Capacity Estimation Station

Level B. Select and use appropriate non-standard measuring units and instruments and discuss reasons for choice

In this activity pupils work on their skills of estimation and of refining estimations. There are three estimation challenges.

1.) Estimating how many unifix cubes will fill the cup,

2.) Estimating how many units will fill the cup

3.) Estimating how many straws will fill the cup

The following procedure could be used for each challenge:

Working in pairs explore the cup and create a 'pair-estimate'. Publish the pair-estimate on the estimates board. When pairs share their estimate, elicit from them how they came up with that estimate, what information or strategy was helpful?

The 'Pair-estimate' will encourage reasoning and discussion on what could be a logical estimate.

Possible Extension:

Working with a mug full of unifix cubes, a mug full of units and a mug full of rice, could you now estimate how much each cup contains?

Assessment

Teacher-child conference, Teacher Observation of estimates board, Teacher observation of reasoning, Self-reflection, Teacher Questioning

Mathematical Skills: Understanding & Recalling, Implementing, Applying & Problem-Solving, Communicating & Expressing, Integrating & Connecting, Reasoning

Splat 100 Square

[1] http://www.primarygames.co.uk/pg2/splat/splatsq100.html

The Toy Factory

Level B.2. Select and use appropriate non-standard measuring units and instruments and discuss reasons for choice

In this activity pupils are creating cylindrical containers using paper and tape to contain collections of items. Items such as cubes or bears could be used. This activity consolidates conservation. Pupils will need card, tape, scissors and bears (or cubes) for this activity. How many medium plastic bears/ blocks do you think this cylinder would hold exactly? Discuss what exactly means, that no more bears could fit into the cylinder. Some pupils may suggest putting a 'MAX' line on the cylinder. Count the bears one by one into the cylinder and compare the measurement with their estimations. Agree where to place the MAX line. Explain to pupils that they are toy manufacturers and that they sell bears in packages of five. Their task is to design and make a paper cylinder that holds exactly five bears. *Discuss the models pupils create.*

Does your cylinder fit exactly 5 bears? Can you fit any more in? Does how you arrange the bears affect the amount of space they take up? What do you notice about the cylinders that others made? What design might you put on the cylinder you created?

Possible Extension: Create a second cylinder that can also hold five bears, but looks different

Teacher Observation, Maths Journal, Teacher Questioning, Self-reflection

Assessment

Mathematical Skills: Understanding & Recalling, Implementing, Applying & Problem-Solving, Communicating & Expressing, Integrating & Connecting, Reasoning

Oh Harry!

Level C.3. Rename units of capacity in l and ml and in decimal and fraction form

This problem is a way of practising reading scales in a challenging context. The challenge comes from the reasoning involved.

A group of eight children in 6th class were measuring water using measuring cylinders. They coloured the water to make reading the scales easier. They lined up the cylinders in two neat rows, each labelled with a child's name and the amount they had measured out. Then Harry opened the window and the wind blew most of the labels onto the floor! "Oh! Harry!" they all wailed. Can you relabel the cylinders for them?

Use these clues to help:

Ahmed had measured out just a thousand millilitres and Belinda twice as much as Ahmed. Grace had measured out three-quarters of the amount that Belinda had done and Freddie had half the amount that Ahmed had measured out. Which were their cylinders? Callum had coloured his water blue. How much did he measure out? Ellie had coloured her water pink and Dan coloured his orange. How much did they measure out?

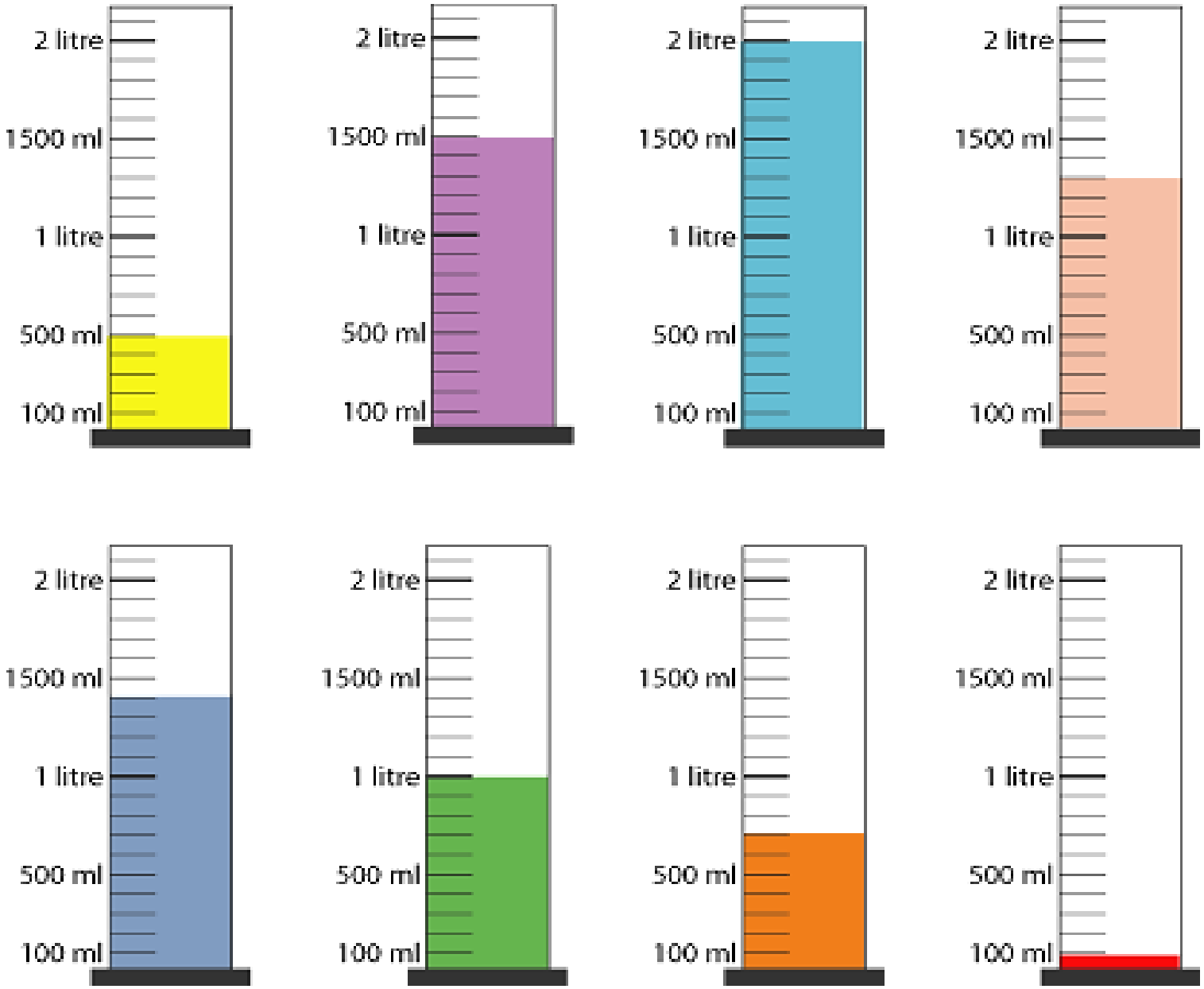
Possible Extension: Using the picture of the cylinders to make up your own questions.

Teacher Observation, Teacher Questioning, Conferencing, Samples of pupils' work

Mathematical Skills: Understanding & Recalling, Implementing, Applying & Problem-Solving, Communicating & Expressing, Integrating & Connecting, Reasoning

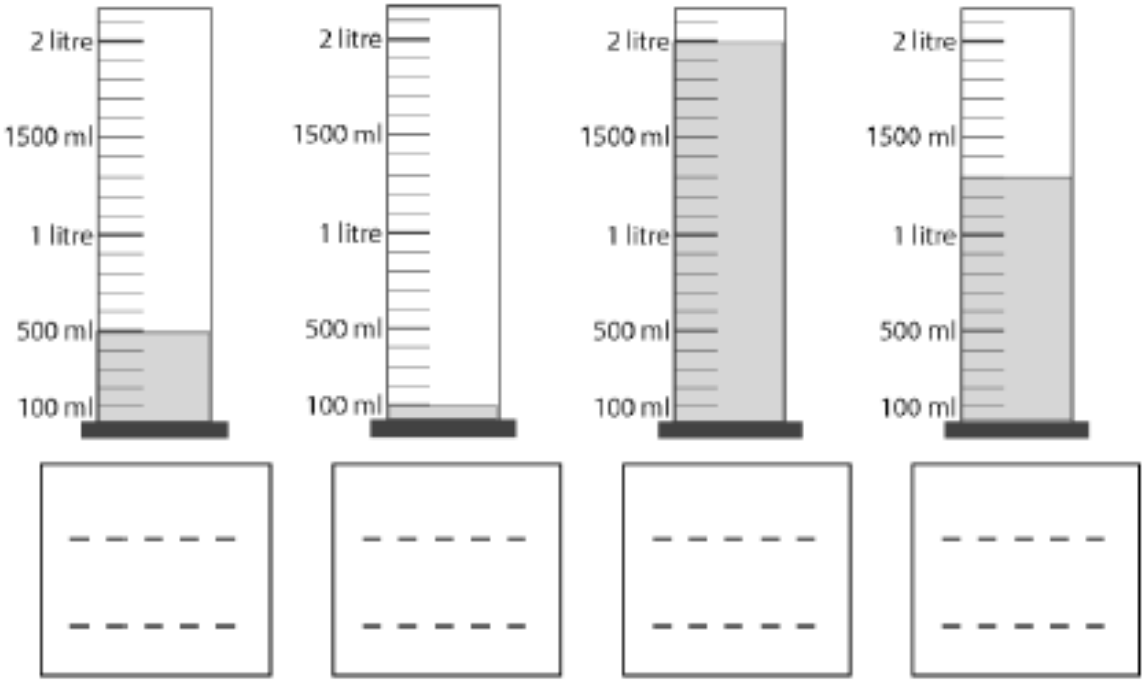
Oh Harry! Clue Sheet

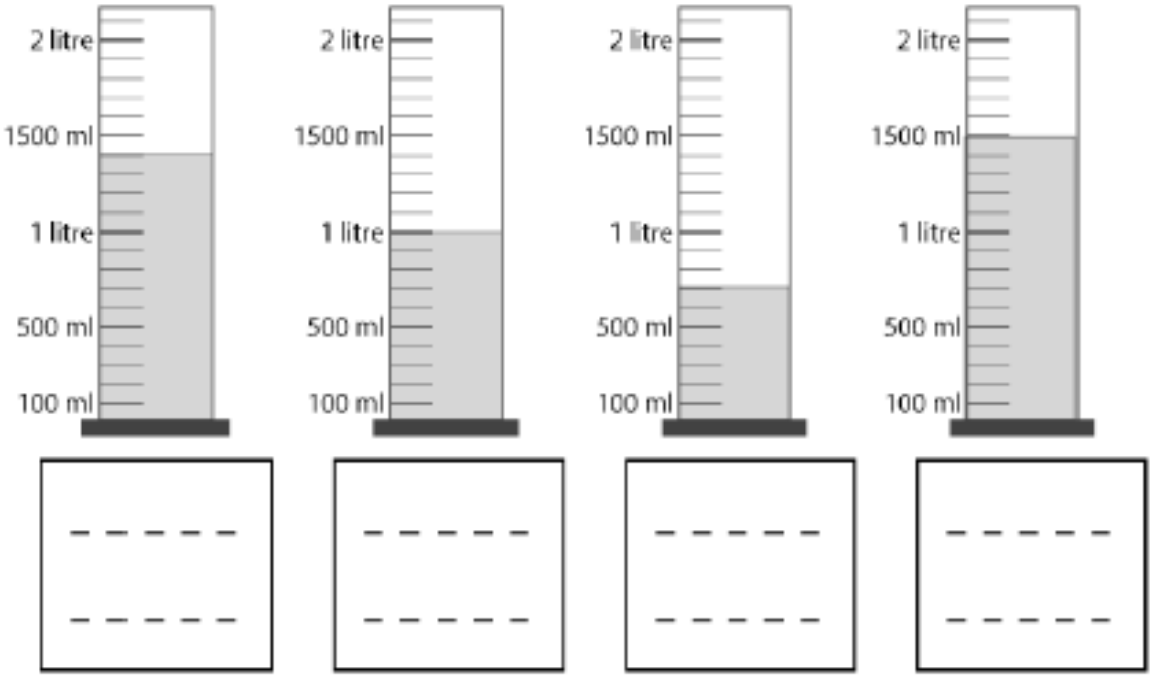
[1] http://nrich.maths.org/5979/note


2 litre
1500 ml
1 litre
500 ml
100 ml

Sample template for pupils to record their work

Oh! Harry!

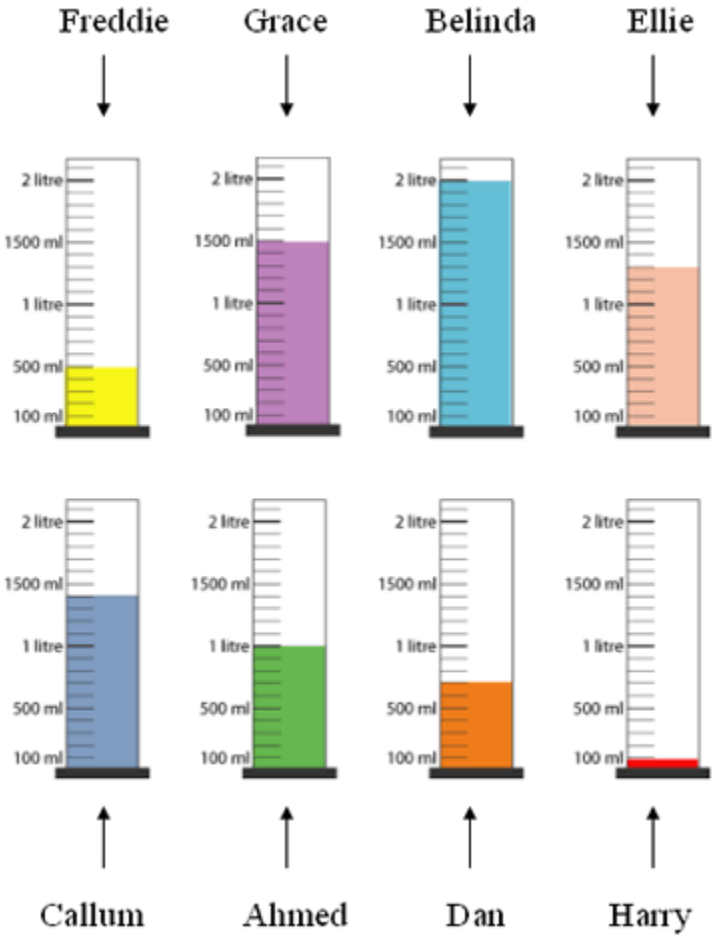




Cut out these name cards

Freddie	Grace	Belinda	Ellie
Callum	Ahmed	Dan	Harry

Solution

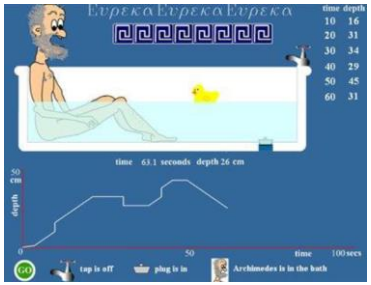


Bathtime Story

adapted from: maths eyes

Maths Science

Level D.1 Estimate, compare, measure **&** record capacity using appropriate metric units **and** select suitable instruments of measurement



This activity uses the story of somebody's bath to introduce the graphs of the maths world. To begin pupils could share their own bathtime stories, through guided discussion elicit from pupils the factors that cause the depth of water to change. The interactive link can provide a way to enable pupils visualise this. Build a picture of what happens during a typical bathtime using a trend graph. Record the graph on the whiteboard.

As the water rises what happens the graph? Does the graph change when the person gets in? Would the power of the taps make a difference? When the plug is taken out what happens the slope of the graph? Why do you think the line has different colors on Patrick's bath? Are there possible alternative explanations for the different parts of the graph? What explanations has your partner?

In pairs look at Patrick's Bath Story and create a story for Patrick's Bath.
Share stories created. Compose a question for an alternative story to yours.

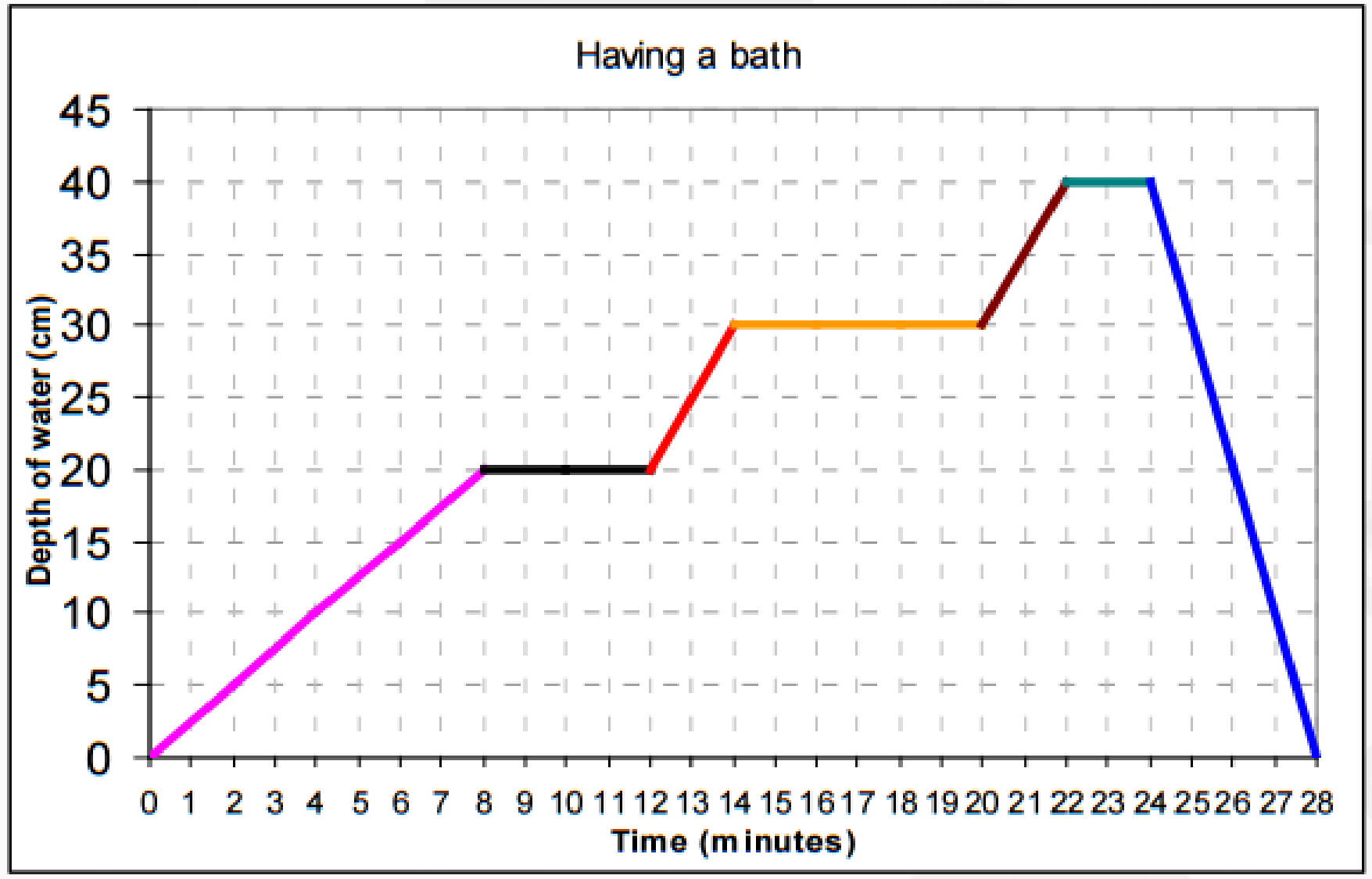
Concept Map on Bathtime Teacher Observation, Pupil Learning Log, Teacher Questioning,

Mathematical Skills: Understanding & Recalling, Implementing, Applying & Problem-Solving, Communicating & Expressing, Integrating & Connecting, Reasoning

Archimedes Bathtub Activity

[1] http://www.colmanweb.co.uk/Assets/SWF/Archimedes.swf

Patrick's Bath



The Two Jug Puzzle

Level D.2 Rename units of capacity in litres and millilitres and decimal or fraction form

You have two jugs. One jug has a capacity of 5 litres and the other jug has a capacity of 3 litres.
Neither of the jugs has any markings.
You have an unlimited supply of water.

Can you measure exactly 4 litres using the jugs?

Could you draw a picture to help with this puzzle? Is there more than one way to solve the puzzle? In order to get 4 litres of water, how much water did you waste? How many refills from the tap, of the jugs, were involved in your solution? Can you convince a friend of your solution? Can you convince a sceptic? Could you create a new water problem using the 3 litre and 5 litre jug?

Possible Extension: Given a 7 litre and a 3 litre jug, obtain exactly 5 litres. Given an 9 minute egg timer and a 5 minute egg timer. Show how to boil a 13 minute egg. Show how to boil an egg for any number of minutes.

Teacher Observation, Maths Journal, Conferencing, Teacher Questioning

Mathematical Skills: Understanding & Recalling, Implementing, Applying & Problem-Solving, Communicating & Expressing, Integrating & Connecting, Reasoning[1]

Decanting Puzzle/ Two-Jar Puzzle Interactive

[1] https://www.mathsisfun.com/games/jugs-puzzle.html

Possible Solutions

1. Fill up the 5 litre jug 2. Fill up the 3 litre jug using the water from the 5 litre jug (leaving 2 litres in the 5 litre jug) 3. Empty out the 3 litre jug 4. Transfer the 2 litres from the 5 litre jug into the 3 litre jug 5. Fill up the 5 litre jug 6. Transfer water from the 5 litre jug until the 3 litre jug is full. Since the 3 litre jug already had 2 litres of water, there is room for just 1 litre. 7. The amount of water in the 5 litre jug is 4 litres	1. Fill up the 3 litre jug 2. Transfer to the 5 litre jug 3. Fill up the 3 litre jug again 4. Transfer water to fill up the 5 litre jug, leaving 1 litre in the 3 litre jug 5. Empty out the 5 litre jug 6. Transfer the 1 litre to the 5 litre jug 7. Fill up the 3 litre jug and transfer that to the 5 litre jug 8. The 5 litre jug contains 4 litres of water