



## ACTIVITY 1 | SAILING BOAT



### STEM Learning Objectives:

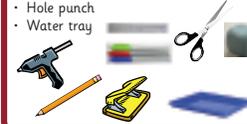
-  **Science:**  
Explore resistance in water by making and testing a boat.
-  **Technology:**  
Use a range of tools, equipment, materials and components.
-  **Engineering:**  
Understand the forces acting on a sailing boat.
-  **Maths:**  
Measuring and marking out.

### WHAT YOU NEED:

- Materials:**
- Polystyrene foam pizza disc
  - A4 coloured card
  - Plastic milk bottle lid
  - Wooden skewer
  - Decorations



- Tools:**
- Low melt glue gun
  - Ruler
  - Felt tip pens
  - Large scissors
  - Lump of poster tack
  - Pencil
  - Hole punch
  - Water tray



Can you spot any hazards? How can you reduce the risks?

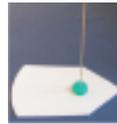
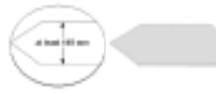
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### WHAT YOU DO:

1. Use the felt tip and ruler to draw a boat shape on your pizza disc. Make it as long as the disc and quite wide to help prevent the boat capsizing. Cut out the boat base.
2. Place the poster tack on the table and press a bottle lid onto it with the open side downwards. Press down with the pencil to make a small hole in the middle. Don't make the hole too big as it needs to be a tight fit on the skewer.
3. Take out the poster tack and glue the lid down towards the front of the boat base. Push the pointed end of the skewer down through the hole in the lid and into the base.
4. Cut the sheet of coloured card so that it is shorter than the skewer, and trim it to your preferred shape. You can decorate it with a felt tip pen. Punch a hole in the middle of the top and bottom, then slide the sail onto the skewer.
5. Place the boat in the water tray and blow into the sail to make it move across the water. You can customise your boat by adding a sailor, flag, decorations etc. You could try to help it move faster, for example by changing the shape of the base to make it more streamlined.



### STEM Explanation:

Gravity acts downwards on the boat, pulling it down onto the water.

The boat base is made from polystyrene foam pizza disc; this contains lots of little air pockets, making it buoyant so that it doesn't sink.

When you blow into the sail the boat moves across the water.

The resistance of the water (drag) slows the boat down.

If you make the boat more streamlined (e.g. by making the front pointed and rounding off the corners) this reduces the drag so the boat can go faster.



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**Draw and annotate your sailing boat here:**

**Explain two improvements you could make to your boat:**

# Egg Parachutes



## ACTIVITY 5 | EGG PARACHUTE



### STEM Learning Objectives:

-  **Science:**  
Explore falling objects and the effects of air resistance.
-  **Technology:**  
Engage in an iterative process of designing and making.
-  **Engineering:**  
Design, make, test and improve a product.
-  **Maths:**  
Measure time; compare duration of events.

### WHAT YOU NEED:

#### Materials:

- Large piece of thin material, e.g. broken umbrella with the spokes removed, bin bag, part of an old lightweight raincoat
- Plenty of packaging material, e.g. bubble wrap, packaging foam, cotton wool, egg box, yogurt pot, foam cup
- Thin string
- A hard boiled egg
- A raw egg



#### Tools:

- Scissors
- Transparent sticky tape
- Stopwatch



Can you spot any hazards? How can you reduce the risks?

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### WHAT YOU DO:

The aim is to construct a parachute to allow an egg to be dropped out of an upstairs window onto a hard surface without it breaking. Here are some suggestions:

1. Tie four or more strings near the corners or edges of the piece of thin material so that it will act as a parachute.
2. Use the hard boiled egg initially. Package it well, particularly underneath, to cushion the impact when it lands.
3. Attach the other end of the strings to the egg package or basket without getting the strings tangled up!

Ask an adult to hold the parachute by the middle, with the egg package hanging down, drop it out of an upstairs window onto hard ground (e.g. concrete). Time the descent of the egg and then check whether it has broken.

Modify and improve your design as required; for example you could make a larger parachute to slow the egg down more (time the descent to see if this has increased). You could change the number of strings or re-position them to improve your parachute, and/or use more packaging underneath the egg.

Once you are happy with your design, place the raw egg in the package instead of the hard boiled egg. Once it has descended, check whether the raw egg has broken.



### STEM Explanation:

The egg and parachute are pulled downwards by gravity.

As they move down the air pushes against them.

The parachute is relatively large; the air resistance gives rise to an upward pull, slowing down the descent of the egg.

The egg must be packaged well to absorb and cushion the impact when it hits the ground.

To prevent the egg from breaking, you can try increasing the air resistance, cushioning the egg better, or both.



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**Draw and annotate your parachute here:**

**What was the result of your first test?**

**Explain how you improved or refined your design:**