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1 HOUR

Paper boat challenge

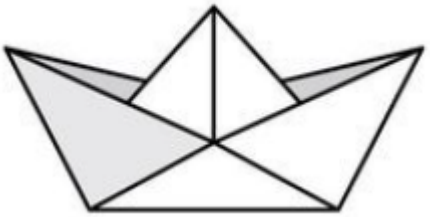
Materials

› A4 Paper

› Colouring pencils/pens

› Cling film/Tinfoil

› Sticky tape



Activity Overview

› This is a fun activity that focuses on the forces that act on a boat, and how boats are able to float when in water

› Do the activity below to help better understand these forces and put your artistic skills to the test!

Activity Plan

› Make a paper boat using the instructions below

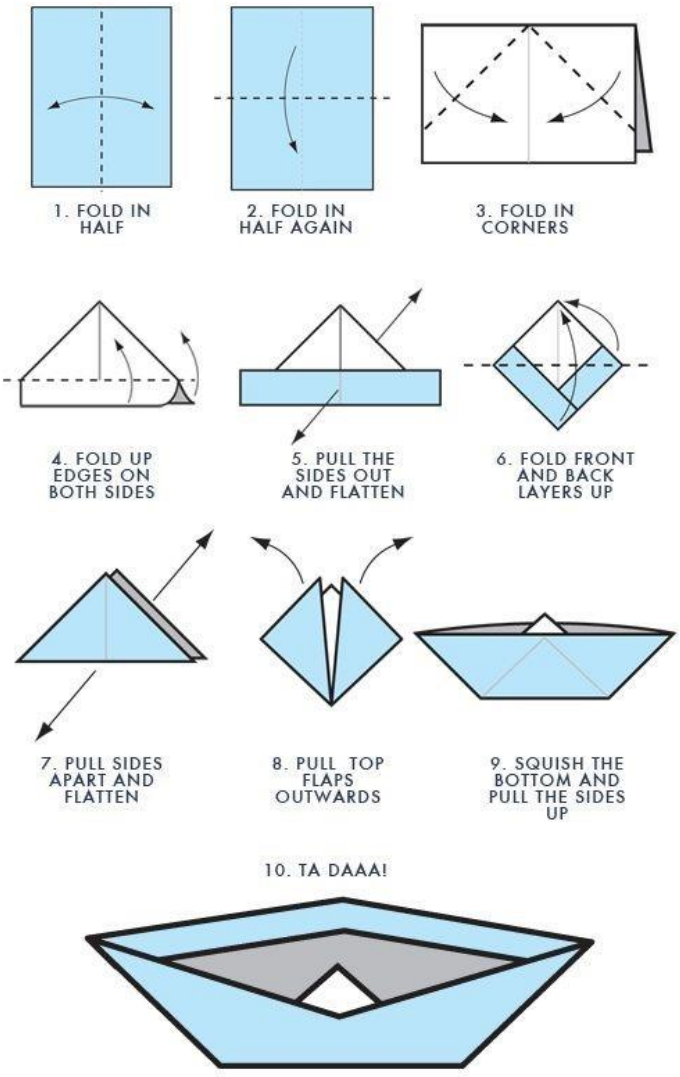
› Give your boat a name and a cool design

› Take a picture of your boat and share it with us using #BabcockSTEM

› Waterproof your boat using cling film, tinfoil and sticky tape

› Place your boat in water, checking to see that it floats. What forces act on the boat as you push it forward?

› Discuss why your boat floats on the water



Learning Objective

› Understand how buoyancy forces allow a boat to float on water

› Understand how density is important when designing a boat

› Observe the forces that act on a boat when it's in water

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Reflective Questions

› Why is the bottom of a boat narrow? Why does this help keep it afloat?

› What happens to your boat if you add more weight to it and why?

› What do Babcock engineers need to think about when designing boats? Think about weight, design, materials, and propulsion.

The importance of buoyancy and density in ship design

Our engineers need to make sure that the ships we design and manufacture are fit for purpose. So why are buoyancy and density so important in ship design?

When an object is placed in water, it pushes water aside. This is known as displacement. The amount of water displaced is equal to how much of the object is in the water. Boats are shaped in a way that displaces as much water as possible, so that the water being pushed aside weighs more than the ship. This means the boat is buoyant because it is lighter than the water displaced around it, allowing the boat to float.

This is where density plays an important part. Density refers to the mass of an object has relative to its volume. A good example of the importance of density is comparing a bowling ball to a football. Although they often have the same volume (are the same size), the football is hollow and filled with air, meaning it has less mass (is lighter) than the bowling ball. When you place them both in water, their volumes displace the same amount of water. But because the football has less mass than the water displaced around it, it will float. The bowling ball is heavier than the displaced water, so it will sink.

As we mentioned, ships are designed to displace a huge amount of water. Although ships are very big, they are mainly hollow inside so their volume is much greater than their mass (similar to a football). This means a ship is a lot lighter than the water displaced around it, allowing the ship to easily float.

Apart from buoyancy, what other forces act on a boat as it moves forward? As buoyancy forces push the boat upwards, gravitational forces will pull the boat downwards. Propulsion forces from ship engines will push the boat forward which is known as thrust. This is met by wind resistance and water friction, also known as drag.