# Overflow - Using water displacement to measure volume

## Why do this?

Why does the water level in your bath rise when you get in? This activity provides children with an opportunity to observe what happens when an object is immersed in water. It could also be used to learn that the volume of an object can be found using water displacement (recognised by Archimedes). The activity will enable your children to take accurate measurements and recordings and use a data set.

Curriculum links: *measuring, Archimedes, volume, water displacement*

## Suitability

Years 3-6

## Practical details

This activity has been prepared using CLEAPSS guidance. If in doubt, or for further information, contact CLEAPSS.

**Safety**

- Ensure any spillages are cleaned up when they occur.
- Ensure the children do not put the materials or liquid used in this activity near their mouths.

**Equipment per group of 3 children**

- 5 medium sized objects eg pears/potatoes
- 1 large container
- 1 school tray/washing up bowl
- Measuring cylinders (various sizes, see notes)
- Measuring jug/beaker with a spout for pouring
- Water
- Tongs
- Paper towels for spills

**Notes**

- Objects used to displace the water must sink into the water rather than float on top, otherwise the volume of water displaced will not relate to the volume of the object.
- Objects must be of similar size; pears and potatoes work well. Avoid apples as they tend to float.
- The large container should be big enough to fit approx. 5 objects. A measuring jug works well.
- 5 average sized pears will displace approximately 750 ml of water. One pear can displace approximately 150 ml (depending on size). Choose measuring cylinders that can measure large volumes.



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**Procedure**

1. Stand a large container in an empty bowl/school tray.
2. Fill the container with water to the very top.
3. Place an object in the water and watch carefully. Make sure the object is fully immersed, so that the maximum amount of water is displaced.
4. Using the tongs, take the object out of the water and put to one side.
5. Take the container out of the tray and put to one side.
6. Pour the overflowed (displaced) water from the tray into an empty jug and then pour the water into a measuring cylinder.
7. Record the volume of water.
8. To collect a full data set, repeat the procedure from steps 1-7 using 2, 3, 4 and 5 similar objects.

## Expected observations and results

When the object is placed in the water, some of it will overflow into the tray. If the activity is repeated with increasing numbers of objects, the volume of water overflowing (being displaced) will increase.

| Number of pears | Volume of water in mls |
|---|---|
| 1 | 152 |
| 2 | 308 |
| 3 | 450 |
| 4 | 610 |
| 5 | 744 |

## Possible further activities

- Use your recorded results to plot a graph or bar chart/histogram of the volumes of water displaced against the number of objects immersed in the water.
- Use your graph to estimate the volume of water that will be displaced if 10 pears/potatoes were used.
- Compare the amounts of water displaced when different sized objects are immersed.
- Measure the volume of water displaced by smaller objects by watching the water level in a measuring cylinder rise.
- Read Aesop's fable, The Crow and the Pitcher. Link the idea of water displacement that the children have observed to how the crow gets to drink the water using the stones.



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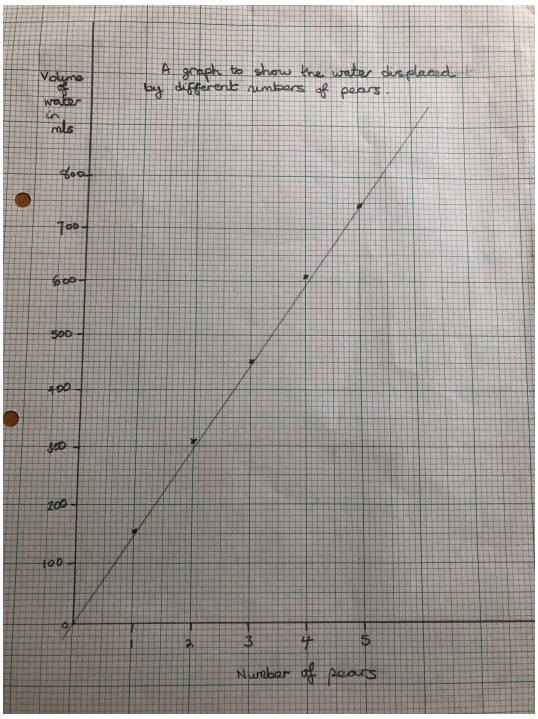


## Background notes

Archimedes was a famous mathematician and scientist from Ancient Greece. He recognised that the volume of the water that is displaced is equal to the volume of the object that makes it spill out. In this activity, the displaced water is the amount that overflows.

This activity is often used as a reliable way of finding out the volume of odd shaped objects (like fruit) that would otherwise be difficult to measure. 1 ml of water has the same volume as 1 $cm^3$ of water.

In order to calculate a more accurate volume of an object, it is better to use more than one object (providing they are of similar size) or to repeat the procedure as this allows for an average to be calculated.

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