

Clay Cargo Ship Activity Instructions



Cornish China clay is exported from Fowey Docks. Cargo ships transport Cornish clay all around the World. The clay is used in everything from toothpaste, medicines, paper, and china crockery; to rubber tyres, fertilisers, space shuttle tiles and plastics.

You must build a clay cargo ship!

You might need...

- 1 shallow tray, washing up bowl or sink, $\frac{1}{2}$ filled with water
- 1 food tub e.g. cream cheese, margarine or ice cream
- Other recycling items like yogurt pots, lids, cardboard etc
- Drinking straws, lolly sticks, twigs from the garden or barbecue skewers
- Insulating tape or sellotape, Blu Tac, elastic bands
- Sharp scissors
- Tin foil
- Wine bottle corks
- 1p or 2p coins - as many as possible!

What to do...

- Use your equipment to make a ship that can carry as heavy a cargo of 1p or 2p coins as possible.
- Top Tip: Use the tub or tray as the base to your ship. It is up to you to work out how to make your boat as good as possible at carrying a heavy cargo.
- Once your boat is finished, float it on the surface of the water in the tray or washing up bowl.
- Make a prediction, how many one penny pieces will your boat hold before it sinks?
- Steadily add one penny at a time, counting how many you can add before your boat sinks.
- Top Tip: It helps to distribute the pennies evenly across the ship.
- Record the number of pennies your boat was able to hold before it sunk.
- Can you improve the design? Or perhaps you can change the design to make it a Tall Ship with sails, as would have carried the clay from local ports in the 1800's.

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What is happening?

Key words: **Buoyancy, Water Displacement, Gravity, Force, Archimedes' Principle.**

Water pushes upwards with a force called 'upthrust'. You can feel upthrust if you try to push a light object such as a balloon under water. If the weight of an object placed on the water is equal to or less than the force of the upthrust then it floats. When something floats we say it is buoyant. The shape, design and construction of a boat determines its buoyancy and therefore the weight of cargo it can hold. If the weight of the boat is greater than the force of the upthrust then it sinks.

If the force of gravity on the boat is stronger than the force of the upthrust then the boat will sink.

Archimedes' Principle tells us if the mass of the water displaced is equal or more than the mass of the boat, the boat will float. Therefore, the more water that the boat displaces the better it will float and the more weight it can carry. Once the boat's mass is heavier than that of the displaced water then it will sink.

Other things to try:

- Modify your ship using the equipment available. Make a new prediction and then re-test your modified ship. Have your modifications improved the weight bearing capability of your ship? Record the type of modifications you made and the number of pennies your ship was able to hold before it sunk.
- Some of the objects you find are more buoyant than others. Find out which materials and objects are the most buoyant. Can you explain why?
- What design features make for the most effective cargo ship?
- Challenge yourself to make the most effective ship with the least amount of equipment/materials.

