. As long as you keep pressure on it by rubbing it between your hands, it stays solid. Stop rubbing, and it melts into a puddle in your palm.



Materials

60g corn starch

60ml water

A spoon

A bowl for mixing

Design icons



Sir Isaac Newton described how 'normal' liquids or fluids behave. He observed that their viscosity only changes with variations in temperature or pressure. In non-Newtonian fluids their viscosity also depends on the force applied to the liquid.

How does it work?

When you mix cornflour with water, the large cornflour particles remain suspended in the liquid. When you stir the mixture slowly it acts like a liquid because the suspended particles have time to move past each other. When you put sudden stress on the mixture, the water quickly flows out of the area but the particles do not have enough time to move out of the way – making the mixture act like a solid.

CARDBOARD BOAT



CARDBOARD BOAT

Designed by Ben,
Design engineer at Dyson

The brief

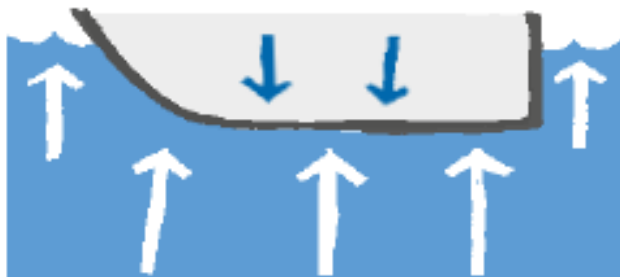
Construct a boat to support up to 250g without sinking.

The method

1. Draw out the basic shape of your boat on the cardboard, and cut it out.
2. Create walls for your boat from more cardboard.
3. Stick the bottom of the boat and the walls together with tape or glue.
4. Back everything with wax paper or foil – be careful not to leave any gaps where the water can get in.
5. Place the 250g weight in the boat.
6. Set your boat afloat.

Top tip

Think about stability. Some shapes are more stable than others when a load is applied.



How does it work?

When a boat is placed in water, it displaces an amount of water equal to the boat's weight – as long as the object is less dense than the water, it will float.

Materials

Cardboard

Wax paper

Tape or glue

Rubber bands

Foil

Scissors

(with adult supervision)

Craft knives

(with adult supervision)

A 250g weight

Design icons



The SS Great Britain was the first iron steamer to cross the Atlantic. Designed by Isambard Kingdom Brunel in 1845, it was the first ship to combine an iron body with a screw propeller.

CARDBOARD CHAIR



CARDBOARD CHAIR

Designed by Andy,
Design engineer at Dyson

The brief

Construct a chair that you can sit on using only cardboard. No glue, tape or other fixing materials allowed.

The method

1. Write down or sketch some ideas as to how you will construct the chair.
2. When you are planning, think about using cones, interlocking sheets, spirals, tubes – or even using strips of card like sewing thread.
3. Use the materials to create a chair made from cardboard.
4. If your first design doesn't work, evaluate what went wrong and try again.

Top tip

Think about structure.

Materials

Cardboard

Cutting equipment
(with adult supervision)

Rulers

Pencils



Examples of different structures:

